

ITA-AITES RECOMMENDATIONS FOR THE APPLICATION OF ISO 19650 SERIES DURING THE DELIVERY OF UNDERGROUND PROJECTS & ASSETS - INFORMATION MANAGEMENT PROCESS & RESPONSIBILITY MATRIX - Vol 1

ITA Working Group 22
Information Modelling in Tunnelling

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ASSOCIATION
INTERNATIONALE DES TUNNELS
ET DE L'ESPACE SOUTERRAIN

AITES

ITA

INTERNATIONAL TUNNELLING
AND UNDERGROUND SPACE
ASSOCIATION

ITA-AITES RECOMMENDATIONS FOR THE APPLICATION OF ISO 19650 SERIES DURING THE DELIVERY OF UNDERGROUND PROJECTS & ASSETS - INFORMATION MANAGEMENT PROCESS & RESPONSIBILITY MATRIX - Vol 1

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1 >> ABOUT THIS DOCUMENT

- 1.1. This recommendation has been developed by the International Tunnelling Association (ITA) to support the adoption of Building Information Modelling (BIM) and digital information management processes within the tunnelling and underground construction industry.
- 1.2. This document sets forward the ITA recommendations for the application of ISO 19650-1 and 2 for underground built assets. First, the main concepts of the information management using BIM are summarised, then a typical process for planning and delivering of underground built assets along with a responsibility matrix for each stage of the underground asset life cycle are proposed.

2 >> CONTEXT AND INTRODUCTION

The drive for data driven decision making as well as the requirements for improving sustainability and the importance of efficiency in delivery are amongst some of the key drivers for adopting digital ways of working on infrastructure projects. The application of Building Information Modelling (BIM), Digital Engineering, Asset Information Modelling or Virtual Design and Construction are key processes in achieving improved project delivery and performance. This document adopts the broadest possible interpretation of 'BIM', and therefore covers all the above principles.

The adoption of BIM is not only a digital visual representation of physical and functional characteristics of a building, piece of physical infrastructure or environment but it is also a comprehensive ecosystem for all data and information that is fully referenced and indexed. This allows multiple access points for users of information to find relevant content.

As such, BIM serves as a shared knowledge resource for information about an asset throughout its lifecycle—supporting decision making—from strategic appraisal and planning through to design and construction as well as operation, maintenance, and renewal. BIM enables a collaborative way of working using digital processes to facilitate more productive methods of planning, designing, constructing, operating, and maintaining assets throughout their lifecycle.

Governments globally recognise the importance of BIM in the delivery and management of infrastructure assets as it offers many tangible benefits throughout the asset lifecycle and has the potential to drive efficiency, value for money, productivity, innovation, and safety.

To realise the benefits of BIM a clear framework is required to aid in the adoption, integration, and application of the processes in the infrastructure sector. In this context, the ISO 19650 series propose a standard framework for information management of built assets using information modelling processes applicable throughout the asset life cycle.

In current Information Management Systems, which used throughout the different stages of

a built asset development; the information is captured, represented, produced, processed, and stored in documents, databases, and other “information containers”. This is using processes, methods and tools specified separately for each given project and each milestone by the information owner or receiver. These containers are exchanged between different parties involved in the project for different purposes. These purposes can be for activities such as analysis, interpretation, review, check, approval, quantity take-off, construction management, planning, budgeting, pricing, forecasting, or other activities carried out during the asset life cycle.

The ISO 19650 series proposes to use 3D models as part of a “central information container” of the asset information. The models inherently contain the geometrical information of the assets and parts and their special locations. Other information can be added to each part of the model, these are called meta-data. Other type of information containers such as reports, factual data, specifications, suppliers' data sheets, drawings (etc., referenced, or using hyperlinks) can be added to each part of the model to complement the meta-data information.

The information details required to be captured and stored in the model depends on the required activity (to be performed using the model) as well as the project requirements and the stage of the asset life cycle. For example, if design check activity is carried out using the 3D model, the modelled information, the associated meta-data, and the linked documentation should be attributed to a package containing the design information needed to perform this activity. To carry out a scheduling activity using a model, the production rates of each part of the model are needed to be added as meta-data.

As such, every bit of information contained in the model, either geometrical, meta-data or linked documentation is designed to carry out a specific task. These may be related to design, construction, operational or other asset related activities at any given stage of the asset life cycle. The type of activity and the stage during which this activity is carried out therefore defines the level of detail to be achieved in the model.

The following sections summarise the ISO 19650 concepts and propose a high-level process for information management with a stage-by-stage Responsibility Matrix to ISO 19650 applicable for underground assets.

3 >> TERMS & DEFINITIONS

The following terminology has been developed within the ISO 19650 standards and is used in this guideline for clarity. In the absence of any national BIM framework, the ITA recommends the use/adoption of the ISO 19650 Series terms and definitions in the underground industry, particularly where bids are open for international competition.

3.1 GENERAL TERMS	
Responsibility matrix	Chart that describes the participation by various functions in completing tasks or deliverables.
Information Management Assignment Matrix	Where the appointing party appoints a prospective lead appointed party or a third party to undertake all or part of the information management function, the use of the information management assignment matrix can help with establishing the scope of services needed. The Information Management Assignment Matrix uses the Responsibility Assignment Matrix (RAM) or RACI matrix concept: R Responsible for undertaking activity A Accountable for activity completion C Consulted during activity I Informed following activity completion Task
Space	Limited three-dimensional extent defined physically or notionally.

3.2 TERMS RELATED TO ASSETS & PROJECTS	
Actor	Person, organisation, or organisational unit involved in a construction process. This can be any individual, group, or organisation involved in a project delivery or assets management process, i.e. an owner, a designer, a contractor, or an external standardising institution.
Appointment	Agreed instruction for the provision of information concerning works, goods, or services.
Appointed party	Provider of information concerning works, goods, or services. This typically describes those working for the owner, i.e. the designers, contractors, or facility managers.
Appointing party	Receiver of information concerning works, goods, or services from a lead appointed party. This is typically meant as the owner, client, or owner's representative.
Client	Actor responsible for initiating a project and approving the brief. Often this is the owner.
Delivery team	Lead appointed party and their appointed parties. This is e.g. the designer and subcontractors or the contractor and subcontractors.
Task team	Individuals assembled to perform a specific task.
Asset	Item, thing, or entity that has potential or actual value to an organisation.
Project information	Information produced for or utilised in a particular project.
Life cycle	Life of the asset from the definition of its requirements to the termination of its use, covering its conception, development, operation, maintenance support and disposal.
Delivery phase	Part of the life cycle, during which an asset is designed, constructed, and commissioned.
Operational phase	Part of the life cycle, during which an asset is used, operated, and maintained.
Trigger event	Planned or unplanned event that changes an asset or its status during its life cycle, which results in information exchange.
Key decision point	Point in time during the life cycle when a decision crucial to the direction or viability of the asset is made.

3 >> TERMS & DEFINITIONS

3.3 TERMS RELATED TO INFORMATION MANAGEMENT	
Information	reinterpretable representation of data in a formalised manner suitable for communication, interpretation, or processing.
Information requirement	specification for what, when, how and for whom information is to be produced.
Organizational information requirements (OIR)	information requirements in relation to organisational objectives.
Asset information requirements (AIR)	information requirements in relation to the operation of an asset.
Project information requirements (PIR)	information requirements in relation to the delivery of an asset.
Exchange information requirements (EIR)	information requirements in relation to an appointment.
Information exchange	act of satisfying an information requirement or part thereof.
Information model	set of structured and unstructured information containers.
Asset information model (AIM)	information model relating to the operational phase.
Project information model (PIM)	information model relating to the delivery phase.
Federation	creation of a composite information model from separate information containers.
Information container	named persistent set of information retrievable from within a file, system or application storage hierarchy.
Status code	meta-data describing the suitability of the content of an information container.
Building information modelling (BIM)	use of a shared digital representation of a built asset to facilitate design, construction, and operation processes to form a reliable basis for decisions.
Common data environment (CDE)	agreed source of information for any given project or asset, for collecting, managing, and disseminating each information container through a managed process.
Level of information need	framework which defines the extent and granularity of information.
Capability	measure of the ability to perform and function.
Capacity	resources available to perform and function.

4 >> STANDARDS

The following standards are referenced in this guideline:

STANDARD	TITLE
ISO/TS 12911	Framework for Building Information Modelling (BIM) Guidance
ISO 15686 Series	Buildings and constructed assets - Service life planning
ISO 19650 Series	ISO 19650-1: Organization and digitisation of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling — Part 1: Concepts and principles ISO 19650-2: Organization and digitisation of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling — Part 2: Delivery phase of the assets
ISO 55000 Series	ISO 55000:2014 Asset management – Overview, principles, and terminology ISO 55001:2014 Asset management – Management Systems – Requirements ISO 55002:2018 Guidelines for the application of ISO 55001
ISO 21500	Guidance on project management
ISO 9001	Quality Management Systems Requirements
ISO 31000	Risk Management Guidelines
PMBOK® Guide	Project Management Institute (PMI): A Guide to the Project Management Body of Knowledge

Table 1: ISO standards referred to in this Guideline.

5 >> INFORMATION MANAGEMENT USING BIM: CONCEPTS, PRINCIPLES, & INFORMATION DELIVERY PROCESSES ACCORDING TO ISO 19650

This chapter gives a general review of the ISO 19650-1 and 2. The objective is to capture the main points to be considered during the development of a tunnelling project

5.1. ASSET LIFE CYCLE

According to ISO 19650 the built asset life cycle includes the following phases:

- **Strategy and Initial Phases:**

The project strategic requirements and Initial plans for the delivery and Operation phases are defined in these stages.

- **Delivery Phase:**

This phase includes the design, construction, and Commissioning of the asset.

- **Operational Phase:**

This stage marks the starting of the use of the asset where the asset value and performance is constantly assessed and monitored.

- **Post Operational phase:**

As shown in ISO 19650-1 Section 13, during the Operation/Use Stage, the asset owner may require undertaking new activities related to the asset such as refurbishment, upgrade, extensions, demolishing, or related to other built/planned assets interfacing with it partial or total modification of the asset in which case a new project delivery phase definition and planning re-starts at Initial Stage. The information collected during Operation/Use stage are used as inputs for the new activities.

These phases can be typically illustrated in figure 1 below:

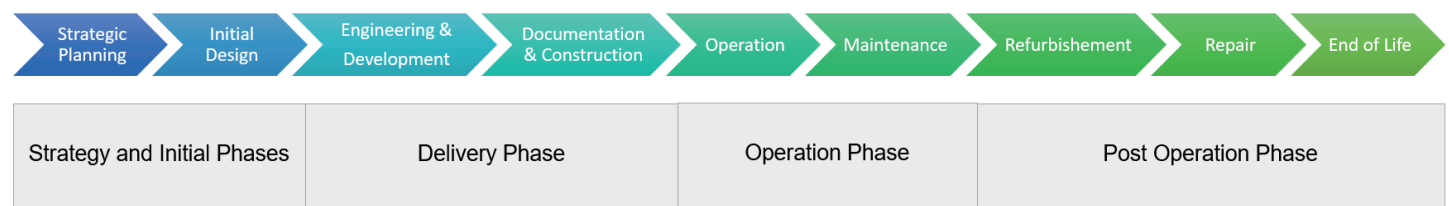


Figure 1: Asset Life Cycle for Built Assets.

5.2. INVOLVED PARTIES

The different parties involved in the delivery of a built asset are classified in ISO 19650 into the following categories (refer also to Figure 7 of this document):

- **Interested External parties:**

These are, e.g. governmental authorities, Policy Makers, Insurers, Regulators, Investors, Asset Users.

- **The project Team:**

- Appointing Party (A): The Asset Owner/client/Employer or Representative.
- Delivery Team (B & C): Lead appointed parties (B) and their Appointed Parties (C), which include subcontractors, sub-consultants, etc.. The Appointed parties (C) are also referred to as Task Teams.

The Interested External Parties and the Appointing party are the receivers of the information, and the Delivery Team is the author and producer of the information.

For each party of the Project Team (parties A, B and C mentioned above), the Information Management tasks are carried out by their respective Information Manager or BIM Manager. The Information Manager can be internal to the party or external (Third Party) according to the project's required Information Management and authoring skills and capabilities.

5.3. INFORMATION LIFE CYCLE

During the project initial and delivery phases, the Information is managed within the Project Management framework (see ISO 21500 and PMBOK® Guide) which includes, Scope, Time, Cost, Quality, Procurement, Resources, Communications, Risk and Stakeholder management. During Operation and post

operation phases, the information is managed within the Asset Management framework (ISO 55000). In both phases, the Project Team uses a BIM-based Information Management System (BIM-IMS) to develop and manage Information throughout the Asset life cycle stages. BIM tools are used to author and manage information during the Project phase. This results in the development of a Project Information Model (PIM). Similarly, the management and



Figure 2: Asset Information Management life cycle (ISO 19650-1).

authoring of information using BIM tools during the Operational phase results in the development of an Asset Information Model (AIM). The AIM is developed according to the Owner's organisation management systems for built assets. In ISO 19650-1, the Information Life Cycle in figure 2 above shows that where relevant, the Information developed using BIM is transferred from a Project to Operation and from Operation to new Projects by transferring information from the PIM to the AIM and then back to new PIMs, in a continuous cycle.

5 >> INFORMATION MANAGEMENT USING BIM: CONCEPTS, PRINCIPLES, & INFORMATION DELIVERY PROCESSES ACCORDING TO ISO 19650

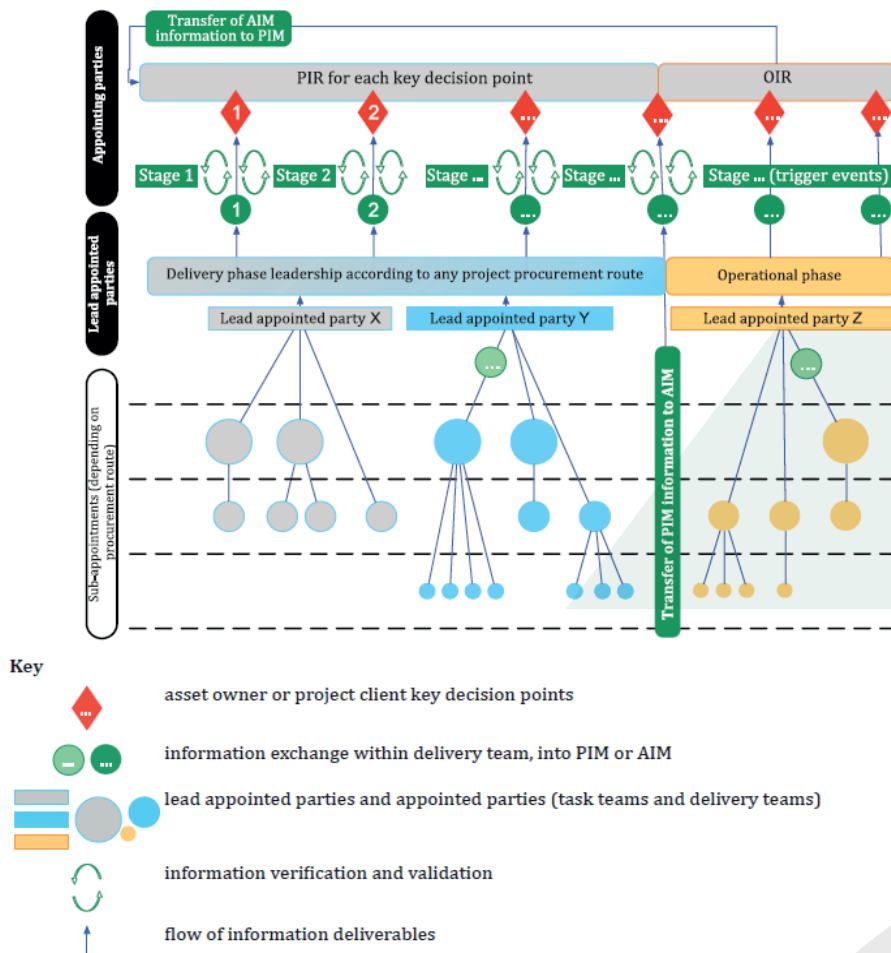


Figure 3: Information Transfer Between Asset Life Cycle Stages (ISO 19650-1).

5.4. INFORMATION REQUIREMENTS

Each of the parties mentioned above has different perspectives and requirements for information use and need. These perspectives and requirements determine the level of information needed by each party.

As per ISO 19650, the Level of Information need defines the extent and granularity of information created and communicated. The level of information need is specific to each stage and deliverable and should be specified clearly within the Organizational Information Requirements (OIR), the Project Information Requirements (PIR), the Asset Information Requirements (AIR) and the Exchange Information Requirements (EIR).

The Information requirements and subsequent level of Information needed should be clarified and incorporated by the Information Manager of each party during the specification, planning and delivery of the Information.

It is imperative that the appointing party Information Manager understands what information is required concerning the asset or the project to support his organisational or project objectives. These requirements can come from the Information Manager's own organisation or the Interested external parties. All asset and project information that is to be supplied during the asset life cycle should be specified by the appointing party through sets of information requirements which are used as

part of the Information procurement process.

The information requirements are categorised into:

A. Requirements related to achieving the organisational objectives, perspectives and goals prescribed in the following deliverables:

- **OIR:**

Requirements for high-level strategic objectives of the appointing party.

- **PIR:**

Requirements for high-level strategic objectives of the appointing party related to a particular built asset project.

B. Requirements related to the procurement of the information prior to any appointment prescribed in the following deliverables

- **AIR:**

Requirements for producing asset information.

- **EIR:**

Requirements for exchanging and sharing asset information.

Information requirements associated with the delivery phase of an asset should be expressed in terms of the project stages that the appointing party or lead appointed party intends to use.

Information requirements associated with the operational phase of an asset should be expressed in terms of foreseeable life cycle trigger events.

The information is managed in the Common Data Environment (CDE) through workflows predefined by the Appointing party prior to starting of the delivery and operation phases.

The quality of the required information is also specified by the appointing party before starting of the project. The project or asset information production should follow the Plan-Do-Check-Act cycle.

5.5 STAGES OF TYPICAL INFORMATION FLOW

The information management consists of the following actions performed at each stage of

5 >> INFORMATION MANAGEMENT USING BIM: CONCEPTS, PRINCIPLES, & INFORMATION DELIVERY PROCESSES ACCORDING TO ISO 19650

the asset life cycle:

- Assessment and need - Specify information requirements
- Invitation to tender
- Tender response
- Appointment
- Mobilisation
- Collaborative production of information
- Information model delivery
- Project close-out

At each stage of the asset life cycle, the Information is specified, planned, produced, augmented, exchanged, used, and archived to fulfil organisational, project management, asset management and user goals and perspectives as well as to support organisational, project management and asset management decision making.

5.6. INFORMATION DELIVERY

As part of the Information procurement process at any stage of the built Asset Life Cycle, the appointing party includes the appointing party's information requirements relevant to the Stage within the tender documents. The candidate's (bidder) response to the tender should include a Pre-appointment BIM Execution Plan (PRE-BEP) that outlines the delivery team's proposed approach and plan for information management and their capability and capacity to manage information.

Upon award of the appointment and before starting of the project, the appointed party Information Manager undertakes the development of the following deliverables:

- **RACI Matrix:**
Responsibility matrix for the information management tasks and deliverables.
- **BEP:**
BIM Execution Plan, detailing how the information management aspects of the appointment will be carried out by the delivery team.
- **MIDP:**
Master Information Delivery Plan incorporating all relevant task Information plans.
- **TIDP:**
Task Information Delivery Plan scheduling the information delivery plan for a specific task.
- **PIM:**
Project Information Model which is stage-specific.
- **AIM:**
Asset Information Model developed by the Asset Manager based on the handed-over as-built PIM.

These deliverables are adapted for each appointment along the asset life cycle based on the Level of Information needed to be specified in the appointing parties' requirements. Appointment of the Information management scope can be done at the same time of appointment of the other project related scopes (design, construction, operation).

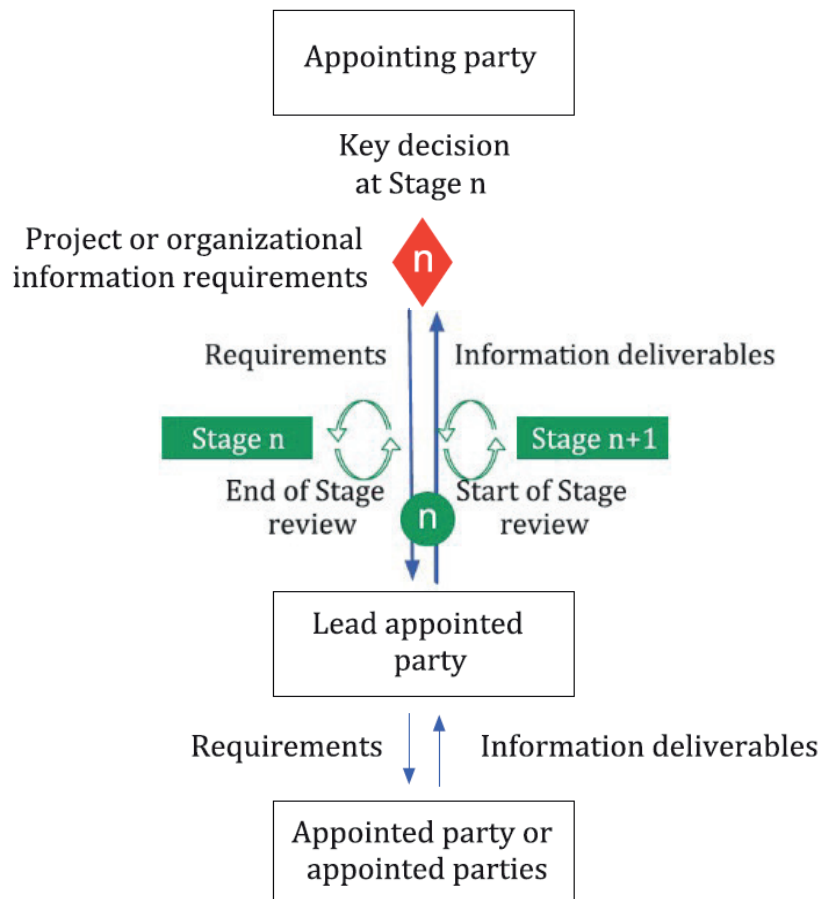
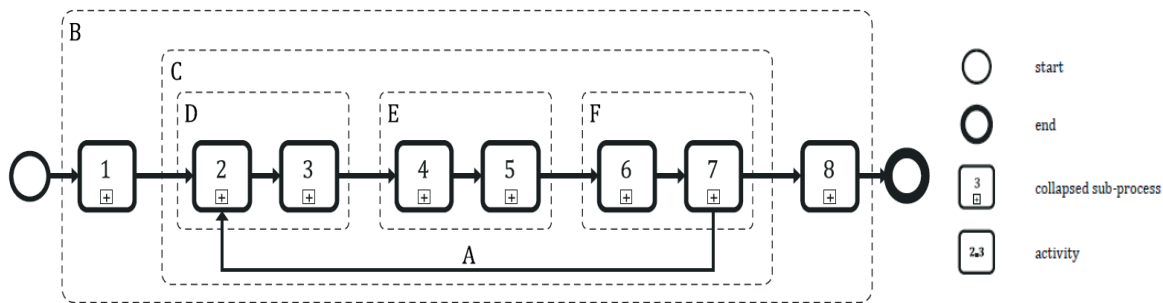


Figure 4: Information Management Process by Stage (ISO19650-1).

5 >> INFORMATION MANAGEMENT USING BIM: CONCEPTS, PRINCIPLES, & INFORMATION DELIVERY PROCESSES ACCORDING TO ISO 19650



Activities

- 1 assessment and need
- 2 invitation to tender
- 3 tender response
- 4 appointment
- 5 mobilization
- 6 collaborative production of information
- 7 information model delivery
- 8 project close-out (end of delivery phase)

- A information model progressed by subsequent delivery team(s) for each appointment
- B activities undertaken per project
- C activities undertaken per appointment
- D activities undertaken during the procurement stage (of each appointment)
- E activities undertaken during the information planning stage (of each appointment)
- F activities undertaken during the information production stage (of each appointment)

Figure 5: Information Management Process by Appointment (ISO 19650-2).

6 >> INFORMATION MANAGEMENT USING BIM - ITA WG22

RECOMMENDATIONS FOR THE APPLICATION OF ISO 19650 SERIES



DEF: Definition/Initial Stage; BRF: Preparation & Briefing/Project Definition Stage; PRE: Concept and Preliminary Design Stage; REF: Baseline/Reference Design Stage; CON: Construction Stage; COM: Commissioning Stage; OPE: Operation and Monitoring Stage.

Figure 6: Typical Asset Life Cycle Stages – ITA WG22 (adopted from [7]).

In the absence of a country based or Organisation based Information Management framework, ITA WG22 recommends the use of the following guidance for Information Management of underground projects.

6.1. TYPICAL UNDERGROUND ASSET LIFE CYCLE

The asset life stages referred to in this document are typical stages of underground projects and asset delivery. Appendix 1 provides a translation for the corresponding stage names for typically used in each Member Nation.

6.2. INVOLVED PARTIES

Underground projects, like any infrastructure project, involve different parties acting at different stages. In this recommendation, the terminology of the FIDIC Emerald Book (Section 1.1 General Provisions-Definitions) is used for the designation of the involved parties in an underground project. The following figure gives an example of the involved parties

The Owner or the Employer is the only party which is present at all the asset life stages, therefore the ITA WG22 recommends that the Employer should drive the Information Management tasks and process.

6.3. PROCESS

The typical process and required deliverables for information management using BIM at each stage of the delivery of underground assets is shown in Appendix 2. At each stage of the asset life cycle, the Information is specified, produced, validated and approved as per the Plan-Do-Check-Act process (ISO 9001). The Information requirements should include an implementation plan for the Level Information

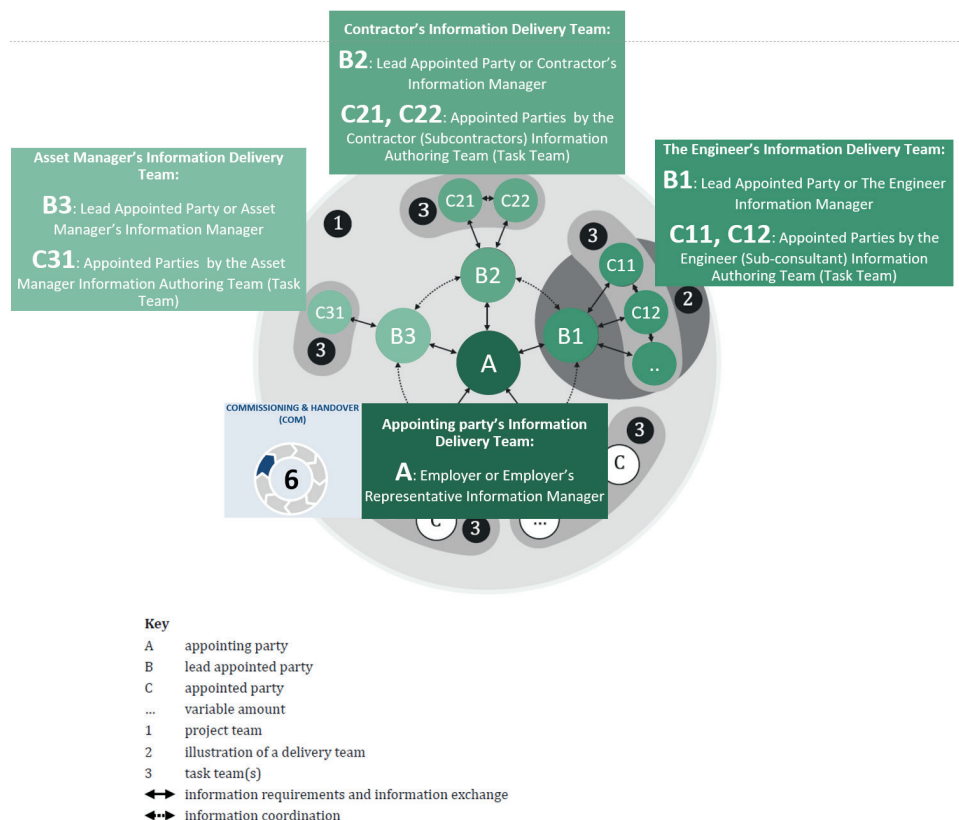


Figure 7: Typical configuration of an Underground Project Involved Parties at Stage 6 – ITA WG22 (Adopted from ISO 19650-1).

Need that answers the following questions:

- **Specification:**
What Information is needed?
- **Purpose:**
Why is the required information needed?
- **Party:**
Who needs (owns) and who produces the information?
- **Stage:**
When is the required information needed?

• Methodology:

how the information is produced and delivered?

The need for BIM is different from a stage to another and depends on the purpose or use intended by the information owner. As such, the following table lists the areas for which the level of Information Need is should be developed.

6 >> INFORMATION MANAGEMENT USING BIM - ITA WG22

RECOMMENDATIONS FOR THE APPLICATION OF ISO 19650 SERIES

	ASSET MANAGEMENT (ISO 55000)	PROJECT MANAGEMENT (ISO 21500)
Level Of Information Need for:	<ul style="list-style-type: none"> • Asset Management strategy & planning, • Asset Management decision making, • Asset life cycle delivery activities, • Asset knowledge enablers, • Organization and people enablers, • Risk & review 	<ul style="list-style-type: none"> • Integration Management • Scope Management • Time Management • Cost Management • Quality Management • Procurement Management • Resources Management • Communication Management • Risk Management • Stakeholder Management

Table 2: Asset and Project Management Activities that May Generate the Need for Information Modelling.

6.4. INFORMATION MANAGEMENT USING BIM - RESPONSIBILITY MATRIX

The tables in Appendix 3 suggest a guide for developing the responsibility matrix (RACI) for information management of underground projects.

The table considers that the Information Management function is internal to the appointing and lead appointed party organisations. The Information Management functions can be assigned by the appointing party to the lead appointed party or a third party external to the appointing party organisation. In that case, a scope of services should be established by the appointing party considering

a clear specification of the tasks that the external Information Manager will be responsible for, if the extent of delegated authority and the minimum capabilities, competency and skills required to fulfil this function. If a lead appointed party appoints external third party to undertake the Information Management function, a similar process should be followed.

7 >> REFERENCES

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[7] RIBA Plan of Work 2020: <https://www.architecture.com/knowledge-and-resources/resources-landing-page/riba-plan-of-work>

8 >> APPENDIX 1 – UNDERGROUND ASSET LIFE CYCLE STAGES USED BY ITA WG-22 AND EQUIVALENT STAGES USED BY MEMBER NATIONS

	0	1	2	3	4	5	6	7
Stage Goal	Define the project and state the strategic requirements	Assess Feasibility, Plan the project and prepare the next procurement phases	Assess the design options and shape the project	Develop the design final option, and Prepare the coordinated baseline	Detail the design and Plan the Construction of the Asset	Construct the Asset	Handover the Asset	Operate, monitor and maintain the Asset
ITA (WG22)	STRATEGIC DEFINITION	PREPARATION & BRIEFING	CONCEPTUAL & PRELIMINARY DESIGN	BASELINE REFERENCE DESIGN	DETAILED/ CONTRACTOR DESIGN	CONSTRUCTION	COMMISSION-ING & HANDOVER	USE/OPERATION
Note: During Operation or Use of asset, partial or total modification of the asset triggers a new Stage 0.								
ISO 19650 & 15686	STRATEGIC PLANNING	PROJECT DELIVERY						OPERATION
APM (GLOBAL)	STRATEGY	OUTCOME DEFINITION	FEASIBILITY	CONCEPT DESIGN	DETAILED DESIGN	DELIVERY	PROJECT CLOSE	BENEFITS REALISATION
RIBA (UK)	STRATEGIC DEFINITION	PREPARATION & BRIEFING	CONCEPT DESIGN	SPATIAL COORDINATION	TECHNICAL DESIGN	MANUFACTURING & CONSTRUCTION	HANDOVER	USE
ACE (EU)	INITIATIVE	INITIATION	CONCEPT & PRELIMINARY	DEVELOPED DESIGN	DETAILED DESIGN	CONSTRUCTION		Asset USE
AIA (US)	Strategic Definition & Planning	Feasibility	Conceptual design	Preliminary Engineering	DETAILED DESIGN	Construction	Commissioning & Handover	Operation & Maintenance
NATSPEC (AUS)	ESTABLISHMENT		CONCEPT & PRELIMINARY	DESIGN DEVELOPMENT	CONTRACT DOCUMENTATION	CONSTRUCTION		FACILITY MANAGEMINT
NATSPEC (NZ)	PREDESIGN		CONCEPT & PRELIMINARY	DEVELOPED DESIGN	DETAILED DESIGN	CONSTRUCT		OPERATE
AUTRICHE AUSTRIA	PROJECT PREPARATION & FEASIBILITY	PRELIMINARY DESIGN	BASIC DESIGN	DETAILED DESIGN	CONSTRUCTION	CONSTRUCTION	PROJECT CLOSE	OPERATION
SLOVENIA	STRATEGIJA / STRATEGY	PREDHODNE ŠTUDIJE / PRELIMINARY STUDIES	IDEJNA ZASNOVA / CONCEPTUAL DESIGN	PROJEKT ZA PRIDOBITEV GRADBENEGA DOVOLJENJA / BASIC DESIGN	PROJEKT ZA IZVEDBO GRADNJE / DETAILED DESIGN	GRADNJA / CONSTRUCTION	PREDAJA OBJEKTA / HANDOVER	UPRAVLJANJE / FACILITY MANAGEMINT
AFRIQUE DU SUD SOUTH AFRICA								
ALGERIE ALGERIA								
ALLEMAGNE GERMANY								
ARABIE SAOUDITE SAUDI ARABIA								
ARGENTINE ARGENTINA								
AUSTRALIE AUSTRALIA	STRATEGIC PLANNING	INITIAL DESIGN	ENGINEERING & DEVELOPMENT	DOCUMENTATION & CONSTRUCTION	OPERATION	STRATEGIC PLANNING	INITIAL DESIGN	ENGINEERING & DEVELOPMENT
AUTRICHE AUSTRIA								
AZERBAIDJAN AZERBAIJAN								
BELARUS	PRELIMINARY DESIGN			ARCHITECTURAL DESIGN, TENDER	CONSTRUCT-ION DESIGN	CONSTRUCTION		OPERATION
BELGIQUE BELGIUM	STRATEGY	FEASIBILITY	AVANT PROJET / PRELIMINARY DESIGN	REFERENCE DESIGN / TENDER DOCUMENT (if DESIGN AND BUILD)	DETAILED DESIGN / TENDER DOCUMENT	CONSTRUCTION DESIGN / CONSTRUCTION	COMMISSIONING / HANDOVER	EXPLOITATION / OPERATION
BHOUTAN BHUTAN								
BOLIVIE BOLIVIA								

8 >> APPENDIX 1 – UNDERGROUND ASSET LIFE CYCLE STAGES USED BY ITA WG-22 AND EQUIVALENT STAGES USED BY MEMBER NATIONS

BOSNIE- HERZEGOVINE BOSNIA & HERZEGOVINA	PRELIMINARY DESIGN FEASIBILITY STUDY	MAIN DESIGN	DETAILED DESIGN	CONSTRUCTION	OPERATION	PRELIMINARY DESIGN FEASIBILITY STUDY	MAIN DESIGN	DETAILED DESIGN
BRESIL BRAZIL								
BULGARIE BULGARIA								
CAMBODGE CAMBODIA								
CANADA								
CHILI CHILE								
CHINE CHINA	FEASIBILITY STUDY		PRELIMINARY DESIGN		DETAILED DESIGN	CONSTRUCTION		OPERATION
COLOMBIE COLOMBIA								
COREE DU SUD SOUTH COREA								
COSTA RICA								
CROATIE CROATIA								
DANEMARK DENMARK								
EGYPTE EGYPT								
EMIRATS ARABES UNIS UNITED ARAB EMIRATES								
EQUATEUR ECUADOR								
ESPAGNE SPAIN								
USA								
FINLANDE FINLAND								
FRANCE	ETUDES D'OPPORTUNITE / OPPORTUNITY STUDIES	ETUDES PRELIMINAIRES / PRELIMINARY STUDIES	AVANT PROJET / PRELIMINARY DESIGN STUDIES	PROJET / PROJECT STUDIES	DOSSIER DE CONSULTATION DES OPERATEURS ECONOMIQUES / TENDER DOCUMENT	ETUDES D'EXECUTION / EXECUTION STUDIES	RECEPTION / ACCEPTANCE	EXPLOITATION / OPERATION
GRECE GREECE								
HONGRIE HUNGARY								
INDE INDIA								
INDONESIE INDONESIA								
IRAN								

8 >> APPENDIX 1 – UNDERGROUND ASSET LIFE CYCLE STAGES USED BY ITA WG-22 AND EQUIVALENT STAGES USED BY MEMBER NATIONS

ISLANDE ICELAND								
ISRAEL								
ITALIE ITALY	PIANIFICAZIONE E PROGRAMMAZIONE		PROGETTO DI FATTIBILITÀ TECNICO- ECONOMICA	PROGETTO DI FATTIBILITÀ TECNICO- ECONOMICA	PROGETTO ESECUTIVO E PROGETTO COSTRUTTIVO	ESECUZIONE DEI LAVORI	CONSEGNA DEI LAVORI	GESTIONE
JAPON JAPAN	STRATEGIC PLANNING		CONCEPT DESIGN	DETAILED DESIGN	CONSTRUCTION DOCUMENTS	CONSTRUCTION	PROJECT CLOSE	OPERATE
MLIT(Japan)	PLANNING		SCHEMATIC/ PRELIMINARY DESIGN	DETAILED DESIGN		CONSTRUCTION		O&M
MAFF(Japan)	PLANNING	CONCEPTUAL DESIGN	SCHEMATIC/ PRELIMINARY DESIGN	DETAILED DESIGN		CONSTRUCTION		O&M
KAZAKHSTAN								
LAOS								
LESOTHO								
MACEDONIE MACEDONIA								
MALAISIE MALAYSIA								
MAROC MOROCCO								
MEXIQUE MEXICO								
MONTENEGRO								
MYANMAR								
NORVEGE NORWAY	DEFINITION OF STRATEGY	OUTCOME DEFINITION	FEASIBILITY	CONCEPT DESIGN	DETAILED DESIGN	PRODUCTION AND DELIVERY REFERING TO THE CONTRACT	PROJECT CLOSE, FINISHING, TESTING AND HANDOVER	BENEFITS REALISATION - PUT ON TRAFFIC - ROUTINES FOR MAINTAINING, OPERATION AND SAFETY - REHABILITATE
PANAMA								
PAYS-BAS								
NETHERLANDS								
PEROU PERU								
POLOGNE POLAND								
ROMANIA								
ROYAUME UNI UNITED KINGDOM								
RUSSIE RUSSIA								
SERBIE SERBIA								

8 >> APPENDIX 1 – UNDERGROUND ASSET LIFE CYCLE STAGES USED BY ITA WG-22 AND EQUIVALENT STAGES USED BY MEMBER NATIONS

SINGAPOUR SINGAPUR								
SLOVAQUIE SLOVAKIA								
SLOVENIE SLOVENIA								
SUEDE SWEDEN	(ATGÄRDSV ALLSSTUDIE) / DEFINITION OF STRATEGY	(PLANSKEDE/ SYSTEMHANDLING) / FEASIBILITY STUDY	(PLANSKEDE/ SYSTEMHANDLING) / CONCEPT DESIGN	(PLANSKEDE/ SYSTEMHANDLING) / PRELIMINARY DESIGN	(BYGGHANDLING) / DETAILED DESIGN	(BYGGSKEDE) / CONSTRUCTION	(ÖVERLÄMNANDE) / HANDOVER	(DRIFTSKEDE) / OPERATION AND MAINTENANCE
SUISSE SWITZERLAND	STRATEGISCHE PLANUNG Phase 11 (SIA 103)	VORSTUDIEN Phase 21-22 (SIA 103)	VORPROJEKT Phase 31 (SIA 103)	BAUPROJEKT Phase 32 (SIA 103)	AUFÜHRUNGSPROJEKT Phase 51 (SIA 103)	AUFÜHRUNG Phase 52 (SIA 103)	INBETRIEBNAHME Phase 53 (SIA 103)	BEWIRTSCHAFTUNG Phase 60 (SIA 103)
REPUBLIC CZECH REPUBLIC	DEFINITION (DEFINOVÁNÍ)	PREPARATION (PŘÍPRAVA)	STUDIES (STUDIE)	ZONING DECISION DESIGN, BUILDING DECISION DESIGN, DETAILED TENDER DESIGN (DUR, DSP, PDPS)	WORKSHOP DRAWINGS (DPS)	CONSTRUCTION (REALIZACE)	HANDOVER, AS BUILT (PŘEDÁNÍ STAVBY, SKUTEČNÉ PROVEDENÍ)	OPERATION AND MAINTENANCE (PROVOZ A ÚDRŽBA)
THAILANDE THAILAND								
TURQUIE TURKEY								
UKRAINE UKRAINE								
VENEZUELA								
VIETNAM								

9 >> APPENDIX 2 – TYPICAL INFORMATION MANAGEMENT PROCESS FOR UNDERGROUND PROJECTS

Legend for Information Management deliverables (refer to figures 3 to figure 7 for references to the symbols and other acronyms used in Figure 8 pages 22-23):

OIR: Organizational Information Requirements

PIR: Project Information Requirements

AIR: Asset Information Requirements

BRIEF EIR: Exchange Information Requirements For Stage 1: Preparation And Brief

CONCEPT EIR: Exchange Information Requirements For Stage 2: Concept And Preliminary

REFERENCE EIR: Exchange Information Requirements For Stage 3: Reference Design

CONSTRUCTION EIR: Exchange Information Requirements For Stages 4, 5 And 6: Contractor's Design, Construction And Commissioning

USE EIR: Exchange Information Requirements For Stage 7: Use And Operation

PRE-BEP: Pre-appointment BIM Execution Plan At Tender Stage

BRIEF BEP: BIM Execution Plan For Stage 1: Preparation And Brief

CONCEPT BEP: BIM Execution Plan For Stage 2: Concept And Preliminary

REFERENCE BEP: BIM Execution Plan For Stage 3: Reference Design

CONSTRUCTION BEP: BIM Execution Plan For Stages 4, 5 And 6: Contractor's Design, Construction And Commissioning

USE BEP: BIM Execution Plan For Stage 7: Use And Operation

BRIEF MIDP/TIDP: Master Information Delivery Plan/ Task Information Delivery Plan For Stage 1: Preparation And Brief

CONCEPT MIDP/TIDP: Master Information Delivery Plan/ Task Information Delivery Plan For Stage 2: Concept And Preliminary

REFERENCE MIDP/TIDP: Master Information Delivery Plan/ Task Information Delivery Plan For Stage 3: Reference Design

CONSTRUCTION MIDP/TIDP: Master Information Delivery Plan/ Task Information Delivery Plan For Stages 4, 5 And 6: Contractor's Design, Construction And Commissioning

USE MIDP/TIDP: Master Information Delivery Plan/ Task Information Delivery Plan For Stage 7: Use And Operation

9 >> APPENDIX 2 – TYPICAL INFORMATION MANAGEMENT PROCESS FOR UNDERGROUND PROJECTS

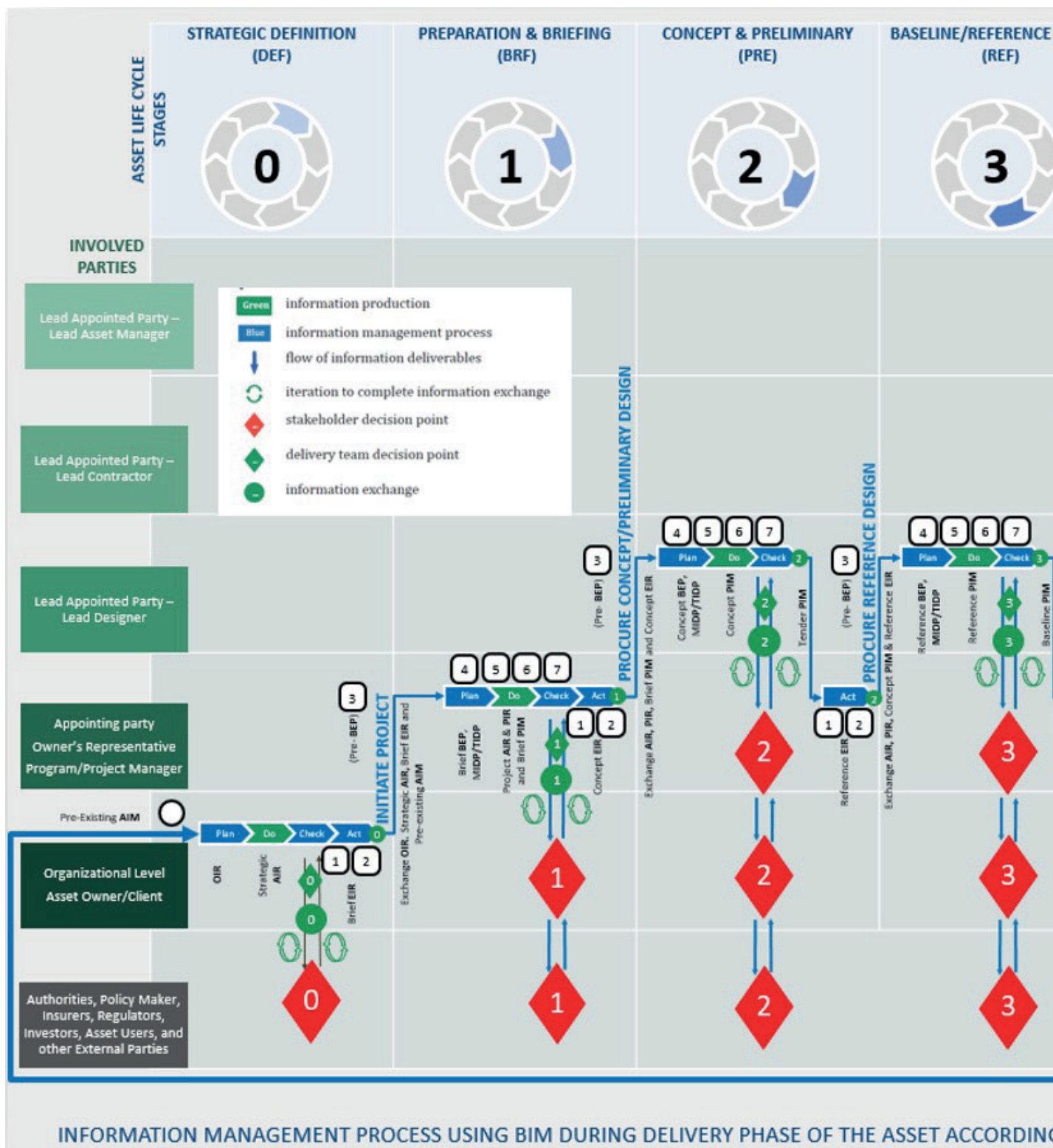
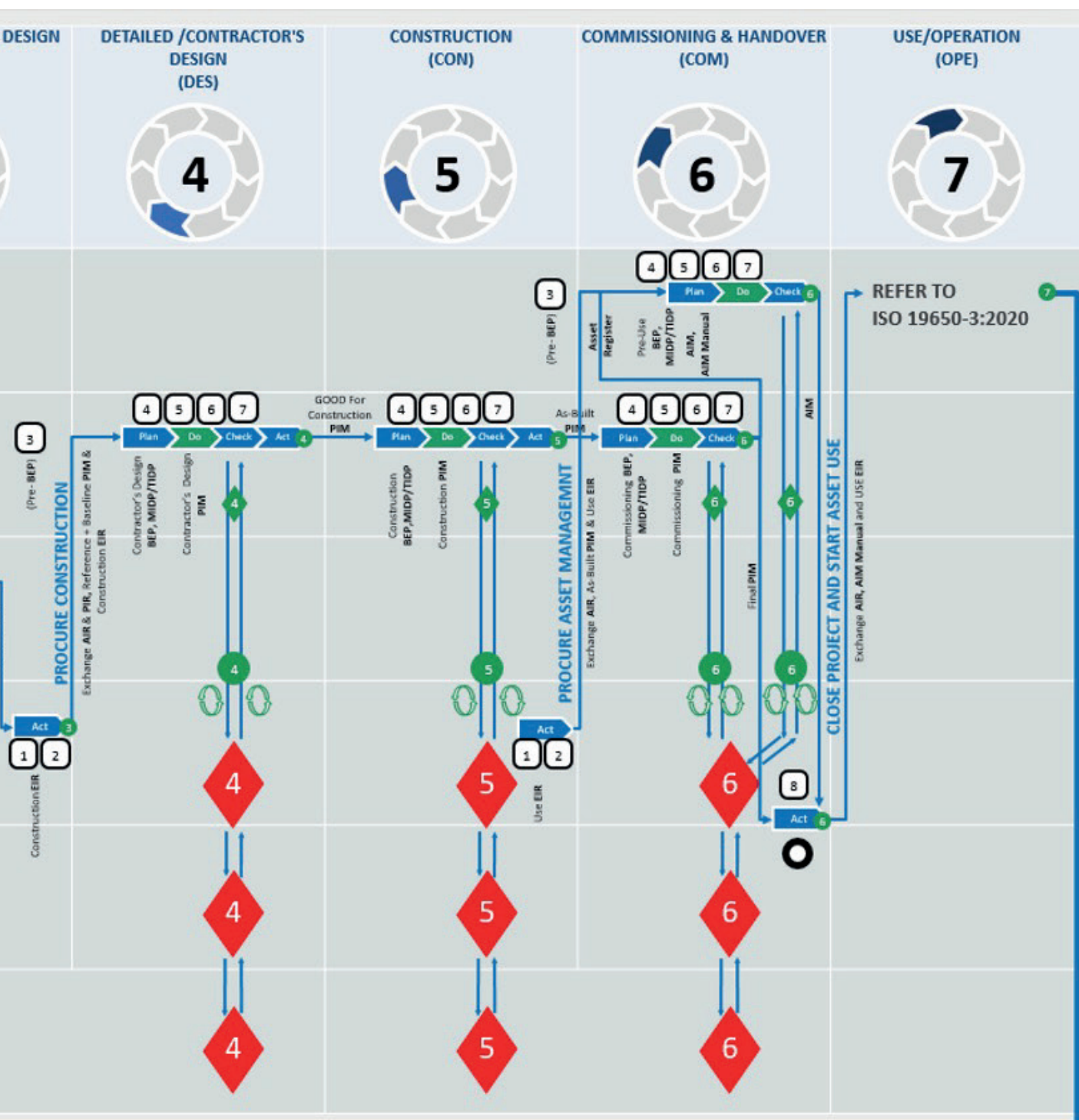


Figure 8: Overview and Illustration of the Information Management Process – ITA-WG22

9 >> APPENDIX 2 – TYPICAL INFORMATION MANAGEMENT PROCESS FOR UNDERGROUND PROJECTS



10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

<div>KEY</div> <div>R Responsible for undertaking activity</div> <div>A Accountable for activity completion</div> <div>C Consulted during activity</div> <div>I Informed following activity completion task</div>		STRATEGIC DEFINITION			<div><div></div><div>0</div><div></div></div>
		Employer / Owner (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)	N/A (no other party involved at this stage)	N/A (no other party involved at this stage)
		Owner	Project Management Consultant		
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities.	The Employer appoints internal Information Manager to undertake the Information Assessment and Need then assist during Tender for appointment of the Employer Representative (Project Appointing Party) Information Manager who will undertake the Information Management related to Stage 1 .			
5.1	INFORMATION MANAGEMENT PROCESS – ASSESSMENT AND NEED				
5.1.1	Appoint individuals to undertake the information management function	R			
5.1.2	Establish the Organizational Information Requirements (OIR)	R			
5.1.3	Establish the Stage 1 information delivery milestones	R			
5.1.4	Establish the Stage 1 information standard	R			
5.1.5	Establish the Stage 1 information production methods and procedures	R			
5.1.6	Establish the Stage 1 reference information and shared resources	R			
5.1.7	Establish the Stage 1 common data environment	R			
5.1.8	Establish the Stage 1 information protocol	R			
5.2	INFORMATION MANAGEMENT PROCESS – INVITATION TO TENDER TO APPOINT THE EMPLOYER REPRESENTATIVE				
5.2.1	Establish the Owner's exchange information requirements: Brief EIR	R			
5.2.2	Assemble reference information and shared resources	R			
5.2.3	Establish tender response requirements and evaluation criteria	R			
5.2.4	Compile invitation to tender information	R			
5.3	INFORMATION MANAGEMENT PROCESS – TENDER RESPONSE FROM STAGE 1 PROJECT MANAGEMENT CONSULTANT				
5.3.1	Nominate individuals to undertake the information management function		R		
5.3.2	Establish the delivery team's pre-appointment BIM execution plan (PRE-BEP)		R		
5.3.3	Assess each task team capability and capacity		R		
5.3.4	Establish the delivery team's capability and capacity		R		
5.3.5	Establish the delivery team's mobilisation plan		R		
5.3.6	Establish the delivery team's risk register		R		
5.3.7	Compile the delivery team's tender response	I	R		

10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

<div>KEY</div> <div>R Responsible for undertaking activity</div> <div>A Accountable for activity completion</div> <div>C Consulted during activity</div> <div>I Informed following activity completion Task</div>		PREPARATION AND BRIEFING			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

<div>KEY</div> <div>R Responsible for undertaking activity</div> <div>A Accountable for activity completion</div> <div>C Consulted during activity</div> <div>I Informed following activity completion Task</div>		PREPARATION AND BRIEFING			<div>1</div>
		Employer (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)		
		Owner	Project Management Consultant		
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities.	The Employer representative appoints internal Information Manager to undertake Stage 1 Appointment, Mobilisation, Collaborative Production of Information and Brief Information Model Delivery (Brief PIM) tasks, then assist during Tender for appointment of Stage 2 Lead Appointed Party.			
5.1	INFORMATION MANAGEMENT PROCESS — ASSESSMENT AND NEED OF STAGE 2				
5.1.1	Appoint individuals to undertake the information management function	I	R		
5.1.2	Establish the project's information requirements		R		
5.1.3	Establish the project's information delivery milestones	A	R		
5.1.4	Establish the project's information standard		R		
5.1.5	Establish the project's information production methods and procedures		R		
5.1.6	Establish the project's reference information and shared resources		R		
5.1.7	Establish the project's common data environment		R		
5.1.8	Establish the project's information protocol	C	R		
5.2	INFORMATION MANAGEMENT PROCESS — INVITATION TO TENDER FOR APPOINTING STAGE 2 CONCEPT CONSULTANT				
5.2.1	Establish the appointing party's exchange information requirements		R		
5.2.2	Assemble reference information and shared resources		R		
5.2.3	Establish tender response requirements and evaluation criteria		R		
5.2.4	Compile invitation to tender information	I	R		

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10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

<div>KEY</div> <div>R Responsible for undertaking activity</div> <div>A Accountable for activity completion</div> <div>C Consulted during activity</div> <div>I Informed following activity completion Task</div>		CONCEPT AND PRELIMINARY			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></di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10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

KEY R Responsible for undertaking activity A Accountable for activity completion C Consulted during activity I Informed following activity completion Task		CONCEPT AND PRELIMINARY			
		Employer/Owner (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)	LEAD APPOINTED PARTY (Design Consultant's Information Manager)	LEAD APPOINTED PARTY (Contractor's Information Manager)
		Owner	Project Management Consultant	Reference Design Consultant	Contractor
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities (Delivery team = Task team)	The Employer representative appoints internal Information Manager to undertake Stage 1 Appointment, Mobilisation, Collaborative Production of Information and Brief Information Model Delivery (Brief PIM) tasks, then assist during Tender for appointment of Stage 2 Lead Appointed Party.			
5.4	INFORMATION MANAGEMENT PROCESS — STAGE 3 APPOINTMENT INFORMATION MANAGEMENT PROCESS TENDER RESPONSE FROM STAGE 2 CONCEPT DESIGN CONSULTANT				
5.4.1	Confirm the delivery team's BIM execution plan (BEP)		C	R	
5.4.2	Establish the delivery team's detailed responsibility matrix			R	
5.4.3	Establish the lead appointed party's exchange information requirements		C	R	
5.4.4	Establish the task information delivery plan(s) (TIDP)			R	
5.4.5	Establish the master information delivery plan (MIDP)			R	
5.4.6	Complete lead appointed party's appointment documents	I	R	I	
5.4.7	Complete appointed party's appointment documents	I	R	I	
5.5	INFORMATION MANAGEMENT PROCESS — STAGE 3 MOBILIZATION				
5.5.1	Mobilise resources		I	R	
5.5.2	Mobilise information technology		I	R	
5.5.3	Test the project's information production methods and procedures		I	R	
5.6	INFORMATION MANAGEMENT PROCESS — STAGE 3 COLLABORATIVE PRODUCTION OF INFORMATION				
5.6.1	Check availability of reference information and shared resources		I	R	
5.6.2	Generate information		C	R	
5.6.3	Undertake quality assurance check			R	
5.6.4	Review information and approve for sharing			R	
5.6.5	Information model review			I/R	
5.7	INFORMATION MANAGEMENT PROCESS — STAGE 3 INFORMATION MODEL DELIVERY				
5.7.1	Submit information model for lead appointed party authorisation		I	A/R	
5.7.2	Review and authorise the information model			R	
5.7.3	Submit information model for appointing party acceptance		A	R	
5.7.4	Review and accept the information model	I	R		

10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

<div>KEY</div> <div>R Responsible for undertaking activity</div> <div>A Accountable for activity completion</div> <div>C Consulted during activity</div> <div>I Informed following activity completion Task</div>		CONCEPT AND PRELIMINARY			<div><div></div><div>3</div><div></div></div>
		Employer/Owner (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)	LEAD APPOINTED PARTY (Design Consultant's Information Manager)	LEAD APPOINTED PARTY (Contractor's Information Manager)
		Owner	Project Management Consultant	Reference Design Consultant	Contractor
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities (Delivery team = Task team)	The Employer representative appoints internal Information Manager to undertake Stage 1 Appointment, Mobilisation, Collaborative Production of Information and Brief Information Model Delivery (Brief PIM) tasks, then assist during Tender for appointment of Stage 2 Lead Appointed Party.			
5.1	INFORMATION MANAGEMENT PROCESS – ASSESSMENT AND NEED FOR STAGES 4,5 AND 6				
5.1.1	Appoint individuals to undertake the information management function	I	R		
5.1.2	Establish the project's information requirements		R		
5.1.3	Establish the project's information delivery milestones	A	R		
5.1.4	Establish the project's information standard		R		
5.1.5	Establish the project's information production methods and procedures		R		
5.1.6	Establish the project's reference information and shared resources		R		
5.1.7	Establish the project's common data environment		R		
5.1.8	Establish the project's information protocol	C	R		
5.2	INFORMATION MANAGEMENT PROCESS – INVITATION TO TENDER FOR STAGE 4 CONTRACTOR				
5.2.1	Establish the appointing party's exchange information requirements		R		
5.2.2	Assemble reference information and shared resources		R		
5.2.3	Establish tender response requirements and evaluation criteria		R		
5.2.4	Compile invitation to tender information	I	R		
5.3	INFORMATION MANAGEMENT PROCESS – TENDER RESPONSE FOR STAGES 4,5 AND 6 CONTRACTOR				
5.3.1	Nominate individuals to undertake the information management function				R
5.3.2	Establish the delivery team's (pre-appointment) BIM execution plan (PRE-BEP)		C		R
5.3.3	Assess each task team capability and capacity				A/R
5.3.4	Establish the delivery team's capability and capacity				R
5.3.5	Establish the delivery team's mobilisation plan	I	A		R
5.3.6	Establish the delivery team's risk register				R
5.3.7	Compile the delivery team's tender response				R


10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

<div>KEY</div> <div>R Responsible for undertaking activity</div> <div>A Accountable for activity completion</div> <div>C Consulted during activity</div> <div>I Informed following activity completion Task</div>		CONTRACTOR'S DESIGN			<div><div></div><div>4</div><div></div></div>
		Employer/Owner (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)	LEAD APPOINTED PARTY (Design Consultant's Information Manager)	
		Owner	Project Management Consultant	Contractor	
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities (Delivery team = Task team)	The Employer representative appoints internal Information Manager to undertake Stage 1 Appointment, Mobilisation, Collaborative Production of Information and Brief Information Model Delivery (Brief PIM) tasks, then assist during Tender for appointment of Stage 2 Lead Appointed Party.			
5.4	INFORMATION MANAGEMENT PROCESS – STAGE 4 APPOINTMENT				
5.4.1	Confirm the delivery team's BIM execution plan (BEP)		C	R	
5.4.2	Establish the delivery team's detailed responsibility matrix			R	
5.4.3	Establish the lead appointed party's exchange information requirements		C	R	
5.4.4	Establish the task information delivery plan(s) (TIDP)			R	
5.4.5	Establish the master information delivery plan (MIDP)			R	
5.4.6	Complete lead appointed party's appointment documents		R	I	
5.4.7	Complete appointed party's appointment documents		R	I	
5.5	INFORMATION MANAGEMENT PROCESS – STAGE 4 MOBILIZATION				
5.5.1	Mobilise resources		I	R	
5.5.2	Mobilise information technology		I	R	
5.5.3	Test the project's information production methods and procedures		I	R	
5.6	INFORMATION MANAGEMENT PROCESS – STAGE 4 COLLABORATIVE PRODUCTION OF INFORMATION				
5.6.1	Check availability of reference information and shared resources		I	R	
5.6.2	Generate information			R	
5.6.3	Undertake quality assurance check			R	
5.6.4	Review information and approve for sharing			R	
5.6.5	Information model review			A/R	
5.7	INFORMATION MANAGEMENT PROCESS – STAGE 4 INFORMATION MODEL DELIVERY				
5.7.1	Submit information model for lead appointed party authorisation		I	A/R	
5.7.2	Review and authorise the information model			R	
5.7.3	Submit information model for appointing party acceptance		A	R	
5.7.4	Review and accept the information model	I	R	I	


10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

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Task</div>		CONSTRUCTION			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></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10 >> APPENDIX 3 – INFORMATION MANAGEMENT RESPONSIBILITY MATRIX FOR UNDERGROUND PROJECTS

KEY R Responsible for undertaking activity A Accountable for activity completion C Consulted during activity I Informed following activity completion Task		COMMISSIONING			
		Employer/Owner (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)	LEAD APPOINTED PARTY (Contractor's Information Manager)	LEAD APPOINTED PARTY (Asset Manager's Information Manager)
		Owner	Project Management Consultant	Contractor	Asset Manager
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities (Delivery team = Task team)	The Employer representative internal Information Manager assists during Tender for appointment of Stage 7 Lead Appointed Party (Asset Manager) then supervises Asset Manager's Mobilisation, Collaborative Production of Information between Contractor and Asset Manager, Asset Information Model (AIM) Delivery, and Project Close out tasks.			
5.3	INFORMATION MANAGEMENT PROCESS – TENDER RESPONSE FROM STAGE 7 ASSET MANAGER				
5.3.1	Nominate individuals to undertake the information management function				R
5.3.2	Establish the delivery team's (pre-appointment) BIM execution plan (PRE-BEP)		C		R
5.3.3	Assess each task team capability and capacity				R
5.3.4	Establish the delivery team's capability and capacity				R
5.3.5	Establish the delivery team's mobilisation plan				R
5.3.6	Establish the delivery team's risk register				R
5.3.7	Compile the delivery team's tender response	I	A		R
5.4	INFORMATION MANAGEMENT PROCESS – ASSET MANAGER APPOINTMENT				
5.4.1	Confirm the delivery team's BIM execution plan (BEP)		R		
5.4.2	Establish the delivery team's detailed responsibility matrix		R		
5.4.3	Establish the lead appointed party's exchange information requirements		R		
5.4.4	Establish the task information delivery plan(s) (TIDP)		R		
5.4.5	Establish the master information delivery plan (MIDP)		R		
5.4.6	Complete lead appointed party's appointment documents	R			
5.4.7	Complete appointed party's appointment documents	R			
5.5	INFORMATION MANAGEMENT PROCESS – ASSET MANAGER MOBILIZATION				
5.5.1	Mobilise resources				R
5.5.2	Mobilise information technology				R
5.5.3	Test the project's information production methods and procedures				R
5.6	INFORMATION MANAGEMENT PROCESS – CONTRACTOR & ASSET MANAGER COLLABORATIVE PRODUCTION OF INFORMATION				
5.6.1	Check availability of reference information and shared resources			R	R
5.6.2	Generate information			R	R
5.6.3	Undertake quality assurance check			R	R
5.6.4	Review information and approve for sharing			R	R
5.6.5	Asset Information model review			R	R

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KEY R Responsible for undertaking activity A Accountable for activity completion C Consulted during activity I Informed following activity completion Task		COMMISSIONING			
		Employer/Owner (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)	LEAD APPOINTED PARTY ((Contractor's Information Manager)	LEAD APPOINTED PARTY (Asset Manager's Information Manager)
		Owner	Project Management Consultant	Contractor	Asset Manager
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities (Delivery team = Task team)	The Employer representative internal Information Manager assists during Tender for appointment of Stage 7 Lead Appointed Party (Asset Manager) then supervises Asset Manager's Mobilisation, Collaborative Production of Information between Contractor and Asset Manager, Asset Information Model (AIM) Delivery, and Project Close out tasks.			
5.7	INFORMATION MANAGEMENT PROCESS – PROJECT AND ASSET INFORMATION MODEL DELIVERY				
5.7.1	Submit information model for lead appointed party authorisation			R	R
5.7.2	Review and authorise the information model			R	R
5.7.3	Submit information model for appointing party acceptance			R	R
5.7.4	Review and accept the information model		R		
5.8	INFORMATION MANAGEMENT PROCESS – PROJECT CLOSE OUT				
5.8.1	Archive the project information model	R			
5.8.2	Capture lessons learned for future projects	R			

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		Employer/Owner (Employer Information Manager)	APPOINTING PARTY (Employer Representative's Information Manager)	LEAD APPOINTED PARTY (Asset Manager's Information Manager)	APPOINTED PARTY (Asset Management Sub-consultants or Sub-contractors)
		Owner	Project Management Consultant	Asset Manager	Asset Manager
	Information Procurement under FIDIC Emerald Book Scenario 1: Employer, Appointing Party, and lead appointed Party have internal Information Management and Production Capabilities (Delivery team = Task team)	The Asset Manager undertakes the Collaborative Production of Information and Asset Information Model Update/Maintenance (UP-AIM) tasks.			
5.6	INFORMATION MANAGEMENT PROCESS – STAGE 7 COLLABORATIVE PRODUCTION OF INFORMATION				
5.6.1	Check availability of reference information and shared resources			R	
5.6.2	Generate information			R	
5.6.3	Undertake quality assurance check			R	
5.6.4	Review information and approve for sharing			R	
5.6.5	Information model review			R	
5.7	INFORMATION MANAGEMENT PROCESS – STAGE 7 ASSET INFORMATION MODEL UPDATE AND MAINTENANCE				
5.7.1	Submit information model for lead appointed party authorisation		R		
5.7.2	Review and authorise the information model		R		
5.7.3	Submit information model for appointing party acceptance		R		
5.7.4	Review and accept the information model	R			
5.2.4	Compile invitation to tender information	R			

>> ACKNOWLEDGMENTS

Notes for the User: This document is an adjunct to, and not a substitute for, expert legal advice.

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COUNTRY

USA

Belarus

Bosnia and
Herzegovina

China

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Czech Republic

UK

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France

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Australia

Slovenia

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