Victorian Health Building Authority

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Victorian Health Building Authority Digital Engineering Framework Project Information Requirements

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Glossary of Terms

Terminology relating to Building Information Modelling and Digital Engineering is in line with the terms used in the relevant national and international standards.

Note: '(AS)' denotes a term from AS ISO 19650 series of standards.

Table 1: Terms and definitions

Term	Abbreviation	Definition
Appointed Party (AS)	-	A provider of information for the project, including services and typically working under a **lead appointed party** such as an Architect or Managing Contractor.
Appointing Party (AS)	-	VHBA is the Appointing Party (the Principal). The term VHBA or Appointing Party is used throughout documentation to reflect this.
As-Built	-	Refers to a set of drawings, documentation or models that represent the final specifications and conditions of a construction project as it was actually constructed.
Asset	-	Defined as an 'item, thing or entity that has potential or actual value to an organisation'. Assets can be tangible or intangible through physical and non-physical (digital) assets. Data and information should be considered digital asset. For the purposes of the VHBA DE Framework, an asset is defined as an item contained in the **asset equipment list**.
Asset equipment list	-	List of items deemed as an asset within the VHBA DE Framework requiring specific information in line accordance with the AIR.
Asset Information Model (AS)	AIM	Information model, including geometrical and non-geometrical information and documentation used for the operational phase of the asset.
Asset information management system	AIMS	The system that supports organisations to meet relevant asset or facilities management requirements.
Asset information requirements (AS)	AIR	Information requirements in relation to the operation of the asset.
Australasian Health Facility Guidelines	AusHFG	A significant body of available intellectual property, contained within practical resources suitable for application to all Australian and New Zealand jurisdictions.
Building Information Modelling (AS)	BIM	The use of a shared digital representation of a built asset to facilitate design, construction and operation processes to form a reliable basis for decisions.
Building Information Models	BIM (or BIMs)	All models that any contributing party (or its subcontractors) is required to produce and deliver in line with the DEMP and PIR.
Building Management System	BMS	A control system that monitors and manages the mechanical, electrical, and electromechanical services in a building, such as ventilation, lighting, power systems, fire systems, and security systems.

Term	Abbreviation	Definition
Combined team	-	The Appointing Party, the Lead Appointed Party and their Appointed Parties. **Includes** VHBA. For example, the complete team. **Note:** the use of the term '**combined team**' in the VHBA DE Framework is the equivalent of 'project team' in the AS ISO 19650 series of Standards and VDAS.
Common data environment (AS)	CDE	An agreed source of information for any given project used to collect, manage and disseminate project information for multi-disciplinary teams in a managed process.
Computer aided design or drafting	CAD	Means any computer aided design or drafting that any contributing party (or its subcontractors) is required to produce and deliver in line with the DEMP and PIR.
Construction digital engineering management plan	Construction DEMP	A detailed plan, created from the VHBA Template, which documents the use of DE on a project. It outlines who is responsible for what in the construction process, when in the process they are responsible for it, and how they will execute VHBA requirements as specified in the PIR.
Computerised maintenance management system	CMMS	A system that contains a computer database of information about an organization's maintenance operations.
Cost breakdown structure	CBS	A hierarchical representation of the costs associated with a project, aligned to the work breakdown structure, to organize, categorize, and break down the total project cost into smaller, manageable components.
Design digital engineering management plan	Design DEMP	A detailed plan, created from the VHBA template, which documents the use of DE on a project. It outlines: • who is responsible for what in the design DE process • when in the process they are responsible for it • how they will execute VHBA requirements as specified in the PIR.
Digital engineering	DE	The process of using digital tools to develop information and data-rich deliverables when designing and constructing assets (for example, BIM, GIS, CAD, project controls, cost, time).
Digital engineering management plan template	DEMP	The standard VDAS digital engineering management plan template to be used by project teams. Refers to design DEMP and construction DEMP, which may be combined depending on procurement.
Exchange information requirements (AS)	EIR	VHBA requirements to enable the exchange of information between parties and from the PIM to the AIM. For VHBA, the EIR is combined with the PIR to reduce the number of documents needed to specify DE.
Environmental sustainable design	ESD	Design of buildings, products, or processes that are environmentally responsible and resource-efficient throughout their lifecycle.

Term	Abbreviation	Definition
Facility maintenance management system	FMMS	It is a type of system used to manage and streamline the maintenance activities within a facility.
Federated model	-	An assembly of curated discipline or trade BIMs combined for uses such as coordination, collaboration and exchange with the appointing party.
Furniture, fixtures and equipment	FF&E	All movable or easily removed objects in a building or space.
Geographic information systems	GIS	A computer system designed to capture, store, manipulate, analyse, manage and present all types of geographical data.
Health services	HS	A registered funded agency, multi-purpose service or health service establishment, or any other person, body or organisation that provides, delivers, funds, facilitates access or provides insurance in relation to health services, or as defined in the *Health Services Act 1988* (Vic). **Note**: the VHBA health services definition is in line with the definition in the Health Services Act 1988.
High value high risk framework	HVHR	A series of project assurance checks and processes for projects to increase the likelihood that they will achieve their stated benefits and be delivered successfully, on time and to budget. **Note:** This is in line with the definition in the Victorian Department of Treasury and Finance HVHR Framework.
Project Profile Model	PPM	Victorian Department of Treasury and Finance's risk-based assessment tool used to determine whether a project should be subject to the HVHR project assurance framework.
Industry Foundation Classes	.ifc	ISO 16739-1 – Open BIM file format that can be exported and imported by the majority of BIM authoring tools. Accommodates VHBA attributes in .ifc elements (within geometry) using custom property sets.
Key decision point (or points) (AS)	-	A point in time during the project lifecycle when a business decision crucial to the direction or viability of the asset is made. This can be made using information created by the project team.
Lead appointed party (AS)	-	An external party appointed by VHBA with sub-consultants or subcontractors. This role may change depending on the procurement method. For example, transfer from the architect (design) to the contractor (construction).

Term	Abbreviation	Definition
Level of development	LOD	The degree to which: • an element's geometry and attached information have been progressed, and • project team members may rely on the information when using the model. VHBA does not specify the LOD. However, if the project team wishes to use LOD, the 2021 US BIM forum specification shall be used as a guiding principle.
Level of information	LOI	A way of describing specific information or asset data associated with the individual objects within the BIMs, and when it is to be exchanged
Level of information need (AS)	-	Framework which defines the extent and granularity of information, described by different concepts: • geometrical information • alphanumerical information, and • documentation (BS EN 17412-1). More granular than LOD and LOI.
Laser scanning	-	The process of capturing digital information about the shape of an object with equipment that uses a laser to measure the distance between itself and the object. The resulting output is a point cloud.
Massing model	-	An early volumetric model useful for understanding bulk and scale, areas of floor plates and departmental layouts and adjacencies.
Model element	-	An individual component in a BIM. For example, wall, floor, nurse call device, room, diffuser or column.
Model element author	MEA	A person responsible for creating an element (object) in the BIM environment.
openBIM	-	A universal approach to the collaborative design, realisation and operation of buildings based on open standards and workflows. Typically uses Industry Foundation Classes (ISO 16739 1) format.
Photogrammetry	-	The process of extracting 3D information from photos or video to convert to digital models or point clouds.
Principal's project requirements	PPR	VHBA requirements for a specific project.
Project digital engineering lead	Project DE Lead	A lead appointed party-provided (consultant or contractor) resource to manage the digital engineering and asset information creation processes on the project.
Project information model (AS)	PIM	The information model relating to the delivery phase. The PIM consists of documentation, non-geometric (alphanumerical) information and geometric information of the project.

Term	Abbreviation	Definition
Project information requirements (AS)	PIR	VHBA project information requirements and exchange processes to enable the creation and management of the PIM to support the ongoing AIM (this document).
Project manager	PM	A VHBA-assigned resource to ensure the project team complies with the PIR and DEMP, enabling the creation of the PIM and AIM. The project manager is responsible for managing project scope, time, cost, quality, resources, communications and risk.
Project management framework	PMF	VHBA's internal guide and primary reference document for all VHBA teams managing projects.
Project profile model	PPM	Victorian Department of Treasury and Finance's risk based assessment tool used to determine whether a project should be subject to the HVHR project assurance framework.
Project team	-	The lead appointed party and their appointed parties. **Excludes** the appointing party (VHBA). **Note**: the use of the term 'project team' in the VHBA DE Framework differs from its typical use in the AS ISO 19650 series of Standards and VDAS (where it is referred to as 'delivery team').
Quantity surveyor	QS	An appointed party that specialises in managing and controlling costs and contracts related to construction projects.
Responsible, accountable, consulted, informed matrix	RACI	The RACI matrix is a model that describes the participation by various roles in completing tasks or deliverables for a project.
Room data sheets	RDS	Detailed documents that provide specific information about the design, equipment and functional requirements of each room or space in a hospital.
Room layout sheets	RLS	Detailed architectural drawings that provide the specific layout and arrangement of a hospital room or space.
Schedule of accommodation	SoA	A document listing accommodation facilities and provisions considering the operational, spatial and locational requirements of the health facility.
Total construction cost	TCC	Sum of all the costs associated with building the structure, including the cost of materials, labour, and overhead.
Virtual buildings information system	VBIS	An asset classification system to provide standardisation for asset classification and data linking.
Victorian Digital Asset Policy	VDAP	The Digital Asset Policy sets the minimum actionable digital practices and standards to improve productivity for project delivery. [1]

1 Victorian Government's Digital Asset Policy web page <https://www.vic.gov.au/digital-asset-policy>

Term	Abbreviation	Definition
Victorian Digital Asset Strategy	VDAS	The Victorian Digital Asset Strategy sets out a whole-of- Victorian-Government strategy for digitising construction.[2]
Victorian Health Building Authority	VHBA	The **Appointing Party**.
VHBA delivery team	-	A VHBA term for their internal project delivery team. May include VHBA Project Director, Technical Director or Project Manager. **Note**: the use of 'delivery team' in the VHBA DE Framework differs from its typical use in the AS ISO 19650 series of Standards and VDAS.
VHBA digital engineering lead	VHBA DE Lead	An appointing party resource (Technical Advisory Services – Digital Engineering) provided to manage the digital engineering and asset information creation processes within the organisation. **Note**: VDAS equivalent is 'VDAS Champion'.
VHBA digital engineering project champion	VHBA DE Project Champion	An appointing party (VHBA) resource provided to manage the information management functional role on the appointing party's side of the project. Note: VDAS equivalent is 'DE Project Champion'.
Victorian Infrastructure Delivery Authority	VIDA	The Victorian Infrastructure Delivery Authority delivers the state's transport and health infrastructure programs. VHBA is a project office under VIDA.

2 Victorian Government's Victorian Digital Asset Strategy web page <https://www.vic.gov.au/victorian-digital-asset-strategy>

1. Introduction

A key element of VHBA's Digital Build & Data Strategy, The Digital Engineering (DE) Framework is VHBA's structured approach to using emerging technologies to improve the design and construction of our health infrastructure. Aligned with the Victorian Digital Asset Policy (VDAP), it provides a consistent, scalable and reusable methodology for data creation, sharing, and management across the project life cycle.

Founded on VDAS, the *Victorian Digital Asset Policy*[3] (VDAP) was released to support the Victorian Government in delivering unprecedented levels of new infrastructure by uplifting the capability of Victorian departments and agencies. The VDAP provides clear digital requirements for departments and agencies to support the planning, design, and construction of Victorian Government projects and assets. This includes the design, delivery, and asset management of:

- all new major construction projects
- those involving significant alterations, extensions, renovations, and repurposing of existing assets.

The Victorian Health Building Authority's (VHBA) *Digital Engineering Framework* (DE Framework) consists of project information requirements (PIR) that inform the structure of digital engineering management plans (DEMP), which the supply chain updates to provide information about how they intend to meet VHBA's information requirements.

> Digital engineering (DE) is a fundamental component of a digital asset approach.

DE aims to create an efficient flow of information across the lifecycle of an asset. It is supported by a common data environment (CDE) aligning digital information systems including:

- building information modelling (BIM)
- computer aided design (CAD)
- geographic information systems (GIS)
- other related systems.

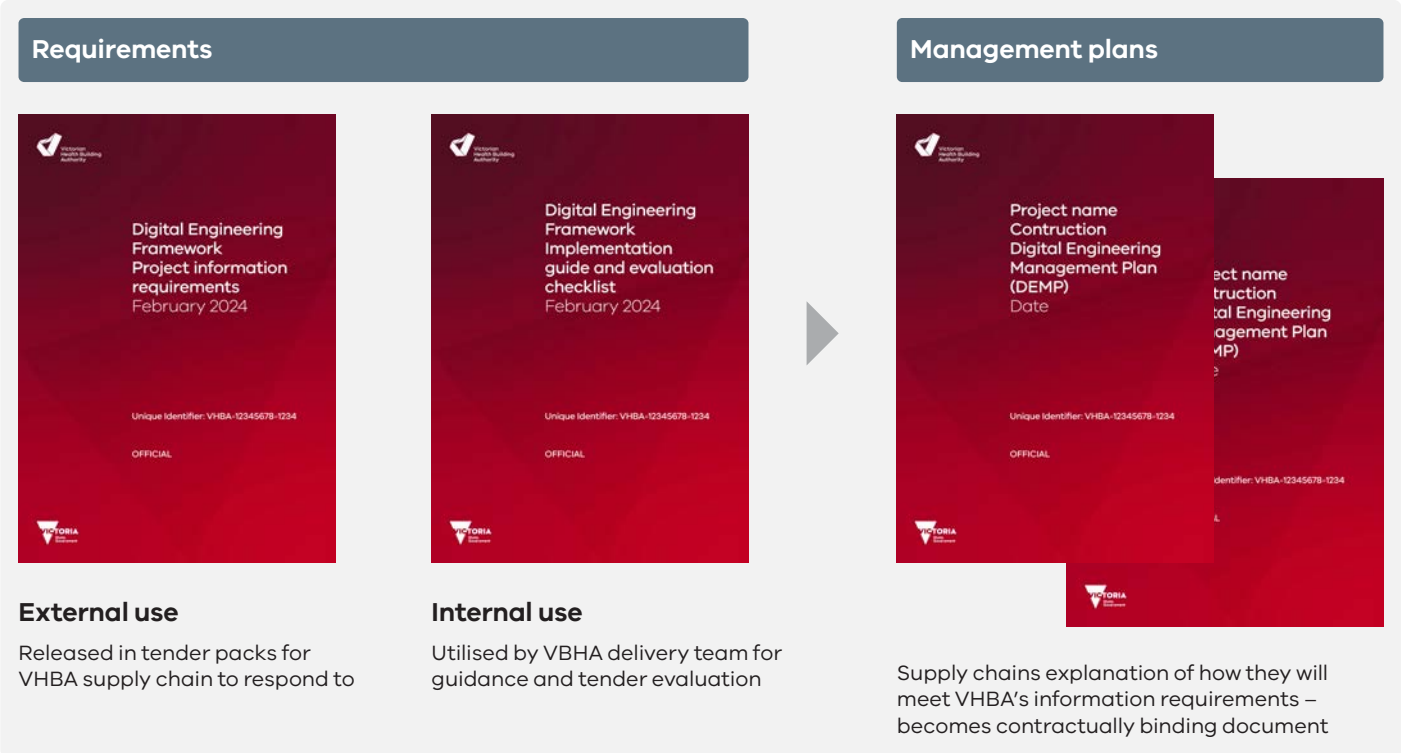
The core elements of DE include:

- a standardised classification system
- open data format
- object-based models
- spatially located data
- structured information across all asset phases.

The Victorian Health Building Authority (VHBA) has developed this document; the Project Information Requirements (PIR) – a key part of the Digital Engineering (DE) Framework, which:

- defines VHBA required uses of DE by the Project Team
- identifies the information requirements by the Project Team at specific phases
- is aligned with the International Standard for BIM – the AS ISO 19650 series
- is aligned with VDAS and VDAP.

Figure 1: The VHBA DE Framework



3 https://www.vic.gov.au/digital-asset-policy

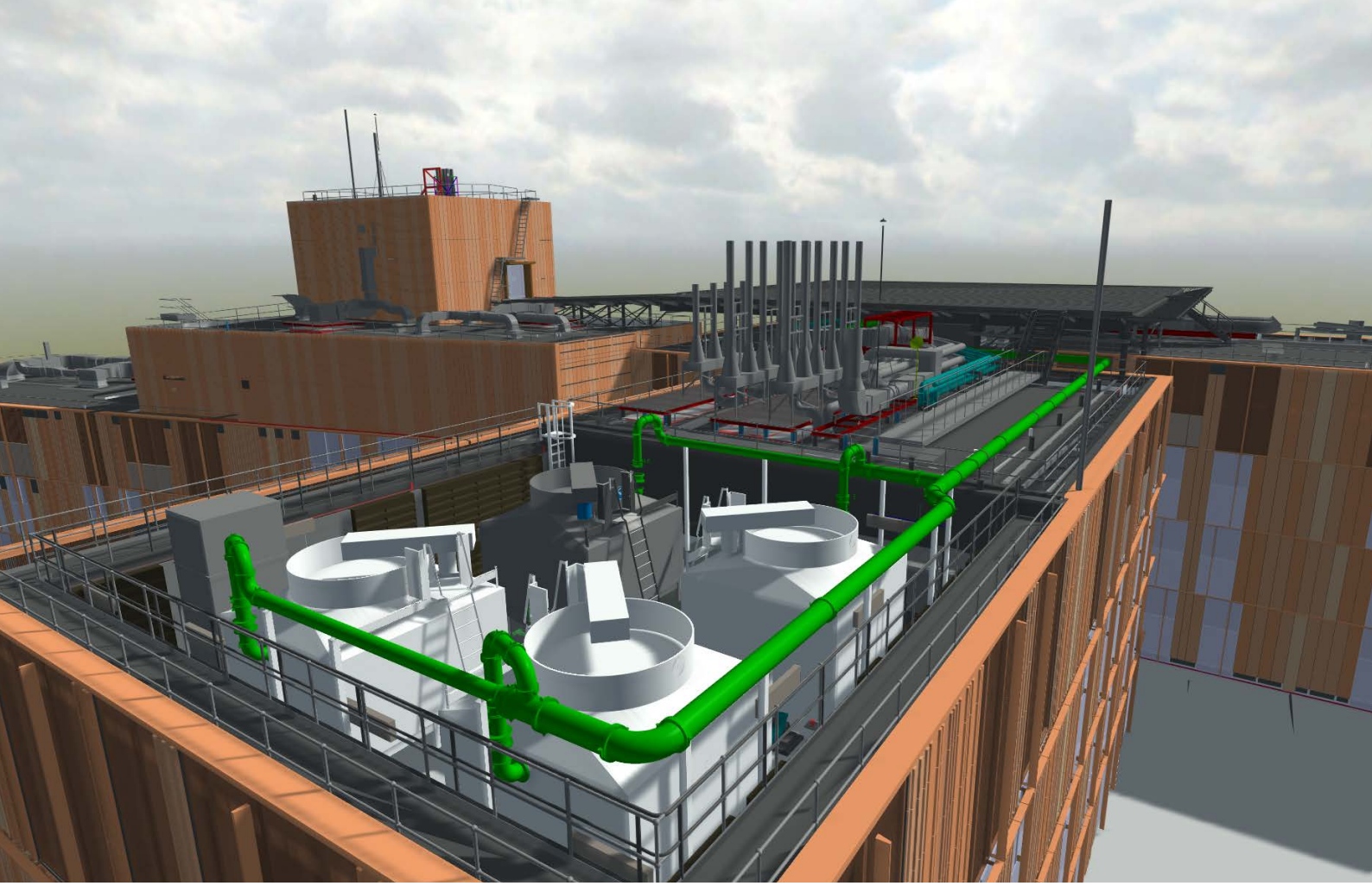
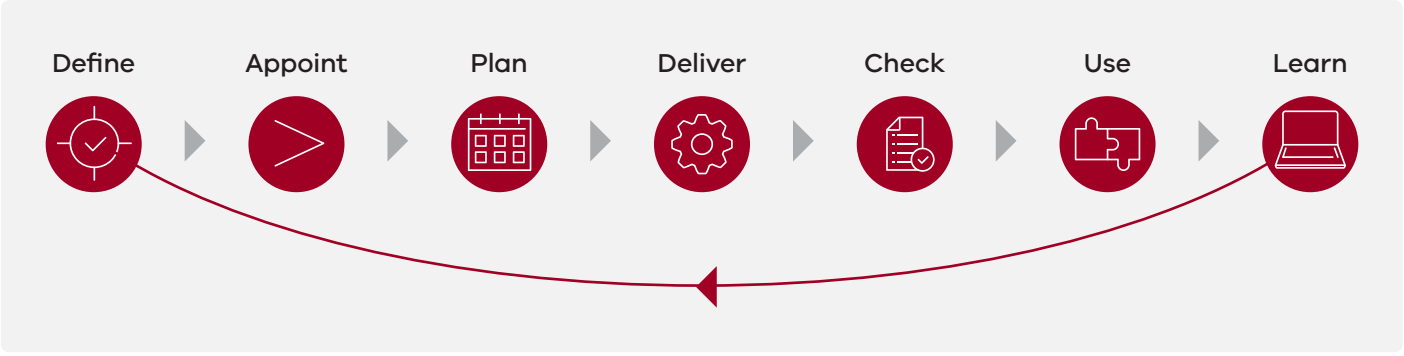


Figure 2: Understanding of the information requirements continual improvement cycle.



This PIR also incorporates the Exchange Information Requirements (EIR) and Asset Information Requirements (AIR), reducing the number of documents and aiding the Project Team's understanding of the required DE deliverables.

As VHBA's information needs further evolve, it is anticipated this document will be further refined and developed as part of VHBA's continual improvement cycle. Any future amendments will not be retrospectively applied to active or historic VHBA projects already under contract.

1.1 Project and Asset Information Models

Aligning with VDAS, this PIR and the described use of BIM will support the creation of the Project Information Model (PIM) and Asset Information Model (AIM) as defined in the AS ISO 19650 series of standards.

For clarity, the PIM is defined as the information needed to design and construct the asset or facility. BIM is just one element of the PIM (see **Figure 3**), along with other elements such as:

- the cost plan
- drawings
- reports
- schedules (such as assets, furniture, fixtures and equipment)
- room layout sheets (RLS)
- room data sheets (RDS)
- schedule of accommodation (SoA).

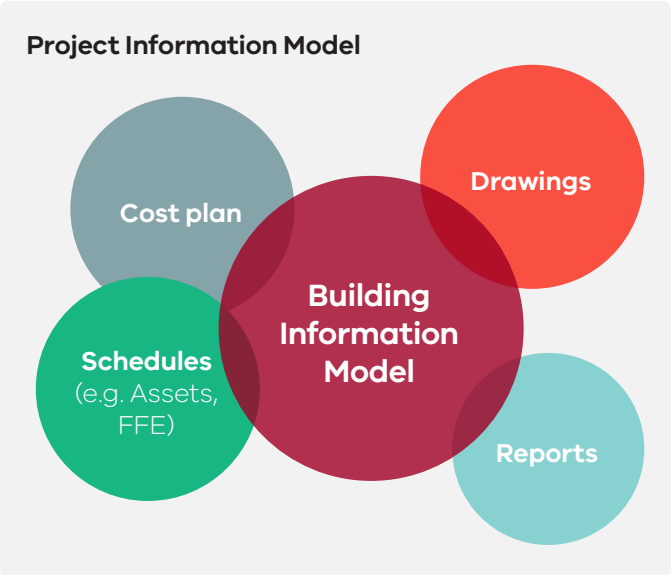
At handover, the relevant elements of the PIM will contribute to the AIM (see **Figure 4**), supporting the health services in the ongoing use of the asset information. For clarity, the AIM is defined as the information used to operate and maintain the facility.

The AIM shall be developed to assist the health services longer-term needs and strategies, as defined by:

- AS ISO 19650 (BIM)
- ISO 55000 (Asset Management)
- Asset Management Accountability Framework (AMAF).

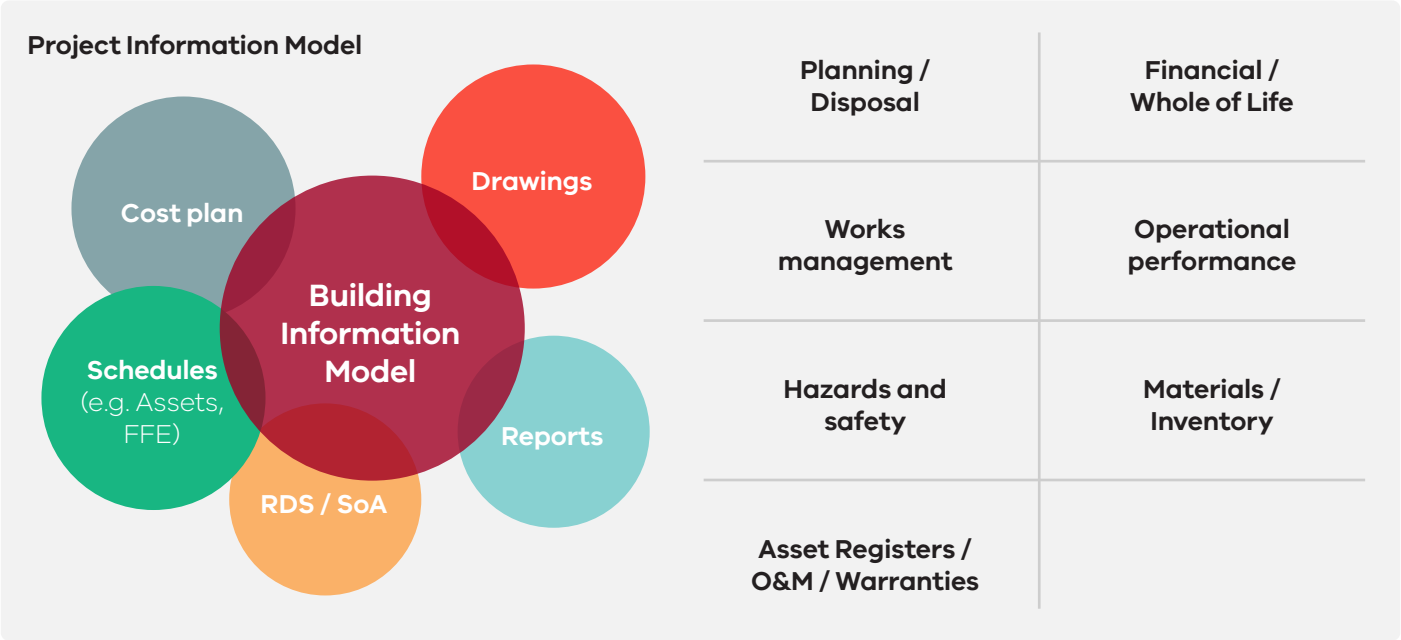
The BIMs shall be leveraged when upgrades are required of the asset. It is therefore important that BIM is scalable and delivered in native, coordination formats, and an openBIM format[4] – Industry Foundation Classes (.ifc) – at handover to enable enhancement over time.

Figure 3: Project information Model (PIM)



4 BuildingSMART's openBIM definition web page <https://www.buildingsmart.org/about/openbim/openbim-definition/>

Figure 4: Asset Information Model (AIM) (including elements of the PIM)



1.2 Document Structure

This PIR is divided into Commercial, Managerial and Technical sections, in line with AS ISO 19650 series of standards. The **Managerial** section is further split into the logical project delivery phases. In this way, appointed parties can work through the project delivery phases, understanding the specific DE requirements for each discipline for the given phase.

See section **2.3 Project Roles and Parties** for specific information on DE roles, teams, and parties. This document articulates how information shall be structured, managed and delivered by each appointed party, contributing to the PIM during the design and construction phases.

The VHBA DE Framework project lifecycle phases have been developed to suit the needs of specifying DE deliverables for VHBA projects. **Figure 5** shows how the framework lines up with:

- VDAS lifecycle
- VHBA *Project Management Framework* (PMF)
- VHBA *Consultancy Services Agreement* (CSA) project lifecycle phases

Table 2: Project Information Requirements (PIR) Structure with audience (roles)

2	3	4
Section 2 – Commercial • VHBA DE Lead • VHBA DE Project Champion • Project Team • Project DE Lead	**Section 3 – Managerial** • VHBA DE Project Champion • VHBA Delivery Team • Project DE Lead • Discipline/Trade DE Lead	**4 – Technical** • VHBA DE Project Champion • VHBA Delivery Team • Project DE Lead • Discipline/Trade DE Lead

1.3 Reference Documents

This document shall be read in conjunction with other VHBA requirements documents, reference materials, and the specific project scope and appointment documents. Nothing in this document is intended to relieve the Project Team of their responsibility to comply with VHBA standards and local standards (and embedded standards) such as:

1.3.1 DE Framework References

- VHBA Design DEMP Word Template
- VHBA Construction DEMP Word Template
- VHBA Asset Equipment List
- VHBA Asset Uploader Template
- VHBA Revit Template and shared parameter files
- VHBA .ifc mapping file

1.3.2 VHBA Standards

- Consultant's Brief/Contract clauses/ Principal Project Requirements (PPRs)
- VHBA Sustainability guidelines for capital works

1.3.3 International and Australian Standards

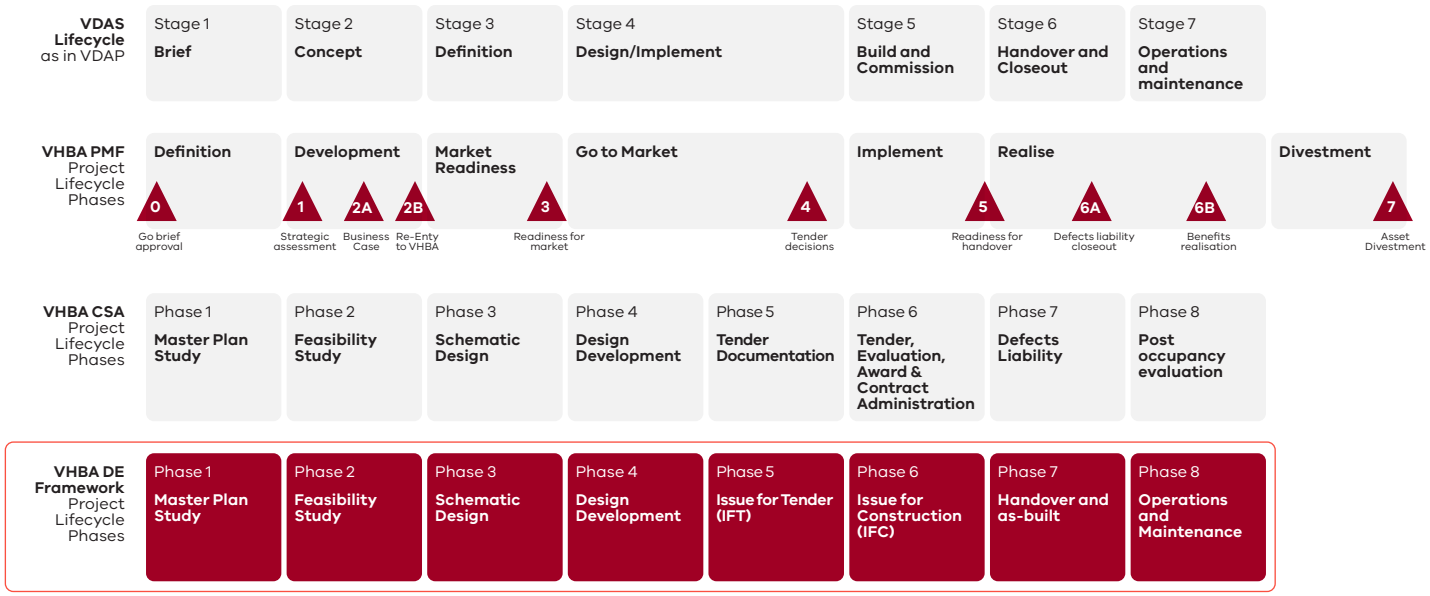
- AS 5488-1:2022 Classification of subsurface utility information (SUI)
- AS ISO 55000:2014 Asset Management series of Standards
- AS ISO 19650-1:2019 Organisation and digitisation of information about buildings and civil engineering works, including Building Information Management (BIM) – Information Management using BIM. Part 1: Concepts and principles
- AS ISO 19650-2:2019 Organisation and digitisation of information about buildings and civil engineering works, including Building Information Management (BIM) – Information Management using BIM. Part 2: Delivery Phase of the Asset
- AS ISO 12006-2:2021 Building construction – Organization of information about construction works, Part 2: Framework for classification.
- ISO 16739-1:2018 Industry Foundation Classes (.ifc) for data sharing in the construction and facility management industries – Part 1: Data schema
- BS EN 17412-1:2020 Building Information Modelling – Level of Information Need, Concepts, and principles

1.4 Key VHBA Contacts

Any queries about the VHBA DE Framework may be directed by email to the following contacts:

- VHBA Digital Engineering Team: digital.engineering@health.vic.gov.au
- VHBA Sustainability Team: sustainability@health.vic.gov.au
- DH Asset Performance Team: assetmanagement@health.vic.gov.au

Figure 5: Victorian Health Building Authority DE Project Lifecycle phases (bottom row)



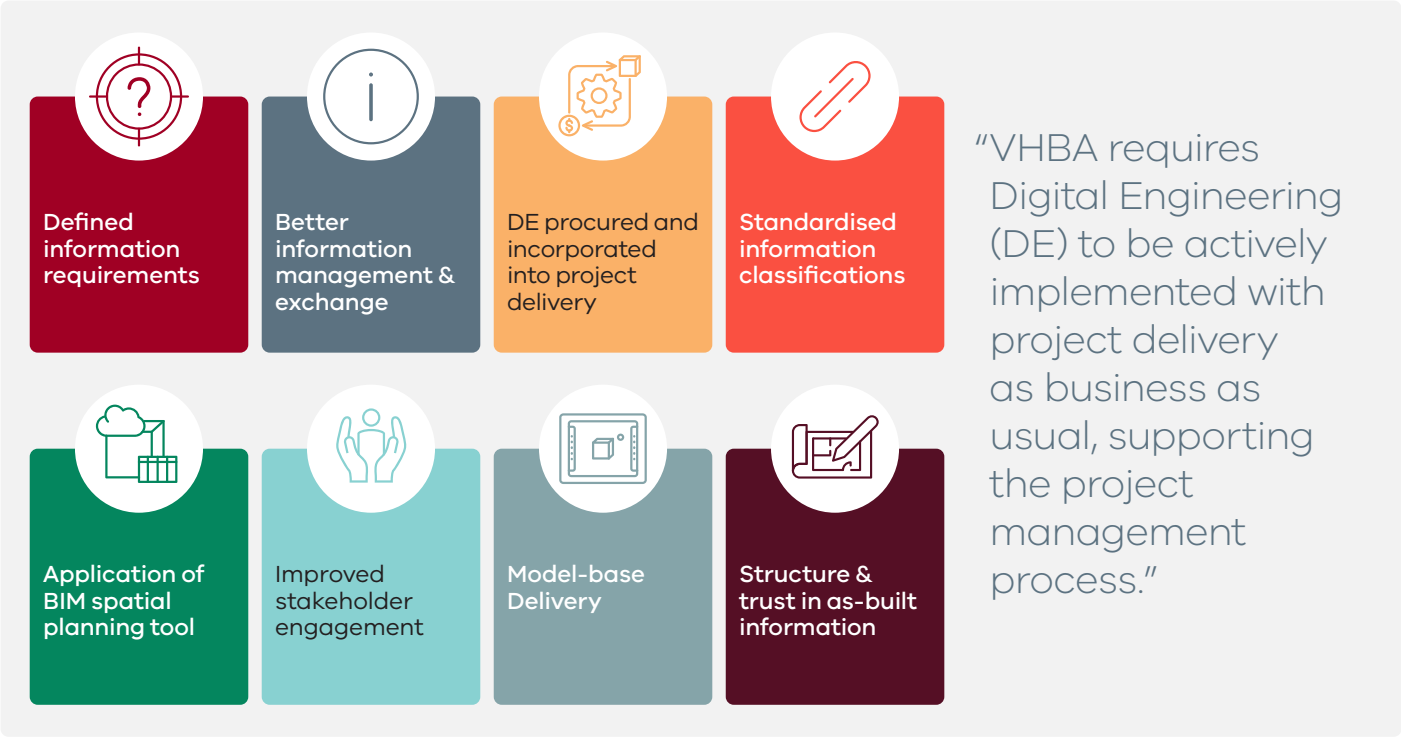
2. Commercial

The application of the VHBA DE Framework is mandatory for all VHBA Projects (see section **2.2 Digital Engineering Levels**). DE also applies to projects under $20 million on an agreed value demonstrated basis, at the request of a VHBA project director.

Note on procurement and delivery process: VHBA requires DE to be actively implemented, with project and asset information managed as part of the project.

2.1 Digital Engineering Objectives

Figure 6: VHBA Digital Engineering Objectives



VHBA is committed to the DE objectives listed in **Table 3**. The Project Team shall maximise the use of BIM and DE during design, construction, and commissioning to realise these objectives. VHBA application is prescribed by DE level in section **3.4 Digital Engineering Requirements by Project Phase**.

Table 3: VHBA Digital Engineering Objectives

No.	VHBA DE Objective	Section
1	Better information management and exchange	**2.1.1**
2	Application of BIM Spatial planning tool	**2.1.2**
3	Defined information requirements	**2.1.3**
4	Standardised information classifications	**2.1.4**
5	Model-based delivery of BIMs to provide for As-Built	**2.1.5**
6	Improved stakeholder engagement	**2.1.6**
7	Structure and Trust in As-built information	**2.1.7**
8	DE procured and incorporate into project delivery	**2.1.8**

2.1.1 Better Information Management and Exchange

Align VHBA's information management processes with those of VDAS and the AS ISO 19650 series of standards to improve the management of information across the lifecycle of assets.

Implement processes to improve the use of CDE to better manage information exchanges with the combined team, serving as a secure, accessible, collective repository of information.

Any BIMs generated by the Project Team shall be interoperable between all DE systems in an open format. The chosen software shall have .ifc 2x3 (or higher) export and import functionality. The .ifc format deliverables are required at major milestones along with the native BIM authoring files and other exchange formats.

The VHBA application is prescribed by the DE level in section **3.4 Digital Engineering Requirements by Project Phase**. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- establishing the project's CDE to serve the overall requirements of the project and to support the collaborative production of information

2.1.2 Application of BIM Spatial Planning Tool

VHBA aims to apply BIM spatial planning tools in projects, improving spatial planning, data management and encourage design consistency across its portfolio. Application of a spatial planning and data management software that integrates with 3D Building Information Modelling (BIM) tools to streamline functional planning, room data and scheduling of building information.

The VHBA application is prescribed by the DE level in section **3.4 Digital Engineering Requirements by Project Phase**. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- development of schedule of accommodation connected with models during early design
- consistent and structured data connected to rooms
- enabling benchmarking.

2.1.3 Defined Information Requirements

VHBA has defined key information deliverables at the end of each project phase. This information shall be incrementally captured in or linked to the BIMs. Each phase constitutes VHBA's key decision points across the project lifecycle. These are used to document the timeframe for the incremental delivery of digital information, such as BIMs, schedules, drawings or asset data.

The VHBA application is prescribed by the DE level in section **3.4 Digital Engineering Requirements by Project Phase**. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- quality assurance and compliance review of DE deliverables at phase completion.

2.1.4 Standardised Information Classification

The BIMs shall be integrated with classification information from the Australasian Health Facility Guidelines (AusHFG) and the Virtual Buildings Information System (VBIS).

VHBA aims to ascertain AusHFG room coding for each modelled space or room within the BIMs.

Scheduling of VHBA assets, as defined by the VHBA Asset Equipment List, shall contain its respective VBIS classification.

The VHBA application is prescribed by the DE level in section 3.4 Digital Engineering Requirements by Project Phase. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- application of AusHFG classification codes to rooms in models.
- application of VBIS classification codes to assets in models.

2.1.5 Model based Delivery

SoA, drawings, schedules, AusHFG and health services asset coding to be coordinated and linked to BIM.

The BIMs shall be integrated with information from other sources, such as the cost plan, SoA, AusHFG coding, VBIS classification and standard components.

Scheduling of model elements (rooms, doors, windows, furniture, fixtures and equipment) shall be undertaken in BIM or alternatively bidirectionally linked to a space planning or database tools. This information shall be coordinated between systems, such as the CMMS, FMMS and BMS.

Drawings shall be derived from the discipline or trade-centric models, post-coordination with other disciplines or trades.

The federated model for each project shall be a core instrument in all project workflows.

While some meetings will be required to establish the DEMP and related DE processes, it is expected that DE (as a process) and BIMs (as digital outputs) will be leveraged in many other traditional project meetings, such as design meetings, coordination meetings or safety in design meetings.

The VHBA application is prescribed by the DE level in section **3.4 Digital Engineering Requirements by Project Phase**. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- digitisation of occupational health and safety (OHS) management
- costing and quantification
- sustainability
- virtual reality prototypes.

2.1.6 Improved Stakeholder Engagement

Leverage the federated model, static renders and interactive walkthroughs of the proposed asset to explain the project or operation of equipment.

The Project Team shall leverage visualisation from BIM (for example, 3D collaboration tools that may be supplemented with virtual reality or augmented reality) to help convey intent and inform stakeholders of design or constructability solutions.

The VHBA application is prescribed by the DE level in section 3.4 **Digital Engineering Requirements by Project Phase**. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- virtual reality prototypes
- visual walkthrough
- project staging
- safety-in-design
- communication tool.

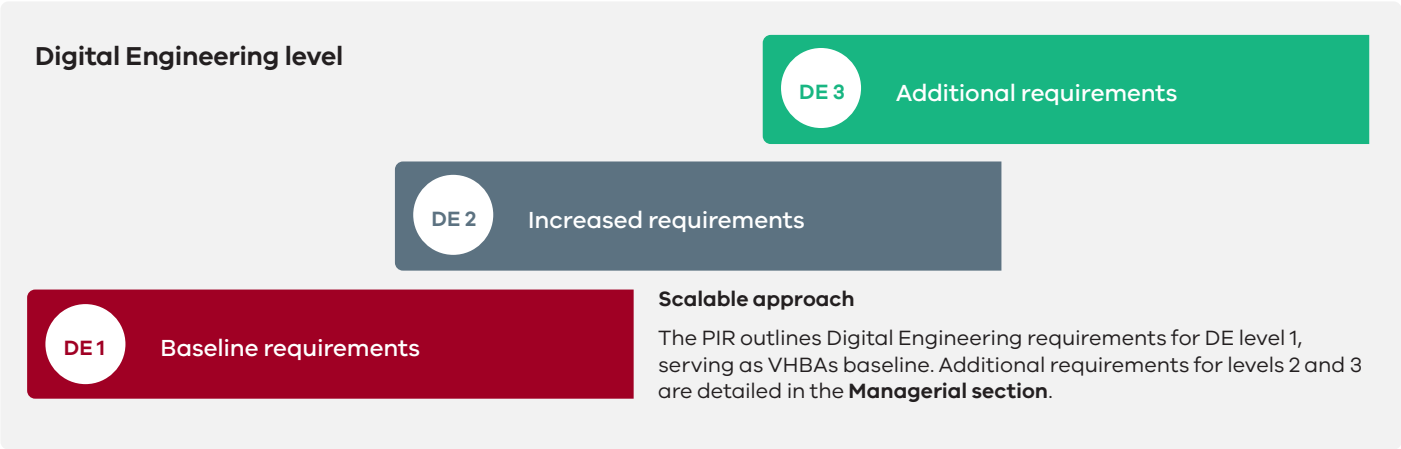
2.1.7 Structure and Trust in As-built Information

VHBA requires the active updating of BIMs and associated databases throughout design and construction, resulting in the delivery of accurate As-builts.

VHBA has defined workflows and deliverables at each project phase regarding information about assets, including identification, classification, location and status data. This information shall be incrementally captured by phase or milestone in or linked to the BIMs.

The VHBA application is prescribed by the DE level in section 3.4 **Digital Engineering Requirements by Project Phase**. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- Verification of As-Builts BIMs through photogrammetry or laser scanning increases the level of certainty and reliability of geometrical information at project handover.
- Leveraging DE for operational planning, decanting and staging, and construction planning. The federated model shall be used to communicate the intent with relevant stakeholders.



2.1.8 DE procured and incorporated into project delivery

Make DE business as usual for the supply chain. The DE Framework is to be suitably referenced and contractually binding. VHBA requires DE to be actively implemented with project delivery as business as usual, supporting the project management process.

From the earliest outset, design and construction DEMPs are to be developed, based on the PIR and administered and updated by the Project DE Lead.

The discipline or trade-centric BIMs for the project shall be aggregated to form a federated model by the Project DE Lead. The federated model shall be used as the primary coordination and decision making tool, improving mutual understanding within the project team and VHBA. Use DE to better define roles and responsibilities to ensure clear accountable parties for project deliverables or artefacts.

The VHBA application is prescribed by the DE level in section 3.4 **Digital Engineering Requirements by Project Phase**. The application is defined by the DE level and project phase. Workflows may include but are not limited to:

- further development of pre-award DEMP by the successful tenderer to reflect DE execution for phases engaged.

2.2 Digital Engineering Levels

Not all VHBA projects require the same DE approach. As this PIR is intended to be used for many VHBA projects, the DE levels described next outline how DE is scaled to meet the needs of different projects. This PIR defines the minimum information requirements for each DE level.

Project DE level is determined by VHBA prior to tender and is prescribed in tender. As DE deliverables vary depending on the DE level, it is important that the tenderers confirm the DE level in their tender documents or directly with the VHBA DE Project Champion before attempting to respond to the PIR with a design DEMP or construction DEMP.

> **Note on DE levels**: This PIR outlines DE requirements for DE Level 1, serving as VHBA's baseline. Additional requirements for levels 2 and 3 are detailed in the **Managerial** section.

Project DE Level 2 requirements encompass DE Level 1 requirements and include additional deliverables. These are specified under the DE Level 2 section for each phase (see **Managerial** section).

Project DE Level 3 requirements, encompassing DE Level 1 and DE Level 2 requirements, are specified under the DE Level 3 heading for each phase (see **Managerial** section). DE Level 3 may include more advanced projects, such as PPP projects. These projects are expected to go beyond DE Levels 1, 2, and 3 and should address the operational requirements and additional needs of the Health Service. The approach for these projects should be documented in the return DEMP.

2.3 Project Roles and Parties

2.3.1 Roles

VHBA have defined a list of key roles used throughout the VHBA DE Framework, including this PIR and in the DEMP templates. **Table 4** describes these roles, their relationship with VDAS roles, and the make-up of the appointment party (as described in **Figure 7**).

Table 4: VHBA DE Roles and alignment with other terminology

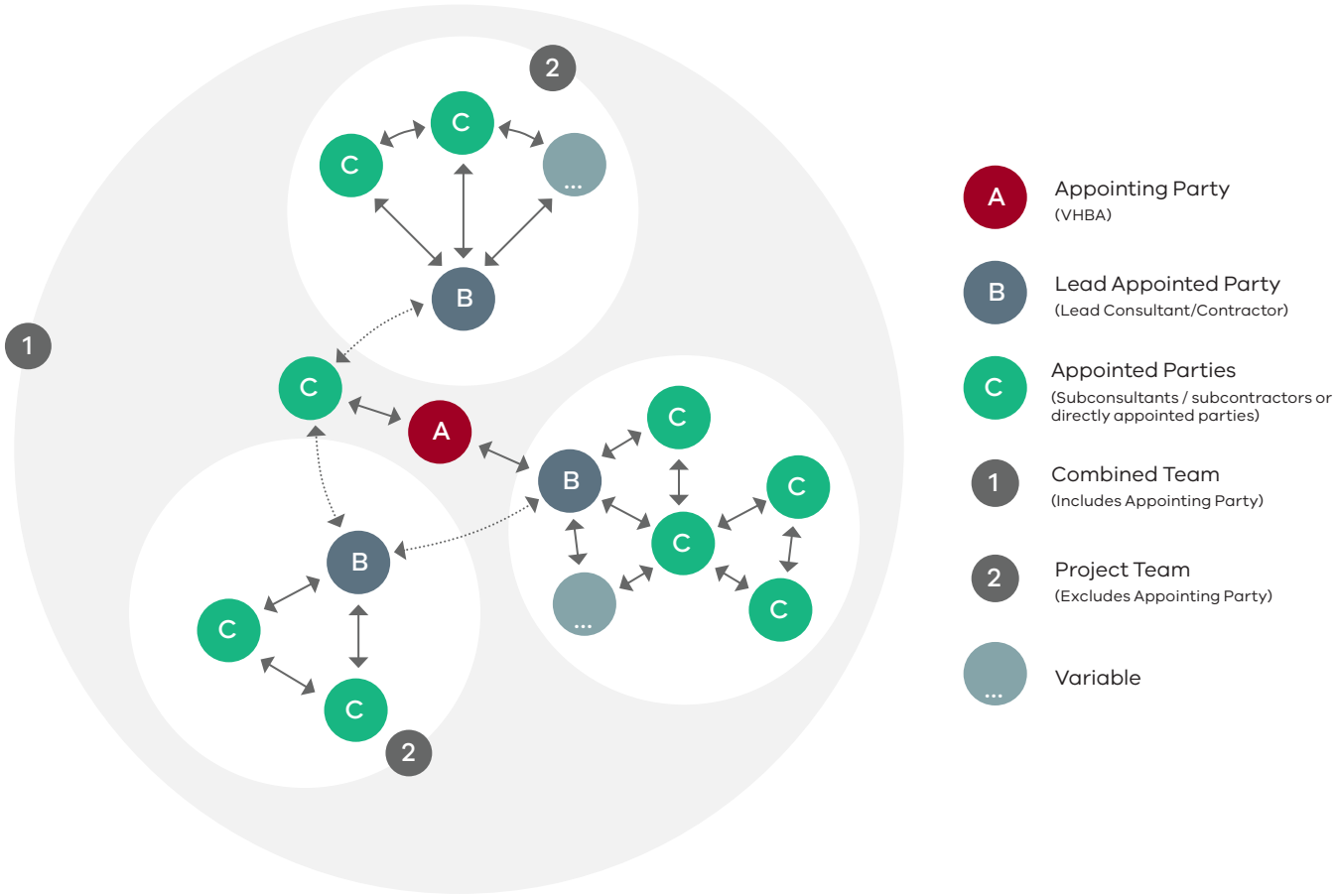
DE Framework role	VHBA role	Related roles or description	VDAS role	Party (appointment)
VHBA Delivery Team	✓	VHBA Project Director, Technical Director or Project Manager	-	Appointing Party
VHBA DE Lead	✓	Technical Advisory Services – Digital Build and Data	VDAS Champion	Appointing Party
VHBA DE Project Champion	✓	VDAS Project Champion – VHBA person in project delivery, either as a standalone or as additional responsibility	DE Project Champion	Appointing Party
Project Team		Lead Appointed Party with all Appointed Parties	Delivery Team	Lead Appointed Party
Project DE Lead		Lead Appointed Party's DE lead or manager	DE Lead	Lead Appointed Party
Discipline/ Trade DE Lead		Discipline or trade DE Manager Discipline BIM Manager	Appointed Party's supply chain	Appointed Party
Model Element Author		Discipline or trade DE or BIM Modeller	Appointed Party's supply chain	Appointed Party

2.3.2 Parties

The interfaces between parties, for the purpose of information management, is shown in **Figure 7**.

This terminology aligns with VDAS and AS ISO 19650-2, and is used throughout the VHBA DE Framework to describe responsibilities within an appointment.

Figure 7: Combined team



Legend and description

A Appointing Party

VHBA is the Appointing Party (the Principal). This role is typically represented by the Project Manager (PM) or Project Director.

VHBA, as the Appointing Party, may also nominate an internal or appoint an external DE Project Champion to represent their interests in this specialised area.

B Lead Appointed Party

The Lead Appointed Party is an external party, such as a lead consultant or lead contractor, responsible for their project team which consists of sub-consultants and subcontractors.

One of the Lead Appointed Party's tasks is to ensure the management and production of digital information related to the built form assets are in line with VHBA's needs and compliant with this PIR.

The Lead Appointed Party is responsible for checking, validating and quality-assuring information before any Appointed Party shares or publishes this to the Appointing Party.

C Appointed Parties

The Appointed Party is typically a sub-consultant or subcontractor appointed by the Lead Appointed Party.

They are responsible for collaborative production of information in a task team.

1 Combined Team

The Combined Team consists of the Project Teams (the Lead Appointed Party or Appointed Parties and their sub-consultant or subcontractors) and includes the Appointing Party (the Principal).

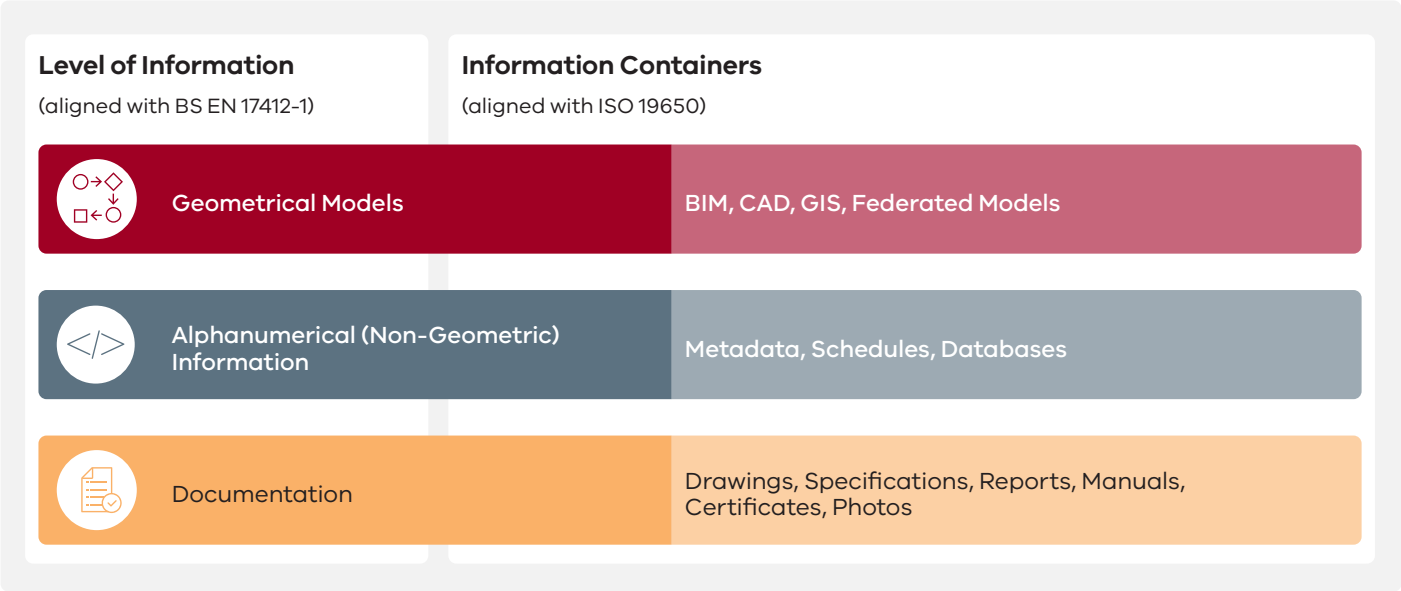
Note: Under AS ISO 19650 this is typically called the project team.

2 Project Team

The Project Team consists of the Lead Appointed Party and their Appointed Parties (excluding the Appointing Party (the Principal)). The size and structure of each project team reflects the scale and complexity of the asset management or project delivery activities.

Note: Under AS ISO 19650 this is typically called the delivery team.

Figure 8: Information Containers



2.4 Information Management

VHBA is a project office under the Victorian Government's Victorian Infrastructure Delivery Authority (VIDA), responsible for the planning and delivery of the government's multibillion-dollar health infrastructure program.

VHBA has a business objective to improve the quality and reliability of their digital assets, which also aligns with the requirement of the VDAP. Using DE, asset information will be generated throughout design and construction, and needs to deliver on the requirements set out in this PIR.

2.4.1 Information Containers

Three core data types (as defined in AS ISO 19650 series) shall be considered when producing information in alignment with the PIR:

- **Geometrical information** – for example, BIMs, 3D and 2D modelled elements, spatially arranged to a common coordinate system.
- **Alphanumerical (non-geometrical) information** – for example, asset data, classification, schedules. Typically structured data.
- **Documentation** – for example, specifications, reports, warranties, drawings, operation and maintenance (OM) manuals. Typically unstructured data.

2.4.2 Level of Information Need

The level of information need of each information deliverable should be determined according to its purpose. This should include the appropriate determination of quality, quantity and granularity of information, which can vary from deliverable to deliverable. For further information, see section **4.4 Level of Information Need (LoIN)**.

The structure of linkages to asset data, OM manuals and data embedded in BIMs for use in design, construction, operation and maintenance is described in section **4.5 Asset Information Requirements (AIR)**.

2.5 Allowable Digital Engineering Uses

VHBA requires the Project Team to adhere to, and demonstrate the following:

a. The Project Team shall nominate a dedicated Project DE Lead for design and again for construction who will manage the BIM processes for the project. A full-time employed Project DE Lead is to be funded and denoted on the Lead Appointed Party's organisation chart in tender submissions for DE Level 2 and 3 projects.

b. The Project Team shall incorporate the associated costs of DE into their tender response, captured in the contractual returnable schedule, which includes (but is not limited to) the costs associated with managing adequate DE resources, meeting technical requirements for each phase, model review platform costs as defined in section **4.13.1 Model Review Platform and Issue Management** and in line with VHBA DE objectives.

c. The responsibility for the production, development, and implementation of the DEMP lies with the Project Team and shall be managed by the Project DE Lead. The Project Team shall ensure that the contents of the DEMP are collaboratively developed with their supply chain, as each are appointed. The BIM approach must be documented in the relevant VHBA DEMP template with each Appointed Party agreeing to the approach as they are appointed. The construction DEMP shall build on the information in the design DEMP to ensure consistency across the project.

d. Capability, capacity, and competence of the Project Team to meet the PIR shall be demonstrated in the returned DEMP. If there are any requirements of the PIR that cannot be met due to capability, technical or other reasons, these shall be clearly stated in the returnable pre-contract DEMP section, 'Amendments to Project Information Requirements'. Post-award, these items shall be addressed and negotiated before final acceptance of the DEMP as contractually binding.

e. Information shall be collaboratively developed, shared and managed using a CDE or a centralised approach to information management.

f. Object-based design and construction models (referred to as BIMs) shall be created to satisfy the PIR, driving efficiency and predictability throughout the project. BIMs shall be scalable, interoperable between Appointed Parties and a federated model shall be available for review using model reviewing software.

2.6 Auditing and Validation

VHBA's DE Project Champion (or representative) reserves the right to audit the information created by the Project Team at designated project information delivery milestones, as defined in this PIR. VHBA also reserves the right to undertake an audit of the Project Team's DE deliverables at any point in time. This is not a substitute for Quality Assurance undertaken by the Lead Appointed Party, as described in section **4.18 Quality Control**.

3. Managerial

This section standardises digital engineering processes, and deliverables, specifying the data required at each stage of a project. This consistent application simplifies digital workflows

3.1 Digital Engineering Management Plans

The design and construction DEMPs are the primary instrument for managing DE on the project and become contractually binding once approved by VHBA.

This PIR specifies VHBA's DE requirements. The design and construction DEMPs can be considered as the response documents – plans that capture the Project Team's approach to delivering to the PIR needs.

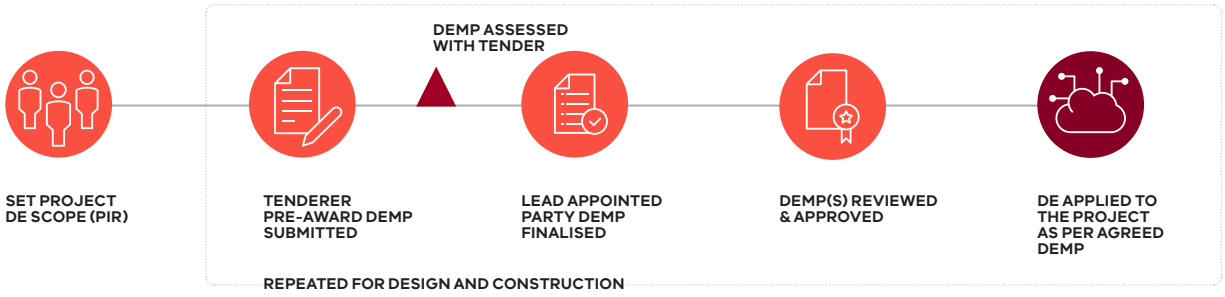
The DEMP shall be created and managed by the Project Team's appointed DE Lead, with input from relevant Appointed Parties.

> **Important!** The Appointed Parties and VHBA must agree to the processes and requirements defined in the DEMP, as the DEMP shall be contractually binding.

Figure 9: DEMP templates (right) respond to the DE requirements in the PIR (left)

3.1.1 The DEMP Creation Process

Figure 10: Simplified DEMP creation process



3.1.1.1 Pre-award DEMP for Tenderers

For each tender, each bidding party must create a pre-award DEMP addressing the project phases of which they are engaged. For example, master planning to schematic design, or design development to handover.

A pre-award DEMP shall be produced by each bidding party, relevant to their scope and project phases, using the required VHBA DEMP templates.

The Lead Appointed Party must produce the pre-award DEMP using the VHBA design and construction DEMP templates (see **Figure 10**) and submit it in MS Word and .pdf format as part of the tender response.

The returned pre-award DEMP will be evaluated as part of the tender evaluation. This forms part of the tender assessment criteria regarding information delivery planning and the DE capability of tendering parties.

Important! The appointment scope and brief will guide which DEMP templates to use. Note that these VHBA templates can be combined, split and edited as needed by the tendering parties to address the project scope. Different procurement methods and project phases require a flexible approach to developing a DEMP. Tenderers should adapt the DEMP templates to best suit their project approach.

3.1.1.2 Pre-Award Digital Engineering Management Plan evaluation

During tender evaluation, VHBA will assess the pre-award DEMP, measuring compliance with this PIR and the tenderer's DE capability.

The results will inform the tender assessment process and be used to provide feedback to the successful tenderer for further development of the post-award DEMP.

Figure 11: Design and construction DEMP templates aligned to project lifecycle phases for traditional procurement

3.1.1.3 Post-award DEMP for the Lead Appointed Party

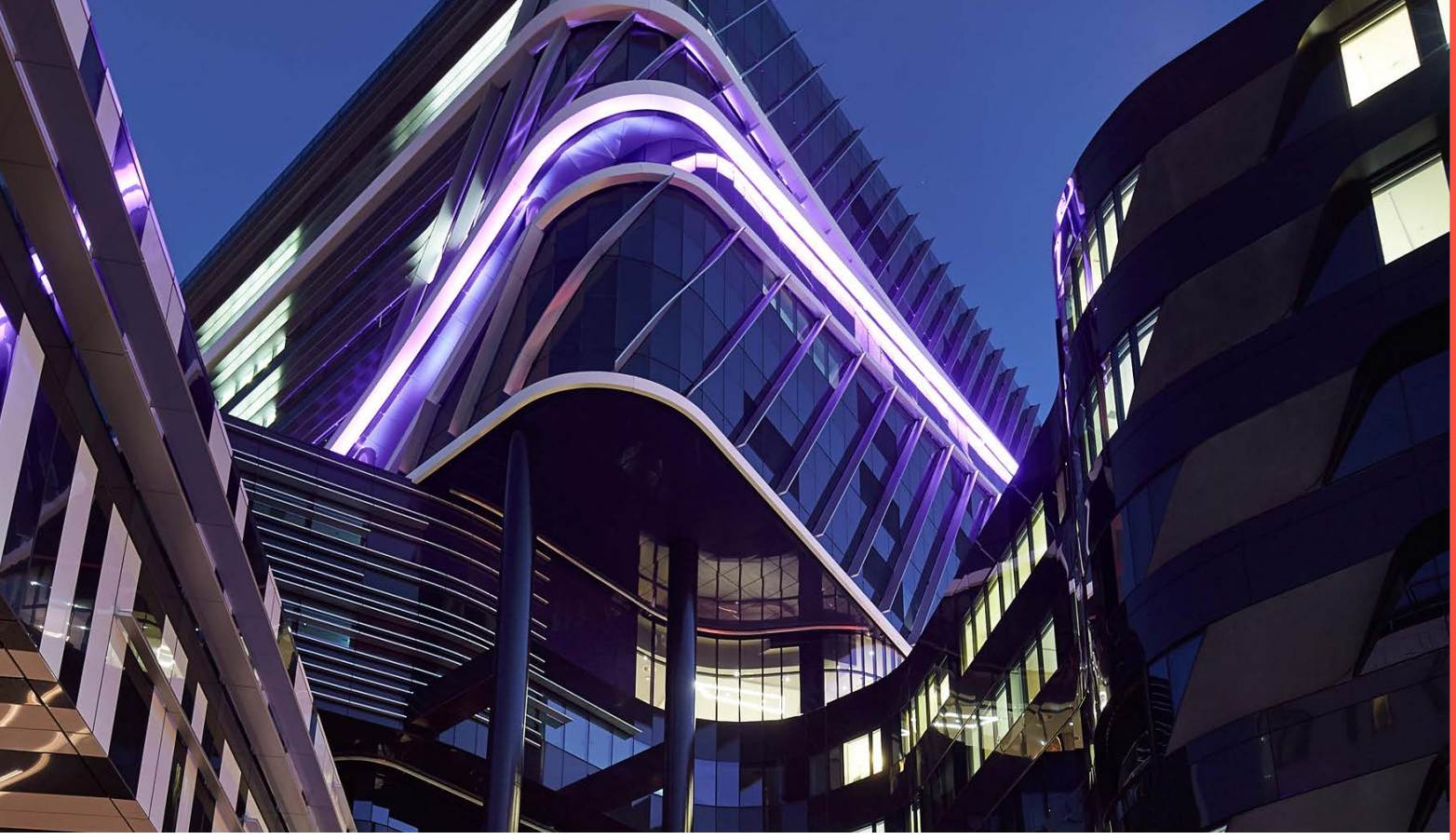
Post-award, the successful Lead Appointed Party must continue to develop the DEMP, in consultation with their Appointed Parties and VHBA (strictly within 30 days for the first draft, unless noted otherwise by the VHBA Project Director).

The final DEMP will acknowledge the requirements set out in this PIR and document how the Project Team is planning to deliver information on the project.

If developing the construction DEMP, it shall be based on the previously agreed design DEMP.

The Lead Appointed Party's DE Lead will further develop, finalise and submit an agreed DEMP which has incorporated the requested changes from the VHBA DE Project Champion (or representative) that suitably responds to the needs of this PIR.

Once approved, the DEMP shall become a shared resource on the CDE, in PDF format. The DEMP is a key instrument (second to the PIR) for managing DE on the project and is contractually binding once approved.



3.1.2 DEMP Update and Approval Process

Changes during project planning and delivery are inevitable, such as new Project Team members joining the project. The Lead Appointed Party shall revise the DEMP, when a newly Appointed Party joins the project and prior to each new project phase. Once an agreement on the changes has been reached by all Appointed Parties, the VHBA DE Project Champion will review and either:

- endorse the DEMP revision or
- require changes to the DEMP.

DEMP revisions can only occur at the following key decision points:

- when a newly Appointed Party joins (or leaves) the Project Team
- prior to the start of any project phase
- when a change (Principal, design or contractor or vendor-initiated) occ.

3.2 Roles and Responsibilities

The DEMP must describe the relevant Project Team DE roles and responsibilities for each party, in line with the terminology used in this PIR – see section **2.3.1 Roles**. Depending on the scale, complexity and project type, these may vary between projects.

The Lead Appointed Party shall nominate an overall resource, the Project DE Lead for design and construction phases. This role may be resourced by 2 different individuals to support the proposed procurement method – one for design and a different resource for construction or could be the same individual in the case of a design and construct procurement model.

Regardless, there shall always be an allocated resource undertaking the DE management role on the project on behalf of the Project Team, and sufficient handover time is allowed if the resource changes.

The Project DE Lead shall oversee and report on DE and information management process to the VHBA Project Manager or VHBA DE Project Champion (or both), ensuring that Appointed Parties conform to the content of the DEMP and this PIR. The following conditions apply:

a. Any replacement of the Project DE Lead shall be advised to the nominated VHBA DE Project Champion (or representative) within 10 days.
b. If the resource changes, the nominated handover time shall be documented and prior approval sought from VHBA.
c. The DE management experience of the resource shall be provided in the bidding parties tender response package stating the years, projects, experience, technical and communication abilities.
d. The nominated allocation of time this resource will spend each week, by phase, by deliverable on DE and information management-related tasks.

Each Appointed Party must allow for a nominated Discipline or Trade DE Lead to coordinate the development and quality assurance of the discipline-specific BIMs in close consultation with the Project DE Lead.

3.2.1 RACI

The Lead Appointed Party shall produce a RACI (responsible, accountable, consulted, informed) matrix that clearly sets out the roles and responsibility for each Appointed Party at various points of the project's life cycle.

This matrix shall be added as an appendix to the DEMP and may be organised using AS ISO 19650-2 sections.

3.3 Project Meetings

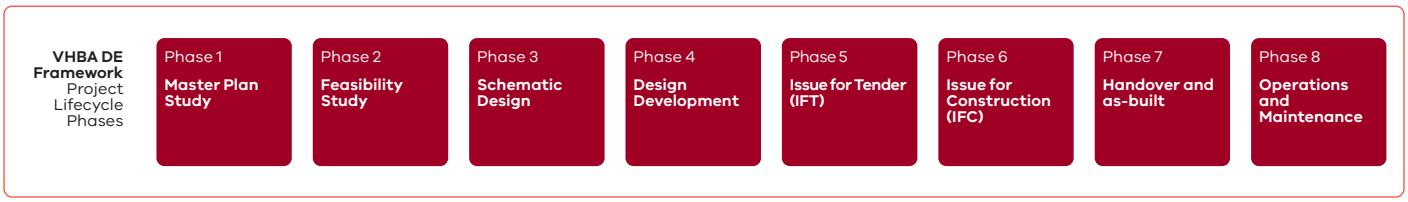
Design reviews, coordination and asset handover planning should not be approached as 'DE tasks'. Rather, they should be standard project tasks, leveraging DE and the federated model for decision making, which shall be incorporated into traditional design and construction review meetings.

Project meetings shall be captured in the DEMP.

3.4 Digital Engineering Requirements by Project Phase

> **Important!** This PIR describes the requirements for all project phases. However, the specific scope or brief for each appointment identifies which DE Framework phases are relevant to the Lead Appointed Party's scope.

Figure 12: DE Framework project lifecycle phases



3.5 Existing Conditions

All Appointed Parties shall verify with VHBA the availability of any previous as-built BIMs or drawings prior to undertaking any work in any of the early design phases.

Existing drawings, surveys and any BIMs (if available) shall be obtained and site checked for accuracy by the Project Team.

Existing critical assets (as defined in section **4.5.2 Asset Equipment List**) shall be modelled and incorporated into the federated model. These asset locations shall be agreed prior to modelling and verified by means of traditional survey or laser scanning. The use of laser scans (point clouds) or high-resolution photogrammetry shall be implemented, facilitating the existing conditions capture and verification of the existing conditions modelling.

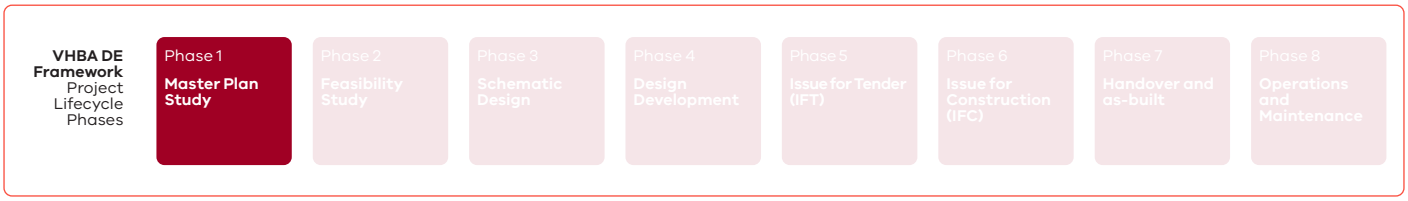
The extent of modelling beyond the affected areas and the required level of critical asset information shall be determined and agreed based on the VHBA cost, time and project needs. These requirements shall be discussed and agreed during the project kick-off meeting and shall be documented in the design DEMP.

The information sourced during the strategic assessment (functional requirements, existing conditions, easements, topography, orientation and so on) shall be collated and validated for currency, to be leveraged in future phases including the development of the BIMs.

3.6 Phase 1 – Master Planning

> **Note:** This DE Framework Lifecycle Phase relates to VHBA PMF project lifecycle phase: **Definition**

Figure 13: Master Planning Phase



To ensure the project is developed with specific health services needs in mind, collaboration between the VHBA DE Project Champion, the Project Team and the ultimate facility managers for the project should be sought during the Master Planning phase, determining that project-specific needs are met. This may include information such as project level naming, room numbering and drawing numbering.

Documentation and visualisations shall be produced at this phase. Departmental functional relationships and adjacency diagrams and whole-of-hospital departmental relationships shall be developed. This includes the production of 3D staging block and stacking diagrams, site sections identifying level differences across the site and circulation across departments at different levels.

3.6.1 Overview

For DE Level 1 Projects during the Master Planning phase any documentation created must contain the following requirements:

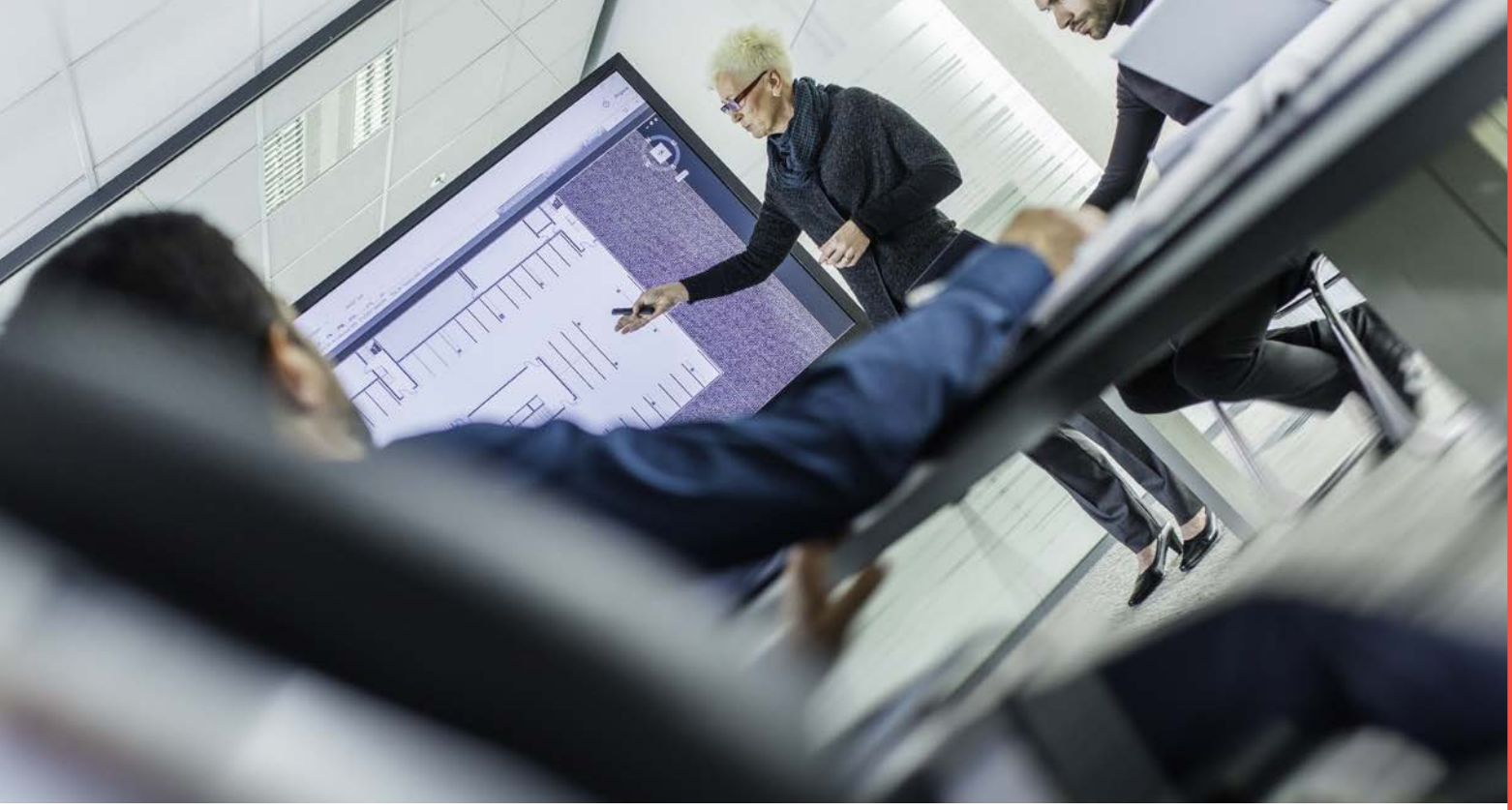
a. levels or storeys and grids to be managed by the Project DE Lead and coordinated across disciplines
b. stacking diagrams and site sections identifying level differences across the site and circulation across departments at different levels
c. 3D staging block and stacking diagrams.

3.6.2 DE Level 2 and 3 projects

A master plan massing model shall be created, where it may be generated in either a mass modelling platform or a BIM-enabled platform throughout the Master Planning phase, enabling continuity from the Master Planning to Schematic Design phases.

For DE Level 2 and 3 projects, a 3D massing model must be created during the Master Planning phase, containing the following requirements:

a. A site 3D model created with the current survey included and site benchmark, the project set out point, and nominal building grids and levels or storeys identified.
b. A preliminary existing conditions 3D model (or models) created (based on section **3.5 Existing Conditions**) and existing elements identifiable as existing via an attribute (extents of the existing conditions model to be defined and agreed with the VHBA DE Project Champion and documented in Design DEMP).
c. Accurately geolocated from the site 3D model (as managed by the Project DE Lead) to ensure correct coordination between disciplines for all models.



3.6.3 DE Level 3 projects

A master plan massing model shall be created, where it may be generated in either a mass modelling platform or a BIM-enabled platform throughout the Master Planning phase, enabling continuity from the Master Planning to Schematic Design phases.

A space planning or database tool (such as dRofus or approved equivalent) that can manage the SoA and briefed area shall be implemented, supporting the strategic Master Planning and strategic infrastructure assessment. The space planning tool shall be linked to the massing models or BIMs, providing a robust way of tracking the SoA brief versus designed requirements and, in future phases, the asset data.

For DE Level 3 projects, the additional requirements shall be provided as follows:

a. The quantity surveyor (QS) shall work with the Project Team to collaboratively develop the modelling requirements (units of measure, codification) and enable cost estimation from BIM for cost breakdown structure (CBS) development. For more details on costing and quantification see section **4.7 Costing and Quantification**.

b. The massing models shall be developed by the Lead Appointed Party and used to enable energy efficiency modelling software connectivity for sustainability review (see section **4.8 Sustainability**)

c. Additional health services asset information beyond the minimum asset information requirements are defined in section **4.5 Asset Information Requirements (AIR)**.

3.6.4 Master Planning DE Deliverables

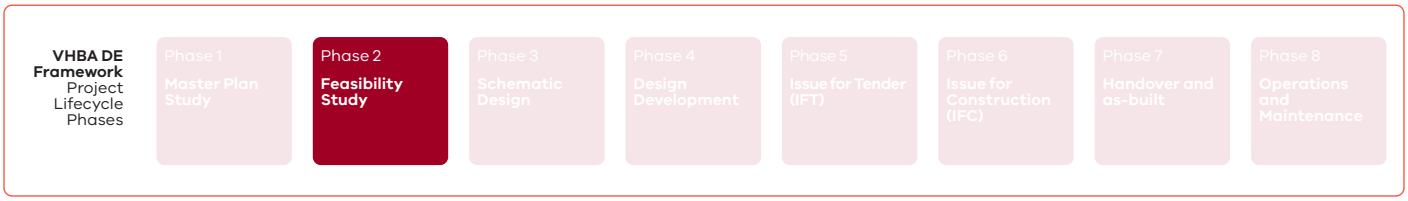
Table 5: Master Planning DE deliverables

No.	Deliverable	Description
1	**Design DEMP**	Updated design DEMP (as in section **3.1**)
2	**Existing BIMs and documentation**	Existing VHBA models or drawings (exchanged as in section **4.10**)
3	**Master plan 3D design models**	Master plan massing models (exchanged as in section **4.10**)
4	**Documentation**	2D documentation (generated from models and exchanged as in section **4.10**) as specified in contract

3.7 Phase 2 – Feasibility Study

> **Note:** This DE Framework lifecycle phase relates to VHBA PMF project lifecycle phase: **Development**

Figure 14: Feasibility Study Phase



At the beginning of this phase, an assessment of the documentation and any massing models generated and delivered during the Master Planning phase shall be undertaken and further developed for feasibility study requirements.

Basic general arrangement drawings and visualisations shall be further developed and produced at this phase. Departmental functional relationships and adjacency diagrams and the whole-of-hospital departmental relationships shall be refined at this phase.

This includes further development of the previous phase 3D staging block and stacking diagrams, site sections identifying level differences across the site and circulation across departments at different levels.

The completion of this phase is marked with a preferred design option that balances business and project objectives.

3.7.1 Overview

All requirements of the previous phases plus the following requirements are needed by the end of this project phase. Basic general arrangement drawings and visualisations shall be produced at this phase, with documentation for DE Level 2 and 3 projects derived from the feasibility study models.

For DE Level 3 projects, space planning data is mandatory for submission to VHBA at the Feasibility Study phase and may be used by the Project Team to document any initial concept designs.

For DE Level 1 projects during the Feasibility Study phase, any documentation created must contain the following requirements:

a. levels or storeys and grids to be managed by the Project DE Lead and coordinated across disciplines
b. basic general arrangement plans capturing the function and form of the selected concept design or feasibility study models.

3.7.2 DE Level 2 and 3 projects

At the beginning of this phase, an assessment of any massing models or BIMs generated and delivered during the Master Planning phase shall be undertaken and further developed for feasibility study requirements.

A feasibility study massing model shall be created, where it may be generated in either a mass modelling platform or a BIM-enabled platform throughout the Master Planning phase, enabling continuity from the Feasibility Study to Schematic Design phases.

For DE Level 2 and 3 projects, a 3D model must be created during the Feasibility Study phase, which may be BIM-enabled, containing the following requirements:

a. Operational planning and department staging 3D visuals, animations and documentation are to be derived from the Feasibility Study models depicting a clear plan for potential future, staged, construction on the site to add new facilities or replace or renew existing buildings and site services infrastructure, incorporating timeframes, aiding stakeholder understanding of the proposed works (see **4.15 Operational Planning and Staging**).

b. Any feasibility study models are to be accurately geolocated from the site model (as managed by the Project DE Lead) to ensure correct coordination between disciplines for all models.

3.7.3 DE Level 3 projects

A feasibility study massing model shall be created in a BIM-enabled platform throughout the Feasibility Study phase, enabling continuity from the Feasibility Study to Schematic Design phases.

A space planning or database tool (such as dRofus or approved equivalent) that can manage the SoA and briefed area shall be implemented, supporting the feasibility study and strategic infrastructure assessment. The space planning tool shall be linked to the BIMs, providing a robust way of tracking the SoA brief versus designed requirements and reporting the differences.

For DE Level 3 projects, a BIM-enabled 3D model must be created during the Feasibility Study phase, containing the following requirements:

a. The QS shall have a defined CBS and all engaged Project Team parties shall develop the BIMs to enable area-based costing by the QS (see **4.7 Costing and Quantification**).
b. The feasibility study (massing) model/s shall be developed by the Lead Appointed Party to enable the environmental sustainable design (ESD) consultant to use energy efficiency modelling software for sustainability purposes and reviews (see section **4.8 Sustainability**)
c. Space planning tool is to be used, this must be setup before any modelling takes place and then bi-directional synchronisation must be achievable in later project phases
d. Population of the space planning tool with project briefed SoA must be achieved prior to the commencement of Schematic Design and be provided in an alphanumeric format specified in section **4.10 Information Containers and Exchange Frequency**.
e. Any feasibility study models are to incorporate the QS units of measurement and codification to enable extraction for CBS development.
f. 3D BIMs shall be developed and made available to the ESD consultant in the requested format to enable the ESD consultant to use or export the 3D models to energy efficiency modelling software for sustainability purposes and reviews.

3.7.4 Feasibility Study DE Deliverables

Table 6: Feasibility Study DE deliverables

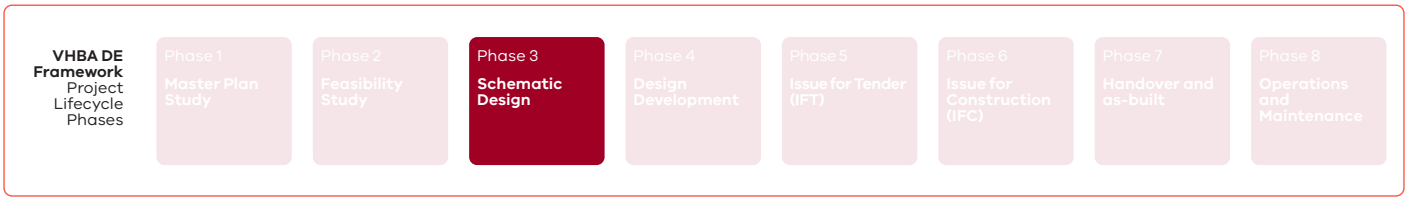
No.	Deliverable	Description
1	**Design DEMP**	Updated design DEMP (as in section **3.1**)
2	**Existing BIMs and documentation**	Existing VHBA models, drawings or survey (exchanged as in section **4.10**)
3	**Feasibility study models**	Discipline feasibility models (exchanged as in section **4.10**)
4	**Documentation**	2D documentation (generated from BIMs) as specified in contract


GENERAL

3.8 Phase 3 – Schematic Design (SD)

> **Note:** This DE Framework Lifecycle Phase relates to VHBA PMF project lifecycle phase: **Market Readiness**

Figure 15: Schematic Design Phase



All existing conditions and survey information shall be verified and federated at this phase – if not already completed – to ensure the proposed schematic design options created in BIM will be coordinated with the existing condition constraints.

The Lead Appointed Party shall consult with the VHBA DE Project Champion and health services representative to ensure project specific needs are met. Existing health services information shall be incorporated into the DEMP for implementation. This may include information such as:

- project level naming
- room numbering
- drawing numbering.

The development of the schematic design will require a preferred option (or options) to be refined and documented in BIM, in line with the design DEMP, up until the submission of schematic design.

The building set out, orientation, preliminary building grid and floor-to-floor heights (including allocation of space for services) shall be confirmed at this phase and defined in BIM.

This shall provide area analysis that can be:

- compared with the master planning and feasibility study
- used to generate an initial cost plan and revised SoA.

The use of space planning tools is preferred and visualisations are required for user group consultation (see section **4.14 Visualisation**).

Circulation areas (such as footpaths, walkways, ramps, stairs or vertical transportation) shall be generically modelled. Travel distance routes (both horizontal and vertical) shall be modelled to validate that distances have been kept to a minimum.

The RLS and RDS shall be generated from the BIMs, with schedules produced from model element data or a bidirectionally-linked database.

The building and space asset data (see section **4.5 Asset Information Requirements (AIR)**) shall be captured in BIMs and exported for milestone delivery.

Each Space contained in the BIM shall be assigned an AusHFG code, following AusHFG standards. The **Managerial** section of the design DEMP shall contain and expand on each discipline's modelling requirements for the schematic design BIMs.

3.8.1 Overview

If any BIMs were created prior to Schematic Design, they must contain the requirements of the Feasibility Study phase above. The BIMs must define the design intent and accurately represent the Schematic Design solution.

The BIMs must incorporate all modelled elements nominated in this section and must be compliant with the PIR.

a. All BIMs created during Schematic Design must be correctly geospatially referenced to the Architectural model, which in turn is correctly georeferenced to the Site BIM, and a federated model must be created and used for project coordination.

b. All parameters in *VHBA BIM Shared Parameters.txt* shall be added to BIMs from the provided VHBA Project Schedules (Revit)_2023.rvt if authoring tools permit, or use the tables provided in section **4.5 Asset Information Requirements (AIR)**.

c. The appointed Project DE Lead is to federate all BIMs and undertake high-level geometric and information coordination activities (that is, all models correctly georeferenced, correct attributes or parameters created). Coordination reports are not required until Design Development phase.

d. Once the preferred option is approved, the use of BIM by all Appointed Parties is mandatory and shall form part of the stakeholder engagement and communication process. Typically, at this phase, the model elements are geometrically represented within the model as a generic system, object or assembly with approximate quantities, size, shape, location and orientation.

e. Asset information and the VHBA BIM shared parameters relevant to Schematic Design shall be populated in the BIMs as in section **4.5 Asset Information Requirements (AIR)** by each model element author as required.

f. All model elements to be assigned an appropriate phase such as existing, temporary works, new construction.

g. The RLS and RDS shall be generated from the BIMs, with schedules verified and produced from model element data or a bi-directionally linked database.

3.8.2 DE Level 2 and 3 projects

For DE Level 2 and 3 projects, BIMs must be created during the Schematic Design phase containing the following requirements:

a. Cloud model review environment is established, and workflows such as Safety in Design (SiD) and wider OHS risks shall be linked to the federated model (see section **4.13.1 Model Review Platform and Issue Management**).
b. BIMs shall contain or be linked to the briefed SoA.
c. Technologies such as virtual and augmented reality shall be used during this phase as beneficial aids to support model review, drawings, the RLS and to gain final user group sign off (see section **4.14 Visualisation**).
d. SoA linked to BIM and cost plan through the use of a common classification schema.
e. Virtual reality and static renders are to be generated from the schematic design BIMs for stakeholder communication.

3.8.3 DE Level 3 projects

For DE Level 3 projects, BIMs must be created during the Schematic Design phase containing the following requirements:

a. Relevant model elements shall be classified and coded to enable costing from BIM (see **4.7 Costing and Quantification**) where model export functionality is required for support in development of the cost plan.
b. The BIMs shall be utilised to enable energy efficiency modelling software connectivity for sustainability review (see section **4.8 Sustainability**).
c. Any schematic design models are to incorporate the QS units of measurement and codification to enable extraction for CBS development.
d. BIMs shall be developed in a manner that is compatible with export for use in energy efficiency modelling software for sustainability purposes and reviews by the ESD consultant.

3.8.4 Geometrical and Alphanumerical Information

At this early project information delivery milestone, the geometrical information shall consist of low detail 3D objects or generic placeholders representing all objects appearing in drawings, modelled as generalised systems or assemblies with indicative quantity, shape, size, location, orientation and appearance.

Cross-discipline modelling coordination shall be deployed by all consultants to minimise coordination issues, with interaction between objects considered. The geometrical information shall be sufficient to enable the uses of BIM for this phase, as defined in this PIR.

Alphanumeric information shall be embedded within model elements or the model itself, as described in section **4.5 Asset Information Requirements (AIR)**. The attributes required for the project phase, as described in section **4.5.5 Asset Attributes**, shall be populated and delivered in the appropriate information container. All project information shall be exchanged as defined in section **4.3 Common Data Environment (CDE)**.

3.8.5 Schematic Design DE Deliverables

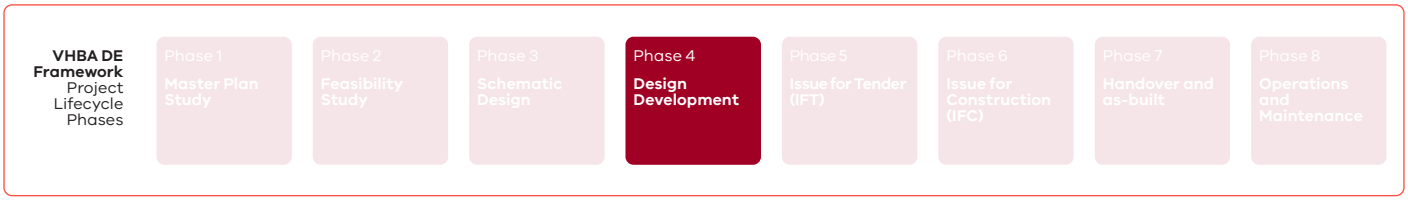
Table 7: Schematic Design DE deliverables

No.	Deliverable	Description
1	**Design DEMP**	Updated design DEMP (as in section **3.1**)
2	**Existing BIMs and documentation**	Verified existing VHBA models, drawings and survey (exchanged as in section **4.10**)
3	**SD BIMs**	Separate discipline models in native, .nwc and .ifc formats (exchanged as in section **4.10**)
4	**Federated model (.nwc)**	A Federated Model from .nwc file format BIMs submitted in .nwd format (as in section **4.11**)
5	**Federated model (.ifc)**	A Federated Model from .ifc file format BIMs submitted in .nwd format (as in section **4.11**)
6	**Documentation**	2D documentation (generated from BIMs), including RDS and RLS, as specified in contract
7	**Asset data extracts**	All specified building and space data (see section **4.5**) populated in BIMs and extracted (exchanged as in section **4.10**)
8	**QA report**	A Lead Appointed Party compliance report reviewing alignment of the BIMs with the PIR (as in section **4.18**)

3.9 Phase 4 – Design Development (DD)

> **Note:** This DE Framework lifecycle phase relates to VHBA PMF project lifecycle phase: **Go to Market**

Figure 16: Design Development Phase



To meet the health service's needs, collaboration between the VHBA DE Project Champion, the Project Team and the health service facility management representative for the project should be sought during the Schematic Design phase, determining the project specific needs are met.

The Project Team shall continue to use BIM during the Design Development phase, building on the models and the requirements from the Schematic Design phase. The Project Team is responsible for enabling, creating, and progressively delivering information that increases in detail (geometrical information, alphanumerical information, and documentation) throughout the design phase. This shall be managed by the Project Team's nominated Project DE Lead.

The Lead Appointed Party shall confirm the asset information described in section **4.5 Asset Information Requirements (AIR)** meets the needs of the project. This should be reviewed and agreed by the VHBA DE Project Champion, the VHBA Asset Performance team, and the HS Facility Manager.

BIM must be used for Design Development as defined in the PIR and must be capable of meeting the defined needs for this phase.

3.9.1 Overview

For Design Development onwards the BIMs must contain the requirements of the previous project phases above and incorporate the following:

a. Demonstrate that the requirements of this PIR, are documented within the DEMP and the BIMs being produced comply with these requirements.
b. When 2D drawings are required, these shall be derived from the BIMs. Documentation and data cannot be created using separate 2D processes or detached data. Any drawings (for example, typical details) that are developed outside of BIM shall be clearly identified in the DEMP and approved by VHBA prior to implementation.
c. The design and documentation across all design disciplines, unless otherwise agreed with VHBA and documented in the Design DEMP, must use a BIM authoring tool capable of producing the required output data (IFC 2x 3 or later) and documentation as specified for all project deliverables.
d. All VHBA parameters (see *VHBA Project Schedules (Revit)_2023* or *VHBA BIM Shared Parameters*) must be added to BIMs if not previously done.

e. An integrated modelling process and regular coordination of modelled elements between all disciplines is required and must be documented in the design DEMP.

f. The BIMs are to include spatial data including the designed net square metres, and data including room name, number and AusHFG Room code. This shall be used to report SoA.

g. Model elements must be integrated and synchronised with the space planning database (if used) including the architectural, mechanical, electrical, hydraulic, fire protection, communication and security, and specialised equipment services models. BIMs are to include programme information to verify designed space against programmed/briefed space. Integration and synchronisation may be required for other models as described in the PIR.

h. All general arrangement drawings, RLS, elevations and sections are to be generated from coordinated BIMs to a scale of 1:50 and above. All smaller scales (that is, 1:20, 1:10, 1:5, 1:2) are to be derived from the BIMs and supplemented with 2D detail unless otherwise agreed by a VHBA DE Project Champion and nominated in the design DEMP.

i. Supplementary 2D linework on the drawings may be required at smaller scales. Model element authors are to ensure that any supplementary linework is coordinated with model elements. Details with significant drafted content such as 'standard' and 'typical' details are not to contradict the model elements and shall utilise the BIM as an underlay, at a minimum for the purposes of verification and coordination.

j. Any 2D drawings not derived from the BIMs must be documented in the design DEMP.

k. All Schedules and Room Data Sheets (RDS) are to be produced from the data in the space planning database or, where this is not practicable, data in the BIMs. Proposed data sources for Schedules and RDS and any Schedules to be produced from non-BIM sources are to be documented in the design DEMP.

l. All furniture, fixtures and equipment (FFE) shall be identified in BIMs, RLS and RDS with the appropriate AusHFG coding.

m. FFE schedules shall be generated using information contained within the BIMs

n. All instances of model elements in a service run must be allocated to a defined system

o. Where possible within the design authoring software, all services must be modelled as closed systems to take advantage of advanced tools such as analysis and performance calculations.

p. Where duplication of Model Elements occurs across disciplines, ownership of the Model Elements is to be resolved by the Project Team and documented in the design DEMP considering both geometrical and alphanumerical information.

q. Where duplication of model elements cannot be avoided due to the requirements of the discipline, the ownership previously nominated is responsible for ensuring only the correct model elements are uploaded to the federated model.

r. All new assets, as defined in the asset equipment list, shall be attributed with the specified VHBA_ Asset parameters relevant to Design Development and shall be extracted into the provided asset uploader template, as defined in section **4.5 Asset Information Requirements (AIR)**.

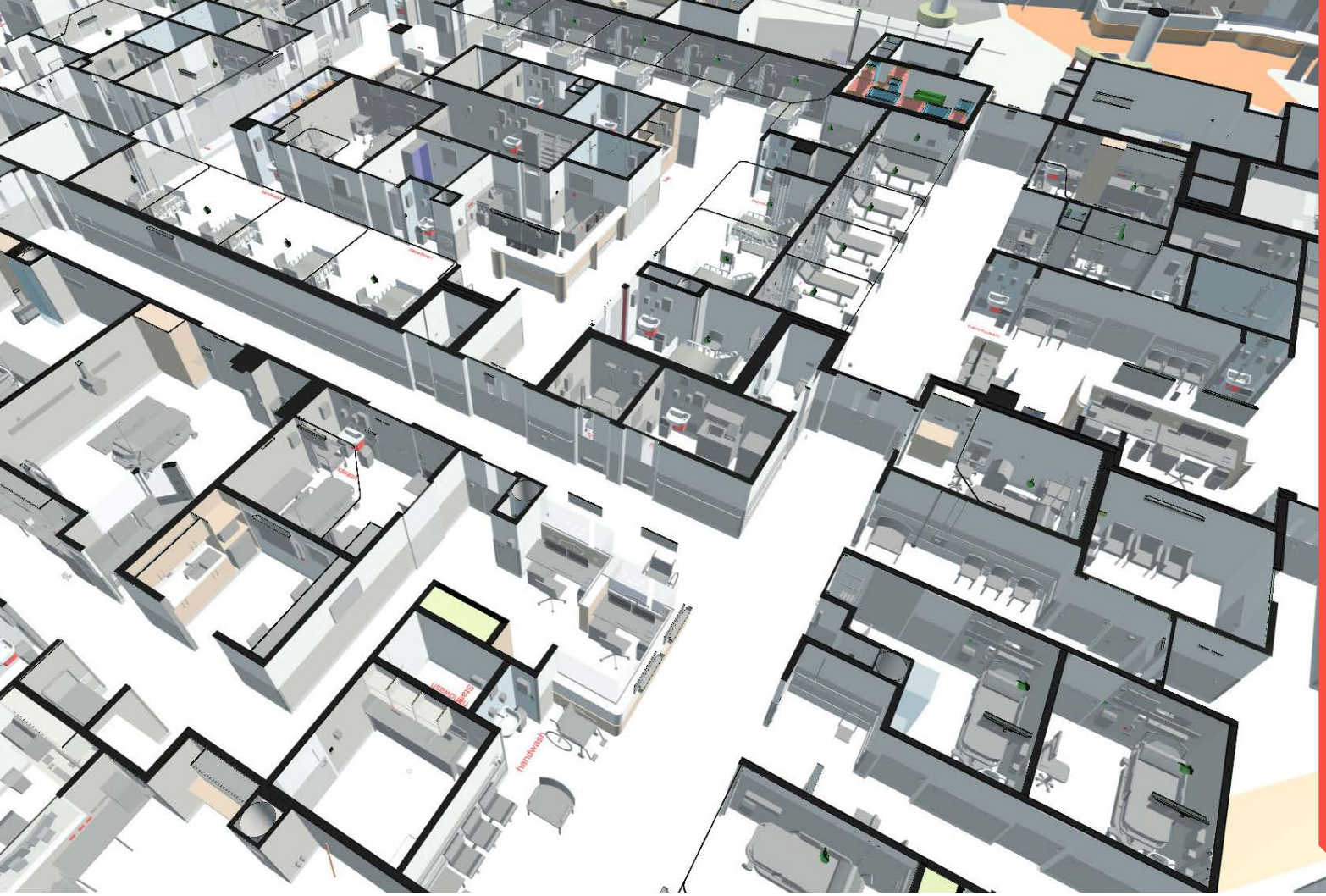
s. Any additional Appointed Parties engaged during Design Development phase shall be incorporated into the federated model, where spatial coordination is required (any other disciplines not engaged during Schematic Design), with the architectural model will occur during this design phase by the Project DE Lead for use by the Combined Team.

t. Using a BIM coordination tool in line with Technical section **4.13 Coordination**, prepare a clash detection report that will be reviewed and actioned by all Appointed Parties.

u. A federated model, compiling all discipline-centric BIMs in .nwc is used for coordination and accessible to VHBA at the Design Development phase.

v. A federated model, compiling all discipline-centric BIMs in .ifc is used for data validation and accessible to VHBA at the Design Development phase.

The **Managerial** section of the design DEMP shall contain and expand on each discipline's modelling requirements for the design development BIMs.



3.9.2 DE Level 2 and 3 projects

For DE Level 2 and 3 projects, BIMs must be created during the Design Development phase containing the following requirements:

a. SiD and OHS risks identified, analysed and mitigation strategies documented via issues linked to and viewable in the federated model (see section **4.13.1 Model Review Platform and Issue Management**).

b. Technologies such as virtual reality and augmented reality shall be used for virtual prototyping (material rationale, alternative design options and so on) with the Appointing Party and key stakeholders (see section **4.14 Visualisation**).

c. Visualisation technologies, such as generic renders and animations, are to be generated from the design development BIMs for stakeholder communication and approval (see section **4.14 Visualisation**).

3.9.3 DE Level 3 projects only

For DE Level 3 projects, BIMs must be created during the Design Development phase containing the following requirements:

a. Design development BIMs are to incorporate the QS units of measurement and codification to enable extraction for detailed elemental and whole of life costing by the QS (see **4.7 Costing and Quantification**).

b. Operational planning and staging documentation are to be further developed from the design development BIMs with risks (associated with safety, time, and spatial constraints) identified, analysed and mitigation strategies documented via issues linked to, and viewable in, the federated model (see section **4.15 Operational Planning and Staging**).

c. BIMs shall be developed in a manner where model element quantities are extractable to assist in ESD analysis and are compatible with export for use in energy efficiency modelling software for sustainability purposes and reviews by the ESD consultant.

3.9.4 Geometrical and Alphanumerical Information

At this project information delivery milestone, the Geometrical Information shall consist of specific model elements representing the design, construction and operational needs of the facility.

Model elements represent all objects appearing in drawings, modelled as specific systems or assemblies with accurate detail, quantity, shape, size, location, orientation and appearance.

Cross-discipline or trade coordination undertaken (with minimal coordination issues remaining, that is, those approved by VHBA) with interactions and interfaces between objects and systems considered.

Alphanumeric information shall be embedded within model elements or the model itself, as described in section **4.5 Asset Information Requirements (AIR)**. The attributes required for the project phase, as described in section **4.5.5 Asset Attributes**, shall be populated and delivered in the appropriate information container.

All project information shall be exchanged as defined in section **4.3 Common Data Environment (CDE)**.

3.9.5 Design Development DE Deliverables

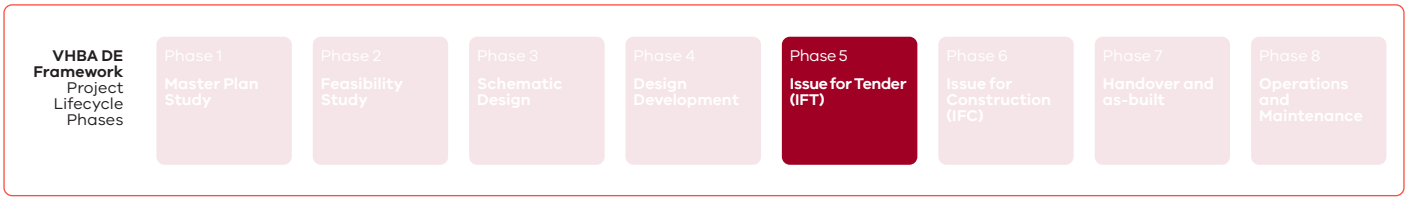
Table 8: Design Development DE deliverables

No.	Deliverable	Description
1	**Design DEMP**	Updated design DEMP (as in section **3.1**)
2	**DD BIMs**	Separate discipline models in native, .nwc and .ifc formats (exchanged as in section **4.10**)
3	**Federated model (.nwc)**	A federated model from .nwc file format BIMs submitted in .nwd format (as in section **4.11**)
4	**Federated model (.ifc)**	A federated model from .ifc file format BIMs submitted in .nwd format (as in section **4.11**)
5	**Documentation**	2D documentation (generated from BIMs), including FFE schedules, RDS and RLS, as specified in contract
6	**Asset data extracts**	All specified building, space and services asset data (see section **4.5**) populated in BIMs and extracted (exchanged as in section **4.10**)
7	**QA report**	A Lead Appointed Party compliance report reviewing alignment of the BIMs with the PIR (as in section **4.18**)

3.10 Phase 5 – Issue for Tender (IFT)

> **Note:** This DE Framework lifecycle phase relates to VHBA PMF project lifecycle phase: **Go to Market**

Figure 17: Issue for Tender phase



Discipline BIMs and other information containers, such as the cost plan, will continue to be further developed to greater precision of geometrical information, alphanumerical information, and documentation, informing the investment decision by VHBA and suitable for competitive tendering, that is, Issued for Tender (IFT) documentation, specifications and schedules.

The Project DE Lead will undertake regular and detailed coordination reviews, as in section **4.13 Coordination**, on the federated model and all discipline outputs (BIMs, drawings, schedules, specifications) ensuring there are minimal geometrical coordination issues prior to tender. The federated model shall be suitable for supply to prospective tenderers for uses defined in this PIR, supporting the traditional 2D documentation.

All asset data shall be attributed to model elements or the model itself, and extracted into the provided VHBA asset uploader template, providing the tenderers with accurate asset information (including classification, location and counts) as defined in section **4.5 Asset Information Requirements (AIR)**.

The **Managerial** section of the design DEMP shall contain and expand on each discipline's modelling requirements for the Issue for tender BIMs. The final IFT design DEMP must undergo a final update to ensure it reflects the modelling approaches, systems, and actual processes employed by the Project Team for all design phases prior to construction.

Geometrical and alphanumerical information must be further developed during this phase in preparation for tender.

3.10.1 Overview

The Project Team must deliver discipline-centric BIMs that define the design intent allowing VHBA to tender the project to a selection of managing contractors.

The BIMs shall be ready for construction modelling and must be an accurate representation of the design for this phase and must be capable of meeting the needs defined in the PIR. Once BIM is complete for IFT it is ready to progress to workshop detailing and defined costing by tendering construction parties. From Issue for Tender onwards the BIMs must contain the requirements of the previous project phases above and incorporate the following:

a. All discipline BIMs are to be delivered to VHBA in the agreed open standard format (IFC 2x3 minimum) containing all VHBA BIM shared parameters in user-defined custom property sets. Model exports should be run through an IFC 'model optimiser' tool prior to submission.

b. All native BIMs submitted are to be compatible and editable within the native BIM authoring tools. No models or objects shall be stripped of data and all drawings and schedules should remain in and linked to the BIMs.

c. All tender documentation, including drawings and schedules, must be derived from the BIMs and include information from the space planning database (if used).

d. All BIMs submitted to VHBA are to be 'cleaned' with all extraneous 2D references and 3D elements removed from the BIMs. No BIMs issued after Issue for Tender approval shall contain undefined, incorrectly defined or duplicated elements.

e. Electronic drawing, BIM and space planning database files are to be provided to VHBA via Aconex and Autodesk Construction Cloud, as applicable unless otherwise agreed.

f. Services are to be modelled to the 'as designed' size nominated by the consultant, including external and internal insulation, to enable co-ordination and confirmation of space requirements above ceilings and in risers.

g. All duct and pipe services are modelled as closed systems to allow for system design parameters and system flow information to exist within the models.

h. All equipment and associated terminating devices shall be assigned to a logical system, or circuit or panel (or both).

i. Access and clearance zones shall be shown for each discipline, clearly labelled as such and included in the clash detection process. All BIMs should include (if required) a separate 3D representation of plant egress and replacement routes.

j. Virtual coordination and clash detection as defined in the design DEMP and reported to the VHBA Project Management at nominated intervals. Any remaining design coordination issues shall be identified with mitigation strategies documented for review during construction.

k. Asset parameters relevant to Issue for Tender phase shall be populated in the BIMs as in section **4.5 Asset Information Requirements (AIR)** by each model element author as required.

l. The required schedules for each asset group are created/maintained in relevant BIMs and exported to enable asset information exchange.

3.10.2 DE Level 2 and 3 projects

For DE Level 2 and 3 projects, BIMs must be created during the IFT phase containing the following requirements:

a. SiD and wider OHS identified, analysed and mitigation strategies documented for continuation into construction via issues linked and viewable in the federated model (see section **4.13.1 Model Review Platform and Issue Management**).

b. Technologies such as virtual reality and augmented reality shall be used for virtual prototyping (material rationale, confirmed design option and so on) with the Appointing Party and key stakeholders (see section **4.14 Visualisation**).

c. Visualisation technologies, such as generic renders and animations, are to be generated from the IFT BIMs for stakeholder communication and approval (see section **4.14 Visualisation**).

3.10.3 DE Level 3 projects only

For DE Level 3 projects, BIMs must be created during the IFT phase containing the following requirements:

a. Tender BIMs are to incorporate the QS units of measurement and codification to enable extraction for detailed elemental and whole-of-life costing by the QS and quantities for the tendering cost estimator.

b. Detailed operational planning and staging documentation, such as decanting options, are to be developed from the design development BIMs with risks (associated with safety, time and spatial constraints) identified, analysed and mitigation strategies documented via issues linked to and viewable in the federated model prior to completion of IFT phase (see section **4.15 Operational Planning and Staging**).

c. Detailed operational planning such as space decanting options shall be undertaken using the BIMs.

d. IFT BIMs are to be developed to enable exporting functions to energy efficiency modelling software.

3.10.4 Geometrical and Alphanumerical Information

At this project milestone, the geometrical information shall consist of specific modelled elements needed for tender documentation, modelled as specific systems or assemblies with the necessary detail, quantity, shape, size, location, orientation and appearance for cross-trade coordination and construction layout, with specific interactions and interfaces between modelled elements and systems included.

Finishes and materials shall be nominated for model elements and the federated model shall contain as few spatial coordination issues as possible.

Alphanumerical Information shall also be attached to the model elements as defined in section **4.5 Asset Information Requirements (AIR)** of the PIR.

The attributes required for the project phase, as described in section **4.5.5 Asset Attributes**, shall be populated and delivered in the appropriate information container.

All project information shall be exchanged as defined in section **4.3 Common Data Environment (CDE)**.

3.10.5 Issue for Tender DE Deliverables

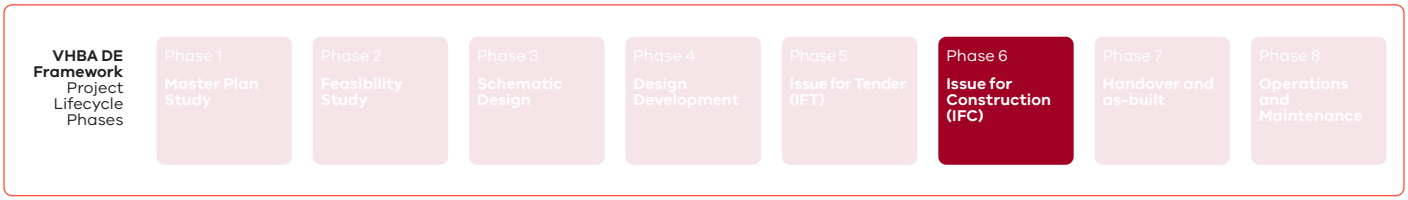
Table 9: Issue for Tender DE deliverables

No.	Deliverable	Description
1	**Design DEMP**	Updated DEMP, ready for prospective tenderers to reference when creating the Construction DEMP (as in section **3.1**)
2	**IFT BIMs**	Separate discipline models in native, .nwc and .ifc formats (exchanged as in section **4.10**)
3	**Federated model (.nwc)**	A federated model from .nwc file format BIMs submitted in .nwd format (as in section **4.11**)
4	**Federated model (.ifc)**	A federated model from .ifc file format BIMs submitted in .nwd format (as in section **4.11**)
5	**Documentation**	2D documentation (generated from BIMs) as specified in contract
6	**Asset data extracts**	All specified building, space, and services asset data (see section **4.5**) populated in BIMs and extracted (exchanged as in section **4.10**)
7	**QA report**	A Lead Appointed Party compliance report reviewing alignment of the BIMs with the PIR (as in section **4.18**)

3.11 Phase 6 – Issue for Construction (IFC)

> **Note:** This DE Framework lifecycle phase relates to VHBA PMF project lifecycle phase: **Implement**

Figure 18: Issue for Construction phase



Due to no construction documentation or contract documentation phase existing in VDAS, VHBA has included further refinement of the BIMs in this Issue for Construction (IFC) phase, as well as including related construction uses of DE. This will guide the refinement of the BIMs when creating the IFC documentation.

Prior to construction commencing, the construction DEMP shall be finalised by the Lead Appointed Party's Project DE Lead, ensuring all aspects of DE within construction are documented, including an approach to field verification, the use of BIM on site and within commissioning workflows. The **Managerial** section of the construction DEMP shall contain and expand on each trade's modelling requirements for the construction BIMs.

Depending on the procurement method, should previously appointed parties from design phases get novated to construction and form part of the Project Team during construction, the remaining identified coordination issues during design shall be reviewed with the documented mitigation strategies and implemented to assist in the production of construction documentation.

If novation is not intended to be a part of procurement, then the coordination of these remaining design issues shall be accounted for in the Managing Contractor's costs.

Subcontractors may prepare shop drawing models in other 3D CAD software packages rather than BIM. These shop drawing models must be integrated into the federated model for coordination purposes and all processes documented in the construction DEMP.

To meet the HS' needs, if not already provided in earlier phases, collaboration between the VHBA DE Project Champion, the Project Team and the HS facility management representative for the project should be performed early during the Construction, to determine if the project needs will be met.

The Project DE Lead shall engage with the VHBA DE Project Champion and the HS Facility Manager to identify, agree and establish project specific handover platform (for example, Aconex field, Autodesk Construction Cloud, OmTrack or Zutec).

Additional handover CDE information shall be incorporated into the construction DEMP once the handover platform has been confirmed. Additional information will be provided for the Project Team upon confirmation of HS handover platform.

The Project DE Lead will undertake regular and detailed coordination reviews, as in section **4.13 Coordination**, on the federated model and all discipline outputs (BIMs, drawings, schedules, specifications) ensuring there are minimal geometrical coordination issues prior to construction.

As built redline mark-ups shall be incorporated into the design (architecture and structural) and construction BIMs (services) to produce the as-built BIMs and as-built federated models of the project at handover. The approach for capturing As-Built conditions shall be described in the construction DEMP.

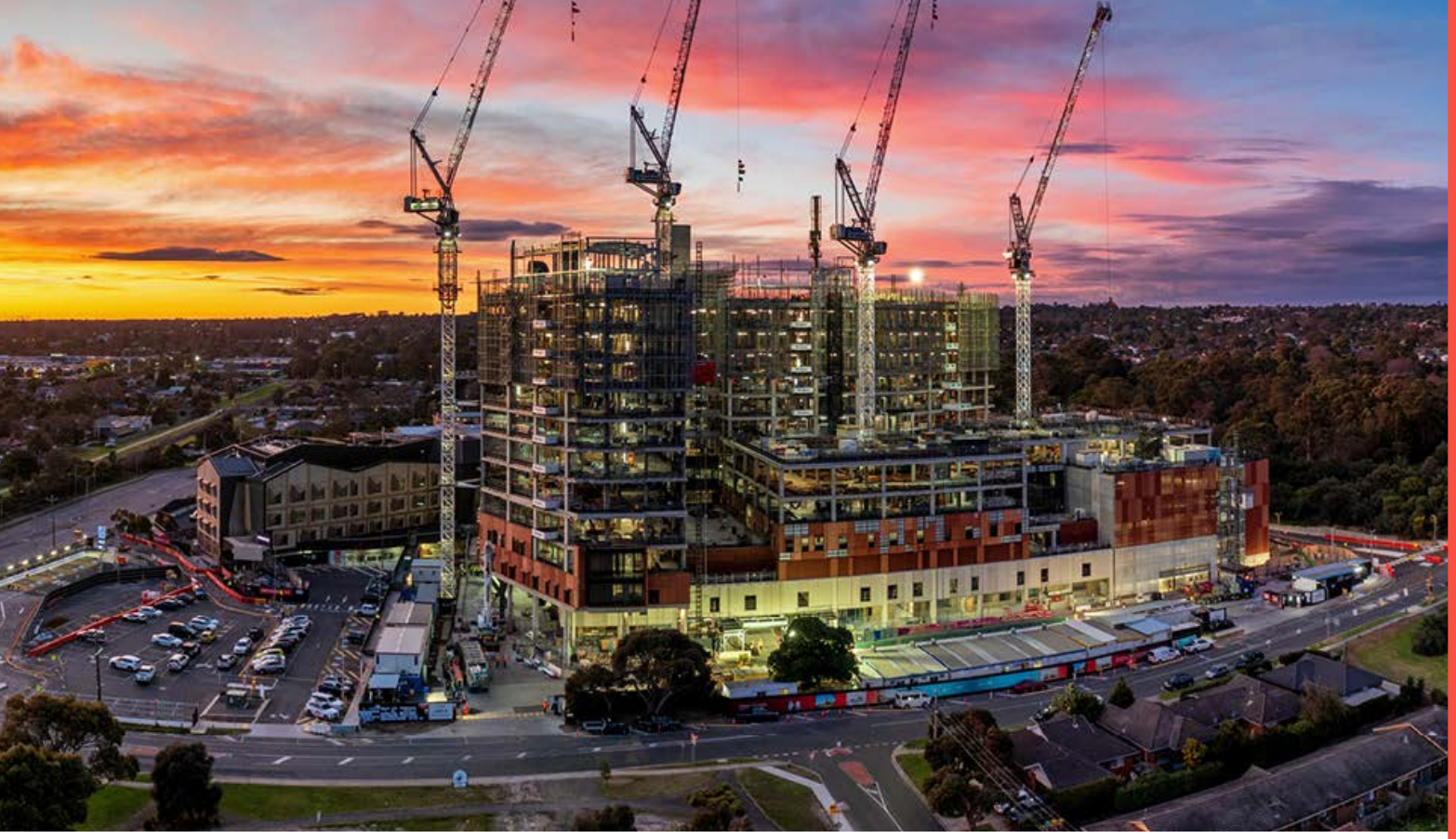
3.11.1 Overview

The Managing Contractor has used the design BIMs and the design DEMP to develop the approach for this construction DEMP, in line with the pre-award construction DEMP submitted as part of their tender.

The Project Team BIMs are to be suitable for construction from IFC onwards. The BIMs must contain the requirements of all previous project phases as nominated in the DEMP and incorporate the requirements listed in this section.

The subcontractors, fabricators and suppliers shall develop BIMs to suit the VHBA requirements of as-builts. All modelling shall be a continuation and further development of the design BIMs, with all requirements of the design DEMP being applicable during construction. Additionally, the following requirements from the PIR shall apply:

a. Throughout construction, modifications may be made to the project because of procurement, cost, material or equipment selection or constructability issues. Where these changes are within the scope of the project these changes must be coordinated within the BIMs and used to produce revised documentation.
b. At the end of construction there must be limited spatial coordination issues (approved by VHBA) and all applicable workshop detailing information should be coordinated and incorporated.
c. Procurement, fabrication and construction will commence within this project phase
d. Design and construction subcontractors may prepare workshop models in non-BIM authoring 3D software packages approved for use by VHBA. However, they must provide models in their native format, .nwc and .ifc exports for co-ordination and handover.
e. Where developing model elements further (from Design phases) to include IFC phase data (for example, VHBA_VBIS Tag, VHBA_ ExternalID), the existing generalised model elements should be modified by enhancing the component – not deleting it and replacing it, which would erase the underlying data produced in earlier design phases.
f. Integration and synchronisation of the BIMs with the space planning tool or database (if used) must be continued from the design phases to support the provision of coordinated as built, asset information during handover.
g. All instances of model elements in a service run must be allocated to a defined system.
h. Rooms and spaces shall contain the appropriate AusHFG coding.
i. VHBA_ Asset parameters shall be populated for each asset in the BIMs, as in section **4.5 Asset Information Requirements (AIR)**. Every model element author is required to align with the VHBA asset information requirements.
j. Where duplication of model elements occurs across disciplines, ownership of the model elements is to be resolved by the Project Team and documented in the DEMP considering both geometrical and alphanumerical information.
k. Where duplication of model elements cannot be avoided due to the requirements of the discipline, the ownership previously nominated is responsible for ensuring only the correct model elements are uploaded to the federated model.
l. A federated model compiling all discipline or trade-centric BIMs in .NWC is used for coordination and accessible to VHBA during the IFC phase.
m. A federated model compiling all discipline or trade-centric BIMs in .ifc is used for data validation and accessible to VHBA at the IFC phase milestones.



3.11.2 DE Level 2 and 3 projects

For DE Level 2 and 3 projects, BIMs must be created during the Issue for Construction phase containing the following requirements:

a. SiD and construction, and OHS risks identified, analysed and mitigation strategies documented via issues linked to and viewable in the federated model (see section **4.13.1 Model Review Platform and Issue Management**).
b. Static renders and technologies (such as virtual reality and augmented reality) shall be generated from the IFC BIMs for communication with the Appointing Party and key stakeholders (see section **4.14 Visualisation**).
c. The contractor's cost estimator shall use BIM to improve cost accuracy for trade packages.
d. Appointed Party BIMs are to incorporate the QS units of measurement to enable extraction for contractor's cost estimator use in improving cost accuracy for the trade packages (see section **4.7 Costing and Quantification**).

3.11.3 DE Level 3 projects only

For DE Level 3 projects, BIMs must be created during the IFC phase containing the following requirements:

a. BIMs are to incorporate the QS units of measurement and codification to enable extraction for detailed elemental and whole-of-life costing by the QS.
b. Detailed 3D operational planning and staging documentation, such as detailed space decanting options, are to be developed from the design development BIMs with risks (associated with safety, time and spatial constraints) identified, analysed and mitigation strategies documented via issues linked to the federated model (see section **4.15 Operational Planning and Staging**).
c. 4D programming and construction sequencing processes are to be integrated with the BIMs and federated model to clearly communicate construction program and scheduled works (see section **4.16 Construction Sequencing**).
d. BIM shall be used to monitor and report status and progress on site (approach to be documented in the construction DEMP).
e. BIMs shall be leveraged in the field to reduce risks and improve value (approach to be documented in the construction DEMP).

3.11.4 Geometrical and Alphanumerical Information

At this project information delivery milestone, the geometrical information shall consist of specific model elements representing the design, construction and operational needs of the facility. Model elements represent all objects appearing in drawings, modelled as specific systems or assemblies with accurate fabrication detail, quantity, shape, size, location, orientation and appearance.

Cross-discipline or trade coordination undertaken (with minimal coordination issues remaining that is, those approved by VHBA), construction layout with specific interactions and interfaces between objects and systems included. The geometrical information shall be sufficient to enable the uses of BIM as defined in this PIR.

Alphanumeric information shall be embedded within model elements or the model itself, as described in section **4.5 Asset Information Requirements (AIR)**.

The attributes required for the project phase, as described in section **4.5.5 Asset Attributes**, shall be populated and delivered in the appropriate information container.

All project information shall be exchanged as defined in section **4.3 Common Data Environment (CDE)**.

3.11.5 Issue for Construction DE Deliverables

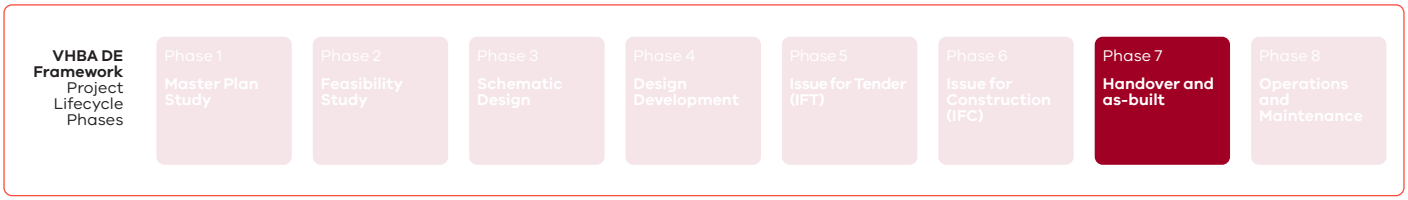
Table 10: Issue for Construction DE deliverables

No.	Deliverable	Description
1	**Construction DEMP**	Updated construction DEMP (as in section **3.1**)
2	**Construction BIMs**	Separate trade models in native, .nwc and .ifc formats (exchanged as in section **4.10**)
3	**Federated model (.nwc)**	A federated model from .nwc file format BIMs submitted in .nwd format (as in section **4.11**)
4	**Federated model (.ifc)**	A federated model from .ifc file format BIMs submitted in .nwd format (as in section **4.11**)
5	**Documentation**	2D documentation (generated from BIMs) as specified in contract
6	**Asset data extracts**	All specified building, space, and services asset data (see section **4.5**) populated in BIMs and extracted (exchanged as in section **4.10**)
7	**QA report**	A Lead Appointed Party compliance report reviewing alignment of the BIMs with this PIR (as in section **4.18**)

3.12 Phase 7 – Handover and As-Built

> **Note:** This DE Framework Lifecycle Phase relates to VHBA PMF project lifecycle phase: **Handover and As-Built**

Figure 19: Handover and As-Built Phase



During construction, the verification of as-built information shall be incrementally captured in the BIMs. As in section 4.17, this may consist of a measured approach using laser scanning, or a visually verified approach using photogrammetry, 360 photos, or photos.

The Project DE Lead shall consult with the VHBA DE Project Champion and the VHBA Asset Performance team, testing the transfer of asset data from the PIM to the AIM, to improve asset data handover. This process shall be refined and documented in the Construction DEMP.

The final critical asset data transfer of information from the PIM to the AIM will occur during this phase, in line with the asset information requirements, as described in section 4.5 Asset Information Requirements (AIR) and further refined in the construction DEMP. The final updated trade and discipline As-Built BIMs shall be provided to the Appointing Party using the CDE as described in:

- section **4.3 Common Data Environment (CDE)**
- section **4.10 Information Containers and Exchange Frequency**, and
- the established HS handover platform.

It is expected that information is duplicated across the geometrical information CDE, documentation CDE and the nominated HS handover platform, providing a copy of records to both the HS and VHBA. Any associated as-built 2D documentation including (but not limited to) the building users guide, drawings indicating the location of test points, test reports, commissioning reports, operations and maintenance manuals shall be provided in a searchable digital format.

3.12.1 Quality Assurance

The Project DE Lead shall undertake a monthly audit of all BIM files for the project during this phase ensuring the BIMs are compliant with the requirements of this PIR and the construction DEMP, and are prepared in readiness for handover back to VHBA.

Handover and As-Built asset information deliverables shall be checked for compliant asset data.

A report shall be produced by the Lead Appointed Party for action by the relevant Appointed Parties to ensure all corrective actions are completed in a timely manner, within a nominated timeframe.

The Lead Appointed Party shall leverage the BIMs for tracking and closing out defects, signing off rooms as they complete and updating their status in the federated model. This shall be shared with the Combined Team, including the Appointing Party, through the nominated and agreed platform (for example, Aconex field, Autodesk Construction Cloud, OmTrack or Zutec.).

> **Important!** VHBA reserves the right to independently audit the federated model by the VHBA DE Project Champion, based on the discipline or trade native and .ifc BIMs, against this PIR, the design DEMP, the construction DEMP and other relevant requirements in readiness for handover back to VHBA. Any errors or omissions will need to be remedied by the originating authors, managed by the Project DE Lead.

3.12.2 Handover and As-Built deliverables

Table 11: Handover and As-Built deliverables

No.	Deliverable	Description
1	**Construction DEMP**	Updated construction DEMP capturing all construction processes used on the project
2	**As-built BIMs**	Separate trade models in native, .nwc and .ifc formats. Native formats shall be updated to one (1) version previous to newest release (exchanged as in section **4.10**)
3	**As-built federated model (.nwc)**	A federated model from .nwc file format BIMs submitted in .nwd format (as in section **4.11**)
4	**As-built federated model (.ifc)**	A federated model from .ifc file format BIMs submitted in .nwd format (as in section **4.11**)
5	**As-built documentation**	2D documentation (generated from BIMs) as specified in contract
6	**Handover asset data extracts**	All specified building, space, and services asset data (see section **4.5**) populated in BIMs and extracted (exchanged as in section **4.10**)
7	**Final QA report**	A Lead Appointed Party compliance report reviewing alignment of the BIMs with this PIR (as in section **4.18**)

4. Technical

This section outlines the DE technical requirements for the Project Team, detailing the step-by-step processes to follow, specifying the characteristics of tools and technologies to be used, clarifying accepted workflows, and defining the technical deliverables required at each stage.

4.1 Key Technical Information Requirements

VHBA requires the Project Team to adhere to and demonstrate the following:

a. BIMs shall be created at 1:1 scale, with model origins agreed, using shared a coordinate system.
b. 2D documentation, schedules and visualisations shall be produced from relevant BIMs and not edited post-export. Anything not derived from BIM must be documented in the DEMP.
c. Any proposed use of CAD (for example, typical 2D details) shall be documented in the DEMP and approved by the VHBA DE Project Champion (or representative).
d. The provided BIMs shall contain all information required to recreate the project information.
e. Model elements created in BIM authoring tools shall use the correct function or tool so they actually reflect their intended purpose (for example, beams modelled as beams, not floors).
f. Model elements shall be modelled reflecting their construction methodology (for example, walls from top of slab to underside of the slab above, or stop above ceiling – as designed).
g. Tags and annotation on drawings shall be driven from parameter data, with limited text notes used.
h. Leverage the use of shared resources such as AusHFG standard components model objects and schedule database.
i. All FFE shall be developed, managed and coordinated in BIMs and shall leverage associated data so all FFE schedules are driven by BIMs.
j. All model elements shall be generated in native authoring formats, not imported geometry.
k. The Project Team shall use standardised settings and templates wherever possible to improve consistency of BIMs and data structure.
l. Globally Unique identifiers must be retained across all formats.
m. VHBA assets must be represented by a single model element (for example, one asset to one element).
n. Dimension values shall not be overridden or rounded.
o. The file size of BIMs shall be optimised for performance. Discipline or trade BIMs exceeding 500MB and federated models exceeding 1GB require VHBA approval.

4.2 Software

VHBA does not stipulate the BIM authoring tools used by the Project Team and they are encouraged to use whichever BIM authoring tools are best suited to their discipline or trade practices. Information created in their chosen platform shall be interoperable with other BIM authoring, space planning and collaboration tools through the use of openBIM formats.[5] At a minimum, the chosen BIM authoring tools shall support buildingSMART .ifc for both import and export.

The Lead Appointed Party shall document the Project Team's nominated software in the DEMP, including version and build, and intended use of the software (for example, BIM authoring, issue tracking, collaboration). This table shall also capture who is providing the software and if licensing is provided for other parties or not required.

Interoperability testing shall be performed at each phase, prior to the any deliverable being issued to VHBA.

4.2.1 VHBA Technology Stack

The VHBA technology stack supports the use of:

- Autodesk Construction Cloud (ACC)
- Revizto
- Cupix.

Should the Project Team implement the same software that aligns with the platforms listed here, then they shall email digital.engineering@health.vic.gov.au as bridging opportunities will be available for ease of handover requirements.

4.2.2 Software version update policy

Versioning of software shall be managed by the Project DE Lead throughout the delivery phases.

Any software version updates shall be agreed with the Project Team across all disciplines or trades prior to updating.

Thorough testing shall take place to detect potential issues with the transition. If successful, and the Combined Team would like to proceed with the update, the VHBA DE Project Champion shall be asked to review the timings of the upgrade. Only at this phase shall the upgrade proceed, if approved.

It is recommended that the timing of any updates align with the end or start of project milestone dates to avoid disruption to Project Team deliverables.

VHBA requires native files to be updated to one (1) version prior to newest available release before final handover.

4.2.3 Training

The Lead Appointed Party remains responsible for training of Project Team personnel in the use of:

- BIM
- CAD
- the chosen CDE
- model review platform
- other such systems to meet the requirements documented in this PIR.

5 https://www.buildingsmart.org/about/openbim/

4.3 Common Data Environment (CDE)

The CDE will function as a digital hub within which internal and external stakeholders can collect, manage and disseminate all relevant approved project data in a managed environment. Additional solutions may be provided by the Project Team for model collaboration and exchange, issue tracking and so on.

It is typical for more than one system or platform to be used on a project. As defined in **Table 12**, VHBA uses:

- **Autodesk Construction Cloud (ACC)** as the primary platform to store as-built information for BIM, As-built drawings and documentation
- **Aconex** as the primary platform for documentation, requests for information (RFIs) and project correspondence during delivery.

A technology map must be produced by the Project DE Lead and included in the DEMP.

Table 12: Common Data Environments

Information Type	Information Type	Formats	CDE
Geometrical	Individual discipline / trade / BIM/s	native, .ifc and .nwc	ACC
	Federated models (from .nwc or .ifc format)	.nwd	ACC
	Cost planning models	.dwfx and .ifc	ACC
	Geospatial surveys	native, open and RCP	ACC
	Sustainability models	native, open and .gbxml	ACC
	As-built discipline, trade, BIMs	native, .ifc and .nwc	ACC
Alphanumerical	Schedules, registers, and other tabular information	.xlsx	Aconex
	Asset dataset (in BIM and exported tabular)	.ifc and .xlsx	Aconex
Documentation	Drawings	.pdf and .dwg	Aconex
	As-built drawings	.pdf and .dwg	• Aconex • ACC
	Reports and other textual information	.pdf	Aconex
	Request for information	RFI	Aconex

4.3.1 Geometrical Information CDE

Autodesk Construction Cloud (ACC) is supported as VHBA's CDE for BIMs and federated models. The native collaboration functionality may be used by Appointed Parties possessing their own BIM Collaboration licenses. All other parties shall use the more manual Docs workflow without needing a license. It is expected that all work in progress (WIP) models shall be transmitted and saved to the relevant folder within the CDE, replacing the previously issued model, therefore model naming can remain consistent.

> **Important!** VHBA prefers the use of ACC as the Geometrical CDE as it is the milestone submission platform required by VHBA.

The Project DE Lead shall engage with the VHBA DE Project Champion to establish project specific settings, such as folder structure and permissions.

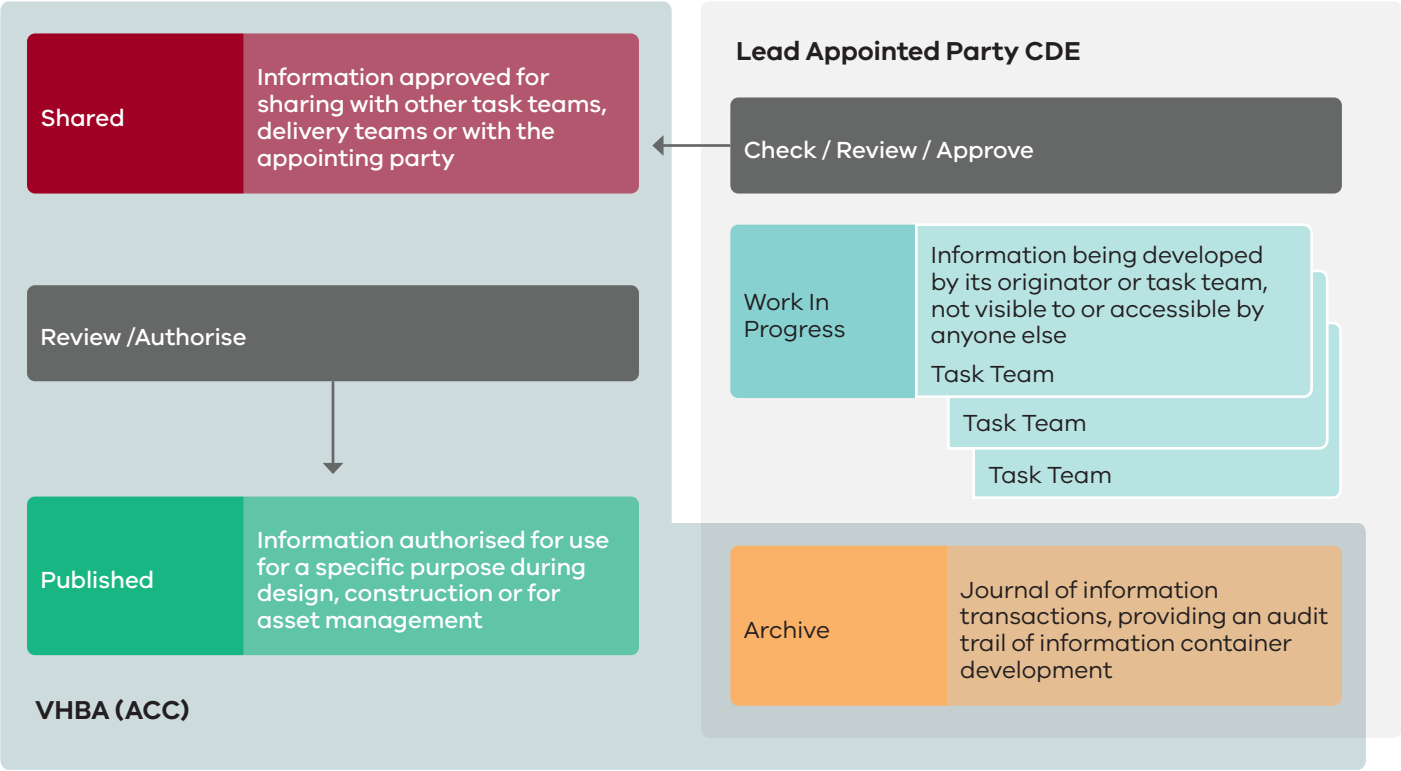
VHBA prefers the use of ACC for information containers in the shared and published states. See the VHBA ACC Guidelines for further details about the use of ACC on VHBA projects.

4.3.2 Documentation CDE

For all other project documents, Aconex is the selected platform. Access and instructions on use will be provided by a VHBA document controller. It is appreciated that relevant information containers shall be developed (WIP) and shared in a Lead Appointed Party environment.

It is anticipated that the Lead Appointed Party may provide their own CDE for delivery, exchanging published (uploading) information at project information delivery milestones into VHBA's Aconex environment.

Figure 21: Preferred use of ACC (by information container state)



4.4 Level of Information Need (LoIN)

The LoIN uses the information container types described here. In line with the VDAS and the AS ISO 19650 series, information containers are considered to be a named, persistent set of retrievable information. As in section **4.10 Information Containers and Exchange Frequency**, information containers are typically referred to at the 'type' level where there are three information container types that make up the project information model (PIM) and the asset information model (AIM):

- geometrical information (see section **4.4.1 Geometrical Information**)
- alphanumerical (non-geometrical) Information (see section **4.4.2 Alphanumerical (Non-Geometrical)** Information)
- documentation (see section **4.4.3 Documentation**).

4.4.1 Geometrical Information

Geometrical Information is the term used in AS ISO 19650-1 and BS EN 17412-1 to describe the geometrical development of objects in BIMs. This is similar to the traditional term 'level of development' (LOD), but there are 5 aspects of geometrical information:

- detail
- dimensionality
- location
- appearance
- parametric behaviour.

At each project phase, the BIMs shall contain the geometrical information required to generate the needed documentation for the project phase and to permit the defined uses for BIM as prescribed in this PIR (for example, coordination, quantity take off).

The geometrical information within each BIMs must be suitably detailed to describe the works for each party, with minimal supplementary 2D embellishment (for example, 2D details).

2D linework shall not replace the geometrical information used to describe the design.

All geometry shall be reflective of methods of construction (for example, to assist in understanding of assembly and installation).

4.4.1.1 Level of Development (LOD)

VHBA does not prescribe the use of LOD for specifying minimum modelling requirements and subsequent uses. This PIR document defines the expected uses of DE. All authoring parties are responsible for assuring that their BIMs or information containers meet their contractual scope (that is, coordinated design and documentation for the relevant VHBA DE project phases).

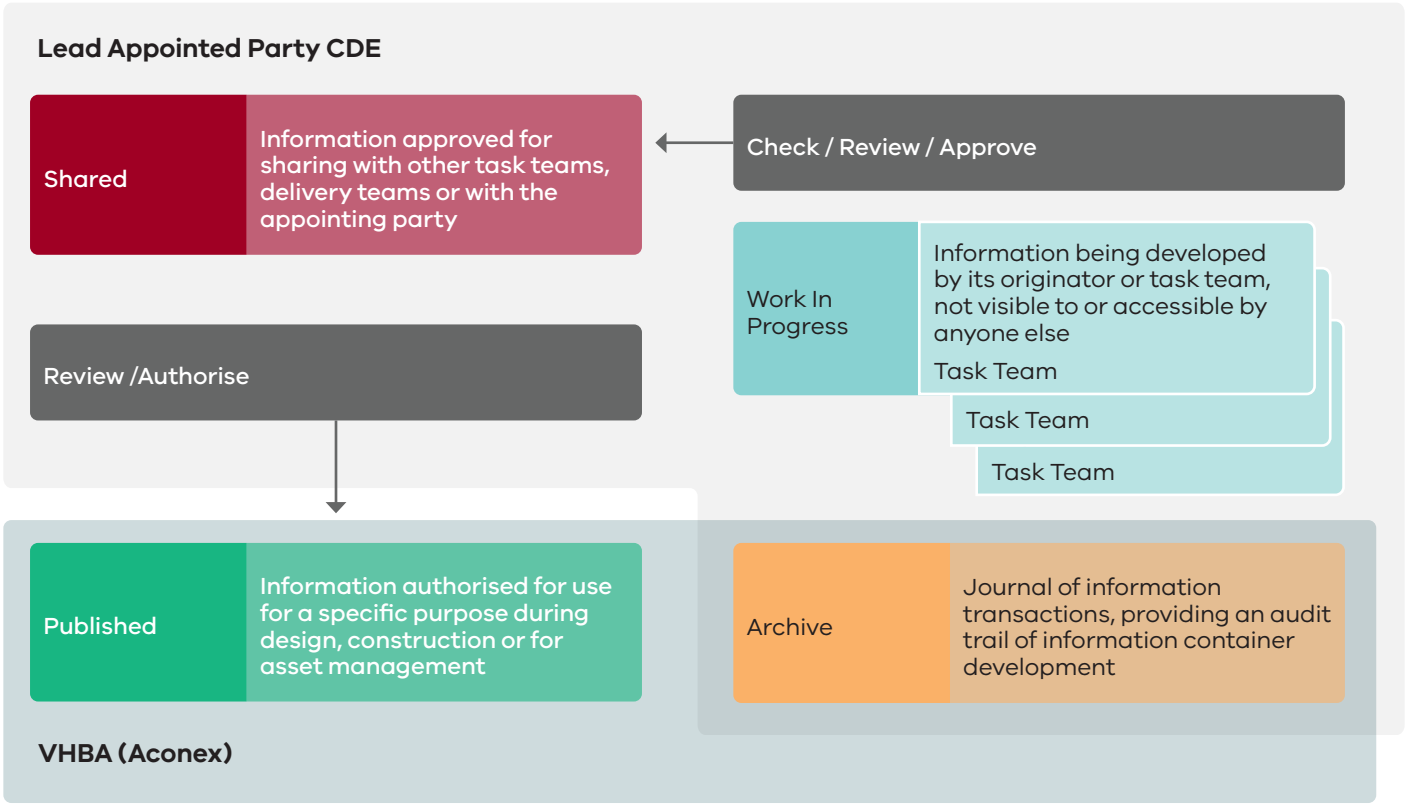
> **Important!** LOD is described textually for each project phase in the **Managerial** section

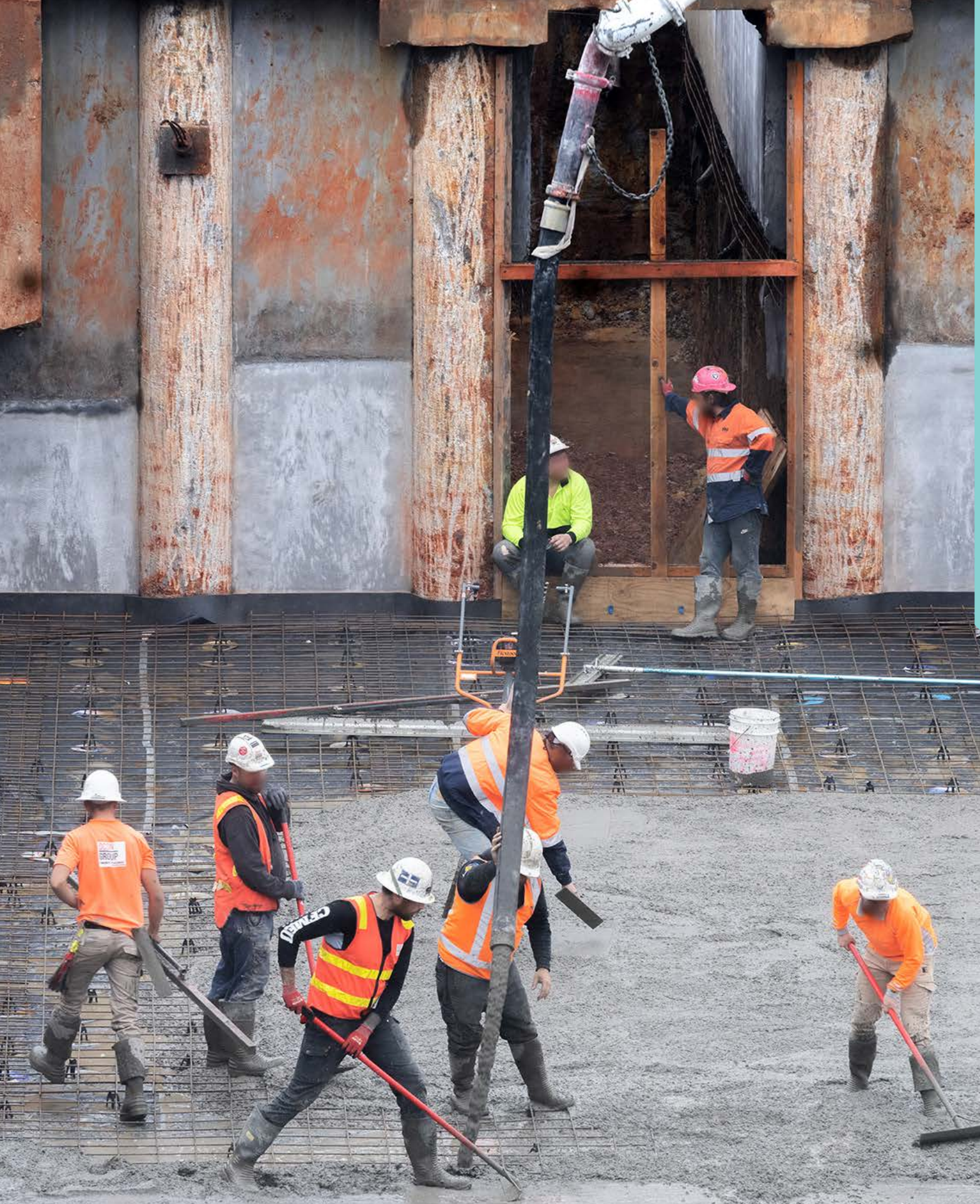
If the Lead Appointed Party wishes to use LOD to prescribe geometrical information requirements to their Appointed Parties, the following LOD bands shall provide guidance:

- Master Planning to Schematic Design – up to LOD 200
- Design Development to IFT – up to LOD 300
- IFC to As-Built – up to LOD 400

If any BIMs or information containers are found to be incomplete or lacking the necessary level of development or information to achieve the desired uses, the Appointed Party will be instructed to rectify their information.

Figure 22: Preferred use of Aconex (by information container state)





4.4.1.2 Model Element Author (MEA) Ownership Matrix

The Lead Appointed Party shall produce a matrix that clearly sets out the ownership of model elements (geometrical information) and data (alphanumerical information) at various points of the project's life cycle. This matrix should be organised with a classification system (for example, Uniclass Ss table) and may include information such as model element author and LOD, if used. See VDAS Appendix 7 for an example.

4.4.2 Alphanumerical (Non-Geometrical) Information

The AS ISO 19650-1 term 'alphanumerical information', further described in BS EN 17412-1:2020, is used to describe the structured non-geometrical information for an object or set of objects. This structured alphanumerical information is associated with objects in the BIMs or linked from an external database to the BIMs using a unique key (for example, Asset Id), and it may be an output of BIM (for example, schedules).

At each project phase, the BIMs shall contain the alphanumerical information required to:

- generate the needed information deliverables and documentation for the project phase
- permit the defined uses of BIM
- achieve identified DE workflows and objectives as prescribed in this PIR.

This includes the assets information described in section **4.4 Level of Information Need (LoIN)**. Alphanumerical Information in BIMs forms the basis of many other exports too, such as SoA, FFE schedules and door schedules.

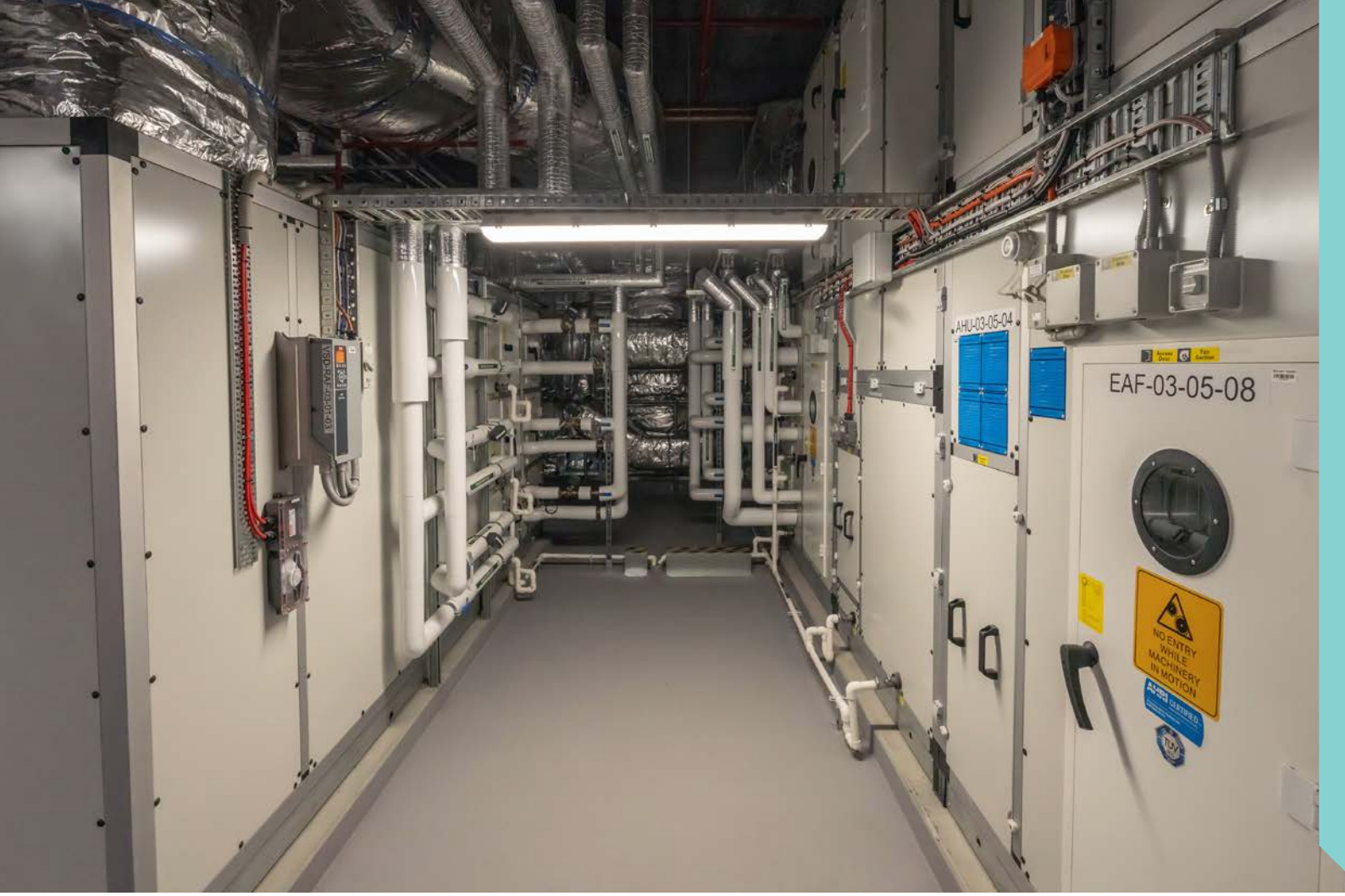
4.4.3 Documentation

Formal documentation issued at project information delivery milestones shall comply with the requirements of the Lead Appointed Party's VHBA-approved naming standard (see section **4.10.1 Information Container Naming**).

All revisions of documentation must follow the requirements described in the Lead Appointed Party's VHBA-approved revision standards within the DEMP.

Native BIMs must be used as the basis for producing all design and construction documentation comprising drawings, schedules, OM manuals, construction set out information and so on.

All documentation must undergo suitable internal reviews and approvals, in line with AS ISO 91650 2, prior to sharing with other parties or VHBA via the CDE.



4.5 Asset Information Requirements (AIR)

This PIR only considers asset information due as part of the DE deliverables. Additional asset information, such as asset registers and OMs, may be required elsewhere within the technical specification for the project.

Important! VHBA's asset information requirements (AIR) are the basic mandatory standards that meet the Victorian Department of Health's needs. Before starting Design Development, the Project Team must consult with the VHBA Project Manager, HS Facility Manager and VDAS or DE Project Champion to decide and agree on any additional AIR needed.

4.5.1 Asset Grouping

Developed from the AIM Asset Framework for ease of specification and documentation, VHBA has 5 asset groups. For the relationships of these groups and their descriptions, see **Figure 24** and the following summaries.

4.5.1.1 Building

Asset data captured for the whole building/model (not against individual objects). See **Table 13** for the required parameters.

To be entered once at the model information level.

4.5.1.2 Spaces

Asset data captured for each room or space. See **Table 14** for the required parameters.

To be entered against the geometry representing the room in the architectural model.

4.5.1.3 Building Services Assets

Asset data captured for each piece of equipment or plant listed in the VHBA equipment list. See **Table 15** for the required attribution.

One model element to one asset.

4.5.1.4 Systems

Asset data captured for each system. See **Table 16** for the required attribution and the systems defined in the equipment list.

To be entered in the asset uploader template.

4.5.1.5 Miscellaneous Assets

Quantitative and type reference data. It is expected that this information is only entered once per type per level extracting the quantities from the BIMs.

This information may be entered in BIMs for type-based model elements, defined in the VHBA asset equipment list, that can be extracted to the asset uploader template.

At a minimum, this information shall be provided in the asset uploader template.

See **Table 17** for the required attribution and the miscellaneous items defined in the equipment list.

4.5.2 Asset Equipment List

The building services assets are itemised in the VHBA asset equipment list (see **Figure 25**).

Additionally, the VHBA asset equipment list shall be used for determining the existing critical assets as specified in section **3.5 Existing Conditions**.

> **Important!** The VHBA asset equipment list defines whether an item is treated as an asset. Any item on this list shall be considered an asset and the data relevant to the Building Services Assets group shall be captured against the asset in BIM.

The VHBA asset equipment list also contains references to data which shall only be captured in the VHBA asset uploader. This includes:

- **Systems information** – data captured for each individual system used on the project, as defined in the VHBA asset equipment list. This information shall only be captured in the VHBA asset uploader template.
- **Miscellaneous asset information** – quantitative and type reference data to be extracted from the BIMs, as defined in the VHBA asset equipment list. This information may be entered in BIMs for type-based model elements, defined in the VHBA asset equipment list, that can be extracted to the asset uploader template but shall be captured in the VHBA asset uploader template at a minimum.

Any item not on these lists does not require asset data (excluding buildings and spaces, which all require asset data as in section **4.5.4 Classification**). The VHBA asset equipment list defines an asset's intended classification, VBIS tag, and description. This list is definitive and should be used as a reference. See the tables in section **4.5.5 Asset Attributes** for the specific asset parameters required for each asset group.

Figure 22: VHBA asset grouping

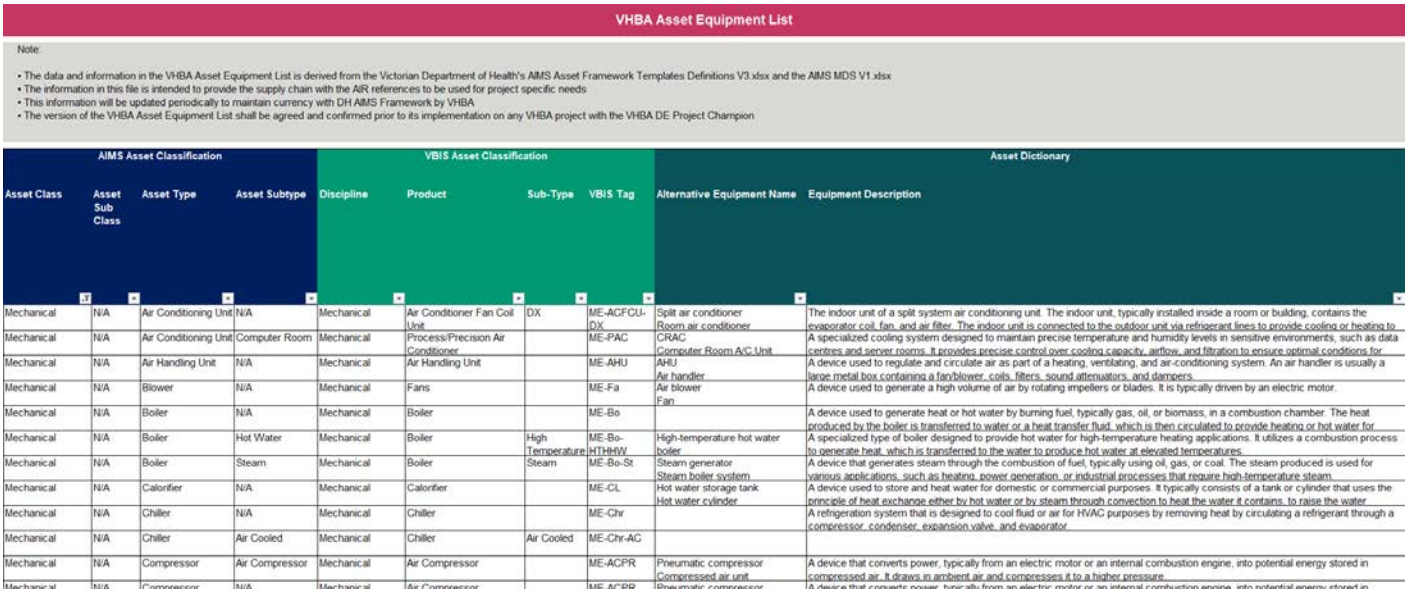
4.5.3 Asset Uploader Template

From Schematic Design phase onwards, it is expected that upon the completion of each project phase the asset uploader template shall be populated by each Appointed Party for submission. The specified attribution in section **4.5.5 Asset Attributes** shall be extracted from each respective discipline BIMs into each Appointed Party's asset uploader document. Each Appointed Party shall submit their asset uploader document for review by the Lead Appointed Party.

The VHBA asset uploader template contains all the specified attributes in section **4.5.5 Asset Attributes**, for which the attributes captured in BIMs shall be extracted and imported into their respective fields in the asset uploader template. Attributes specified to be captured in the Asset Uploader shall be entered directly in the asset uploader template selecting from the built in reference lists for ease of population.

> **Important!** The resulting export from each discipline or trade is to be consolidated into a single document by the Lead Appointed Party prior to delivery at each project phase.

Figure 23: VHBA Asset Equipment List



VHBA Asset Equipment List

Note:

- The data and information in the VHBA Asset Equipment List is derived from the Victorian Department of Health's AIMS Asset Framework Templates Definitions V3.xlsx and the AIMS MDS V1.xlsx
- The information in this file is intended to provide the supply chain with the AIR references to be used for project specific needs
- This information will be updated periodically to maintain currency with DH AIMS Framework by VHBA
- The version of the VHBA Asset Equipment List shall be agreed and confirmed prior to its implementation on any VHBA project with the VHBA DE Project Champion

AIMS Asset Classification				VBIS Asset Classification				Asset Dictionary	
Asset Class	Asset Sub Class	Asset Type	Asset Subtype	Discipline	Product	Sub-Type	VBIS Tag	Alternative Equipment Name	Equipment Description
Mechanical	N/A	Air Conditioning Unit	N/A	Mechanical	Air Conditioner Fan Coil Unit	DX	ME-ACFCU-DX	Split air conditioner Room air conditioner	The indoor unit of a split system air conditioning unit. The indoor unit, typically installed inside a room or building, contains the evaporator coil, fan, and air filter. The indoor unit is connected to the outdoor unit via refrigerant lines to provide cooling or heating to
Mechanical	N/A	Air Conditioning Unit	Computer Room	Mechanical	Process/Precision Air Conditioner		ME-PAC	CRAC Computer Room A/C Unit	A specialized cooling system designed to maintain precise temperature and humidity levels in sensitive environments, such as data centres and server rooms. It provides precise control over cooling capacity, airflow, and filtration to ensure optimal conditions for
Mechanical	N/A	Air Handling Unit	N/A	Mechanical	Air Handling Unit		ME-AHU	AHU Air handler	A device used to regulate and circulate air as part of a heating, ventilating, and air-conditioning system. An air handler is usually a large metal box containing a fan/blower, coils, filters, sound attenuators, and dampers.
Mechanical	N/A	Blower	N/A	Mechanical	Fans		ME-Fa	Air blower Fan	A device used to generate a high volume of air by rotating impellers or blades. It is typically driven by an electric motor.
Mechanical	N/A	Boiler	N/A	Mechanical	Boiler		ME-Bo		A device used to generate heat or hot water by burning fuel, typically gas, oil, or biomass, in a combustion chamber. The heat produced by the boiler is transferred to water or a heat transfer fluid, which is then circulated to provide heating or hot water for
Mechanical	N/A	Boiler	Hot Water	Mechanical	Boiler	High Temperature	ME-Bo-HTHW	High-temperature hot water boiler	A specialized type of boiler designed to provide hot water for high-temperature heating applications. It utilizes a combustion process to generate heat, which is transferred to the water to produce hot water at elevated temperatures.
Mechanical	N/A	Boiler	Steam	Mechanical	Boiler	Steam	ME-Bo-St	Steam generator Steam boiler system	A device that generates steam through the combustion of fuel, typically using oil, gas, or coal. The steam produced is used for various applications, such as heating, power generation, or industrial processes that require high-temperature steam.
Mechanical	N/A	Calorifier	N/A	Mechanical	Calorifier		ME-CL	Hot water storage tank Hot water cylinder	A device used to store and heat water for domestic or commercial purposes. It typically consists of a tank or cylinder that uses the principle of heat exchange either by hot water or by steam through convection to heat the water it contains, to raise the water
Mechanical	N/A	Chiller	N/A	Mechanical	Chiller		ME-Chr		A refrigeration system that is designed to cool fluid or air for HVAC purposes by removing heat by circulating a refrigerant through a compressor, condenser, expansion valve, and evaporator.
Mechanical	N/A	Chiller	Air Cooled	Mechanical	Chiller	Air Cooled	ME-Chr-AC		
Mechanical	N/A	Compressor	Air Compressor	Mechanical	Air Compressor		ME-ACPR	Pneumatic compressor Compressed air unit	A device that converts power, typically from an electric motor or an internal combustion engine, into potential energy stored in compressed air. It draws in ambient air and compresses it to a higher pressure.
Mechanical	N/A	Compressor	N/A	Mechanical	Air Compressor		ME-ACPR	Pneumatic compressor	A device that converts power, typically from an electric motor or an internal combustion engine, into potential energy stored in

The Project DE Lead is to monitor and assess the progressive development of the data capture requirements of each phase, ensuring the quality and validity of the information being submitted. The Project DE Lead shall then submit a collated master asset uploader document capturing each Appointed Party's data in a single document that produces the asset data extract deliverable expected from Schematic Design phase onwards.

This data is used at various phases for differing purposes, for example, to confirm brief area is being met, or to ensure suitable testing and compliance checks can be undertaken throughout project delivery with VHBA's asset systems. This reduces risk for the final handover, ensuring compatibility with VHBA's and the Victorian Department of Health's AIMS needs.

4.5.4 Classification

A series of classification systems are used within VHBA's Asset Information Management System (AIMS). These include fields within the:

- Victorian Department of Health's AIMS Asset Framework
- Virtual Building Information System (VBIS)[6]
- the Australasian Health Facilities Guidelines (AusHFG).

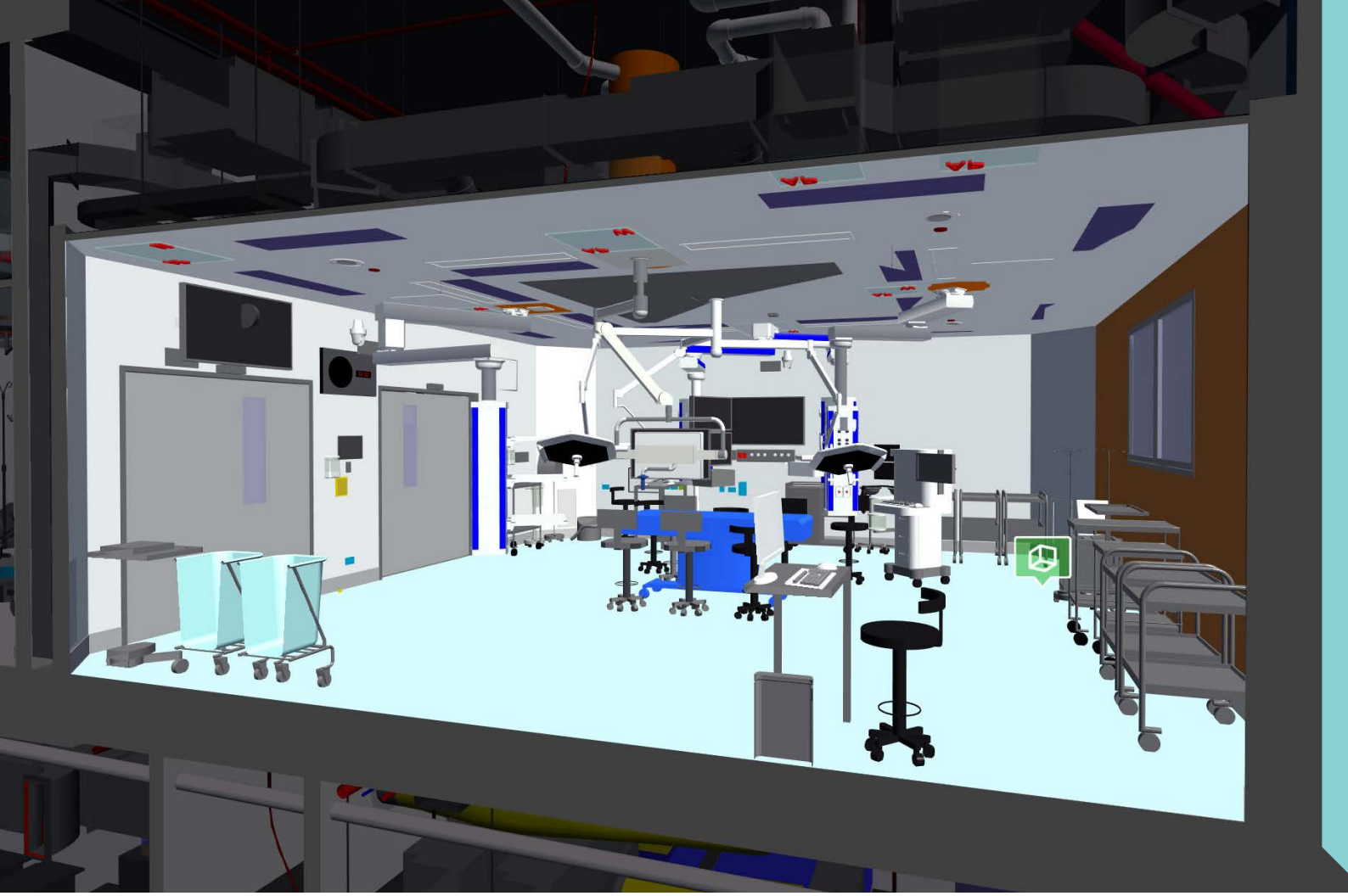
4.5.4.1 AIMS Asset Classification

The AIMS Asset Framework has a series of mandatory built-in fields that make up the classification systems used within VHBA. These fields include:

- Asset Class
- Asset Sub Class
- Asset Type
- Asset Sub Type
- VBIS Tag.

Applies to all Model Elements identified as an asset in the VHBA asset equipment list.

6 https://vbis.com.au/



4.5.4.2 Virtual Building Information System (VBIS)

The Virtual Building Information System (VBIS) classification shall be applied to all model elements identified as an asset in the VHBA asset equipment list. VBIS assists with the seamless handover of asset information to VHBA asset management.

4.5.4.3 Australasian Health Facilities Guidelines (AusHFG)

All spaces and rooms defined in the AusHFG Standard Components[7] shall be populated with the relevant AusHFG room code. Schedules of this data shall be extracted from Schematic Design phase onwards and provided for use by respective VHBA teams.

4.5.5 Asset Attributes

The list of asset attributes and parameters used in BIM is detailed in the following sections. VHBA has prefixed all parameter names with 'VHBA_' as they relate directly to VHBA's needs.

While several native BIM authoring tool parameters may have been equivalent to the VHBA prefixed parameters, the decision was made to prefix the names to:

- improve consistency
- aid in easier identification in the BIM authoring tool environment
- standardise mapping to .ifc as defined in section **4.12 Industry Foundation Class (.ifc)**.

To assist the supply chain, these parameters are available preconfigured for the project environment in Autodesk Revit 2023. It is understood that not all designers use this BIM authoring tool. It is intended that future versions of the VHBA DE Framework may provide preconfigured parameters for other applications, if requested.

If these documents are not compatible with selected BIM authoring tools, use the lists provided next to configure the parameters.

Contact the VHBA DE Project Champion to access the most current supporting files.

7 AusHFG's Standard Components web page <https://healthfacilityguidelines.com.au/standard-components>

4.5.5.1 How to read the tables

The AIR for BIM is itemised over the following sections, broken down by asset group.

Section	Description
Asset Attribute Details	BIM parameter attribute relationship with VHBA Asset Uploader Template, attribute descriptions and reference documentation. Relevant table columns are: • Asset Attribute • Parameter Name • Description • Reference.
Project Phase	The arrows under the abbreviated project phases columns indicate the direction of information flow at each project phase: ◀ Indicates information required from VHBA to enable the population of this field ▶ Indicates information being exchanged by the Project Team to VHBA. Relevant table columns are: • SD (for Schematic Design) • DD (for Design Development) • IFT • IFC • HD (for Handover and As-Built).
Data Location	The responsible Appointed Party (discipline) and the location of where the data shall be captured; in BIM or in the Asset Uploader. ● indicates location. Relevant table columns are: • Discipline • In BIM • Asset Uploader.
Example	Example data

See *VHBA Asset Equipment List.xlsx* and *VHBA Asset Uploader.xlsx* for data types and field constraints.

4.5.5.2 Building

The asset information required for projects, at the whole building level, is detailed in **Table 13**. This information is only entered once per model.

All parameters in this table should be mapped to the VHBA_Building user defined .ifc PropertySet, which applies to IfcBuilding elements.

Table 14: Building Asset Information Requirements

Asset Attribute Details				Project Phase					Data Location			
Asset Attribute	Parameter Name	Description	Reference	SD	DD	IFT	IFC	HD	Discipline	In BIM	Asset Uploader	Example
Building	VHBA_ Building	Name of the building	Project design brief	▶	▶	▶	▶	▶	ALL	✓	✓	John Monash Wing
Campus	VHBA_ Campus	Name of the campus, agency or hospital	Project design brief	◀▶	▶	▶	▶	▶	ALL		✓	Clayton
Facility Type	VHBA_ FacilityType	See list. Select applicable from provided VHBA list.	AIMS Asset Framework Template and Definitions.xlsx	◀▶	▶	▶	▶	▶	ALL		✓	
Service Type	VHBA_ ServiceType	Hospital or Mental Health or Aged Care. Select applicable from terms provided.	AIMS Asset Framework Template and Definitions.xlsx	◀▶	▶	▶	▶	▶	ALL	✓	✓	Hospital
Health Service	VHBA_ Health Service	Health Service Name	Project design brief	◀▶	▶	▶	▶	▶	ALL	✓	✓	Monash Health
Locale	VHBA_ Locale	Metropolitan or Rural. Select applicable from terms provided.	AIMS Asset Framework Template and Definitions.xlsx	◀▶	▶	▶	▶	▶	ALL		✓	City of Kingston
Discipline	VHBA_ Discipline	BIM design or trade discipline	-	▶	▶	▶	▶	▶	ALL	✓	✓	Architectural

4.5.5.3 Spaces

The asset information required for projects, at the spaces and rooms level, is detailed in **Table 14**. All parameters in this table should be mapped to the VHBA_Space user defined .ifc PropertySet, which applies to IfcSpace elements.

Note: the spaces parameters are only required to be populated by architecture (as indicated in the discipline column). All other disciplines may disregard this table, however, may be required to use some of this data from the linked architecture model, for example, room numbers and names.

Table 14: Spaces Asset Information Requirements

Asset Attribute Details				Project Phase					Data Location			
Asset Attribute	Parameter Name	Description	Reference	SD	DD	IFT	IFC	HD	Discipline	In BIM	Asset Register	Example
Floor	VHBA_LevelName	Name of building floor level	Request from HS	◀▶	▶	▶	▶	▶	AR	✓	✓	Level 01
-	VHBA_LevelCode	Level Abbreviation code for example, L1, L01, 01	Request from HS	◀▶	▶	▶	▶	▶	AR	✓	✓	L01
-	VHBA_RoomName	Name of room aligned to AusHFG where applicable	AusHFG (or Design brief)	◀▶	▶	▶	▶	▶	AR	✓	✓	1 Bedroom Bariatric
-	VHBA_ RoomNumber	Unique Room Number	To be agreed with VHBA	◀▶	▶	▶	▶	▶	AR	✓	✓	1.01
-	VHBA_RoomArea	Area in meters of room	Project design brief	◀▶	▶	▶	▶	▶	AR	✓	✓	18m²
-	VHBA_ AusHFGRoomCode	AusHFG Room Number (identifies room type as in AusHFG standards)	AusHFG [8]	▶	▶	▶	▶	▶	AR	✓	✓	1BR-BA
-	VHBA_Department	Hospital department	Project design brief	▶	▶	▶	▶	▶	AR	✓	✓	Intensive Care Unit

8 https://healthfacilityguidelines.com.au/standard-components

4.5.5.4 Building Services Assets

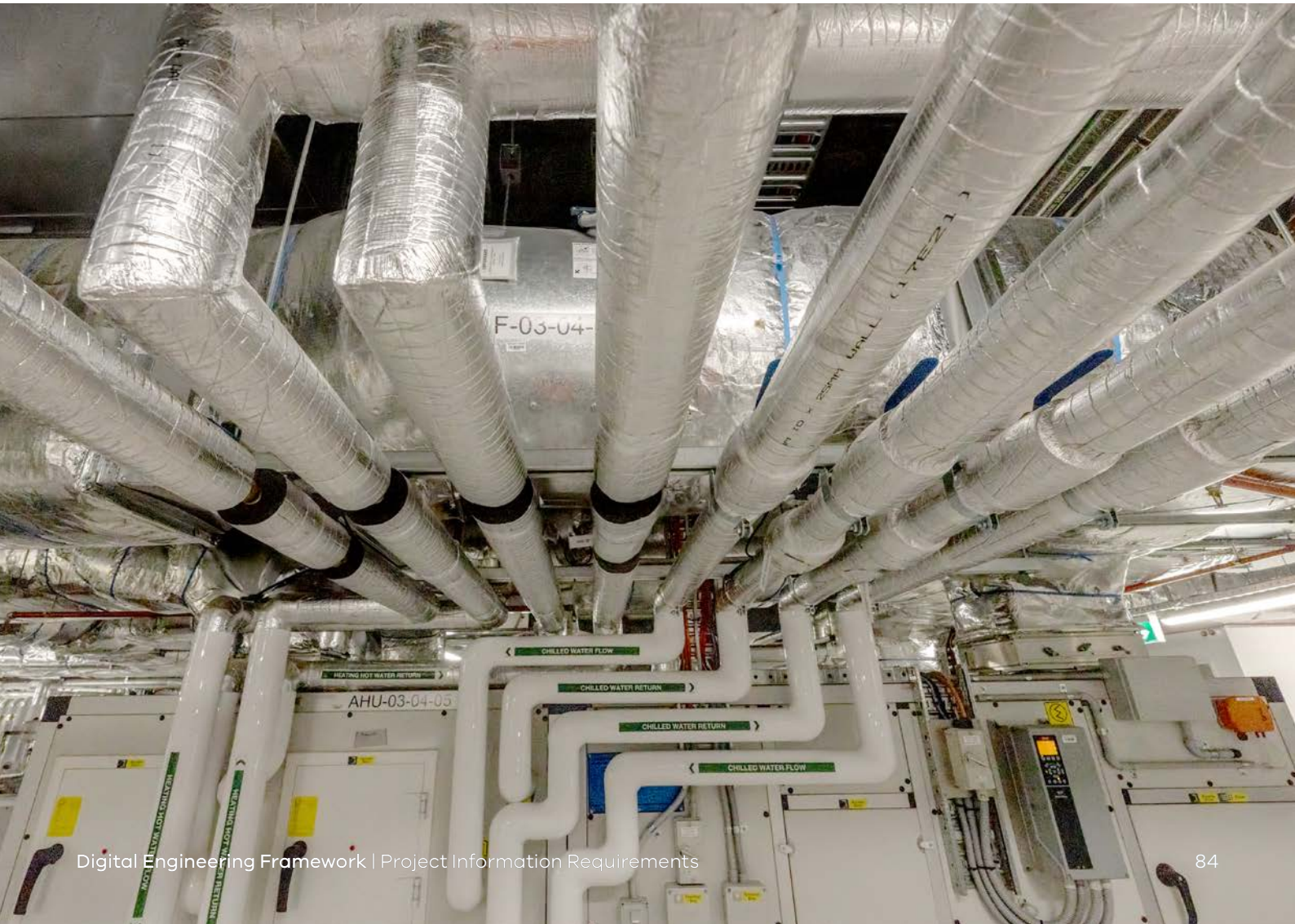
The asset information required for projects, at the individual asset level is detailed in **Table 15**. All parameters in this table should be mapped to the VHBA_Asset user defined .ifc PropertySet (applies to IfcElement).

> **Important!** See the VHBA asset equipment list in section **4.5.2 Asset Equipment List** for detailed lists of equipment that are classed as assets. If objects are not in the VHBA asset equipment list, this asset data may not be required with any objects not listed subject to approval from the VHBA Project Director or VHBA Project Manager for omission acceptance.

Table 15: Building Services Asset Information Requirements

Asset Attribute Details				Project Phase					Data Location			
Asset Attribute	Parameter Name	Description	Reference	SD	DD	IFT	IFC	HD	Discipline	In BIM	Asset Register	Example
External ID	VHBA_ ExternalID	Unique asset ID provided by the Lead Appointed Party (nomenclature to be approved by VHBA)	-		▶	▶	▶	▶	AR, EN	✓	✓	AHU-01.01
Asset ID	VHBA_AssetID	Unique internal VHBA ID. Auto Generated by AIMS. (To be populated in BIM once provided by VHBA pre-handover)	VHBA Asset Equipment List.xlsx					◀▶	AR, EN	✓	✓	-
Asset Name	VHBA_ AssetName	String parameter consisting of <Asset Type>: <Campus> – <Building Name>.	VHBA Asset Equipment List.xlsx				▶	▶	AR, EN		✓	Air Handling Unit: Clayton – John Monash Wing
Asset Category	VHBA_ AssetCategory	Refer to asset categories in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	AR, EN	✓	✓	Mechanical
Asset Class	VHBA_ AssetClass	Refer to asset classes in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	AR, EN	✓	✓	Mechanical
Asset Type	VHBA_ AssetType	Refer to asset type in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	AR, EN	✓	✓	Air Handling Unit
Asset Subtype	VHBA_ AssetSubtype	Refer to asset sub-types in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	AR, EN	✓	✓	N/A
VBIS Tag	VHBA_VBISTag	Refer to VBIS Tag in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx		▶	▶	▶	▶	AR, EN	✓	✓	ME-AHU
Asset Location	VHBA_ AssetLocation	Location of Asset (inherited from VHBA_RoomNumber)	Section 4.5.3.2		▶	▶	▶	▶	AR, EN	✓	✓	1.01
Installation Date	-	Date of install	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	01/01/2024
Brand	-	Brand name of the asset	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	Generic
General Comments	-	General comments relating to this asset	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	

Asset Attribute Details				Project Phase					Data Location			
Asset Attribute	Parameter Name	Description	Reference	SD	DD	IFT	IFC	HD	Discipline	In BIM	Asset Register	Example
Manufacturer	-	Company that manufactured this asset	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	Generic
Manufacturing Date	-	Date of manufacture	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	01/01/2023
Model	-	The make and/or model number as used for ordering purposes	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	AHU 010
Serial Number	-	Manufacturers unique serial number	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	AHU1234
Supplier	-	Supplier of asset	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	Generic
Design Life	-	Design life of the asset – enter whole number (no decimals) in years	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	20
Replacement Cost	-	Replacement cost of the asset – enter number (including decimals) in AUD	VHBA Asset Uploader. xlsx					▶	AR, EN		✓	$5,000.00



4.5.5.5 Systems

The asset information required for projects, at the individual systems level, is defined in **Table 16**. All attributes in this table are to be captured in the VHBA Asset Uploader. The system attributes are not required in the BIMs. Only a single row per complete system is required in the VHBA asset uploader.

> **Important!** See the VHBA asset equipment list in section **4.5.2 Asset Equipment List** for detailed lists of systems. If certain systems are not in the VHBA Asset equipment list, this system data may not be required with any systems not listed subject to approval from the VHBA Project Director or VHBA Project Manager for omission acceptance.

Table 16: Systems Asset Information Requirements

Asset Attribute Details				Project Phase					Data Location			
Asset Attribute	Parameter Name	Description	Reference	SD	DD	IFT	IFC	HD	Discipline	In BIM	Asset Register	Example
Asset Class	-	See asset classes in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	Electrical
Asset Type	-	See asset type in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	Light System
Asset Subtype	-	See asset sub-types in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	Exit
VBIS Tag	-	See VBIS Tag in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	EL-EL-Ex
Area Served	-	Area system is serving	VHBA Asset Uploader.xlsx				▶	▶	EN		✓	Intensive Care Unit
Supplier	-	Supplier of system	VHBA Asset Uploader.xlsx				▶	▶	EN		✓	Generic
Design Life	-	Design life of the asset – enter whole number (no decimals) in years	VHBA Asset Uploader.xlsx					▶	EN		✓	20
Replacement Cost	-	Replacement cost of the asset – enter number (including decimals) in AUD	VHBA Asset Uploader.xlsx					▶	EN		✓	$5,000.00

4.5.5.6 Miscellaneous Assets

The asset information required at the miscellaneous asset level for projects, is defined in **Table 17**. All attributes in this table are to be captured in the VHBA asset uploader. The miscellaneous assets attributes are not required in the BIMs.

> **Important!** See the VHBA Asset Equipment List in section **4.5.2 Asset Equipment List** for detailed lists of miscellaneous assets. If certain miscellaneous assets are not in the VHBA asset equipment list, this data may not be required with any systems not listed subject to approval from the VHBA Project Director or VHBA Project Manager for omission acceptance.

Table 17: Miscellaneous Asset Information Requirements

Asset Attribute Details				Project Phase					Data Location			
Asset Attribute	Parameter Name	Description	Reference	SD	DD	IFT	IFC	HD	Discipline	In BIM	Asset Register	Example
Asset Class	VHBA_Misc_ AssetClass	See asset classes in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	Electrical
Asset Type	VHBA_ Misc_ AssetType	See asset type in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	Light
Asset Subtype	VHBA_ Misc_ AssetSubtype	See asset sub-types in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	Fixture
VBIS Tag	VHBA_ Misc_VBISTag	See VBIS Tag in VHBA Asset Equipment List	VHBA Asset Equipment List.xlsx				▶	▶	EN		✓	EL-Li-Lu
Floor	VHBA_ LevelName	Name of building floor level	VHBA Asset Uploader.xlsx				▶	▶	EN		✓	Level 01
Quantity	-	Number of instances of asset on floor	VHBA Asset Uploader.xlsx				▶	▶	EN		✓	100
Supplier	-	Supplier of asset	VHBA Asset Uploader.xlsx				▶	▶	EN		✓	Generic
Design Life	-	Design life of the asset – enter whole number in years	VHBA Asset Uploader.xlsx					▶	EN		✓	10
Replacement Cost	-	Replacement cost of the individual asset – enter number (including decimals) in AUD	VHBA Asset Uploader.xlsx					▶	EN		✓	$10.00

4.5.5.7 VHBA dependent data

The Asset ID is to be auto-generated by VHBA on upload of the Project Team provided asset data. This Asset ID will be exported along with the accompanying External ID provided by the Contractor and provided back to the Lead Appointed Party for updating in BIM. The External ID can be used as a common key to ingest the new permanent Asset ID into the BIMs by each Appointed Party.

> **Important!** The Asset ID is required in BIM following creation by VHBA and is to be entered by the Project Team in the VHBA_AssetID field (see section **4.5.5.3 Building Services Assets**)

Table 19: VHBA populated data (in AIMS Asset Framework Templates and Definitions V2.xlsx)

Asset attribute: Parameter name	Asset attribute: Description	Due at Handover
Asset ID	Auto generated	◀▶

4.6 Location

The project's real-world coordinates shall be derived from a .dwg file prepared by a licensed surveyor in coordination with the Appointing Party and the Lead Appointed Party. This is to establish the physical (geospatial) location of all BIM, CAD and GIS to ensure geometric alignment and spatial coordination between discipline BIMs. Establishing the real-world position of the project is critical in enabling the spatial coordination process conducted through the course of the design, construction and operational phases.

4.6.1 Coordinates and Datum

All geometrical information and geospatial data submitted to VHBA shall be in line with the following requirements:

a. The Horizontal Datum and projection of all surveys shall align with the Geocentric Datum of Australia 2020 (GDA2020) and Map Grid Australia (MGA).
b. The Vertical Datum for all levels will be Australian Height Datum (AHD). The AHD is the official national vertical datum for Australia.

For BIM, an agreed project base point will be used.

When requested, any exports from the BIMs will be provided in real-world coordinates.

Reference grid files shall be provided by the DE Lead for use by the team.

Table 20: Example of Coordinates and Datum information to be captured in the DEMP

Attribute	Details
Projection	GDA2020 / MGA Zone 55
Height Reference	Australian Height Datum (AHD)
Project Base Point	N/S: 00000.000 E/W: 00000.000 Elevation: 000
Survey Point	0,0,0
Model Rotation (Angle to True North)	0°
Model Positioning	By Shared Coordinates

A BIM master coordinate file shall be created by the Project DE Lead and shared with the Project Team to ensure consistent coordinates are used throughout the Project.

4.7 Costing and Quantification

The BIMs shall be used to assist in the generation of accurate quantity take-offs and cost estimates throughout the lifecycle of an asset.

This process allows the Combined Team to see the cost effects of changes, during all phases of the project, which can help curb excessive budget overruns due to project modifications. The BIMs can demonstrate the impact on cost of additions and modifications, with the potential to save time and money. Often this is most beneficial in the early design phases of a project.

For DE Level 2 and level 3 projects, the Project Team shall provide models in .dwfx and .ifc formats for the QS to review at each Project Information Delivery Milestone. The Project DE Lead shall engage with the QS to ensure all necessary coding and measurements are known, understood, and documented in the DEMP.

The BIMs purpose in costing is to support and validate the findings derived from traditional 2D workflows. Not replacement them.

4.8 Sustainability

Through each phase the Lead Appointed Party shall allow for two workshops with the VHBA sustainability team or the nominated sustainability consultants (or both) to discuss and agree how BIM can be leveraged to progress towards VHBA's sustainability targets. The federated model shall be utilised in these workshops to assist in the sustainability review. Sustainability quality assurance and compliance reviews will be required between the Lead Appointed Party and VHBA sustainability team or the nominated sustainability consultants (or both) as defined in VHBA's guidelines for sustainability in capital works[9].

The delivery processes for the following BIM sustainability requirements are to be defined and documented in the DEMP by the Lead Appointed Party. Any departure of the following requirements will require the approval of the VHBA sustainability lead and DE Project Champion.

9 https://www.vhba.vic.gov.au/sites/default/files/2021-10/Sustainability-guidelines-for-capital-works-VHBA-Revised-October-2021.pdf

4.8.1 Master Planning and Feasibility Study

During the Master Planning and Feasibility Study phases, massing models shall be developed to enable testing such as building orientation, solar gain and heat load calculations, shading and solar panel optimisation (and so on) in line with VHBA's guidelines for sustainability in capital works.

The Lead Appointed Party shall develop the massing model/s in consultation with the VHBA sustainability team or the nominated sustainability consultants (or both) in master planning and feasibility study workshops.

The massing models are expected to contain property information that is embedded within the relevant discipline model, in relation to town planning overlays. It is expected that the documentation derived from the massing models shall incorporate notional information of facade systems to inform the early design on active/passive systems.

4.8.2 Other Design and Construction phases

The Lead Appointed Party, in consultation with the VHBA DE Project Champion, VHBA sustainability team or the nominated sustainability consultants (or both) shall utilise the BIMs to assist in the analysis of the Business-as-usual sustainability requirements as defined in VHBA's guidelines for sustainability in capital works. This may include items such as:

- BIM to be used to provide shading studies of external and internal spaces.
- BIM used to assist the analysis of material life cycle information.
- BIM used to assist the analysis of percentage recycled content.
- BIM used to assist the analysis of water balancing.
- BIM used to assist the analysis of capture of environmental certification (for example, WELS, GECA, energy star rating of appliances).

The design for these phases shall be developed from a design option selected considering sustainability analysis during the previous phase and continue to be tested as the schematic design is refined.

The BIMs shall be utilised to enable energy efficiency modelling software connectivity, either via extraction of .gbxml file formats to external energy efficiency modelling software (for example, DesignBuilder, Integrated Environmental Solutions) or built-in energy modelling software (for example, Revit, Green Building Studio). The file format for integrating the BIMs with energy efficiency modelling software shall be agreed with the VHBA sustainability team, or the nominated sustainability consultant.

The Lead Appointed Party shall use the Federated Model during sustainability compliance reviews in consultation with the VHBA DE Project Champion, VHBA sustainability team or the nominated sustainability consultants (or both) in design, construction and commissioning workshops.

4.9 Occupational Health and Safety (OH&S)

The use of BIM greatly improves a common understanding in relation to health and safety issues. The *Occupational Health and Safety Act 2004* (Vic) requires designers of buildings, structures and plant to ensure, so far as is reasonably practicable, that their design is safe and without risks to the health of persons using it as a workplace for a purpose for which it was designed. There is also an obligation to provide information about the design to other parties.

BIM provides an opportunity to link health and safety, such as a SiD register to the federated model, highlighting areas or specific equipment of concern.

The federated model may be used to not only identify, assess, and track health and safety risks, but to support other safety assessments and operational workshops. This may be as simple as identifying health and safety issues in issue tracking software or using health and safety indicators containing register IDs in the federated model.

The Lead Appointed Party shall enable the use of the BIMs to enhance the health, safety and welfare performance of their project. The federated model shall be utilised for OHS reviews, pre-construction buildability risk reviews during the design phases and in construction. These reviews shall enable the opportunity to detect and design out health and safety risks from the outset, as described in section **4.13.1 Model Review Platform and Issue Management**.

This analysis and comparison may include, but is not limited to:

- fire-rated egress enclosures
- automatic sprinkler system designs
- alternate stair layouts
- pre-construction safety and risk review
- Safety in Design
- Work exclusion zones
- Material loading and handling zones

The Lead Appointed Party shall define their approach to integrating OHS with BIM in the DEMP.

4.10 Information Containers and Exchange Frequency

The DEMP shall identify the information containers that constitute the PIM. The objective is to establish where information will reside and how this information will be consolidated to form an overall PIM for the project. The Project Team can then determine what information should exist in BIMs and what information should exist externally in other data sources, such as space planning, costing, or asset database tools.

This must be documented in the DEMP by way of a diagram explaining the information containers and the relationships between these containers. The DEMP shall be broken down into project phases and the subsequent discipline/trades within those phases, enabling understanding of what information will be contained in the relevant discipline-specific information containers at any point during delivery.

DE Level 2 and 3 projects shall consider the use Task Information Delivery Plans (TIDPs) and a Master Information Delivery Plan (MIDP) to plan and manage the delivery of information containers.

Information will be required in the formats described in **Table 21**. This focuses on information derived from BIM and does not override obligations in other scope documents.

VHBA prefers and will accept the following information container formats.

Table 21: Information types, formats, and exchange frequency

Information Type	Information Deliverable	Format	Frequency
Geometrical	Individual discipline, trade, BIMs	native, .ifc and .nwc	Project milestone (shared for review and acceptance)
	Federated models (from .nwc or .ifc format)	.nwd	• Monthly record (shared for information) • Project milestone (shared for review and acceptance)
	Cost planning models	.dwfx and .ifc	Project milestone (shared for review and acceptance)
	Geospatial surveys	native, open and RCP	Project milestone (shared for review and acceptance)
	Sustainability models	native, open and .gbxml	Project milestone (shared for review and acceptance)
Alphanumerical	Schedules, registers and other tabular information	.xlsx	Project milestone (shared for review and acceptance)
	Asset dataset (in BIM and exported tabular)	.ifc and .xlsx	Project milestone (shared for review and acceptance)
Documentation	Drawings	.pdf and .dwg	• Monthly record (shared for information) • Project milestone (shared for review and acceptance)
	Reports and other textual information	.pdf	Project milestone (shared for review and acceptance)

4.10.1 Information Container Naming

All Shared or Published information containers within the CDE shall use the Lead Appointed Party's, VHBA approved, naming standard including metadata. This shall be an BS EN ISO 19650-2 aligned information container naming approach. This approach shall be proposed in the pre-award DEMP and documented in the agreed DEMP.

4.11 Model Federation

The Project Team Digital Engineering (DE) Lead is responsible for combining all design/construction/trade BIMs into a Federated Model. Two federated model formats must be provided at project information delivery milestones as required in section **3.4 Digital Engineering Requirements** by Project Phase. This includes:

- federated model built from .nwc format BIMs, saved as an .nwd
- federated model built from .ifc format BIMs saved as an .nwd or other agreed format.

These federated models will be used primarily for progress tracking, data validation against this PIR, and general scope compliance, as well as operational reviews. Access to the federated model is to be made available to the VHBA Delivery Team by the nominated model review platform (see section **4.13.1 Model Review Platform and Issue Management**) for reference throughout entire delivery lifecycle, with licenses and training provided to VHBA by the Lead Appointing Party.

4.11.1 Model Topology

The model topology approach may vary per project with consideration given to the complexity of the project, work packages, number of model authoring parties, file sizes, model maintenance during operations, computing performance, and the linking and federation approach. The project's model topology shall be shown in the relevant DEMP, demonstrating how the different discipline or trade BIMs are linked and come together in a consistent structure as a federated model. This is best illustrated in a diagram such as **Figure 26**.

Figure 26: Example model topology diagram

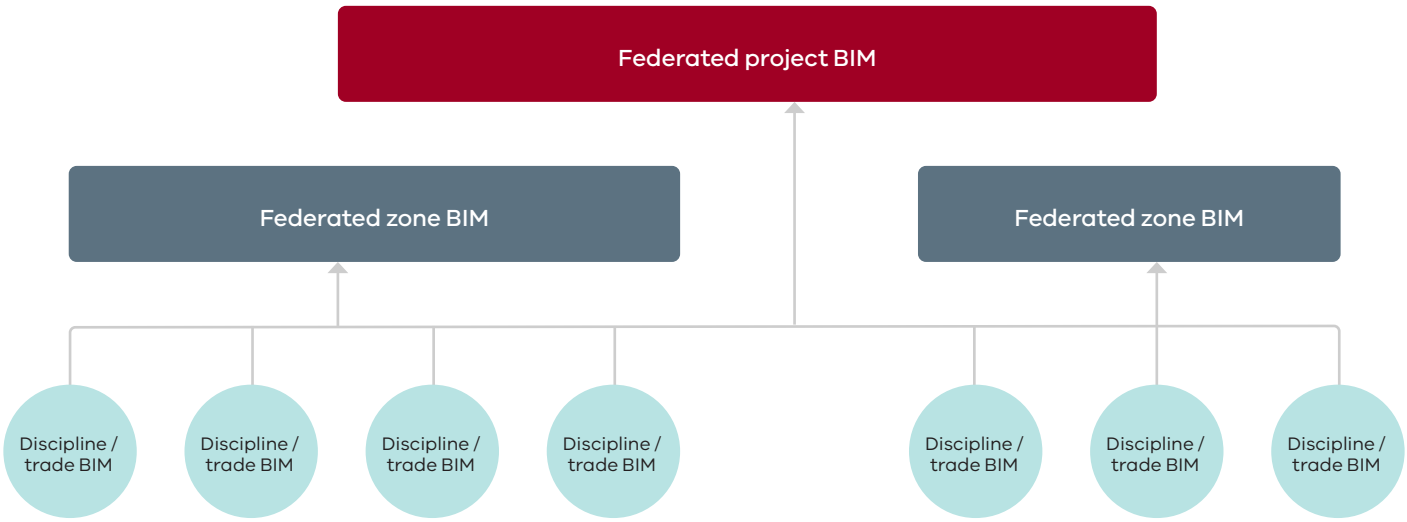
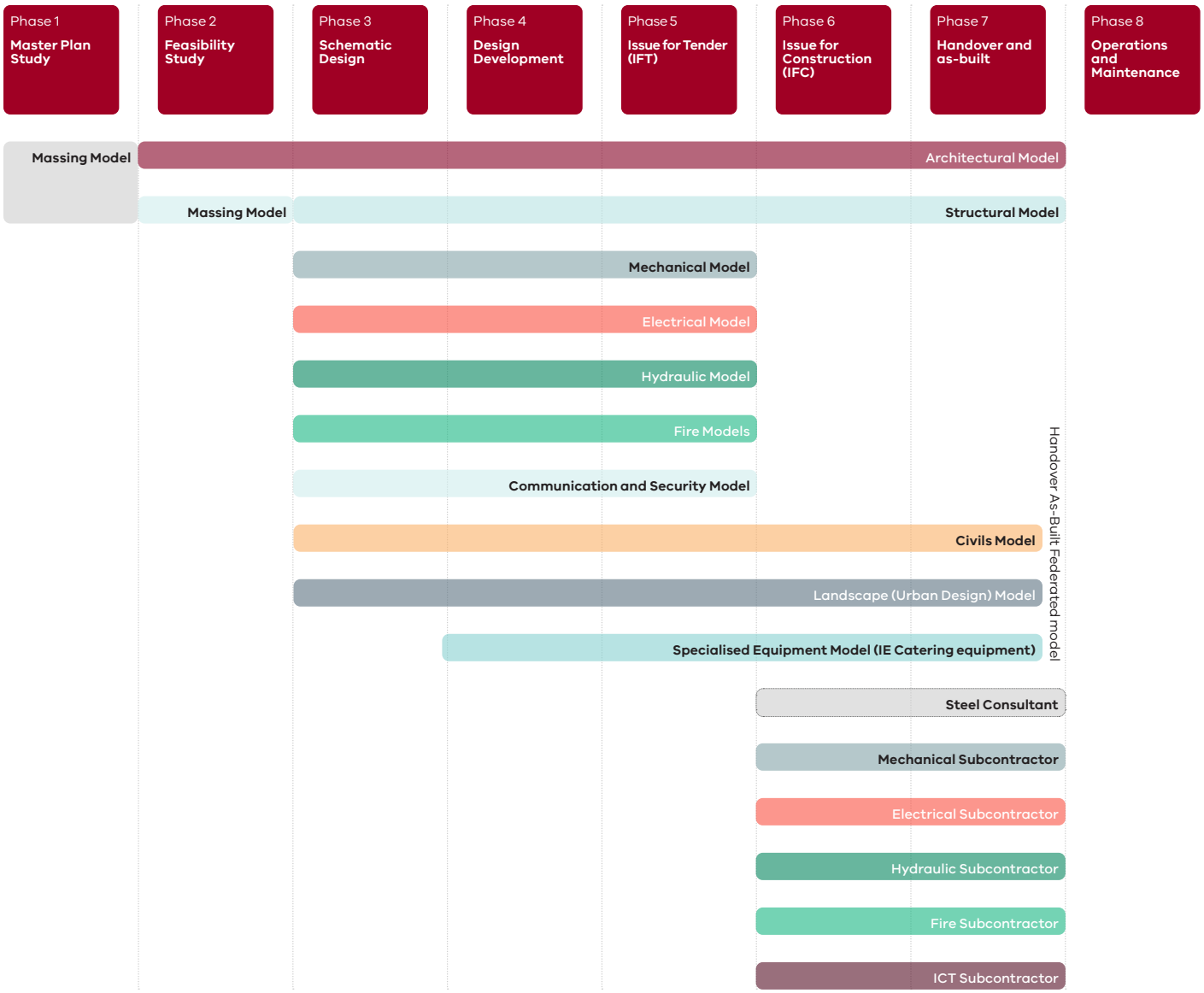


Figure 27: Example federation map and currency of BIMs throughout the project lifecycle



The approach to model typology shall be first documented in the pre-award DEMP, then discussed and agreed with VHBA (that is, split at functional location areas, all structural elements in one BIM) prior to implementation on the project.

All individual discipline BIMs shall contain the same model tree structure, so all data attributes required by VHBA are located at the same tree depth across all models, regardless of the authoring format. If this isn't possible using the native formats, it shall be achieved in the exported open standard, Industry Foundation Classes (.ifc) with data mapped accordingly using custom property sets. The setup and configuration of .ifc workflows shall be administered by the Lead Appointed Party.

A federation map that depicts the timing of connection and disconnection of any BIMs to the Federated Model through the project lifecycle shall be developed by the Lead Appointed Party in the design or construction DEMP. The Project DE Lead is to maintain the currency of the federated model, ensuring that the correct appointed party BIMs are being integrated into the federated model according to its respective phase.

4.12 Industry Foundation Class (.ifc)

Where specified to do so, all IFC models shall be exported as buildingSMART .ifc 2x3 format, however, if all BIM authoring tools are compatible, .ifc 4 may be more appropriate.

An appropriate Model View Definition[10] MVD) shall be selected and the specified VHBA attributes (see section **4.5.5 Asset Attributes**) shall be mapped to the VHBA .ifc user defined property sets when exporting from the BIM authoring tool. This gathers all the VHBA asset attributes conveniently on their relevant tab. See VHBA .ifc Export Mapping for example mapping.

Table 22: Custom .ifc user defined property sets

VHBA Property Set	.ifc Element
VHBA_Building	IfcBuilding
VHBA_Space	IfcSpace
VHBA_Asset	IfcElement

The mapping should also remove the VHBA_ prefix to all parameter names. The property sets retain their VHBA_ prefix. In future, a more integrated approach may be taken to better align VHBA BIM shared parameters with the native properties of the .ifc schema.

All .ifc BIMs must be correctly located using real world coordinates (see section **4.6 Location**). Model exports should be run through an IFC 'model optimiser' tool prior to submission to VHBA.

4.13 Coordination

The Project Team are using automated conflict checking or clash detection software during Schematic Design phase onwards to determine geometric clashes in each discipline or trade BIM and then in the federated model. Once issues are identified, each discipline or trade is resolving the issue within the BIMs they are responsible for.

VHBA expects the coordination to be appropriate to the phase of the project (for example, reducing coordination issues as the project progresses). Major space planning coordination issues between architecture, structure, mechanical and other relevant services must be resolved by the end of Design Development phase. All (100%) design projects should be fully coordinated and constructable at tender.

The Lead Appointed Party will need to define how they will carry out:

- Coordination responsibilities
  - The Project DE Lead facilitates the overall co-ordination and management of clashes during the Design phases
  - The services consultants are responsible for discovering, managing and resolving clashes between services disciplines prior to the issue of discipline BIMs to the Project DE Lead for clash detection.
- Project specific model federation strategy, showing the federation process, platform used and workflow.
- Model review process, including platform to be used to capture model coordination activities.
- Clash sets, including all information required to undertake clash tests and any automation and grouping strategy.
- Clash tolerances, including clash detection matrix.
- Clash priorities.
- Clash reports, including program reporting (such as weekly or fortnightly), during the various project phases to enable progress monitoring. Report format, for example dashboards.
- Issue management process and clash resolution, including processes for review and issue tracking with client access to the platform. Strategy for clash approval process and management within the review platform.
- Coordination schedule, including schedule of review workshops, cash resolution meetings (and so on) with the relevant parties.

10 https://technical.buildingsmart.org/standards/ifc/mvd/

Design and construction coordination reviews shall be conducted regularly by the Project Team as required to satisfy the project phase requirements and to minimise project risk and waste. Coordination should naturally evolve from coarse to granular as the BIMs are developed.

The Lead Appointed Party shall nominate a software to be used for coordination, and document this in the DEMP for approval. Each Appointed Party shall undertake coordination of their own Model Elements, always working in the context of the latest Shared BIMs, as part of their quality assurance processes, before sharing information with the broader Project Team.

The Project DE Lead shall then use the federated model and focus on significant hard clashes, construction tolerances and safe working or maintenance zones. The Lead Appointed Party shall identify details of the coordination process in the DEMP, including:

- proposed software to be used for model federation and clash detection/management
- responsibilities and accountabilities, including timeframes for resolution of identified coordination issues
- the coordination priorities and overall management process
- tolerance strategy
- reporting outputs (for example, coordination issues report, dashboarding)
- proposed software training available to the VHBA DE Project Champion as in section **4.2.3 Training**.

4.13.1 Model Review Platform and Issue Management

The Lead Appointed Party is required to provide their own cloud model review solution to communicate, track, and close out any issues identified with the design, the BIMs or associated data. Integrating the model-based delivery VHBA objective, these issues may include design issues, safety-in-design issues, coordination issues, data quality issues (and so on) but do not replace the formal Request for Information (RFI) process. The software will enable the identification of issues within 2D and 3D environments, attributing issues with – at a minimum:

- a unique identifier
- the reporter's name
- an assignee's name
- date created
- deadline
- description
- comments
- mark-ups
- priority.

Project-specific guidance shall be described or linked to in the DEMP.

It is the responsibility of all Appointed Parties to action issues relevant to their BIMs and other Information Containers within the timeframe set out in the DEMP.

The proposed model review solution shall provide access for VHBA and all Appointed Parties to the current Federated Model via cloud access (no software installation necessary, with a minimum of 6 x licenses provided for VHBA).

4.14 Visualisation

VHBA accept Visualisation work-flows across three typical methodologies

- static renders
- virtual reality
- augmented reality.

The Project DE lead shall work with VHBA to define which spaces and rooms are suitable for virtual prototyping. The use of visualisation shall integrate safety-in-design workshops, stakeholder engagement and public consultation, design development workshops and help inform decisions with key stakeholders.

Visualisations are to be basic or generic material finishes to a level of development that is easy to design and layout, including medical equipment, but do not need to be photorealistic.

The DEMP shall state which proposed rooms and spaces are suitable for virtual prototyping, which must be approved by VHBA.

The proposed virtual reality system is to be capable of moving modelled items in real-time to address live stakeholder feedback. The costs associated with these workflows must be identified in the prelims as an individual line item in the tender response.

Details for requirements at DE level 2 and 3 have been stipulated in the relevant sections for each phase from Master Planning to IFC in the **Managerial** section.

4.15 Operational Planning and Staging

4.15.1 Design

The BIMs shall be used to consider the distribution, adjacencies, and track the areas of spaces, rooms, and departments within a facility.

The use of mass modelling within BIM shall enable visualisation of the layout and analysis of space staging to effectively plan how spaces may be delivered using a phased approach, minimising disruption for the facility. Such applications are particularly useful during renovation, where building segments are to remain occupied.

Stacking diagrams and site sections identifying level differences across the site and circulation across departments at different levels shall be depicted which shall include 3D staging block diagrams.

The space management and tracking allow the consideration of the appropriate allocation of spatial resources throughout the life of the facility. The Lead Appointed Party shall define their approach to design phase operational planning and staging in the DEMP.

4.15.2 Construction

The Lead Appointed Party, led by the construction team, will create 3D staging models to demonstrate planning in logistics, traffic management and any external interface. The use of operational planning and staging is especially important during renovation where various departments are to remain occupied during construction. The use of BIM can help avoid any stakeholder concerns relating to space sequencing.

Where significant risks present in terms of safety, time and spatial constraints, the Lead Appointed Party's Project DE Lead shall capture these risks as issues in the model review platform as defined in section **4.13.1 Model Review Platform and Issue Management**. The Lead Appointed Party shall define their approach to construction phase operational planning and staging in the DEMP.

4.16 Construction Sequencing

The BIMs shall be developed to enable construction sequencing, highlighting progress and any potential build-ability issues during construction. Unlike the previous section, considering space planning, this section considers the construction sequencing of model elements, for example, what order elements are built in.

The works schedule data, when integrated with BIM data, shall become an information source for sequencing complex work. Integrating the data sources shall provide a better understanding of the worksite over time, which leads to an optimised program, higher site productivity, increased safety and reduced risk.

The BIMs shall be used to form the basis of a construction sequencing model, in the selected construction management software, that will demonstrate the construction method simulation process. If required, the Lead Appointed Party's DE Lead shall collate the BIMs to produce a construction sequence model, subsequent construction sequence animations and visualisation shall be derived from the construction sequence model.

The Lead Appointed Party shall define their approach to construction sequencing in the DEMP.

4.17 As-Built Process

Before construction begins, an as-built model verification process shall be defined in the DEMP. This may consist of a measured approach using laser scanning, or a visually verified approach using photogrammetry, 360 photos, or photos. The process shall also cover instances where changes during construction require updated drawings – these shall be driven by updates to the BIMs.

The onsite construction teams are required to provide evidence that element and field validation processes have been implemented and adhered to. This is the process of verifying that elements contained in the BIMs represent the corresponding physical asset onsite and both are aligned.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4.17.1 Field Verification

The as-built process, which includes field verification, shall be documented in the DEMP by the Lead Appointed Party and shall define how as-built information from site is recorded and documented back into the BIMs. This process also needs to include a gap analysis and closeout procedure in the DEMP.

Field verification includes proof that the model elements within the BIMs represent the as-built physical building components. The Project Team is required to provide evidence that a field verification process has been implemented and followed. Consideration to the timing of field verification will impact the usefulness of information captured (for example, scanning before sheeting with plasterboard will allow building services to be captured before they are hidden).

A measured and/or visual approach is a process which the Lead Appointed Party shall define in their DEMP as part of their tender or bid submission.

4.17.1.1 Measured Field Verification

If the Lead Appointed Party opts for a measured field verification approach, the extent of this shall be defined in the DEMP (for example, plant rooms only or a percentage of floor area). The measured field verification process may include, but is not limited to:

- **Point clouds** – a data set produced from a laser scan survey, which captures as-built conditions to a high level of detail. Point clouds may be supplemented with photospheres at each tripod location. These shall be delivered as in section **4.10 Information Containers and Exchange Frequency**.

4.17.1.2 Visual Field Verification

If the Lead Appointed Party opts for a visual field verification approach, this process shall be defined in the DEMP. The process for capturing Visual As-Built must be explicit, transparent and auditable. An example of this could be a reporting mechanism whereby a photograph of the physical as-built element is compared against a view of the model element in the federated model.

For Visual As-Built, specified elements shall be visually checked for correct position, orientation, and alignment, with any recognisable deviations from the modelled element recorded and updated in the BIMs to reflect the as-built condition. Visual as-built may include some basic measurement for the position, alignment and level.

The visual field verification process may include, but is not limited to:

- **Photogrammetry** – when images are captured using a handheld camera or with a camera mounted to a tripod. The output of this method may include a 3D mesh or low density point cloud (with reduced accuracy).
- **360° Images** – 360 degree high resolution photography to create a virtual image record of an internal or external environment which is then spatially mapped to the Federated Model in the model review platform.
- **Images** – Photos captured and overlaid on to the federated model to compare the physical environment with the BIMs.

The DEMP shall define the Lead Appointed Party's approach to visual field verification, including the extent of its use.

4.17.2 Tolerance Strategy

The Lead Appointed Party shall document their proposed tolerance strategy for any deviations between the as-built model elements and the physical elements onsite in the DEMP.

4.17.3 As-Built BIM/s

Following verification of model elements and corresponding physical assets onsite, the Lead Appointed Party and the Appointed Parties shall develop the As-Built BIMs, which shall also incorporate the redline drawings. These constitute the final placement of equipment and routing of systems. The as-built BIMs will serve as the basis for developing the handover and as-built federated model and resulting drawings and other documentation.

4.18 Quality Control

The Project Team shall provide evidence to the VHBA DE Project Champion and the VHBA Project Manager that the activities identified in this PIR and the agreed DEMP are taking place (for example, design reviews, coordination, issue tracking, RDS, scheduling, linkage to SoA, population of asset data). This shall occur monthly for inclusion in the PCG meeting.

The DEMP shall detail the responsibilities of each Appointed Party and the approach to model and data quality control, with consideration given to:

- geometrical accuracy in line with section **4.1 Key Technical Information Requirements**
- software used to support quality control procedures (for example, coordination, data completeness, auditing and reporting)
- verifying alignment between

It is the responsibility of each Appointed Party to ensure their DE deliverables are compliant.

4.18.1 Lead Appointed Party Audit

The Project DE Lead shall undertake a monthly audit of all BIM files for the project during their appointed phases, ensuring the BIMs are compliant with the current phase requirements and are prepared in readiness for the next phase.

These audits will check for compliance of the BIMs and related information against the requirements set out in this PIR and the relevant Design and Construction DEMP documents.

- An audit report will be created to communicate any errors or omissions based on the requirements of this document.
- The relevant Appointed Party will nominate the time required to remedy these issues, which shall not exceed the agreed contractual terms.
- VHBA may prevent the Project Team from commencing subsequent project phases until all information has been validated as complete, to the requirements nominated in this PIR and the agreed Design and Construction DEMP.

Appendix: Image descriptions

Figure 1: The VHBA DE Framework

Requirements

- PIR: External use. Released in tender packs for VHBA supple chain to respond to.
- Implementation guide and evaluation checklist: Internal use only. Used by VHBA delivery team for guidance and tender evaluation.

Management plans

- DEMPs: Supply chain's explanation of how they will meet VHBA's information requirements. Becomes contractually binding document.

Figure 4: Asset information model (AIM) (including elements of the PIM)

The AIM is made up of the following elements:

- PIM
- operational performance
- asset registers, operation and maintenance, and warranties
- planning and disposal
- financial and whole of life
- works management
- hazards and safety
- materials and inventory.

Figure 5: VHBA DE project lifecycle phases (bottom row)

VHBA DE Framework	VHBA CSA	VHBA PMF	VDAS Lifecycle (as in VDAP)
Phase 1: Master Planning	Phase 1: Master Plan Study	Definition • 0: Go brief approval at start	Stage 1: Brief
Phase 2: Feasibility Study	Phase 2: Feasibility Study	Development • 1: Strategic assessment at start • 2A: Business case midway • 2B: Re-entry to VHBA at end	Stage 2: Concept
Phase 3: Schematic Design	Phase 3: Schematic Design	Market Readiness • 3: Readiness for market at end	Stage 3: Definition
Phase 4: Design Development	Phase 4: Design Development	Go to Market	Stage 4: Design, Implement
Phase 5: Issue for Tender (IFT)	Phase 5: Tender Documentation	Go to Market • 4: Tender decision at end	Stage 4: Design, Implement
Phase 6: Issue for Construction (IFC)	Phase 6: Tender, Evaluation, Award and Contract Administration	Implement • 5: Readiness for handover at end	Stage 5: Build and commission
Phase 7: Handover and As-Built	Phase 7: Defects Liability	Realise • 6A: Defects liability closeout midway	Stage 6: Handover and closeout
Phase 8: Operations and Maintenance	Phase 8: PostOccupancy Evaluation	Realise • 6B: Benefits realisation at end **Note:** PMF has one more phase after this – Divestment: • 7: Asset divestment at end	Stage 7: Operations and maintenance

Figure 8: Information containers

Figure shows 3 information containers (aligned with ISO 19650) stacked according to level of information need (aligned with BS EN 17412-1). From top to bottom, these containers are:

- **Geometrical models** – such as BIM, CAD, GIS, federated models
- **Alphanumerical (non-geometric) information** – such as metadata, schedules, databases
- **Documentation** – such as drawings, specifications, reports, manuals, certificates, photos.

Figure 10: Simplified DEMP creation process

DEMP creation process:

- Step 1: Set project DE scope (PIR)
- Step 2: Tenderer pre-award DEMP submitted
- DEMP assessed with tender
- Step 3: Lead appointed party DEMP finalised
- Step 4: DEMPs reviewed and approved
- Step 5: DE applied to project as in agreed DEMP.

Note: All steps but step 1 are repeated for design and construction.

Figure 20: Preferred use of ACC (by Information Container State)

Lead appointed party CDE contains:

- **Work in progess** (task team) – Information being developed by its originator or task team, not visible or accessible to anyone else
- **Archive** – journal of information transactions, providing an audit trail of information container development.

VHBA (ACC) contains:

- **Shared** – information approced for sharing with other task teams, delivery teams or with the appointing party
- **Published** – information authorised for use for a specific pupose during design, construction or for asset management
- **Archive** – same archive as in lead appointed party CDE.

Work in progress goes to Shared once checked, reviewed or approved.

Shared goes to Published once reviewed or authorised.

Figure 21: Preferred use of Aconex (by Information Container State)

Lead appointed party CDE contains:

- **Work in progess** (task team) – Information being developed by its originator or task team, not visible or accessible to anyone else
- **Shared** – information approced for sharing with other task teams, delivery teams or with the appointing party
- **Archive** – journal of information transactions, providing an audit trail of information container development.

VHBA (Aconex) contains:

- **Published** – information authorised for use for a specific pupose during design, construction or for asset management
- **Archive** – same archive as in lead appointed party CDE.

Work in progress goes to Shared once checked, reviewed or approved.

Shared goes to Published once reviewed or authorised.

Figure 25: VHBA asset equipment list

Example row from the VHBA asset equipment list spreadsheet.

Data shown in figure 25 is listed in the following table.

Element	Entry
AIMS asset class	Electrical
AIMS asset sub class	NA
AIMS asset typ	Access card reader
AIMS asset subtype	Security
VHBA discipline	Access control
VHBA product	Card reader
VHBA sub-type	-
VHBA VBIS tag	SE-ACon-CR
Alternative equipment name	• Card Readers • Access Control Readers • Proximity Readers • Smart Card Readers • RFID Readers • Swipe Readers • Magnetic Stripe Readers • Biometric Readers • Credential Readers • Entry Readers • Keycard Readers • Badge Readers • Security Readers • Authentication Readers • Electronic Lock Readers

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