Information management according to BS EN ISO 19650

Guidance Part 2: Processes for Project Delivery

Edition 4

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UK BIM FRAMEWORK

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Editions

Edition 1	July 2019	First release
Edition 2	October 2019	Update includes: About the common data environment (CDE) ISO 19650-2 clause 5: analysis and activities (covering clauses 5.1, 5.2, 5.3, 5.4, 5.8)
Edition 3	January 2020	Update includes: ISO 19650-2 resource map About information requirements About the BIM execution plan ISO 19650-2 clause 5: analysis and activities (covering clauses 5.5, 5.6, 5.7)
Edition 4	April 2020	Update includes: About exchange information requirements About the level of information need About information delivery planning About open data and buildingSMART

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Message from the UK BIM Alliance Chair

Author: Dr Anne Kemp OBE
Chair - UK BIM Alliance

Preparing this Guidance Framework is becoming a labour of love – or otherwise! – for many of the team. I think we are all learning as we go along, and I very much hope that, in doing so, we are able to help you on your own journey in implementing the ISO 19650 series.

There is no question that this Part 2: Process Guidance will evolve. This fourth edition extends guidance into the areas of exchange information requirements, the level of information need, information delivery planning and open data and buildingSMART. It is invaluable having the original authors involved – but even more so having end users testing and challenging how this is presented and explained.

And we are keen to get your feedback! This is an open process, and you really are encouraged to get involved – it is open to all. We remain committed to three monthly updates to ensure we continue to make progress as fast as possible, and to reflect your feedback as soon as possible. We are already hard at work on edition five which will look at the information management function and responsibility matrices.

We are also keen to hear from you on the handbooks, tools and templates that you believe need to be developed to help – as we will work to provide these in collaboration with others going forward, to hang off the Guidance Framework.

I can't thank enough the many people involved in developing the Guidance Framework for all that they are doing. I don't exaggerate when I say this is one of the most richly rewarding activities I've been involved with – true collaboration across industry in action.

Finally, the unsung heroes of the piece, David Churcher and – in particular – Sarah Davidson. Sarah - your focus and determination in driving this forward, I know David will agree, are awesome.

As BSI, CDBB and UK BIM Alliance, we are urging the industry to get behind this Framework and discourage development of multiple "interpretations" of how to implement ISO 19650. We particularly welcome the support of CIC in agreeing to the release of an updated Protocol, authored by Andrew Croft, May Winfield and Simon Lewis. This will be a jointly branded CIC, BSI, CDBB and UK BIM Alliance resource and will form a critical part of the Guidance Framework. Our sincere thanks to CIC for this.

It is incredibly heartening that so many want to lean in to help advance the industry as a whole. I do hope that this inspires the younger generations that this really is an industry to come and work for. It really is richly rewarding.

Foreword

This is the fourth edition of the UK's Guidance Part 2: Processes for Project Delivery, supporting BS EN ISO 19650 Parts 1 and 2. It has been written to help individuals and organizations in the UK to understand the details of building information modelling (BIM) according to ISO 19650 and it complements the Guidance Part 1: Concepts that was first published in April 2019.

Additional navigation routes will also be added in future releases. These are likely to be focused on the information management function plus further information delivery planning activities.

This structure to the guidance has been developed over several months, by the contributors and editors, to make the guidance as useful as possible to practitioners. The subsequent releases will be issued at three-monthly intervals. The next is scheduled for late July 2020, with potential for more updates thereafter.

As with the Concepts guidance, we invite comment and feedback on this Processes guidance at:

guidancefeedback@ukbimalliance.org

Acknowledgments

This guidance represents the collaborative efforts of the following people and organizations

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About BS EN ISO 19650

The BS EN ISO 19650 series of standards (herein after referred to as the ISO 19650 series) supersede some of the existing British Standards and Publicly Available Specifications related to building information modelling (BIM). The ISO 19650 standards are part of a landscape, or ecosystem, of national and international standards supporting information management processes and technical solutions.

The ISO 19650 series considers all information whether it is a construction programme, a record of a meeting, a geometrical model or a contract administration certificate. Building information modelling (BIM) plays a key part in the management of information by providing a methodology which helps us to structure as much of the information as possible so that technology can process it. Computers do not like ambiguity they like things to be right or wrong.

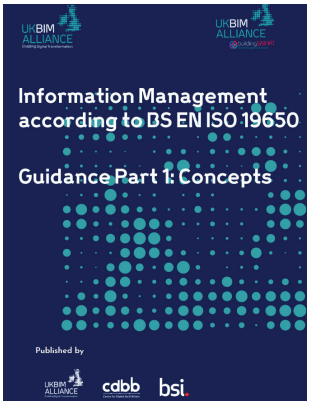
Structuring information using industry standards helps to improve interoperability so that information can be joined-up by people and technology. This enables us to extract more valuable knowledge from it.

Using the same information structures throughout industry enables consistency, repetition and predictability bringing real efficiency gains for businesses and providing the data architecture for the connected future.

Therefore, BIM is just a way of making our information machine interpretable. When we say "BIM information" or "BIM data" we are referring to structured consistent information. The information content is the same information which has always been required during an asset's lifecycle.

The ISO 19650 series is an international standard of good practice. It defines information management principles and requirements within a broader context of digital transformation in the disciplines and sectors of the built environment (including construction and asset management industries). Its implementation in the UK is supported by UK National Forewords in ISO 19650 Parts 1 and 2, and a UK National Annex in ISO 19650 Part 2.

This Guidance Framework is being developed particularly to support implementation of the ISO 19650 series in the UK.



Abbreviations and acronyms

This guidance includes a number of abbreviations and acronyms as set out in table 1.

Table 1: Abbreviations and acronyms

Abbreviation or acronym	Term
AIM	Asset information model
AIR	Asset information requirements
BCF	BIM collaboration format
BEP	BIM execution plan
BIM	Building information modelling
bSDD	buildingSMART data dictionary
CDE	Common data environment
CIC	Construction Industry Council
COBie	Construction operation building information exchange
EDMS	Electronic document management system
EIR	Exchange information requirements
ER	Employer's requirements
ICT	Information, communication, technology
IDM	Information delivery manual
IFC	Industry foundation classes
IT	Information technology
KPI	Key performance indicator
MIDP	Master information delivery plan
MVD	Model view definition
O&M	Operations and maintenance
PIR	Project information requirements
TIDP	Task information delivery plan
WIP	Work in progress

1.0 About ISO 19650 parties, teams and resources

Authors: David Churcher
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1.1 Understanding your role and the team context

This guidance is written so that you can read it from start to finish or you can navigate through it to understand the activities that are particularly relevant to your role within a project team.

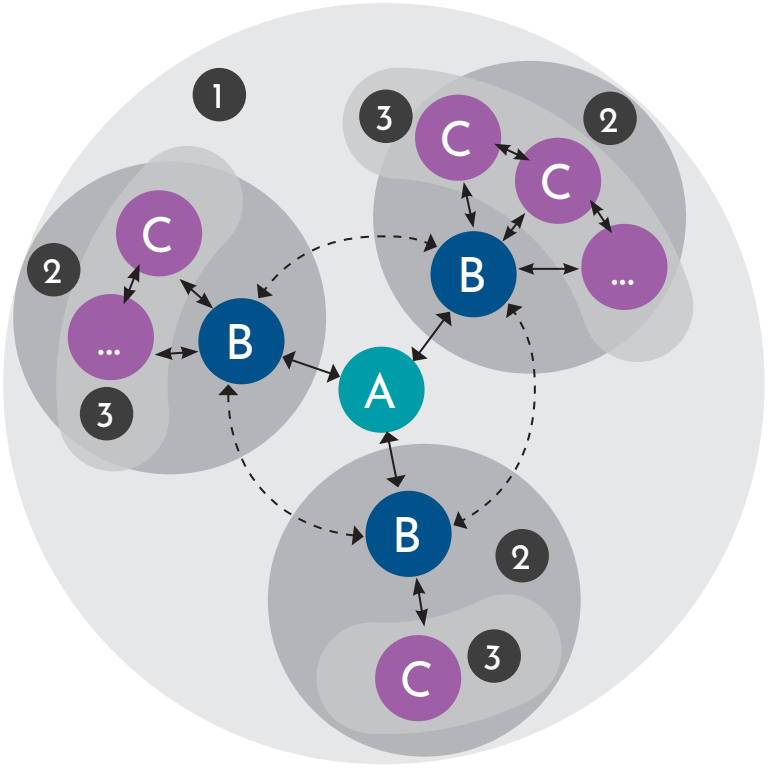
The ISO 19650 series refers to the appointing party, lead appointed party and appointed party and the project team, delivery team and task team.

ISO 19650-2 figure 2 shows the interface between these parties and teams in terms of information management. A colour coded, simplified version of this image, reproduced with permission from BSI, features in this guidance to provide context to the parties, teams and activities.

Figure 1: Interfaces between parties and teams

Key:

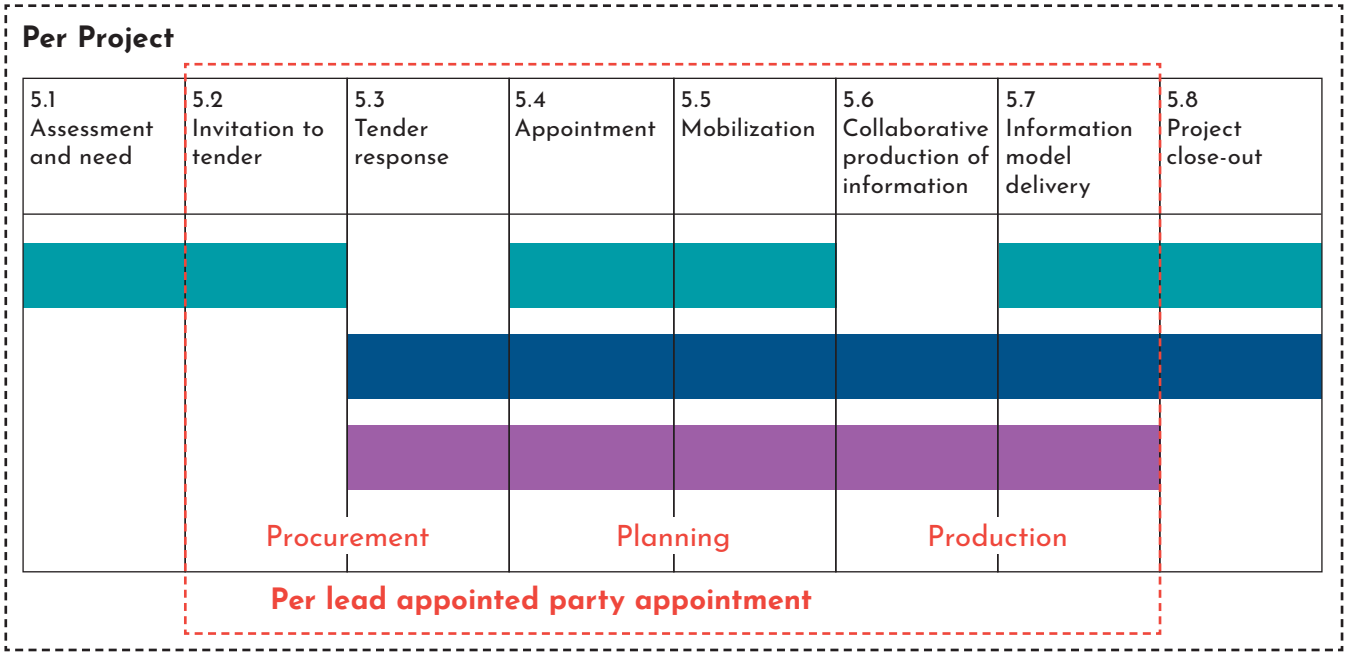
- A — Appointing Party
- B — Lead Appointed Party
- C — Appointed Party
- 1 — Project Team
- 2 — Delivery Team
- 3 — Task Team(s)



Simplified version of ISO 19650-2 figure 2
Image reproduced with permission from BSI

The activities are set out in ISO 19650-2 clause 5 and cover eight stages as follows:

Table 2: Activities and stages



Activities set out in ISO 19650-2 clauses 5.1 and 5.8 relate to a project as a whole. Activities set out in clauses 5.2 to 5.7 are repeated for each piece of work the appointing party (client) tenders (be it for consultants, contractors and/or specialists). The colours represent parties that are active within each stage.

If you want to go directly to the activities relevant to you then:

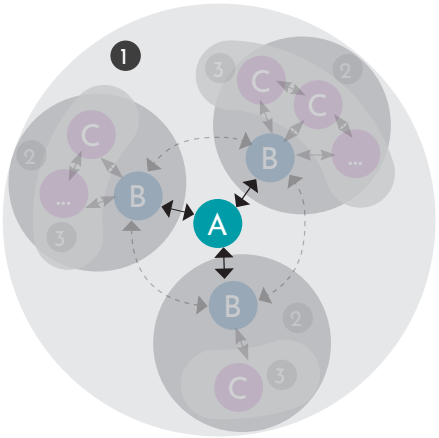
Go to page 10 for the "Appointing Party" section if you are a client or you are managing information on behalf of a client.

Go to page 14 for the "Lead Appointed Party" section if you are you tendering to be/are responsible for co-ordinating information between the delivery team and the appointing party (client).

Go to page 20 for the "Appointed Party/Task Team" section if you are tendering for/appointed to a project generally.

If you want to see the flow of activities between all the parties then go to page 143 for the 'Process Summary'.

1.2 Appointing party



If you are a client or are managing information on behalf of a client this means that you are fulfilling the role of the "appointing party" – you are effectively the party "owning" the appointment/ project in the context of the ISO 19650 series.

As appointing party you are a member of the Project Team.

Your activities and outputs can be summarized as:

Firstly – to make sure that your information management function is fulfilled by people within your organization or people acting on your behalf or a combination of both.

Then wherever the ISO 19650 series refers to the "appointing party" this means the organization(s) fulfilling the client's information management function.

Going forward then, in respect of the whole project and before any invitations to tender are issued, your activities as appointing party are to:

- Establish the project's information requirements, information delivery milestones and information standards
- Identify specific procedures for the production of information including its generation, delivery and secure management
- Identify existing information and/or resources that are relevant to the delivery teams you will be appointing to this project
- Establish the project's information protocol for incorporation into all project appointments.

You will also need to establish a common data environment (CDE) to support the project and the collaborative production of information. You may wish to appoint a third party to host, manage or support the CDE.

Then for each separate piece of work you are sending out to tender, you need to establish your information requirements. Your outputs in compiling each tender package should consider, and where appropriate include:

- Exchange information requirements
- Existing information and resources that are relevant to the tendering opportunity
- Details of how the tender will be evaluated
- Overall project requirements for information delivery, standards and processes
- The project's information protocol.

It is up to you to determine how these project level and appointment specific resources are assembled into the tender and appointment package for a lead appointed party

In the process of confirming an appointment (of the lead appointed party for example the main contractor) you will both need to agree any changes to the information standards and they should inform you of any risks/issues which could impact project information delivery milestones. The appointment documents should then include information and information requirements relevant to the appointment. This is a process/activity that is repeated for each confirmed appointment.

Table 3: Information management components of the lead appointed party's appointment

Lead appointed party's appointment will document the:		Prepared by: **Appointing party**	Prepared by: **Lead appointed party**
Project level	Information standard	✓	
	Information production methods and procedures	✓	
	Information protocol	✓	
Appointment level	Exchange information requirements	✓	
	BIM execution plan		✓
	Master information delivery plan		✓

As appointing party and throughout the project you will review each delivery team's information model against your information requirements and accept or reject as appropriate.

As the project nears close out and the project information model is completed, you will archive the information containers. You will also capture lessons learned with each lead appointed party.

1.2 Appointing party

Activity focus:

The intensity of your activities as appointing party is as follows:

Table 4: Appointing party activity focus

5.1 Assessment and need (project)	High
5.2 Invitation to tender (appointment)	High
5.3 Tender response (appointment)	Low
5.4 Appointment	Medium
5.5 Mobilization	Low
5.6 Collaborative production of information	Low
5.7 Information model delivery	Medium
5.8 Project close-out	High

Relevant clauses to be aware of

For your actions as the appointing party refer to clauses:

5.1.1 Appoint individuals to undertake the information management function
5.1.2 Establish the project's information requirements
5.1.3 Establish the project's information delivery milestone
5.1.4 Establish the project's information delivery standard
5.1.5 Establish the project's information production methods and procedures
5.1.6 Establish the project's reference information and shared resources
5.1.7 Establish the project's common data environment
5.1.8 Establish the project's information protocol
5.2.1 Establish the appointing party's exchange information requirements
5.2.2 Assemble reference information and shared resources
5.2.3 Establish tender response requirements and evaluation criteria
5.2.4 Compile invitation to tender information
5.4.6 Complete lead appointed party's appointment documents
5.7.4 Review and accept the information model
5.8.1 Archive the project information model
5.8.2 Compile lessons learnt for future projects

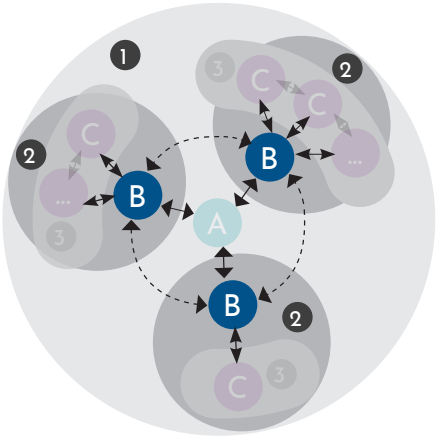
You should also be aware of the following clauses which are relevant because they require you to be informed or to contribute to a process:

5.4.1 Confirm the delivery team's BIM execution plan

5.4.5 Establish the master information delivery plan

5.5.2 Mobilize information technology

1.3 Lead appointed party



If you are responsible for co-ordinating information between the delivery team that you are part of and the appointing party (client) this means that you are fulfilling the role of the "lead appointed party" in the context of the ISO 19650 series.

You are a member of both the Project Team and a Delivery Team.

Reference to the lead appointed party

The ISO 19650 series refers to the lead appointed party in two ways:

1. The prospective lead appointed party i.e. a party tendering for the role of lead appointed party
2. Lead appointed party i.e. a party who is confirmed in that role.

Your key activities and outputs as a prospective lead appointed party are:

Firstly - to make sure that your information management function is fulfilled by people within your organization or people acting on your behalf or a combination of both.

Then wherever the ISO 19650 series refers to the "prospective lead appointed party" or "lead appointed party" this means the organization(s) fulfilling your information management function.

Going forward then, in response to the invitation to tender, and in collaboration with the prospective members of your delivery team you:

- Establish the BIM execution plan
- Summarize the delivery team's capability and capacity to manage and produce information
- Establish the delivery team's mobilization plan, thinking about team-wide approach, responsibilities and required timescales
- Create a risk register to deal with risks associated with timely delivery of information.

The outputs from these activities should form part of your overall tender response.

In order to finalize your appointment as a lead appointed party:

Your completed appointment documents will comprise:

Table 5: Information management components of the lead appointed party's appointment

Lead appointed party's appointment will document the:		Prepared by: **Appointing party**	Prepared by: **Lead appointed party**
Project level	Information standard	✓	
	Information production methods and procedures	✓	
	Information protocol	✓	
Appointment level	Exchange information requirements	✓	
	BIM execution plan		✓
	Master information delivery plan		✓

Your first activity at this point is to update and confirm the BIM execution plan in collaboration with each (to be) appointed party. Any required additions or amendments to the project's information standard, its production methods and procedures, and its information protocol will need to be agreed with the appointing party. The BIM execution plan will have contained a high level responsibility matrix and this now needs to be separately refined, developed and sufficiently detailed to identify what information is to be produced, when and by whom (i.e. which task team).

As lead appointed party you may have your own information requirements in addition to those provided to you by the appointing party. A key activity at this stage is therefore articulating these combined exchange information requirements relevant to each prospective appointed party within your delivery team so that each has clear direction about what is required of them.

You are also responsible for compiling the master information delivery plan through the collation of the task information delivery plans generated by each task team (as a lead appointed party you may also have to undertake task team activities so you may have your own task information delivery plan).

1.3 Lead appointed party

Once you are appointed as lead appointed party

You will need to compile appointment documents for each (to be) appointed party. These should be tailored so that you include the task team exchange information requirements and task information delivery plans that are relevant to the appointment alongside the delivery team's BIM execution plan and the agreed project level documents as presented below:

Table 6: Information management components of the appointed party's appointment

Appointed party's appointment will document the:		Prepared by: **Appointing party**	Prepared by: **Lead appointed party**	Prepared by: **Appointed party/task team**
Project level	Information standard	✓		
	Information production methods and procedures	✓		
	Information protocol	✓		
Delivery team level	BIM execution plan		✓	
Appointment level	Exchange information requirements		✓	
	Task information delivery plan			✓

You then need to mobilize resources. This means getting people within the delivery team suitably trained with technology and processes in place, tested and up and running. The project's common data environment is fundamental to successful information based activities and as lead appointed party you should be made aware of any issues task teams experience with its operation, or with the information/resources accessed through it. Only then is the delivery team in a position to generate, assure, review and authorize information for sharing.

As lead appointed party you have the pro-active role of managing the progression of the delivery team's information model.

A key activity at the end of each milestone is authorizing each task team's information model to ensure that it meets the project's information standard, the BIM execution plan and the exchange information requirements assigned to the task team. An information model which is found to be non-compliant (in any aspect) should be rejected with the associated task team(s) being advised to amend their information accordingly.

The delivery team's information model authorized by you is then reviewed by the appointing party. Rejection of an information model will be communicated by the appointing party to you which you will then need to resolve with the relevant task team. Acceptance of an information model triggers your ability to co-ordinate the information model with other delivery teams' information models.

This process should repeat and continue throughout your appointment.

Another activity of the lead appointed party is to capture lessons learned, in collaboration with the appointing party - ideally throughout your appointment, as opposed to just at the end of it.

1.3 Lead appointed party

Activity focus:

The intensity of your activities as lead appointed party is as follows:

Table 7: Lead appointed party activity focus

5.1 Assessment and need (project)	Nil
5.2 Invitation to tender (appointment)	Nil
5.3 Tender response (appointment)	High
5.4 Appointment	High
5.5 Mobilization	High
5.6 Collaborative production of information	High
5.7 Information model delivery	High
5.8 Project close-out	Medium

For your primary actions as the lead appointed party refer to clauses:

5.3.1 Nominate individuals to undertake the information management function

5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan

5.3.4 Establish the delivery team's capability and capacity

5.3.5 Establish the proposed delivery team's mobilization plan

5.3.6 Establish the delivery team's risk register

5.3.7 Compile the delivery team's tender response

5.4.1 Confirm the delivery team's BIM execution plan

5.4.2 Establish the delivery team's BIM execution plan

5.4.3 Establish the lead appointed party's exchange information requirements

5.4.5 Establish the master information delivery plan

5.4.7 Complete appointed party's appointment documents

5.5.1 Mobilize resources

5.5.2 Mobilize information technology

5.5.3 Test the project's information production methods and procedures

5.6.5 Information model review

5.7.2 Review and authorize the information model

5.8.2 Compile lessons learnt for future projects

You should also be aware of the following clauses which are relevant because they require you to be informed or to contribute to a process:

5.3.3 Assess task team capability and capacity

5.6.1 Check the availability of reference information and shared resources

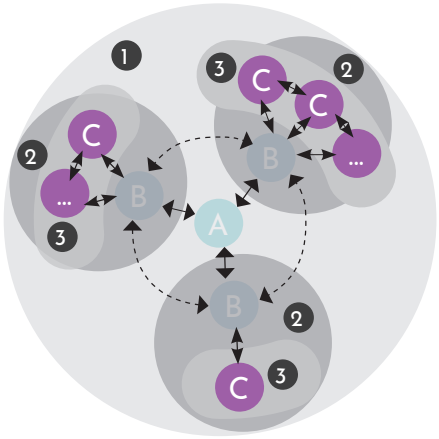
5.6.2 Generate information

5.7.1 Submit information model for lead appointed party acceptance

5.7.3 Submit information model for appointing party acceptance

5.7.4 Review and accept information model

1.4 Appointed party/task team



If you are tendering for or appointed to a project generally this means that you are fulfilling the role of an "appointed party" in the context of the ISO 19650 series. You are a member of both the Project Team and a Delivery Team.

Your organization may include a number of task teams within it.

Reference to appointed party and task team

In ISO 19650-2, most of the requirements below the level of lead appointed party are directed at a task team. There is a lot of flexibility within ISO 19650 regarding the relationship between appointed parties and task teams – in some cases each task team might be a separate appointed party, in other cases an appointed party might include a number of task teams, and in yet more cases a task team might include a number of appointed parties.

To keep things simple in this guidance we are considering the standard to have the same impact on an appointed party and a task team.

Although some ISO 19650 requirements arise before the appointed party/task team is appointed, the standard does not use the term "prospective appointed party", but we do use this term in the guidance.

Your key activity as a prospective appointed party/task team is to:

Assess your capability and capacity. There are three aspects of capability and capacity to be considered.

1. Capability and capacity to manage information – do you have experience of the standards and do you have enough human resource to do this on this project
2. Capability and capacity to produce information – do you have experience of the methods and procedures and do you have enough human resource to do this on this project
3. Availability of IT – do you have the appropriate hardware, software and support, in sufficient quantities for the project.

In order to finalize your appointment as an appointed party/task team:

You help the lead appointed party to confirm the delivery team's BIM execution plan. Any required additions or amendments to the project's information standard, production methods and procedures, and information protocol will need to be agreed with the appointing party. The BIM execution plan will have contained a high level responsibility matrix and this now needs to be separately refined, developed and sufficiently detailed to identify what information is to be produced, when and by whom (i.e. which task team).

The information requirements included in your appointment might be a combination of: those issued to or originating from the lead appointed party. From your perspective it does not matter which requirements originate with whom, as they all need to be addressed in the task information delivery plan(s) that you establish in collaboration with the appointed parties across the task team(s). These plans are then made available to the lead appointed party for them to compile the master information delivery plan.

Your completed appointment documents will comprise:

Table 8: Information management components of the appointed party's appointment

Appointed party's appointment will document the:		Prepared by: **Appointing party**	Prepared by: **Lead appointed party**	Prepared by: **Appointed party/task team**
Project level	Information standard	✓		
	Information production methods and procedures	✓		
	Information protocol	✓		
Delivery team level	BIM execution plan		✓	
Appointment level	Exchange information requirements		✓	
	Task information delivery plan			✓

1.4 Appointed party/task team

Once you are appointed as an appointed party/task team

You work closely with the lead appointed party to mobilize the team resources (personnel and IT) and to participate in training and education where this is necessary to fill knowledge and skills gaps.

You collaboratively generate your information in compliance with the information standard, information production methods and procedures, using the appointing party's reference information and shared resources. To generate appropriate information you will need to understand the project definitions around level of information need, the container breakdown structure and an outline of what information is being produced by other appointed parties/task teams which impacts on your own activities.

You check the information containers that you produce to make sure they are in accordance with the project information production methods and procedures, and against the project information standard. Any non-compliance needs to be addressed by the party who originated the information. Once the procedural aspects of the information container have been checked, you check the contents of the information container to make sure that it meets the information requirements and is in accordance with the level of information need.

You then take part in a delivery team-wide review of the information model. The process of checking your own information and team-wide review can be repeated many times during the production of information leading up to delivery of the information model to the appointing party. At each point of this iterative process, you have to make the agreed changes to your information containers.

When your information model is ready to be delivered, you submit it to the lead appointed party for their review and authorization. If your information is rejected then you make the agreed changes and resubmit.

Once your information has been authorized by the lead appointed party, you submit your information for appointing party review and acceptance. If your information is rejected then this will come back to you via the lead appointed party to be amended and resubmitted.

Activity focus:

The intensity of your activities as appointed party/task team is as follows:

Table 9: Appointed party/task team activity focus

5.1 Assessment and need (project)	Nil
5.2 Invitation to tender (appointment)	Nil
5.3 Tender response (appointment)	Medium
5.4 Appointment	Medium
5.5 Mobilization	Medium
5.6 Collaborative production of information	High
5.7 Information model delivery	High
5.8 Project close-out	Nil

For your primary actions as an appointed party/task team refer to clauses:

5.3.3 Assess task team capability and capacity
5.4.4 Establish the task information delivery plan
5.6.1 Check availability of reference information
5.6.2 Generate information
5.6.3 Undertake quality assurance check
5.6.4 Review information and approve for sharing
5.7.1 Submit information model for lead appointed party authorization
5.7.3 Submit information model for appointing party acceptance

You should also be aware of the following clauses which are relevant because they require you to be informed or to contribute to a process:

5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan
5.4.1 Confirm the delivery team's BIM execution plan
5.4.2 Establish the delivery team's detailed responsibility matrix
5.4.5 Establish the master information delivery plan
5.5.1 Mobilize resources
5.5.2 Mobilize information technology
5.5.3 Test the project's information production methods and procedures
5.6.5 Information model review
5.7.2 Review and authorize the information model
5.7.4 Review and accept the information model

1.5 ISO 19650-2 resources

The ISO 19650 series references resources and content that should be created for successful information management (using building information modelling).

This guidance refers to these as resources and not documents because:

- They do not need to exist as documents – their content could be referenced via a system
- They do not need to standalone – their content might be combined with other content.
- The emphasis is on the existence of content, not how the content is transported.

In terms of the resources referenced in ISO 19650-2, it is possible for resource content to be combined with other design and construction project content. However, care should be taken to ensure that resources:

- Are not incorrectly promoted as appointment (and therefore contractual) resources and equally are not demoted from being appointment resources
- Are authored at the right level (project or appointment). An appointment level resource should not contain project wide content that is not relevant to the appointment.

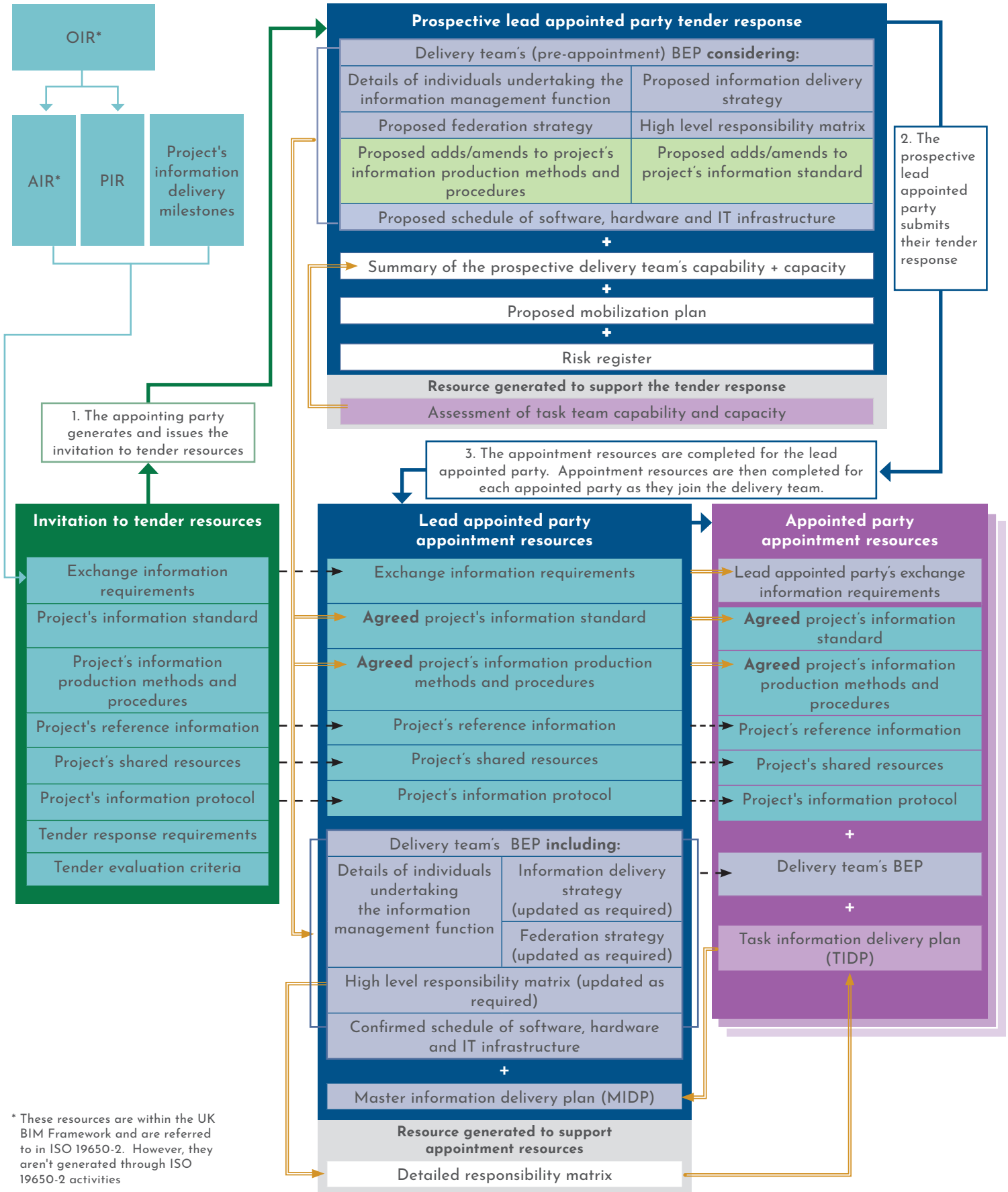
Consideration should also be given to how resource content cascades through the delivery team. Combining content could potentially either aid or complicate this.

Table 10: ISO 19650-2 resources

Resource/content	Created by	Resource		ISO 19650-2	
		Level	Status	Originating clause	
Project's information requirements	Appointing party	Project	For information	5.1.2	Establish the project's information requirements
Project's information delivery milestones	Appointing party	Project	For information	5.1.3	Establish the project's information delivery milestones
Project's information standard	Appointing party	Project	Appointment	5.1.4	Establish the project's information standard
Project's information production methods and procedures	Appointing party	Project	Appointment	5.1.5	Establish the project's information production methods and procedures
Reference information	Appointing party	Project	Appointment	5.1.6	Establish the project's reference information and shared resources
Shared resources	Appointing party	Project	Appointment	5.1.6	
Project's information protocol	Appointing party	Project	Appointment	5.1.8	Establish the project's information protocol
Exchange information requirements	Appointing party	Appointment	Appointment	5.2.1	Establish the appointing party's exchange information requirements
Tender response requirements	Appointing party	Appointment	For information	5.2.3	Establish tender response requirements and evaluation criteria
Tender evaluation criteria	Appointing party	Appointment	For information	5.2.3	Establish tender response requirements and evaluation criteria
(Pre-appointment) BIM execution plan	Lead appointed party	Appointment	For information	5.3.2	Establish the delivery team's (pre-appointment) BIM execution plan
High level responsibility matrix	Lead appointed party	Appointment	For information	5.3.2	Establish the delivery team's (pre-appointment) BIM execution plan
Proposed information delivery strategy	Lead appointed party	Appointment	For information	5.3.2	Establish the delivery team's (pre-appointment) BIM execution plan
Proposed federation strategy	Lead appointed party	Appointment	For information	5.3.2	Establish the delivery team's (pre-appointment) BIM execution plan
Proposed schedule of software, hardware and IT infrastructure	Lead appointed party	Appointment	For information	5.3.2	Establish the delivery team's (pre-appointment) BIM execution plan
Assessment of task team capability and capacity	Appointed party	Task team	For information	5.3.3	Assess task team capability and capacity
Summary of the delivery team's capability and capacity	Lead appointed party	Appointment	For information	5.3.4	Establish the delivery team's capability and capacity

Resource / content	Created by	Resource		ISO 19650-2	
		Level	Status	Originating clause	
Proposed mobilization plan	Lead appointed party	Appointment	For information	5.3.5	Establish the delivery team's mobilization plan
Risk register	Lead appointed party	Appointment	For information	5.3.6	Establish the delivery team's risk register
Delivery team's BIM execution plan	Lead appointed party	Appointment	Appointment	5.4.1	Confirm the delivery team's BIM execution plan
Detailed responsibility matrix	Lead appointed party	Appointment	For information	5.4.2	Establish the delivery team's detailed responsibility matrix
Information delivery strategy	Lead appointed party	Appointment	Appointment	5.4.1	Confirm the delivery team's BIM execution plan
Schedule of software, hardware and IT infrastructure	Lead appointed party	Appointment	Appointment	5.4.1	Confirm the delivery team's BIM execution plan
Lead appointed party's exchange information requirements	Lead appointed party	Appointed party appointment	Appointment	5.4.3	Establish the lead appointed party's exchange information requirements
Task information delivery plan	Appointed party	Task team	Appointment	5.4.4	Establish the task information delivery plan(s)
Master information delivery plan	Lead appointed party	Appointment	Appointment	5.4.5	Establish the master information delivery plan
Lessons learned	Appointing party	Appointment	For information	7.8.2	Capture lessons learned for future projects

Figure 2: ISO 19650-2 resources map



* These resources are within the UK BIM Framework and are referred to in ISO 19650-2. However, they aren't generated through ISO 19650-2 activities

Key:

- Created by the appointing party
- Created by the (prospective) lead appointed party. Resources progress to become appointment resources
- Created by the lead appointed party and inform project level resources
- Created by the (prospective) lead appointed party. Resources do not progress to become appointment resources
- Created by the (prospective) appointed party
- To indicate how one resource informs another
- To indicate static resources

2.0 About the common data environment (CDE)

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Galliford Try

2.1 Introduction

The ISO 19650 Part 1 Concepts guidance available at the UK BIM Framework website explains how the CDE is a combination of technical solutions and process workflows.

A CDE solution could be software, or it could be another form of tool. If information is exchanged by a non-digital solution (for example, a postal service) and/or stored in an organized hard-copy cabinet (which may, for example, be required on a sensitive project where digital methods are not permitted), then this can also be described as a CDE solution that can be supported by workflows.

It is more usual though, for digital solutions like electronic document management systems (EDMS) to play a big part in implementing CDE solutions and workflows. But, it must be recognized that many different technologies can be used within a single workflow.

ISO 19650-2 envisages that a CDE is provided and managed by the appointing party (or a third party acting on their behalf), for the management of all information containers that are developed and exchanged with the appointing party throughout the life of the project from each delivery team. This is referred to in ISO 19650-2 as the project CDE.

However, ISO 19650-2 also envisages that delivery teams may implement their own (distributed) CDEs as well (but not instead of the project CDE). This guidance contains examples of this scenario, which can introduce complexities into the management of information.

2.2 Components of the CDE

There is a potential misconception that the CDE is more about technology and less about workflows. In fact, it is fundamental that workflows are developed first and solutions are selected to facilitate the workflow.

It may also be understood that single technology solutions dominate project information management. This is not the case and many solutions exist to deal with different types of project information. There may, for example, be document management tools for design files, contract management tools that manage commercial information, email management tools for correspondences and mobile based tools for site quality data. Each solution may have multiple and different workflows ensuring that information is carefully planned, shared, stored, managed and retrieved and that it is timely, correct, complete, and consistent.

There are various components of the CDE that this guidance will cover to provide context for the reader in understanding the language of the ISO 19650 series. These include:

- Information States (see section 2.2.1)
- Classification of information containers using metadata assignment (see section 2.4)
- Revision control using metadata assignment (see section 2.5)
- Permitted use of information using metadata assignment (see section 2.6).

2.2.1 Information container states

As an information container develops, it exists in various states. Figure 3 (ISO 19650-1 figure 10) illustrates these states as part of an information container workflow. This figure is a simplification of the actual process and information containers can go through different workflows, potentially using multiple solutions, as noted elsewhere in this guidance.

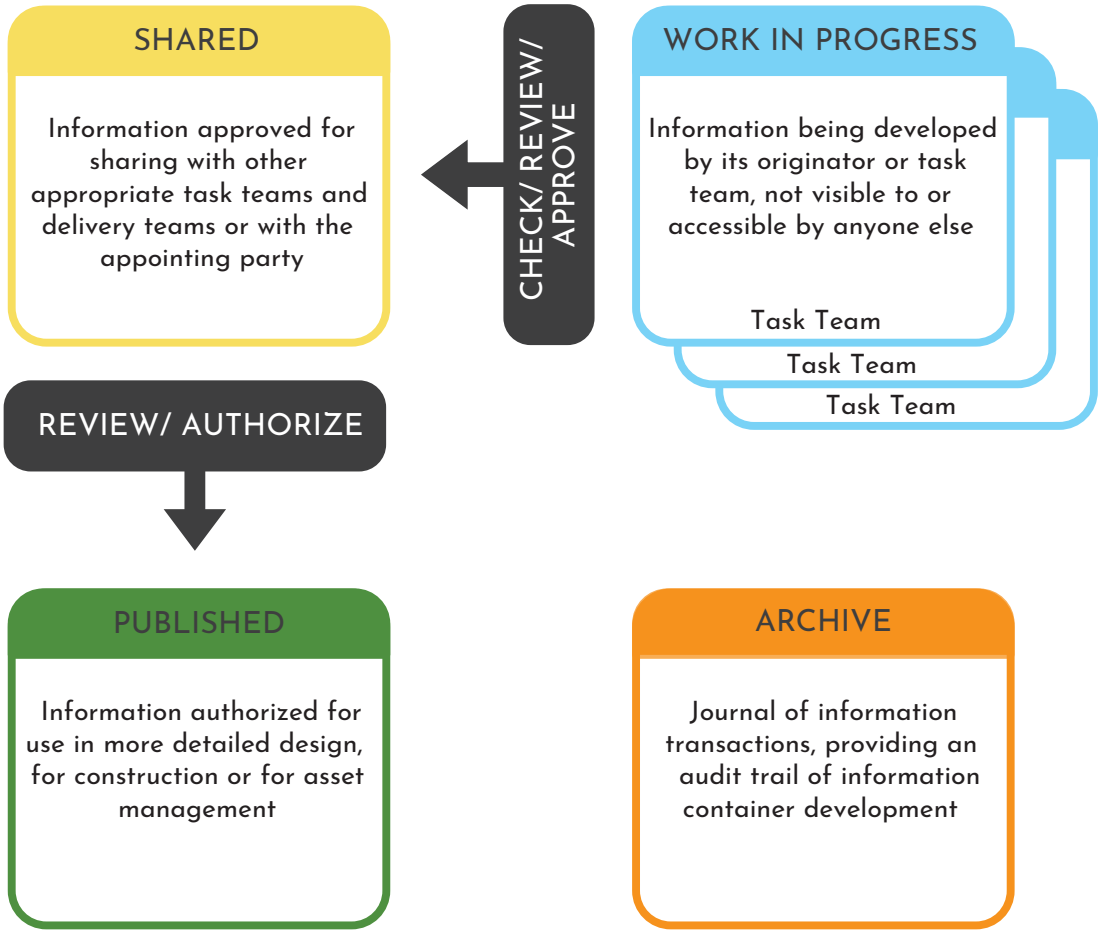


Figure 3: CDE concept as demonstrated in ISO 19650-1 figure 10

Did you know...

...that information container states occur in most information production processes including emails which are often invisible. For example, if you start to write an email, this is Work in Progress. Your email tool may also auto Archive your emails as you progress. Perhaps your email needs to be approved by your manager before you hit send due to its sensitivity. When you do hit send and Share your email, the recipient may accept it and ask you to distribute it to a wider audience thus Publishing it. All whilst yours and the recipient's email tools continuously Archive each step of the email trail.

Emails and other correspondence related to project delivery can be managed via the CDE. The selection of the appropriate items to be managed in this way could be a project specific or a delivery team specific decision. It is suggested that correspondence with a contractual implication is always managed via the CDE.

2.2.2 Metadata

It is important to establish what is meant by metadata as the ISO 19650 series offers no formal definition. Metadata is defined as "A set of data that describes and gives information about other data" (Oxford Dictionary, 2019).

To put this into context, the information container unique ID (see ISO 19650-2 National Annex), can be thought of as metadata because it "describes and gives information about other data". However, ISO 19650-2 requires additional metadata to be assigned but it should not be part of the unique ID.

The ISO 19650 series makes it clear that authors keep strict control of their information throughout its development. It is recommended that this is achieved by the author using metadata assignment. This communicates what version the information container is at and the purpose for which it can be used.

ISO 19650-1 clause 12.1 recommends the following metadata assignment to information containers within a CDE:

- A revision code
- A status code.

ISO 19650-2 clause 5.1.7 then requires that the CDE enables assignment of these codes plus the assignment of:

- A classification code.

The scope of the metadata assignment may expand beyond the recommendations and requirements of the ISO 19650 series.

2.3 Information container management through metadata assignment

2.3.1 Metadata management through CDE Solutions

CDE solutions on the market today offer varying degrees of metadata assignment capability.

Figure 4 illustrates how a CDE solution, in this case a cloud based EDMS can have many different metadata assignments against the information container. Note that this figure extends metadata beyond ISO 19650-2 requirements.

Container Name	Description	Status	Revision	Author	Submittal Date	Container Classification
7001-BBH-ZZ-ZZ-DR-A-00301	First Floor Plan	S3	P04	Joe Blogs	12/11/2017	PM_40_30 : Design information
7001-BBH-ZZ-ZZ-DR-A-00312	West Elevation	A3	C06	Joe Blogs	12/11/2017	PM_40_30 : Design information

Container Name / ID Field

Additional Container Metadata Assignments

Figure 4: An example of a range of metadata that can be assigned in a cloud based CDE solution

2.3.2 Transition of metadata between CDE Solutions

The requirement for metadata creates the challenge of how the metadata can be transferred between CDE solutions. Appointing parties, lead appointed parties and appointed parties could all have their own CDE solutions that make up the project CDE. It is important that these solutions work efficiently together while information is being developed and exchanged as part of the CDE workflow. These solutions however, may not interface with one another perfectly, making automated transfer of metadata impossible.

In the email analogy used in section 2.2.1, almost all email tool providers have adopted a standard exchange protocol (for example, POP) to allow emails to flow seamlessly no matter what tool/solution is used to send or receive them.

There is not currently, however, a standard exchange protocol adopted by our industry. This means that some thought has to go into how a single information container and its metadata can be transferred from one system to another. In reality this is often a manual process which requires re-registration of metadata for each information container in the receiving system.

Figure 5 illustrates how two different CDE solutions are required to work together as part of the project`s CDE workflow. Each solution manages information containers differently.

CDE solution 1 (a distributed CDE) is managed by the lead appointed party for its delivery team. CDE solution 1 manages information containers as a single group regardless of type. It uses metadata assignments to enable the user to filter information containers accordingly. For example, a user can filter using the status code to provide a more focused view of all the stored information containers.

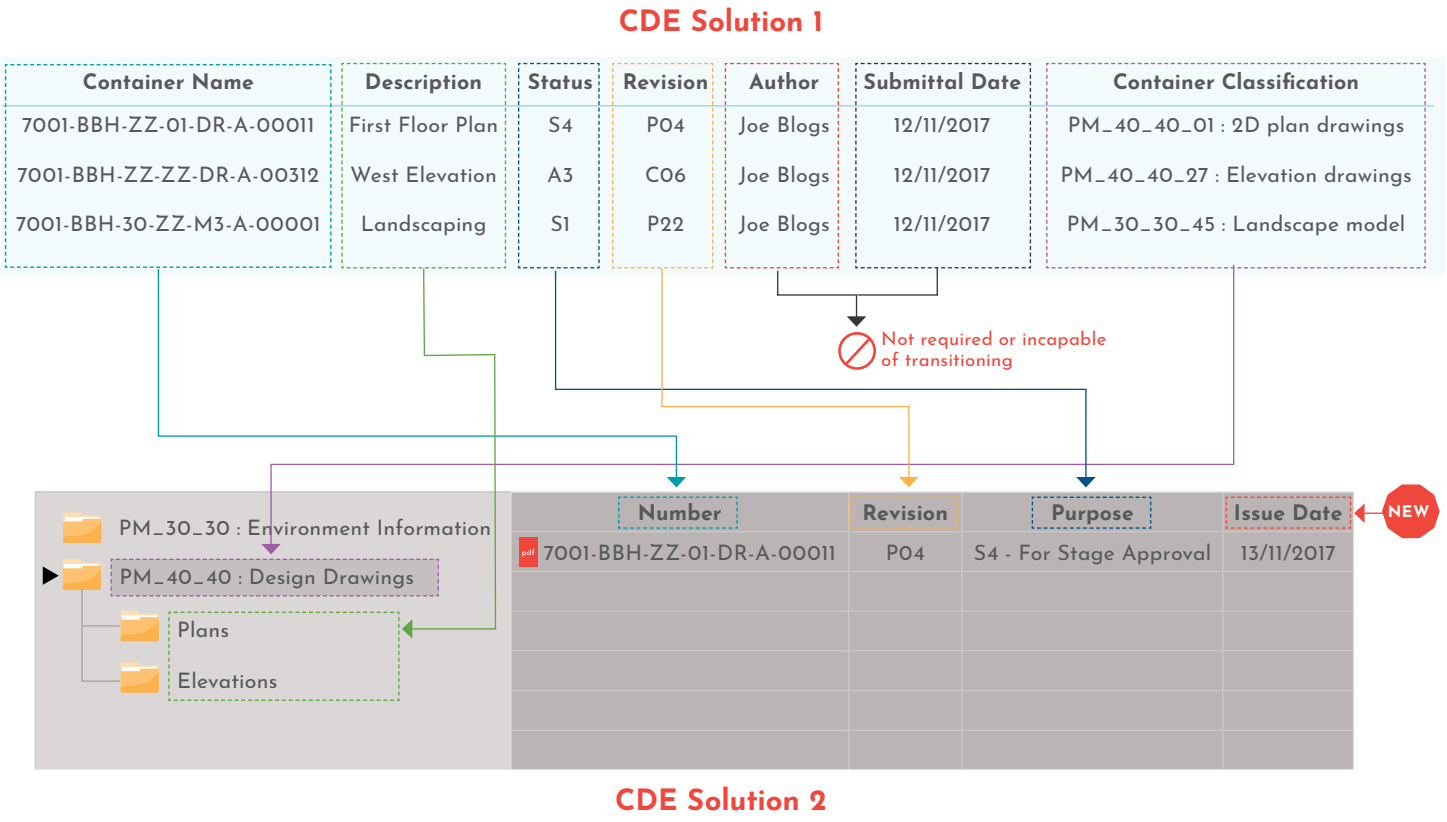


Figure 5: Illustration of two different CDE solutions where metadata assignment must transfer

CDE solution 2 is a project CDE managed by the appointing party and it manages information with a mix of folder structures and metadata assignments.

Before transferring an information container from CDE solution 1 to CDE solution 2 it is critical to agree how the metadata can be retained or accommodated during the transfer process.

For example, CDE solution 2 does not allow for a dedicated classification metadata field. As a result, the appointing party has accommodated the classification metadata field via a folder name. This kind of approach can result in most of the metadata being transferred manually (because it has to be typed or pre-selected at the time of exchange). Care should be taken that folder structures complement the metadata rather than duplicate it.

Although figures 4 and 5 provide examples using drawings and models, metadata assignment is relevant to all information containers regardless of their type.

2.4 Classification through metadata assignment

2.4.1 Information container classification

ISO 19650-2 clause 5.1.7 requires that information containers be assigned classification metadata in accordance to ISO 12006-2. Uniclass 2015 is compliant with ISO 12006-2 and is the preferred classification system in the UK. It is referenced in the ISO 19650-2 National Annex. Uniclass 2015 contains multiple classification tables which can be used to classify different types of information containers.

The appointing party defines the classification method in the project's information standard (if they have a specific preference). This would indicate which of the Uniclass 2015 tables are used for classifying information containers. If the appointing party does not have a preference then the lead appointed party would define requirements. It is important to ensure no other metadata or element of the unique ID is duplicated through the classification.

2.4.2 Assigning metadata within CDE solutions

Assigning classification metadata to information containers within a CDE solution requires consideration of:

1. How to identify the information container and/or its contents
2. How to transfer information containers between whichever CDE solutions are being used.

Figure 5 illustrates how classification information can be transferred between two CDE solutions that approach the use of metadata differently.

A drawback of the CDE solution 2 approach, is the manual creation of (potentially) many folders. But if implemented correctly, it gives the benefit of a consistent assigned classification that allows each user to filter information containers consistently. For example, by "PM_40_40 Design drawings".

ISO 19650-2 does not provide further details about classification, but it is important that classification is used beneficially to indicate the contents of the information container not the type of information container (as this is dealt with by the Type field in the information container unique ID – see ISO 19650-2 National Annex clauses NA.2.2 and NA.3.6).

It is also important to be aware that:

1. Uniclass 2015 is a developing resource, which is subject to regular updates. The granularity of classification available may not be consistent for all information containers and may change over the lifetime of a project

2. Uniclass 2015 comprises a number of classification tables. The classification used should be appropriate to the information container it is being assigned to.

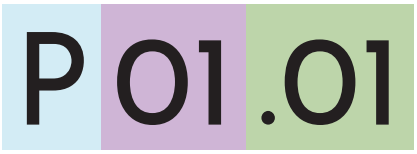
2.5 Revision control through metadata assignment

As information containers are developed it is important to keep track of the changes between previous and current revisions and versions. It is equally important to also keep track of which revision and version is shared with whom.

ISO 19650-1 recommends that the information container revision system should follow an agreed standard. ISO 19650-2 National Annex provides a system (refer to National Annex clause NA.4.3) as shown by figure 6.

Revision metadata made up of three components

See ISO 19650-2 National Annex



Letter prefix can only be P or C.

P represents Preliminary (non-contractual) information containers.

C represents Contractual information containers

Two numeric integer values, representing the primary revision that will eventually be shared with other task teams in the delivery team

Two numeric integer values following a decimal point, representing the WIP version of the primary revision

Figure 6: Explanation of the 19650-2 National Annex revision system

2.5.1 Revision control during Work in Progress (WIP)

Revision management for WIP information containers enables the author to manage their work and avoid losing information during its development. Figure 7 illustrates the benefits of revision management. The scenarios shown in figure 7 demonstrate that when revision control is adopted during WIP, the author has clear oversight of how their information has evolved and can revert to an earlier version if required.

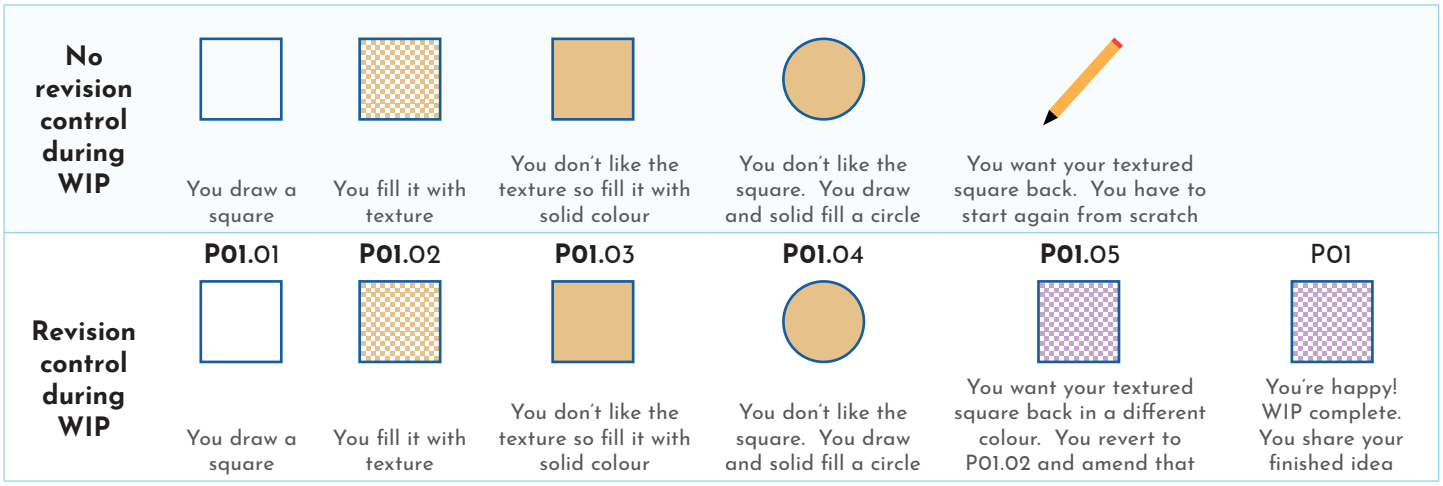


Figure 7: Illustration of the benefits of having a WIP version control using the 19650-2 National Annex approach

2.5.2 Revision control of Shared information

Figure 6 identifies the Shared state revisions as a two-digit integer (shown in the purple text box). This tracks the revision that is being shared outside of the author's task team.

It is important that the revision system consistently accommodates this iterative approach of multiple WIP and Shared revisions for a single information container.

Figure 8 shows the process beyond the first pass of WIP and Shared information by illustrating a further two iterations of information development.

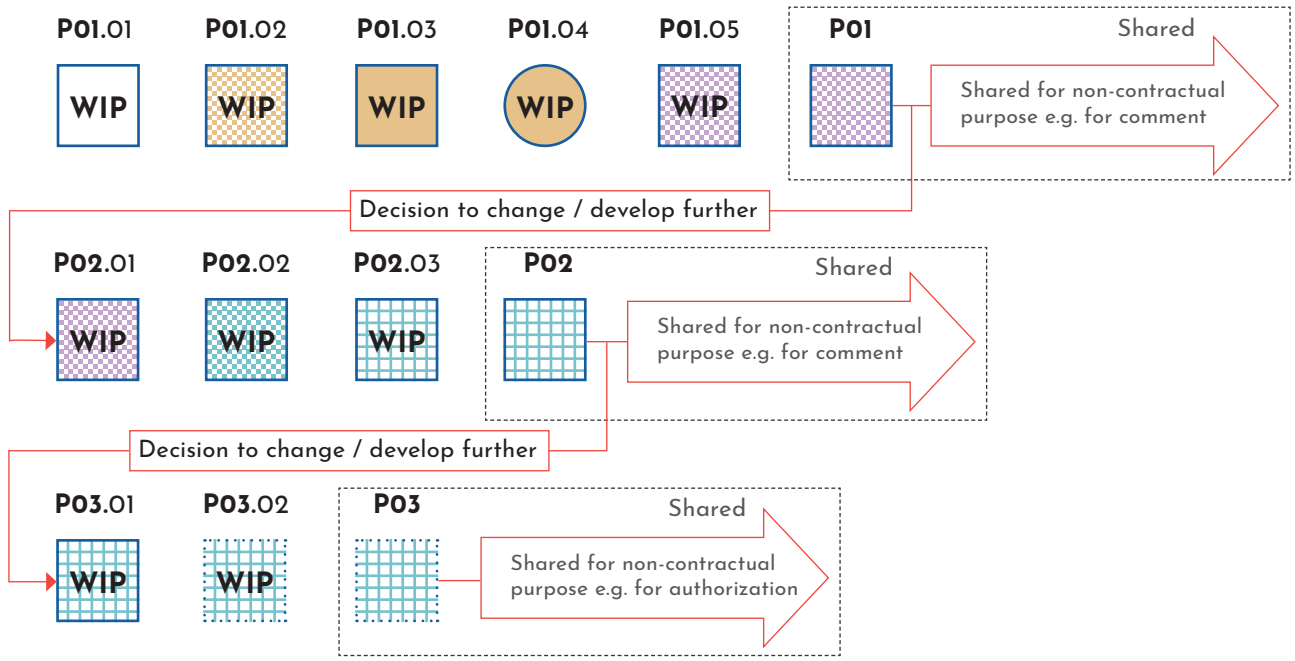


Figure 8: Demonstration of WIP and Shared revisions using ISO 19650-2 National Annex approach

2.5.3 Revision control of Published information containers

Published (contractual) information is information that has been authorized by the lead appointed party and then accepted by the appointing party. An information container is recognizable as Published through the C prefix in its revision code (see National Annex clause NA4.3 and this guidance figure 9). This helps recipients of an information container to clearly distinguish between preliminary (P) and published (C) contents.

Note that some information container types may never reach the Published state. For example, structural geometrical models often used only for coordination purposes may remain preliminary. However, other information container types, including those generated from the structured geometrical models for example, 2D drawings and schedules may indeed be needed for appointment and contract purposes.

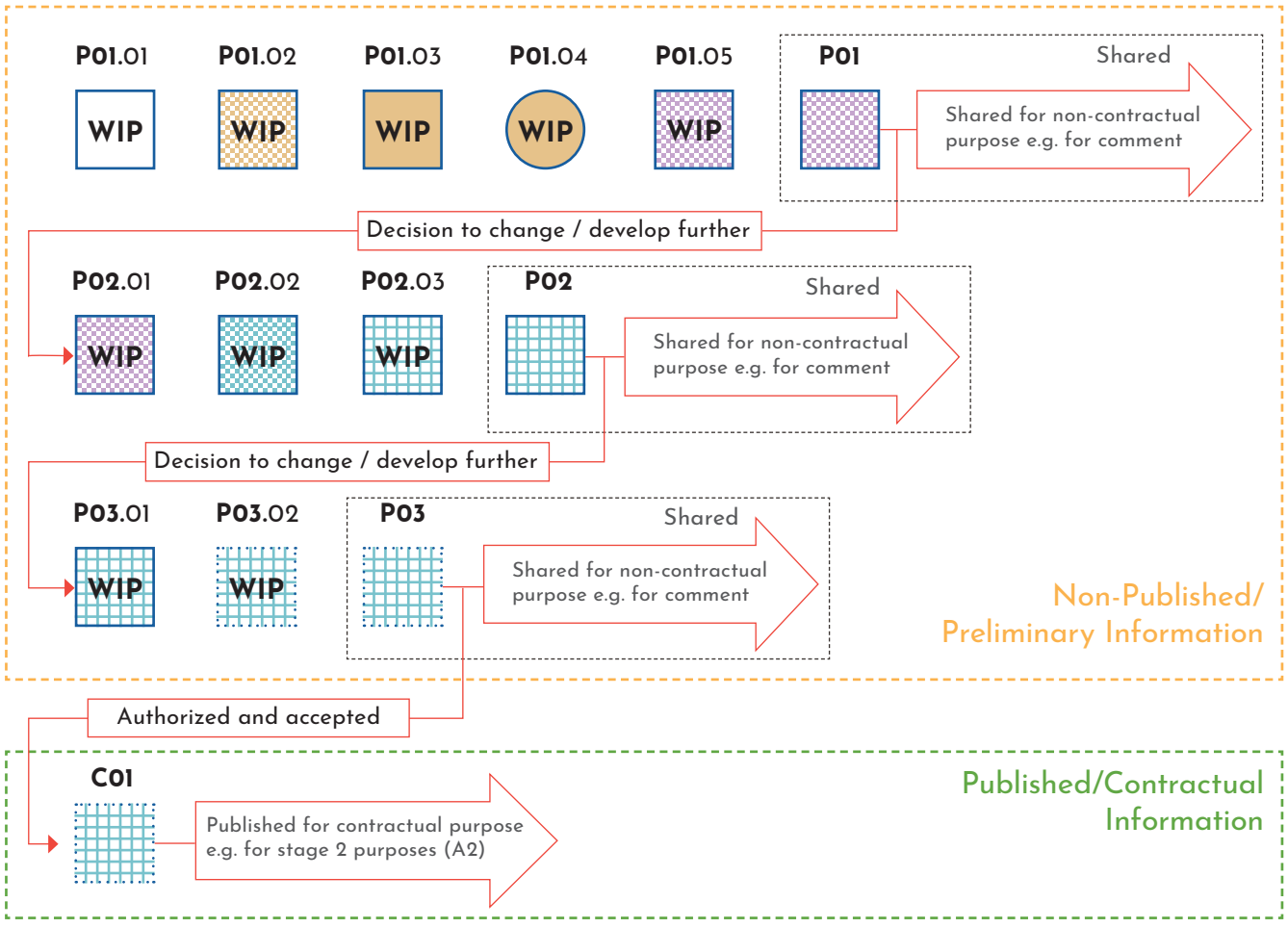


Figure 9: Illustration of how revision metadata distinguishes between different states

2.6 Status allocation through metadata assignment

2.6.1 Status codes

The ISO 19650 series identifies that an information container should be assigned a status code as metadata to show the permitted use of the information container (see ISO 19650-1 clause 12.1).

The reason for assigning a status code is to:

1. Make it clear to the recipient what the information container should be used for, and by extension, what it should not be used for.

   Example 1: An information container with the status code S3 (refer to figure 9) informs recipients that it is only suitable for review and comment.

   Example 2: An information container with the status An (where the "n" represents a project stage) informs the recipient that it has been authorized and accepted to be used for whatever stage of the project the "n" represents. If "n" represents Stage 2 (Concept) thus making the status code A2, this indicates to others that the information container is part of the accepted concept design. This would become part of the reference information for stage 3 WIP.

2. Make it clear where in the CDE workflow the information resides.

   For example, information containers with S1 or S2 metadata are in the Shared state, whereas information containers with A4, A5 or A6 metadata are in the Published state. This avoids the need to create physical segregations within the CDE solution using folders or other types of dedicated areas that can fragment the CDE workflow.

2.6.2 UK defined standard status codes

The ISO 19650-2 National Annex provides standardized status codes for metadata assignment. Each code in table 11 has a corresponding description to inform others. There is also a revision guideline for authors when allocating status codes. For example, an information container that is currently being reviewed (status code S3) should not be used for contractual purposes such as procuring materials, agreeing contract costs or constructing the works.

Table 11: ISO 19650-2 table NA.1 - Status codes for information containers within a CDE

Code	Description	Revision
Work in progress (WIP)		
S0	Initial status	Preliminary revision and version
Shared (non-contractual)		
S1	Suitable for coordination	Preliminary revision
S2	Suitable for information	Preliminary revision
S3	Suitable for review and comment	Preliminary revision
S4	Suitable for stage approval	Preliminary revision
S5	Withdrawn*	N/A
S6	Suitable for PIM authorization	Preliminary revision
S7	Suitable for AIM authorization	Preliminary revision
Published (contractual)		
A1, A*n*, etc.	Authorized and accepted	Contractual revision
B1, B*n*, *etc.*	Partial sign-off (with comments)	Preliminary revision
Published (for AIM acceptance)		
CR	As constructed record document	Contractual revision

* Status code S5 is no longer used and has been withdrawn

2.6.3 Status codes driving CDE workflow

Figure 10 and table 12 illustrate how status codes drive information container development and exchange as part of the CDE workflow in line with clause 5.6 and 5.7 of ISO 19650-2. This particular illustration relates to Stage 3 in the plan of work, and shows:

- How the ISO 19650-2 clauses apply iteratively for each information container in reality
- How information containers can cycle through the WIP and Shared states several times before they become Published
- How the status code tells the recipient what action is required
- How this task team, appointed at Stage 3, create their information in a geometrical model, which is coordinated with other geometrical models and/or their renditions
- How the coordinated information is then exported from its native format as a drawing ready for comment
- How, after comments are received, the native information must be updated as WIP before the drawing is reissued
- How the authorization and acceptance of the reissued drawing must occur before it becomes Published information.
- For simplicity, figure 10 indicates the progression of a drawing from its native geometrical model to authorization and acceptance. In reality, all of the information containers needed to satisfy the information exchange, as defined in the information exchange requirements, would move through a similar process (one such information container would be the geometrical model that has generated the drawing referred to).

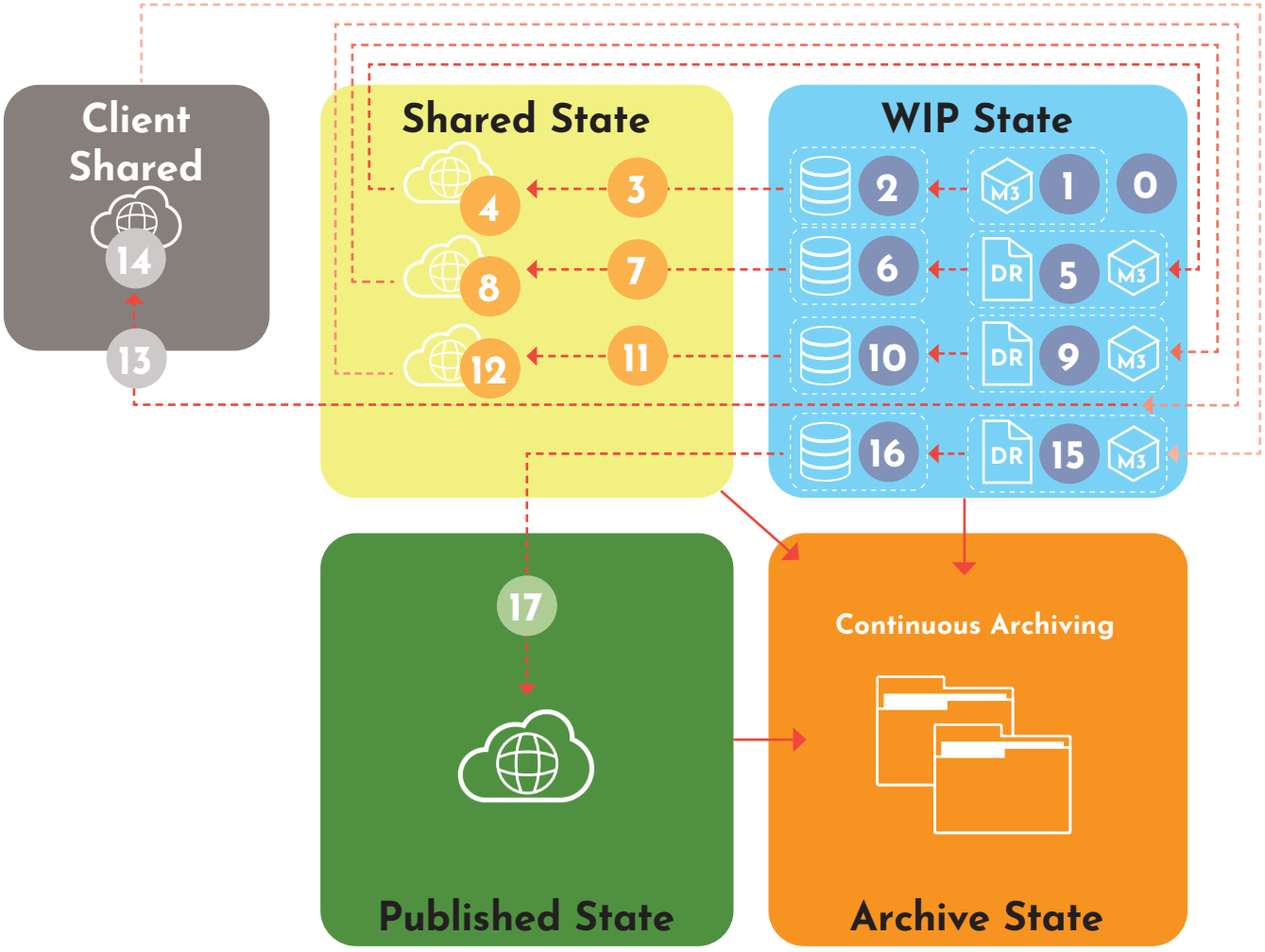


Figure 10: Illustration of an information container transitioning between states

Table 12: Example of the iterative development of an information container

Step	Details	State	Revision	Status	ISO clause
0	Collate and review all necessary information ready for start of Stage 3.	WIP	-	-	5.6.1
1	Information production commences, using other referenced sources for coordination purposes.	WIP	-	-	5.6.2
2	Several WIP iterations of a geometrical model by the author which are saved to a local CDE solution and assigned a metadata status S0. The geometrical model undergoes a quality assurance check within the task team to review the container (not its contents) against the project information standard.	WIP	P01.05	S0	5.6.3
3	The contents of the geometrical model go through a final review within the task team. The geometrical model in its native or in an open format is assigned an S1 status, suitable for coordination only, and released for sharing. The task team has decided not to export documents/drawings from the geometrical model until the coordination review is complete.	Shared	P01	S1	5.6.4
4	The geometrical model is shared via the CDE solution managed by the lead appointed party. The delivery team review the model alongside other information containers to "facilitate the continuous coordination of the information across each element of the information model".	Shared	P01	S1	5.6.5
5	Following the review, the authoring task team updates the geometrical model in the WIP state, based on feedback from the delivery team following their coordination review. The geometrical model is also refined and developed to allow a general arrangement drawing sheet to be exported.	WIP	P02.01	S0	5.6.2
	Drawing exported from geometrical design model. The revision and status columns now track the metadata of the drawing not the geometrical model. The geometrical model will, however, continue to be updated as part of the WIP steps below.				
6	The drawing is assigned a metadata status S0 and saved to a local CDE solution with a metadata revision P01.01 until such time as it passes its quality assurance checks within the task team.	WIP	P01.01	S0	5.6.3
7	The contents of the drawing go through a final completeness and coherency review by the manager of the task team. The drawing is assigned status S3, suitable for review and comment. As this drawing is not being issued for coordination purposes but for comment, the drawing is shared directly with the lead appointed party.	Shared	P01	S3	5.6.4
8	The drawing, along with any other supporting information, is reviewed by the lead appointed party to ensure it is compliant with project requirements. The lead appointed party comments and instructs the task team to update and reissue for authorization.	Shared	P01	S3	5.6.5

Table continues over page

Step	Details	State	Revision	Status	ISO clause
9	Following the review, the authoring task team update the geometrical model in the WIP state based on the drawing comments from the lead appointed party. The drawing is re-exported.	WIP	P02.01	S0	5.6.2
10	The drawing is assigned a metadata status S0 and saved to a local CDE solution with a metadata revision P02.01 until it passes its quality assurance checks within the task team.	WIP	P02.01	S0	5.6.3
11	The contents of the drawing go through a final completeness and coherency review by the manager of the task team. The drawing is assigned an S6 status, suitable for Information model authorization (PIM in relation to capital stage, refer to ISO definition). The drawing is shared directly with the lead appointed party	Shared	P02	S6	5.6.4 5.7.1
12	The lead appointed party reviews the drawing along with any other information issued as part of the information model against the appointment requirements. The lead appointed party is satisfied and authorizes the task team to issue to the appointing party for acceptance. To save time, the lead appointed party may seek permission from the task team to issue directly to the appointing party on their behalf. This can be done so long as the permission is given and the CDE records and manages the process. This may remove the need for step 13 and would also remove the need for the S4 status in 14	Shared	P02	S6	5.7.2
13	Following authorization, the drawing requires no physical update so no WIP effort is required. The drawing is re-issued with status S4, noting the drawing meets the stage requirements and the task team requests that it be accepted by the appointing party. If the physical drawing came with the status metadata physically printed on the drawing, then a WIP effort would be required to amend the drawing contents to make this update.	Client Shared	P02	S4	5.7.3
14	The appointing party reviews the drawing along with any other information issued as part of the information model against the appointment requirement. The appointing party is satisfied and accepts that the information meets stage requirements. The task team is permitted to publish the information container.	Client Shared	P02	S4	5.7.4
15	Following appointing party acceptance, the authoring task team update the geometrical model in the WIP state to change the preliminary revision to a contractual revision. The drawing is re-exported and contains a physical contractual revision so the CDE solution used by the task team will record the drawing as P03.01.	WIP	P03.01	S0	5.6.2
16	The drawing is assigned a metadata status S0 and saved to a local CDE solution with a metadata revision P03.01 until it passes its quality assurance checks within the task team to confirm that the contractual revision has been made correctly.	WIP	P03.01	S0	5.6.3
17	The contents of the drawing go through a final completeness and coherency review by the manager of the task team. The drawing is then approved and the revision updated to reflect a contractual revision. The drawing is assigned status A3 denoting that it has been authorized and accepted as suitable for stage 3 purposes and published onto the CDE for the project team to use. The appointing party will keep a record of this along with all other information that forms the completed stage 3 project information model.	Published	C01	A3	5.7.4

Although this process appears lengthy, it illustrates the application of the ISO clauses through iterative information container development. In reality, efficiencies can be found to streamline the process through intelligent use of the workflows that some CDE solutions provide.

2.6.4 Examples of status codes

Table 13 provides insight into when some of the status codes maybe used in certain situations. These codes are referenced in the National Annex (ISO 19650-2 table NA.1). As stated in ISO 19650-2 clause NA.4.2 Note 2, the codes can be expanded (or by the same principle, excluded) to suit specific project requirements providing the required codes are documented in the project's information standard and agreed.

Table 13: Application of status codes

S0	Assigned by task teams to identify information containers as Work in Progress and not yet suitable to be Shared outside the task team.
S1	Assigned by task teams to limit the information container's use to coordination activities only by its recipients. Information containers assigned this status should only be used to understand or advance their own deliverables in a coordinated manner. It is likely to be assigned to a geometrical information container but it is important to understand that S1 can be assigned to any information container.
S2	Assigned by task teams to limit the information container`s use for any specific activity by its recipients. This status denotes that the author is providing it for information only to help others in certain situations. For example, reference information provided by the appointing party such as a dilapidations report would be given this status code. Another example would be an email file containing site photos.
S3	Assigned by task teams to limit the information container`s use to commenting and review activities only by its recipients. Information containers assigned this status should only be used to review their contents against the information requirements or to provide feedback on their development. For example, an outline proposal to solve a technical design problem during Concept stage.
S4	Assigned by task teams to limit the information container`s use to stage approval activities only by its recipients. The outcome of the review following this status should be the acceptance of the information container that it meets stage requirements.
S5	This status code is not used in the National Annex
S6	Assigned by task teams to limit the information container`s use to the lead appointed party's authorization of the project information model (see ISO 19650-2 clauses 5.7.1 and 5.7.2). The information should not be used for contractual purposes, for example, construction until the project information model that it forms part of has been authorized by the lead appointed party and accepted by the appointing party. If the project information model is rejected but the information container itself does not require amendment its status will remain at S6 until the project information model is authorized. If the project information model is rejected and the information container requires amendment then it is assigned the S0 status until it can be shared again. Note that a project information model could be a single information container or it could be multiple information containers depending on the exchange information requirements.
S7	Assigned by task teams to limit the information container`s use to authorization activities for Stage 6 (Handover) only by its recipients. The outcome of this status should be the authorization of the information model that it meets the requirements for handover to facilities and asset management teams.
A0 - An	Assigned by task teams to represent the Stage the authorized and accepted information container relates to in accordance with the task information delivery plan. For example A1 would represent an authorized and accepted information container generated in Stage 1, A2 would represent Stage 2 and so on
CR	Assigned by task teams to represent an information container that has been authorized and accepted and was previously assigned an S7 status.

2.7 Checklist of actions/key points to consider

ISO 19650-2 clause references are shown in brackets.

- ✓ Has any project-specific expansion of the standard status codes and revision system been defined in the project's information standard by the appointing party (5.1.4) and has that been reviewed or amended (and agreed with the appointing party) to suit delivery requirements by each lead appointed party (5.3.2, 5.4.1)?

- ✓ Has a classification system been defined in the project's information standard by the appointing party (5.1.4) and has that been reviewed or amended (and agreed with the appointing party) to suit delivery requirements by the lead appointed party (5.3.2, 5.4.1)?

- ✓ Has an information container ID codification standard been defined in the project information standard by the appointing party (5.1.4) and has that been reviewed or amended (and agreed with the appointing party) to suit delivery requirements by the lead appointed party (5.3.2, 5.4.1)?

  - ✓ Does the codification standard define how model renditions/exports are to be given different container names? For example, IFC step files should be named differently from their native source geometrical models and PDF files should be named differently from their native 2D drawing equivalents (so that no two containers have the same ID). Note that each time the native information container is updated, associated exports should also be updated (as far as they are impacted by the update of the native information container). This requires the author of the information container to pay careful attention to a) exporting associated updates and b) ensuring there is an audit trail of updates to the native information container and its exported information containers.

- ✓ Have all the potential CDE solutions been reviewed to ensure they support the agreed metadata assignment (5.1.5, 5.5.2)?

- ✓ Have security considerations been considered when selecting the potential CDE solution(s) to ensure that access permissions can be set at an individual and organizational level (5.1.5, 5.3.2, 5.5.2)?

- ✓ If multiple CDE solutions are being used to implement the CDE workflow, some of which maybe owned or managed by different organizations, has the CDE workflow been reviewed to ensure information containers pass seamlessly through each CDE solution (5.5.2)?

  - ✓ Have the CDE solutions been tested to ensure metadata assignments can be transferred between them?

  - ✓ Has it been agreed how information containers will be transferred between solutions manually or automatically?

- ✓ Has a clear CDE workflow been implemented and documented for how each type of information container will be developed> checked> shared> authorized> accepted> published> archived? (associated with Clause 5.5.2)

- ✓ Has the project got a clear documented set of standard methods and procedures for how metadata assignments defined in the information standard shall will be assigned to the information containers (Clause 5.5.3)?

  - ✓ Has it been confirmed which tables/sets of the classification system shall be applied to which types of information/information container?

  - ✓ Has it been confirmed what each status code means and its constraints for use?

  - ✓ Has it been confirmed how new project specific codes will be generated, agreed and documented?

  - ✓ Has it been made clear how each metadata assignment is made in (each of) the CDE solution(s)?

3.0 About information requirements

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Bond Bryan Digital

3.1 Introduction

Information requirements are the most important concept of information management as they define the inputs for the whole information management ecosystem. This section provides guidance for information requirements including:

- Organizational information requirements (OIR)
- Asset information requirements (AIR)
- Project information requirements (PIR).

Exchange information requirements (EIR) guidance is due to be published in April 2020.

3.2 Background

3.2.1 The principles of information management

Before undertaking a project (either in the delivery or operational phase) consideration must be given to specifying the information as well as the physical asset (for example, a brick, a boiler or even an entire building).

Information management is about making sure that the right information is delivered to the right destination at the right time to meet a specific purpose. Information requirements consider both structured and unstructured information.

Table 1 in ISO 19650-1 clause 4.3 defines examples of four information management perspectives which provide a good starting point in understanding why different stakeholders require information.

3.2.2 What are information requirements?

ISO 19650-1 defines the term "information requirement" in clause 3.3.2 but a more detailed explanation is given here.

According to the ISO 19650 series, information should be created for a specific purpose - for someone to make use of it. Information requirements specify the precise information someone needs so that when it is received they can action that purpose successfully. Working collaboratively means that we should always create information with its use in mind.

In this section the following terms are used:

- Information provider – individual/team/organization who generates and/or produces the information
- Information receiver – individual/team/organization who will receive the information (for its own use or on behalf of others).

These terms are found in ISO 19650-1 clauses 3.2.3 and 3.2.4 and during an asset's lifecycle most people within the appointing and appointed parties will be both.

For example: information could be needed to update a spreadsheet, to be used as reference information when designing, to make a decision and/or to manufacture from (as indicated in figure 11).

Figure 11: Flow of information delivery

From an information management perspective, and to define information requirements we have to turn this workflow around.

The starting point is that the information receiver stipulates their requirements. To do this they first have to understand the purposes for which they require information. The information required can then be defined and communicated to the information provider, so they then understand the scope of what they need to produce. ISO 19650-2 emphasizes this by starting with the assessment and need activity in clause 5.1 (illustrated in figure 12).

Figure 12: Flow of information requirements

The activities in figure 12 precede the activities in figure 11 (see ISO 19650-1 figure 6). You should not provide someone with information unless they have told you what they require.

Information requirements are like a skeleton or frame containing many holes of different shapes and sizes (see figure 13). These holes specify the requirements of the information needed to fill them correctly. The information providers then exchange the information deliverables with the information receiver thereby filling in the holes.

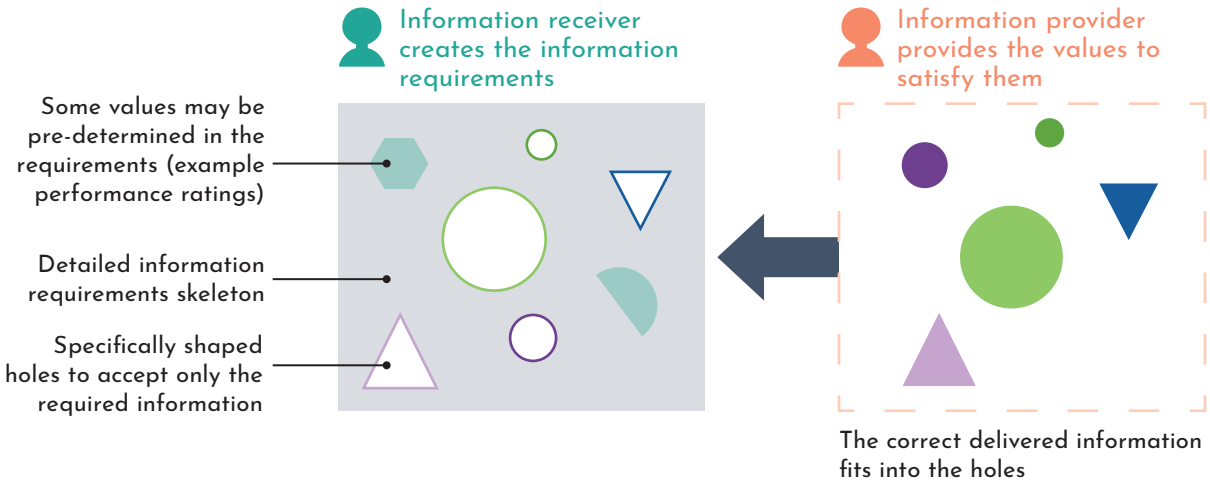

Figure 13: Information requirements skeleton

3.2.3 *Why are information requirements needed?*

According to a variety of sources such as McKinsey[1] and Constructing Excellence[2] the built environment sector is one of the least productive and most unpredictable of the global industry sectors. Given that delivery and/or operational projects are rarely planned holistically, the way information is generated tends to be ad-hoc and reactive. This also means that software applications are rarely used to their full potential. These issues create risk before any related activity even starts. Furthermore, indiscriminate use of technology can exacerbate this by generating more information than can be handled or by masking the lack of a plan.

As a sector we tend to be reactive and poor at planning and consequently think about things too late in the asset lifecycle.
We have to change this mind-set, and everyone (including clients) has a part to play in this.

Without understanding what information is needed, it is very difficult and inefficient to plan how any such information is going to be delivered, the timescales required, and the resources needed. Good quality information requirements are vital to resolve this situation.

Information requirements are fundamental to the ISO 19650 series. Once defined they inform:

- the tendering and appointment process
- information delivery planning
- information generation and delivery
- the authorization and acceptance process by comparing deliverables against requirements
- the appropriate use of the information.

See the information requirements cycle shown in figure 14.

1 2017 McKinsey Global Institute. Reinventing Construction Through a Productivity Revolution
2 2018 Glenigan, Construction Excellence, CITB, BEIS. UK Industry Performance Report

Information requirements underpin the golden thread of information, which is a key concept in the BS 8536 series. See also ISO 19650-1 figure 4.

Without information requirements there is no information management process.

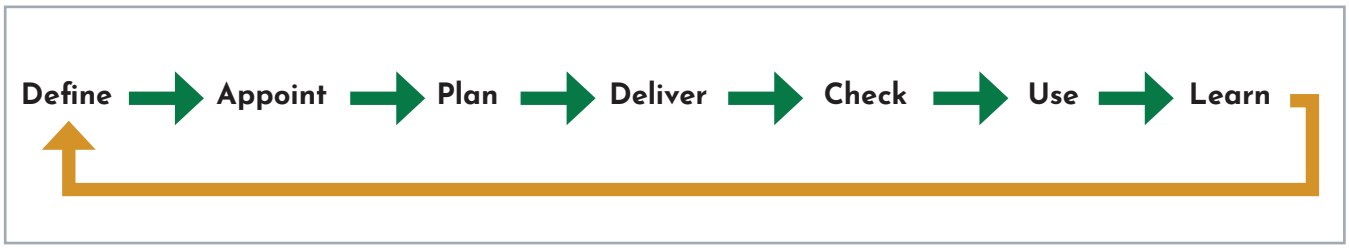

Figure 14: The information requirements cycle

An information receiver asking for information unexpectedly will have a negative impact on the way the information producer is working. This can prove to be extremely disruptive, especially if project programmes are tight.

Information requirements should be developed in a certain order to gradually build up their detail to:

- tell a consistent story
- fulfil their purpose for the project
- fulfil their purpose for the receiver's organization.

Simply referring to the "UK BIM Framework" (or worse still the outdated terminology of "BIM level 2") or copying and pasting examples from standards and guidance without explicitly defining what is needed will not meet the requirements of the ISO 19650 series.

Furthermore, defining information requirements is not a tick box exercise; poor inputs tend to produce poor outputs leading to risks and unpredictability as already noted.

Poor information requirements (input) = poor information delivered (output)

3.2.3.1 Information risk

People need useful information to help them carry out their activities effectively; likewise, most technology solutions need structured or defined information to work efficiently.

The more precisely the information requirements reflect the receiver's needs, then the more likely the provider will be able to successfully deliver the appropriate information. If information requirements are not sufficiently precise, information providers will be left to make their own assumptions and interpretation. This can lead to error and increased risk – which in turn can lead to programme and budget being exceeded.

For example, a contractor (as a lead appointed party) is going to use a digital setting out methodology on site and requires dimensional information to be taken from the geometrical models. These details are not included in the information requirements provided by the contractor. Without this knowledge, the designers produce traditional setting out drawings. They end up wasting time, money and effort creating drawings which are not required.

It is vital that information requirements are defined as early as possible. They are needed to support tender appointments across the whole of the asset lifecycle. As noted in section 3.2.2 ISO 19650-2 supports this by requiring that information requirements are established in the assessment and need and invitation to tender activities, including those of the lead designer and project manager. See ISO 19650-2 clauses 5.1.2 and 5.2.1.

Precise information requirements help to manage risk around information exchange. This is especially important given the complexity of the wide variety of people who may contribute to an information exchange as well as the multitude of technologies that may be in use.

3.2.3.2 Information waste

ISO 19650-2 clause 5.6.2 b) is explicit about not generating wasteful information. To support this, information requirements should seek to avoid waste. All parties, including the client, should only define the information they require, so that they can fulfil their own actions. For example, a client (appointing party) should not try to define information for purposes which will be actioned by a delivery team.

Time will be spent creating, managing, issuing and checking information over many iterations of change. If the information is not required, this is wasted time and resource which increases the costs of the information provider and may increase the costs for the information receiver.

For example, a client should not require information for thermal analysis purposes unless they or a separate delivery team will be carrying out thermal analysis activities. However, they may require information that confirms thermal performance in support of operational activities. In this instance it is down to the delivery team to define the information that they need in order to carry out thermal analysis to assure the thermal performance.

Information receivers should only ask for the information they need.

To reduce wasted effort an appointing party (a client) with a portfolio of assets should consider how they can generate consistent information requirements across their assets to avoid duplication and error. However, it is really important that amendments are introduced as appropriate to make the information requirements project and appointment specific.

3.2.4 How are information requirements defined and communicated?

Information requirements should be considered in two parts:

3.2.4.1 The purposes for information (high-level requirements)

This is the most important part of defining information requirements and is the starting point. It is about understanding the day-to-day reasons why information is required, see ISO 19650-1 clause 5.1. This helps to form high-level requirements. These are equivalent to "interested parties' information requirements" in ISO 19650-1 figure 2.

To define information requirements, start with the reasons why information is needed before the information itself is considered.

3.2.4.2 The information which is needed (detailed requirements)

Describing information generally is subjective. However, information in accordance with the ISO 19650 series can be described across four main facets:

1. Purpose (the need that the information will fulfill). For example, to convey fire performance of elements.
2. Content, this is split into:
   - Content summary (the overall content of the information). For example fire strategy information or elemental cost information.
   - Content breakdown (geometrical and alphanumerical information across an object hierarchy). For example, a wall with the property 'fire rating' or for the project, a property called 'cost limit'
3. Form (how it is presented). For example, a schedule or a drawing.
4. Format (how it is encoded). For example, PDF or IFC(-SPF).

These are equivalent to "appointment information requirements" in ISO 19650-1 figure 2.

The level of information need is a framework for defining information across these facets and is referenced in ISO 19560-1 clause 11.2. In accordance with this, information should be defined across the following three sub-divisions:

1. Geometrical information
2. Alphanumerical information
3. Documentation.

Level of information need is explained further section 4 of this guidance.

Where there is generic or industry accepted means of delivering of an information requirement, such as a topographical survey, this should be referenced. In this instance, it is not necessary to specify the contents of the survey to the nth degree. However, if there is something specific that is required in the survey then this should be stated. A pragmatic approach is helpful.

The need for each information requirement to articulate each facet may be determined by context.

For example, an appointing party (client) specifies a fire strategy deliverable only in terms of its content summary. The other facets of content breakdown, form, purpose and format are left to the delivery team to determine. For another requirement the client specifies more facets by requiring a topographical survey (content summary), which shows the building, car park and access routes (content breakdown), delivered as a drawing (form) in PDF (format).

Information requirements should be structured in a consistent way as far as possible to make understanding of delivery easier and to enable automated checking rules to be established. Using structured tools such as databases and spreadsheets will help achieve this.

A recommended approach would be to establish a master set of information requirements using rationalized purposes plus the level of information need framework, then filter them according to each use case and/or appointment. This would then assist production of appointment specific information requirements and help ensure there is no duplication and no gaps in information delivery, see figure 15.

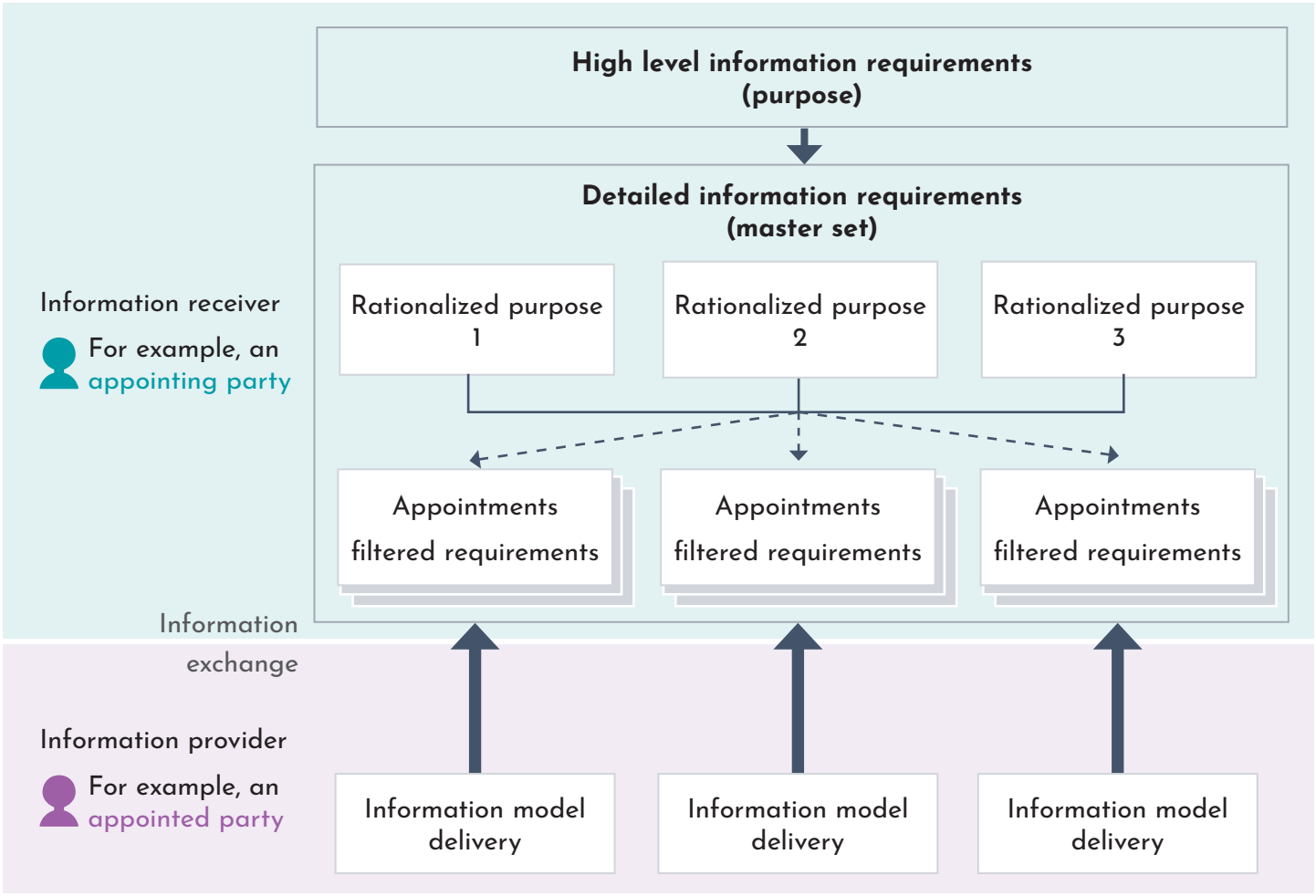

Figure 15: Breakdown of information requirements

3.2.5 Who has information requirements?

ISO 19650-2 considers in detail, the information requirements from appointing to lead appointed parties and then again to appointed parties. For the appointed party this includes information requirements from both the appointing party and lead appointed party.

However, information requirements can exist in the opposite direction and between task/delivery teams, in fact every party within a project is likely to have them.

For the rest of this guidance section 3.0, the focus is on the appointing party (the project client or representative). The appointing party will always require information both during and at the end of a project whether it is to help make decisions, for statutory/regulatory reasons, to manage the facility or to sell it on.

3.3 Information requirements outside of design and construction project delivery

3.3.1 Introduction

During the running of an organization, the principles and processes defined in ISO 19650-1 and PAS 1192-3 should be applied to define information. In these standards there are two types of information requirements:

1. Organizational information requirements (OIR)
2. Asset information requirements (AIR)

For their relationship to each other see ISO 19650-1 figure 2.

3.3.2 Organizational information requirements (OIR)

OIR are explained in ISO 19650-1 clause 5.2 and PAS 1192-3 clause 4.4.

Organizations must consider information requirements around in-use (including operation) before they consider information requirements around project delivery.

See Annex A.1 in this guidance for examples of OIR.

OIR are the starting point for all information management activities. OIR detail the high-level information required by an organization across its whole asset portfolio and its different departments (such as human resources, information technology, finance, facilities management and operations/ production). The information requirements from all the assets and departments should be rationalized and joined up to help streamline the business.

Since the UK BIM Framework is specifically about the lifecycle of physical/built assets the focus in this guidance is on this part of the OIR.

OIR enable understanding of the high-level information needed about assets throughout their lifecycle. This helps the appointing party run their business in an informed and effective manner and to understand the information needs of their clients and stakeholders.

3.3.2.1 What are they for?

To ensure the correct information feeds back into an organization's wider business function to support strategic business decisions. OIR are therefore an important resource to support the organization.

3.3.2.2 When are they defined?

As part of the organization's business activities.

3.3.2.3 Who creates them?

The appointing party, for example, the project client, the asset owner or their representative.

3.3.2.4 What do they include?

Identify the high-level activities for which information is required

To begin this process, it is worth considering the high-level activities which require information within an organization. This will help to create a structure. Examples of these high-level activities can be found in the following standards:

- PAS 1192-3:2014 annex A.2
- BS 1192-4:2014 clause 5.2
- ISO 55001:2014 annex A.

Examples include:

(Extracted/adapted from the high-level activities in PAS 1192-3:2014, Annex A.2)

- Health and safety compliance and management
- Environmental management
- Capital investment and lifecycle costing
- Risk assessment and management
- Maintenance and repairs
- Asset operations
- Space utilization
- Asset modifications.

It may be helpful to group these activities into strategic, tactical or operational groups.

Note these high-level activities can inform the structure but are not sufficient to be used as OIR themselves. It has been observed that these examples have appeared within exchange information requirements (EIR) with no more detail provided. OIR used in this way do not tell the provider what information is required, they are merely a starting point for the receiver.

Identify the purposes for which information is required

As well as defining the activities for which information is required it is also important to define the reasons why information is needed. These are the organization-based purposes and could be to satisfy (for example):

- Objectives/outcomes
- Stakeholders (including staff, end-users, shareholders)
- Regulators (including building control, planning, auditors, inspectors)
- Policies (including quality management)
- Business operation tasks (including corporate reporting, applications, auditing, procuring maintenance contractors, analyzing space utilization).

These can be used to generate a matrix of information needs against information activities where each associated information requirement is defined.

Once completed the OIR set the scene for the next two requirements, the:

1. Asset information requirements (AIR)
2. Project information requirements (PIR)

3.3.2.5 When is the information exchanged to meet them?

Whenever the AIR and PIR are responded to.

3.3.3 Asset information requirements (AIR)

AIR are explained in ISO 19650-1 clause 5.3 and PAS 1192-3 clause 4.5.

See Annex A.2 in this guidance for examples of AIR.

The process of defining the OIR will generate a set of high-level requirements. These will need to be defined in sufficient detail to enable them to be used in asset management related contracts in the form of AIR.

These AIR set out precisely the asset related information which providers should deliver. The AIR will need to be defined and communicated using order and logic to ensure a comprehensive contract resource.

AIR are generated from OIR. They specify the detailed information needed by the appointing party and their clients/ stakeholders to manage physical assets throughout their lifecycle.

3.3.3.1 What are AIR for?

To ensure the correct information is delivered to an organization to fulfil the built asset part of the OIR. The AIR is an appointment-based resource. For a design and construction project AIR form part of the EIR to ensure the delivery of operational information.

For example, AIR content could specify the precise information needed:

- For/from the annual boiler service
- For/from an emergency
- For/from equipment failure
- To review annual energy costs
- To complete an insurance renewal
- To sell a built asset
- To demolish a built asset.

The delivery of information in response to the AIR will build up and/or update the asset information model (AIM). This information will be derived from many sources: from an asset management related contract or from a design and construction project (via the project information model).

As well as telling those providing a service the information which they need to deliver, AIR can be used to aid selection during the tender/appointment activity.

AIR need to be identified no matter how the asset information is going to be managed, be it by a computer system (for example a CAFM system) or otherwise.

AIR are required for in-use activities during an asset's life and they support contractual delivery of information in design, construction and asset management.

3.3.3.2 When are AIR defined?

Defining AIR is an important organizational business activity to support asset management, design and construction contracts. AIR have to be defined prior to any related appointment.

For appointing parties with multiple assets, it is sensible to consider how the AIR can be rationalized so that at appointment level they can be generated in a streamlined and efficient way using a consistent structure as far as practicable.

3.3.3.3 Who creates them?

The appointing party, for example the asset owner or their representative. The creation of AIR is led by the internal team responsible for asset and facilities management (where they exist).

3.3.3.4 What do they include?

To structure the information the level of information need framework should be used which is referenced in ISO 19650-1, clause 11.2 and section 3.2.4 of this guidance.

The AIR specifies precisely the information required for each particular asset. An asset could be an entire piece of infrastructure, an entire building, its spaces, or even for example an individual instance of a pump[3]. Selecting the correct schema and classification system is therefore critical to create a consistent breakdown structure across all the different asset types.

Regulatory information, for example the operations and maintenance (O&M) manual, the health and safety file or the building log book, must be defined through the AIR where they apply. The AIR should consider the different facets of information: the contents, the function, the form and the format.

The AIR should also consider the data requirements of the computer systems that will be used to help manage the asset. This is to:

- Ensure the required data is delivered
- Enable the correct pre-defined mappings to be set up.

Following an industry standard such as BS 1192-4:2014, allows delivery teams to set up methods which can be used across multiple projects and clients.

AIR should only require information which is going to be used to fulfil a specific purpose. This is to ensure that:

- The required information can be delivered in practice
- It is commercially viable to deliver the information.

Note that poor specification of the AIR through, for example, reference to the incorrect classification table, can result in the delivery of information for assets that are not maintainable. The information therefore serves no purpose but has taken time and effort to deliver.

No matter how information is delivered there must be correct and consistent referencing throughout all information containers. The AIR should be therefore compiled and subsequently read in conjunction with the relevant information standard.

For example, an air handling unit which is called AHU-0001 should be identified as this on all relevant drawings, equipment schedules, product data sheets, in any structured data such as a spreadsheet and within geometrical models.

It is important to remember that AIR should be appointment specific as illustrated in figures 15 and 16. An AIR which is not appointment specific will undermine the appointment/contract. It will also overload information providers by requiring them to generate and/or deliver information that is unnecessary.

3 The definition of an asset can be found in ISO 19650-1, clause 3.2.8

3.3.3.5 When is the information exchanged to meet the AIR?

Information exchange is driven by the following hierarchy:

- Trigger events associated to the asset lifecycle
- Appointments to respond to trigger events
- Milestones within appointments.

A trigger event in the context of the ISO 19650 series is one which is going to lead to new or updated information concerning the asset. This information is delivered as an information model and when accepted it is incorporated into the AIM.

Trigger events are linked to information purposes and examples of trigger events are found in PAS 1192-3:2014 Annex A.5. They could include:

- Equipment breakdowns
- Annual servicing
- Financial planning
- Insurance renewals
- Refurbishment
- Emergencies
- The construction of a new built asset.

The AIR would be firstly filtered according to the trigger event.

A trigger event could involve one or more appointments and therefore could require one or more AIR. When appointments are being made the AIR should be filtered again so that they are specific to the appointment. This is shown in figure 16.

Information is exchanged at defined milestones within appointments. An appointment may have just one information exchange at completion, or it may have several within the life of the appointment.

AIR respond to in-use trigger events and are appointment specific.

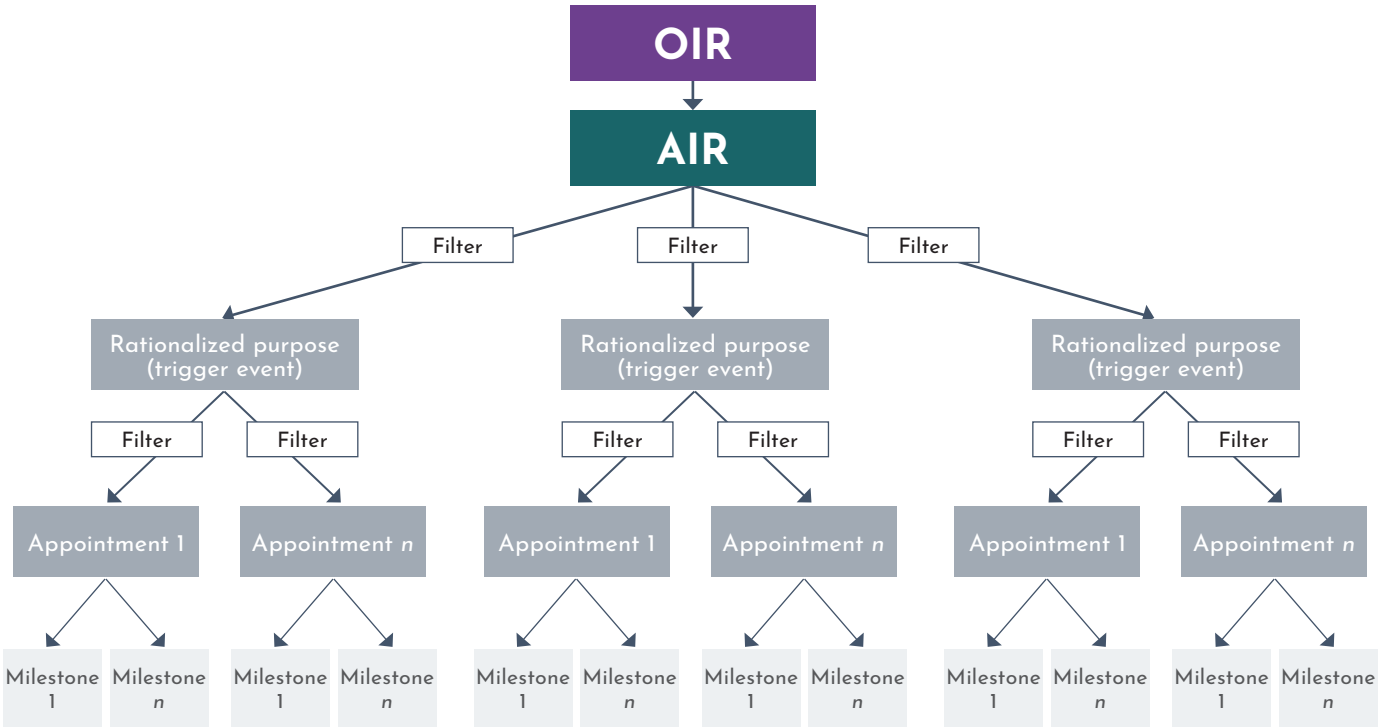

Figure 16: AIR and their breakdown by triggers and appointments

3.4 Information requirements during design and construction project delivery

3.4.1 Introduction

ISO 19650-2 requires that the appointing party's information needs are determined before any delivery team appointments are tendered. There are two types of information requirements to be defined:

1. Project information requirements (PIR)
2. Exchange Information Requirements (EIR) (these will be explained in future guidance).

3.4.2 Project information requirements (PIR)

PIR are explained in ISO 19650-1 clause 5.4 and ISO 19650-2 clause 5.1.2. See Annex A.3 in this guidance for examples of PIR.

See also ISO 19650-1 figure 2 for the relationship between the OIR and PIR.

PIR, like OIR, are high-level and identify what information will be needed for the key decision points determined by the appointing party. There is only one set of PIR per project.

PIR are partly derived from OIR. They enable understanding of the high-level information the appointing party requires during a design and construction project.

3.4.2.2 When are PIR defined?

Some of the PIR content may have already been defined within OIR that are applicable to design and construction projects. For example, statutory requirements or corporate project delivery policies.

Any additional PIR should be identified and added to those derived from OIR at the inception of a design and construction project, before the appointments for any consultants or contractors are tendered.

Organizations with many projects may find it helpful to consider and define their PIR as a separate off-line exercise from any particular project being started.

3.4.2.3 Who creates PIR?

The appointing party, for example the project client, the asset owner (indirectly through OIR) or their representative.

3.4.2.4 What do they include?

PIR are derived from the purposes for which the appointing party requires information. These can include:

- Relevant OIR such as corporate key performance indicators (KPIs)
- Project business case for example, financial information to establish value for money and affordability
- Strategic brief for example, strategic programme to establish opening date for a school
- Project stakeholders who require information for example, local residents
- Project tasks which the appointing party themselves need to carry out for example, completing an application.

With the PIR in place the information to be delivered can then be defined more precisely in EIR (ISO 19650-2 clause 5.2.1).

3.4.2.5 When is the information exchanged to meet the PIR?

The activity of requiring information and then delivering it is called an information exchange.

ISO 19650-2 clause 5.1.2 recommends that the appointing party considers the project plan of work in establishing the PIR. This enables key decision points and associated activities such as information exchange to be anchored against a defined plan, for example the RIBA plan of work.

Key decision points are when the appointing party and other stakeholders make informed decisions about the project such as, whether or not it is financially viable to proceed to the next stage or decisions about appointment of the project team. These decisions are made using information received from information providers.

A key decision point can be y weeks before the end of a work stage or after the beginning of a work stage. Note that ISO 19650-1 clause 3.2.14 could be read to suggest that a key decision point aligns to the end of a work stage but key decisions can be made at any time. Examples might include decisions related to tendering or planning permission. Key decision points need to be mapped out at the start of the project, see ISO 19650-2 clause 5.1.3.

Information delivery milestones are pre-defined points which specify when the required information should be delivered to the appointing party. Information delivery milestones should be defined relative to key decision points, for example x weeks before a key decision point. There are likely to be cases where multiple exchanges may occur at the same information delivery milestone, for example where information models are to be delivered for checking by different delivery teams before being used by the appointing party at a key decision point, see ISO 19650-2 clause 5.7.

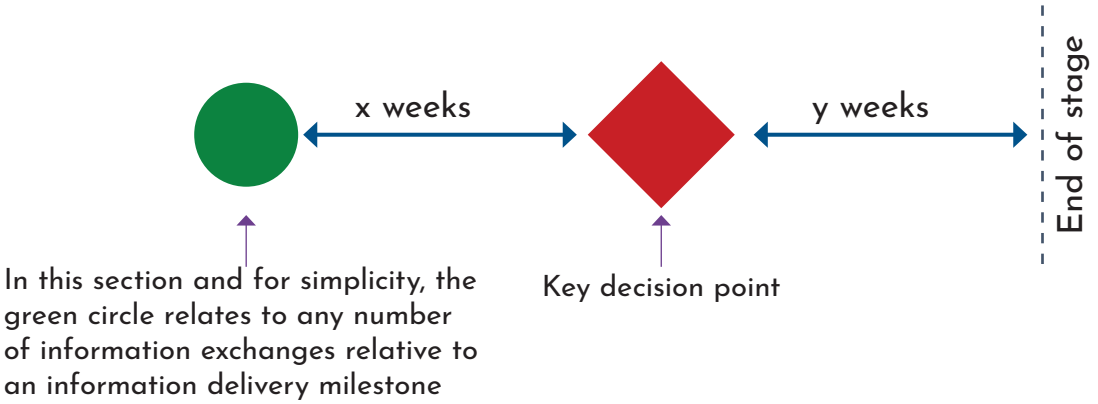

Figure 17: Key decision points and information delivery milestones

When key decision points and information delivery milestones are defined it will be unlikely that all their specific dates will be known. Even so, the dates can and should be defined in relative terms as indicated in figure 17.

For the purposes of this guidance on PIR, it is assumed that information delivery milestones coincide with information exchange dates. This is not necessarily the case and will be considered further in the forthcoming EIR section of this guidance.

Robust planning of the key decision points and information delivery milestones by the appointing party should, as far as possible, eliminate ad-hoc requests for information at the last minute.

Figure 18 shows the information delivery process associated with a number of key decision points. This is in the context of a design and build procurement (through to the end of RIBA work stage 4) and in respect of three of the lead appointed parties involved in this project. Reference to numbers 2 to 7 reflect the information management activities set out in ISO 19560-2 clauses 5.2 to 5.7, which are as follows:

2. Invitation to tender
3. Tender response
4. Appointment
5. Mobilization
6. Collaborative production of information
7. Information model delivery

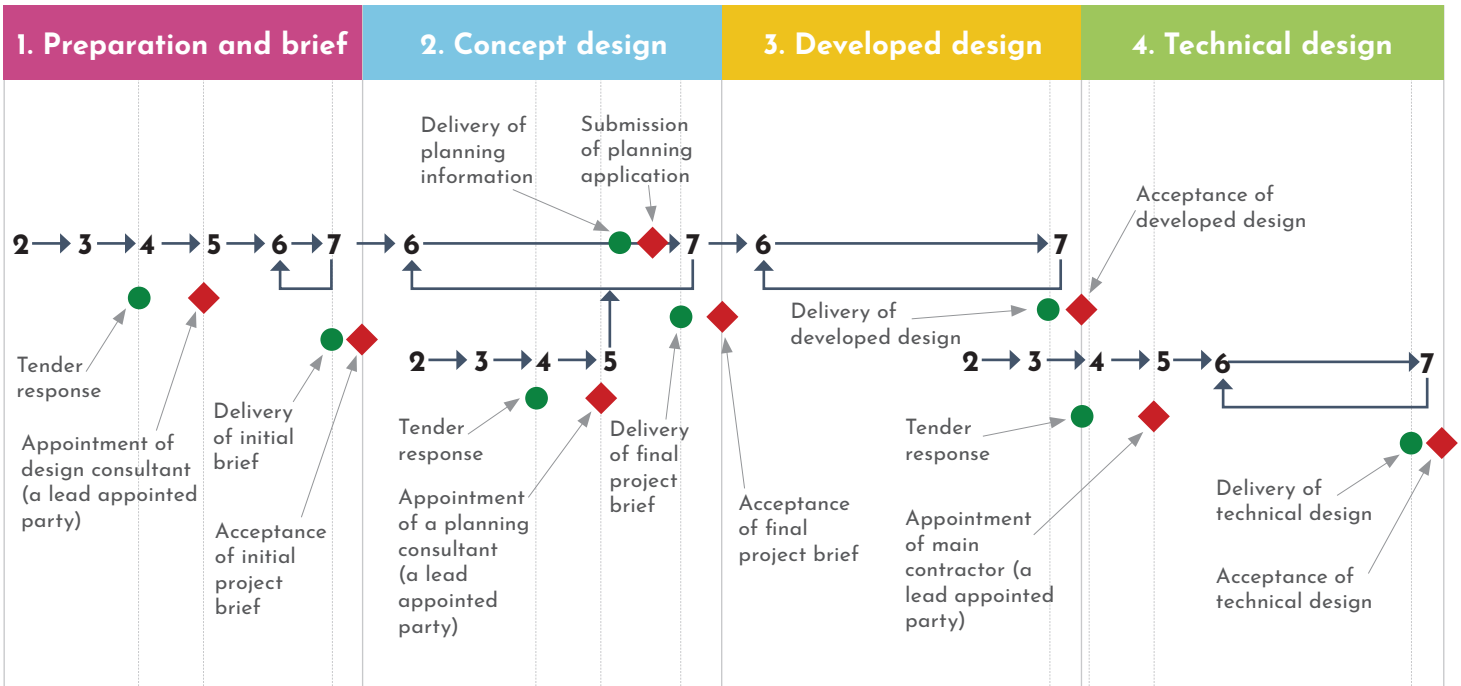

Figure 18: Example of key decision points and information delivery milestones in relation to the RIBA work stages 2013

3.4.3 ISO 19650-2 clause 5.1.2

ISO 19650-2 clause 5.1.2 contains a list of seven points which have to be considered when defining the PIR. They do not have to be considered in any particular order nor, and if they are not relevant or helpful, should they be followed. The list is a tool to help the appointing party arrive at their requirements. Some appointing parties may have a set of questions which they need to answer if they are part of a wider organization or public body. Standalone clients may have other methods they use to develop their PIR – it is very much up to the organization depending on how they want to monitor, check and make use of the information.

Development of PIR should go hand in hand with the strategic project management activities being defined, rather than as a standalone activity. Note that the appointing party does not have to issue a separate document called PIR.

The points to consider as defined in ISO 19650-2 clause 5.1.2 are:

3.4.3.1 Project scope

Having a basic understanding of the project is the first step to understanding what information is required

- What is it you want to build?
- What is the reason for the works?
- What is the business plan?
- What are the objectives/outcomes of the project?

3.4.3.2 The intended purpose for which the information will be used by the appointing party

Like the OIR, defining PIR is very much a stepped process.

The reasons that the appointing party requires information during a project will originate from different departments and stakeholders, see section 3.4.2.4.

This should be done at a high-level and will give a solid base for the information management of the entire project.

3.4.3.3. The project plan of work

This defines the stages of a project and it is generally possible to align the stages with a timescale. There is a unified plan of work that is described in BS 8536. The stages align with the RIBA Plan of Work 2013 and the CIC stages. Some specific types of work or project may have their own variation on a standard plan of work.

3.4.3.4 The intended procurement route

Procurement is the process for 'buying' goods and services. For a design and construction project this covers the strategy, methodology and framework for tendering and appointing single or multiple parties. The procurement route affects the types of contractual relationships that are created and also how information is managed. For example, the way information flows through the project team is completely different for a design and build project compared to alliancing contracts. During invitation to tender the procurement route and appointment structure will influence the different sets of EIR which are produced by the appointing party.

3.4.3.5 The number of key decision points throughout a project

The appointing party needs to define the number of key decision points and when they occur in relation to work stages. See section 3.4.2.5 for more information.

3.4.3.6 The decisions that the appointing party needs to make at each key decision point

At the key decision points there will be decisions that the appointing party needs to make. The scope of key decision could range from deciding whether to proceed to the next stage of a project to finalizing the internal finishes of a new-build project.

These decisions may be generated from the purposes (such as the business plan) so doing this activity of identifying the key decisions alongside defining the purposes may be beneficial. They may also be defined as part of a wider organizational activity (for example, standard decisions based on spatial information or financial information may have been pre-defined).

Like the purposes, starting with identifying the decisions enables the appointing party to then determine the information required to make those decisions. It may be beneficial to do this for each key decision point in turn.

Examples of decision points include:

- Whether the energy performance of the built asset is acceptable
- Whether the overall layouts meet the needs of the staff and end-users
- What specialist equipment will be needed
- Which main contractor to select
- Whether the scheme is financially viable
- Whether it meets the organization's strategic vision.

3.4.3.7 The questions to which the appointing party needs answers, to make informed decisions

Some organizations may have questions which they need to ask themselves during a design and construction project as part of their wider organizational strategies. This is to provide assurance that the project is performing as intended.

In this scenario, these questions (referred to as plain language questions in BS 8536 or key performance questions in business language) can also be used as a reason/ purpose for requiring information. This required information essentially becomes a KPI for the project and will be required at the appropriate key decision point(s).

The reason key performance questions exist is to create more useful KPIs. Again, defining purpose first creates better requirements.

Therefore, information requirements have two main benefits; firstly, they define what information is needed. Secondly they can also be used as a comparison tool to which the delivered information is compared.

The previous sections give a mixture of reasons why the appointing party could need information. These reasons can also be reworded into questions should the appointing party find this useful.

3.4.4 Exchange information requirements (EIR) under ISO 19650-2

EIR are explained in ISO 19650-1 clause 5.5 and ISO 19650-2 clauses 5.2.1 and 5.4.3.

Examples of EIR will be provided in edition five of this guidance (planned for release in Q3 2020).

As noted above, the two clauses that define EIR in ISO 19650-2 are:

1. Clause 5.2.1 - Appointing party's EIR to be met by lead appointed parties
2. Clause 5.4.3 - Lead appointed party's EIR to be met by appointed parties

Since EIR essentially perform the same function for the appointing party and lead appointed party, this section of guidance accommodates both the appointing party's and lead appointed party's EIR, with any differences explored.

The appointing party's process of defining OIR, AIR and PIR will satisfy ISO 19650-2 clause 5.2.1 a) by specifying the information required and the degree of granularity needed to fulfil organizational, asset and project-related activities. These will inform EIR, see sections 3.4.2 and 3.4.3. For each appointment, as described in ISO 19650-2, the role of the EIR is to precisely specify what information is to be delivered at each information exchange.

EIR form part of the appointment process, which may be through an invitation to tender package, and they are in essence the information part of the employer's requirements (ER).

Information should be considered in the same manner as any physical asset.

The EIR need to be defined and communicated using order and a logical approach to ensure a comprehensive appointment resource. Think of EIR as a specification for the exact information required.

To satisfy ISO 19650-2 clause 5.4.3 a), the appointing party's EIR are combined with the lead appointed party's information requirements to form the lead appointed party's EIR. These are filtered as appropriate and cascaded down through the delivery team.

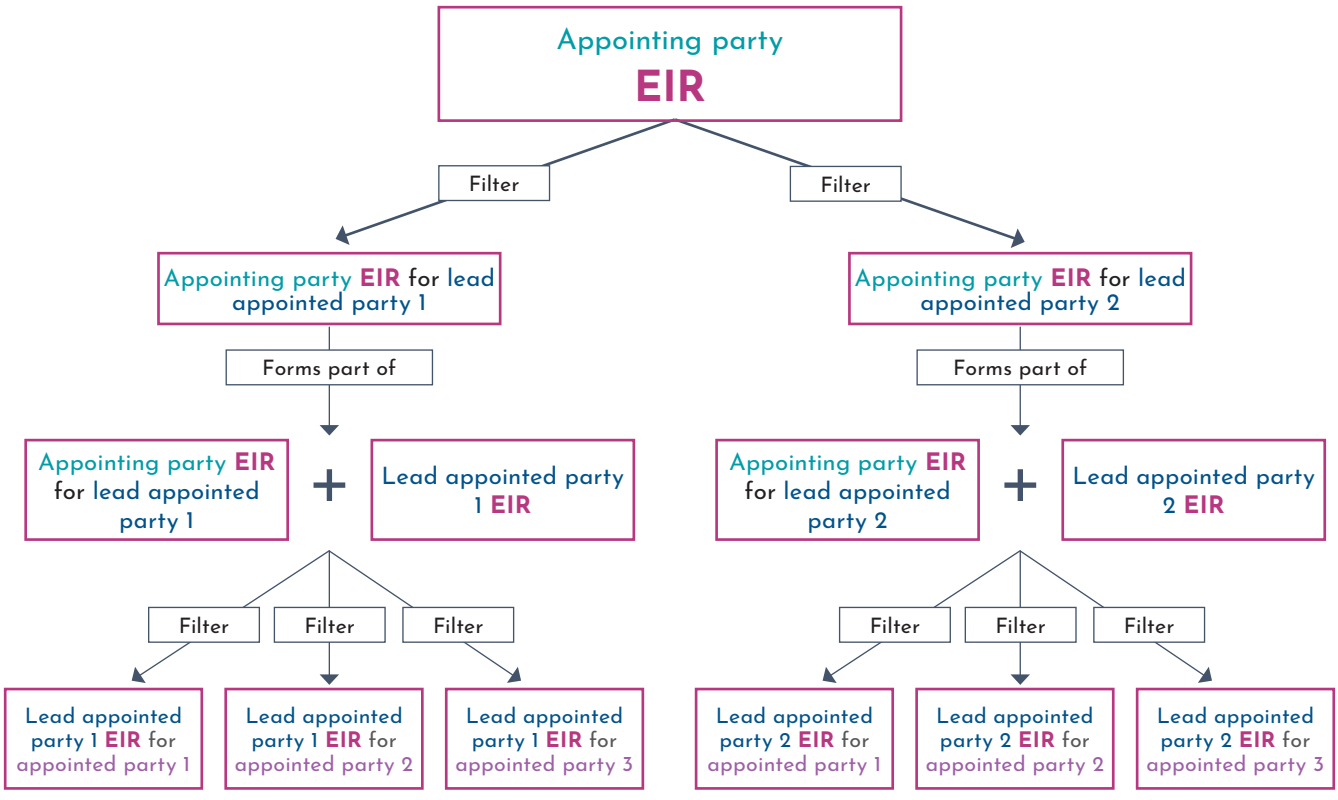

Figure 19: Cascade of appointing party's and lead appointed party's information requirements through delivery teams

3.4.4.1 What are EIR for?

EIR are created to ensure that the correct information is delivered to an appointing party or lead appointed party, which enables them to fulfil specific and necessary activities during a project and during the operational phase. EIR have several functions, including:

For the appointing party:

- Selection of those lead appointed parties who can best demonstrate delivering the requirements
- Specifying precisely what information is required at each information exchange, i.e. the information the lead appointed party (provider) is to deliver (on behalf of its delivery team) to the appointing party (receiver), to enable the appointing party to carry out its purposes effectively
- From a technology perspective EIR enable pre-defined mappings to be established, allowing communication between systems across the project team, to improve interoperability
- Carrying out checks to ensure that the information received from the lead appointed party is compliant with what was initially required by the appointing party.

For the lead appointed party:

- Selection of those appointed parties who can best demonstrate delivering the requirements
- Specifying precisely what information is required at each information exchange, i.e. the information the appointed party (provider) is to deliver to the lead appointed party (receiver), to enable the lead appointed party to carry out its purposes effectively, and deliver the information required by the appointing party on behalf of the delivery team as a whole
- From a technology perspective EIR enable pre-defined mappings to be established, allowing communication between systems across the project team, to improve interoperability
- Carrying out checks to ensure that the information received from an appointed party is compliant with what was initially required by both the lead appointed party and appointing party.

EIR need to be identified regardless of how the information is going to be delivered, be it by a geometrical model or otherwise. Since every appointment is made up of information exchanges, EIR will always be required to specify what information is needed.

3.4.4.2 When are EIR defined?

EIR have to be defined prior to every appointment and issued as part of the appointment process:

For an appointing party this occurs before any consultants, specialists or contractors are selected

For a lead appointed party this occurs before any sub-contractors and specialists are selected.

The appointing party should develop one master set of EIR for each project, which is then filtered to create a tailored set for each appointment. Therefore, where there are multiple appointments during a project there will be multiple EIR.

For appointing parties with multiple assets, it is sensible to consider how the EIR can be rationalized so that at appointment level they are specified in a streamlined and efficient way using a consistent structure as far as practicable.

3.4.4.3 Who creates EIR?

The appointing party, for example, the asset owner or their representative

The lead appointed party, for example, a designer or a main contractor, depending on the project timeline.

3.4.4.4 What do EIR include?

For this section the EIR is broken down into:

- Purpose
- Structuring of information
- Definition of information.

Purposes

The importance of purpose is highlighted throughout section 3 of this guidance. At the EIR stage, the purposes need to be rationalized and thought of as a mini system of inputs, processes and outputs, as shown in figure 20.

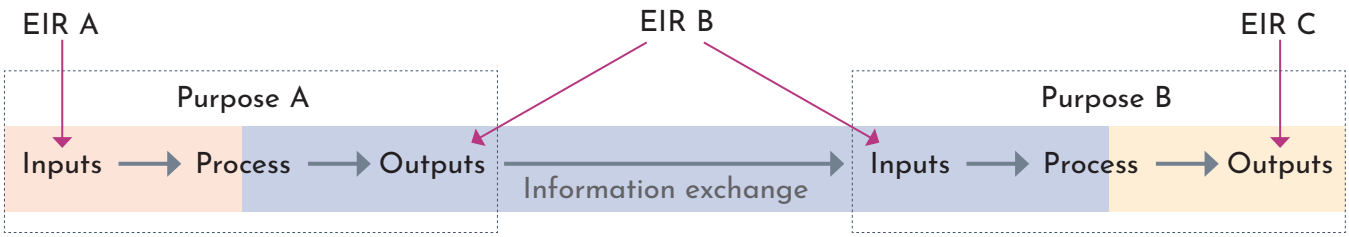

Figure 20: Chain of purposes connected via information exchanges

For each purpose, inputs will be required to feed into processes, both of which will require certain information. Once processed this will generate the specific outputs that are required to feed in to the next process, and so forth.

Purposes form into chains linked by information exchanges to enable information and data to be transferred.

Establishing a set of rationalized purposes should be the starting point of defining EIR.

The appointing party will have already defined the asset-related purposes as part of the AIR. Any project-related purposes should be derived from the PIR.

Lead appointed parties will also have their own purposes which cover design and construction. These need to be captured as part of their EIR.

The following list provides examples of more rationalized purposes, noting that these are not exclusive to the assigned party indicated:

Appointing party

- Asset registration (from the AIR)
- Planned maintenance (from the AIR)
- Replacement (from the AIR)
- Operational cost, e.g. as informed from energy analysis (from the AIR)
- Cost forecasting (from the PIR)

Lead appointed party

- Geometrical coordination
- Construction planning
- Construction costing
- Energy analysis
- Commissioning

Structuring of information

To achieve open shareable information for the whole life of assets it is important that structured information is delivered, and how it is structured needs to be specified in the EIR.

For structured information this would include specifying the data that is to be exported from primary purposes (authoring) for input into secondary purposes, as illustrated in figure 21. Therefore, the secondary purposes should be considered before the contents of the structured information for primary purposes.

Once the purpose has been accomplished, the information can be output as either structured or unstructured information, depending on its next purpose.

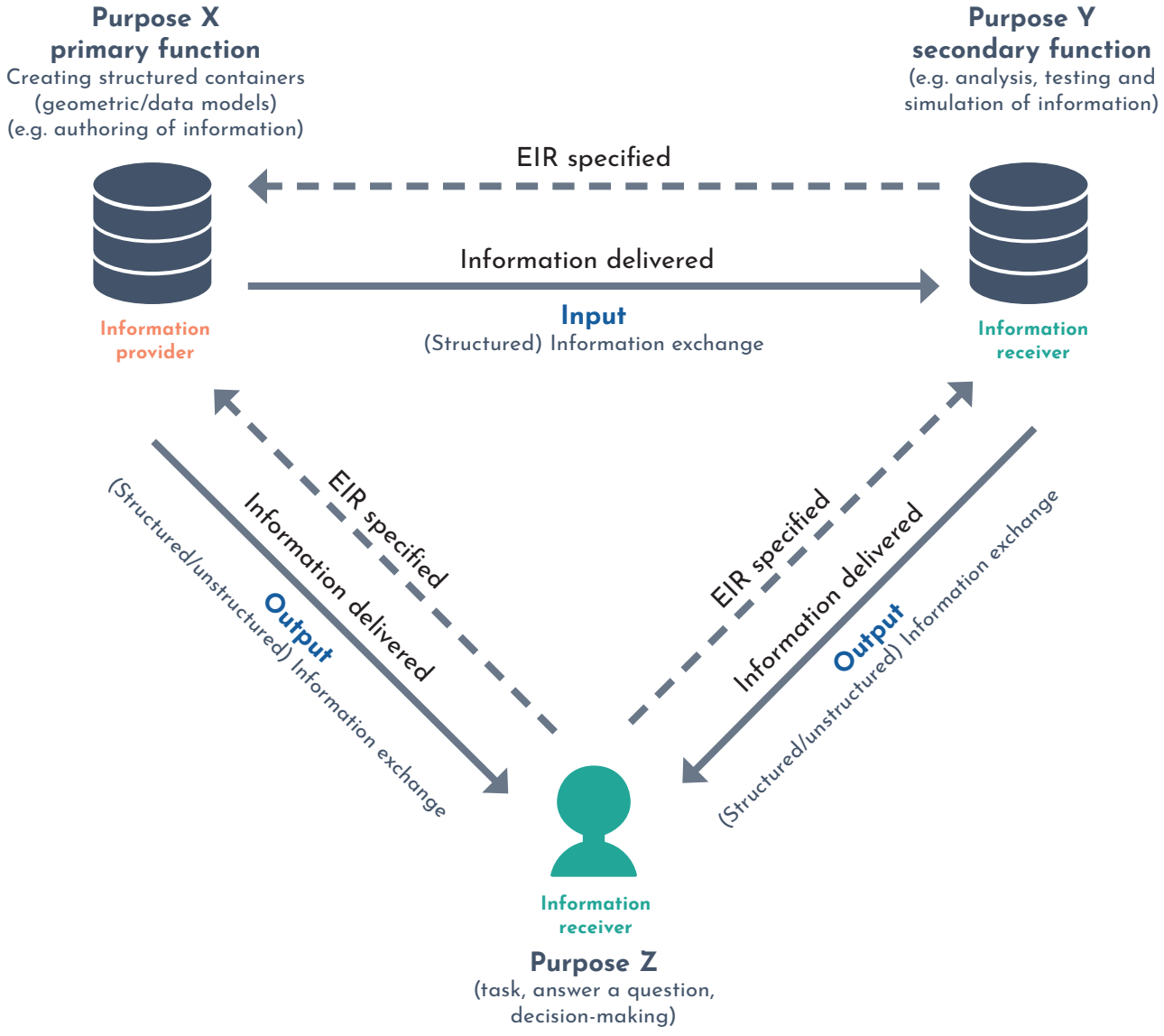

Figure 21: Exchange information requirements between software applications and people

Unfortunately marketing language has moved people away from defining actual information requirements to using the terms 4D, 5D, 6D, etc. This does not help to define what these purposes are. These are just umbrella terms which have very little meaning from an information perspective. Those defining requirements should always detail what is required to a point that allows useful information to be provided.

Applying this to the chain of purposes we can start to see how structuring information is applied to a project. Figure 22 is set within the collaborative production of information activity (ISO 19650-2 clause 5.6), which is based on repetitive cyclical workflows and generally follows a pattern of authoring, analyzing and decision-making which then feeds back into the authoring process.

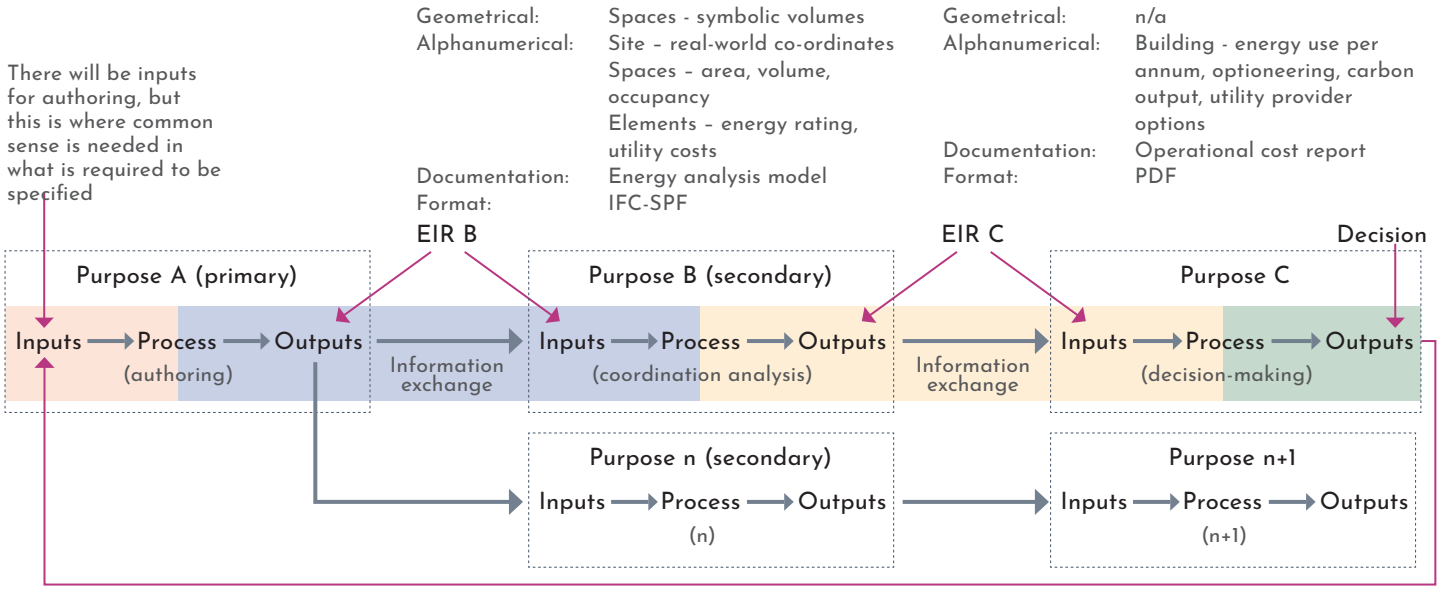

Figure 22: Purpose and EIR applied to a delivery context

Definition of information

To define the precise information needed it must be broken down into its constituent parts. Depending on purposes, this will likely be a mixture of structured and unstructured information.

In section 3.2.4.2 the idea of information facets was introduced as a way of describing how both structured and unstructured information could be broken down across content, form and format. Different combinations of describing these facets contribute to the EIR.

For example, a main contractor needs information to undertake the rationalized purpose of cost. The information they require will be produced using a mixture of processes supported by technologies. This is likely to call upon forms of information including:

- Geometrical models (3D)
- Drawings.

The cost reporting technology import requires information in an open standard, and therefore the information is required in IFC-SPF and PDF format, respectively.

However, this is only part of the requirement, as the content also needs to be specified at an overall summary and breakdown level. At the summary level the model view definition is specified, as well as requiring general arrangement information. The breakdown of the content is the complex part but to simplify, this content can be broken down into geometrical and alphanumerical information across different objects.

To define all this in a more formal manner the level of information need framework should be used as referenced in ISO 19650-1 clause 11.2 and detailed further in section 4 of this guidance. Level of information need is also covered in ISO 19650-2 clauses 5.2.1 b) and 5.4.3 b).

The level of information need provides one of the building blocks of the EIR.

As a result of the complexity of defining information requirements, it is imperative that a consistent breakdown structure is created by selecting a suitable schema and classification system across all the different:

- Objects (asset types/elements) (from a pump to an entire facility)
- Attributes and properties
- Information containers

Regardless of how information is delivered there must be correct and consistent referencing throughout all information containers. Therefore, the project's information standard in part will help form the composition of EIR, and any other parts should be read in conjunction with the EIR.

There will be many purposes that overlap in terms of their information requirements. It is important to ensure consistency and considering the EIRs holistically as one overall information resource is helpful. For example, in one purpose the property OccupancyMax could be required. But the same data deliverable could be required in another purpose as MaxOccupancy. Rationalizing this will increase efficiency (see figure 23).

There is, however, another important aspect to consider: all of these requirements are interlinked; properties reside in objects and objects reside in information containers.

Therefore, using more structured methods to define and communicate these requirements, for example, in linked tables such as spreadsheets, or even better, a database, will ensure that these relationships are maintained. This reduces the risk of duplication and contradiction and makes EIR easier to define.

Following industry standards such as ISO 16739-1:2018[4](and the sub schema of BS 1192-4:2014 [5]) allows appointing parties and delivery teams to set up methods that can be used across different purposes and multiple projects.

Conversely, departing from these standards means that delivery teams have to respond to wide-ranging and diverse approaches. This introduces inefficiencies, taking more time and resources and potentially introducing risk. It also prevents development of open sharable information across the whole life of the asset.

In summary, and as explained in section 3.2.3.2 of this guidance, you should only specify information for the purposes needed. We have talked about building up the EIR by purpose, but the final EIR outputs should be filtered by appointments (an appointment may contain multiple purposes). An EIR that is not appointment-specific will undermine the appointment/contract. It will also overload information providers by requiring them to generate and/or deliver information that is either unnecessary, or which duplicates/ contradicts information from other information providers.

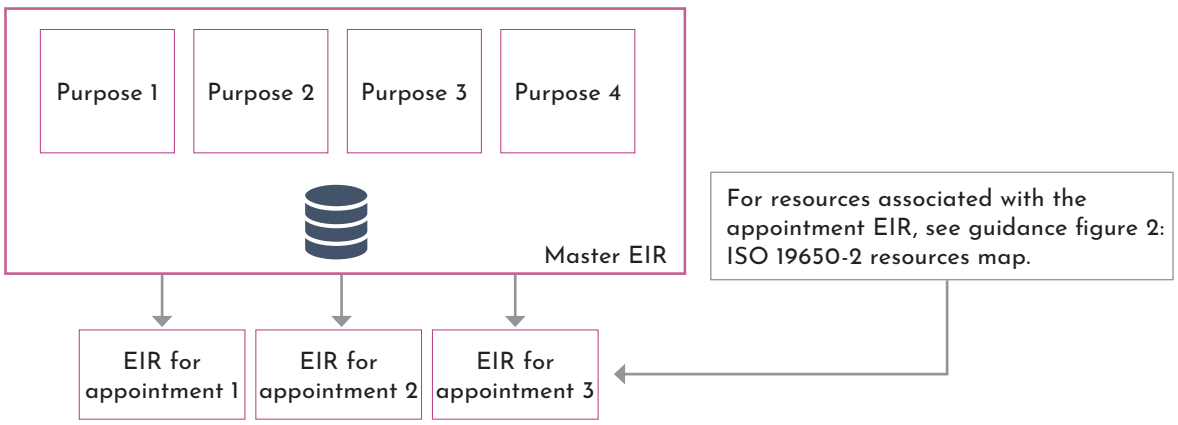

Figure 23: Formation of EIR

3.4.4.5 When is the information exchanged to meet the EIR?

Dates for information exchange are covered in ISO 19650-2 clauses 5.2.1 e) and 5.4.3 d).

The information exchange is completed when the information receiver accepts the information.

For an appointing party, the information delivery milestones are defined relative to the key decision points (see section 3.4.2.5). In this section it was assumed that the information exchange dates coincided with the information delivery milestones. In practice, the actual dates of the exchange need to be specified when defining the EIR, and there may be multiple dates for each information delivery milestone.

These dates signify when the information is to be submitted by the information provider into the CDE workflow. There will be a period of time between the information being submitted and it being accepted to allow for the governance process defined in ISO 19650-2 clause 5.7.4, and this will need to be factored in - see figure 24.

For lead appointed parties, their own governance processes must also be considered when setting dates (see ISO 19650-2 clause 5.7.2). Information exchanges for the lead appointed party should be defined around:

- Information required for secondary structured information purposes, for example, coordination analysis
- Information required for certain other purposes, for example, planning or work packages.

Ideally, specific dates should be defined, but if this is not realistic a time period relative to the information delivery milestones could be sufficient instead.

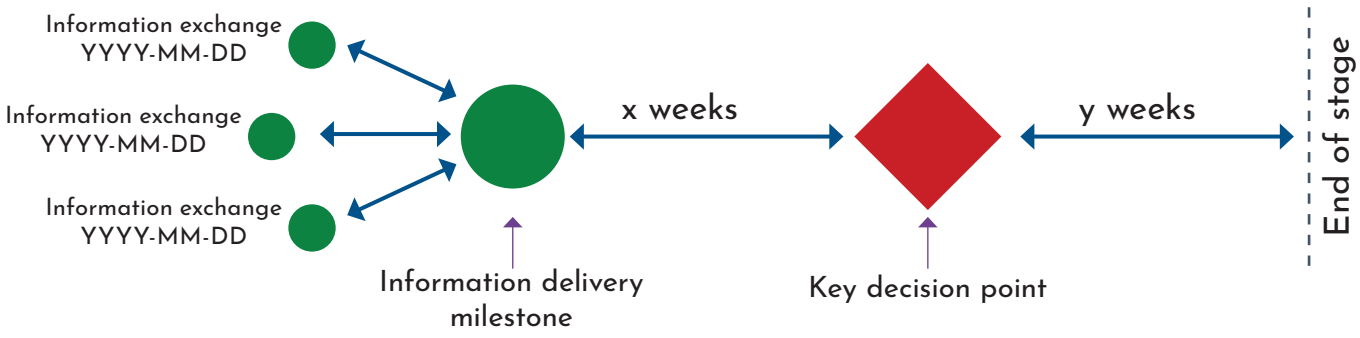

Figure 24: Key decision points, information delivery milestones and information exchanges

3.4.4.6 Additional information for clauses 19650-2 5.2.1 and 5.4.3

Acceptance criteria

Acceptance criteria are covered in ISO 19650-2 clauses 5.2.1 c) and 5.4.3 c). Where structured information has been specified, these acceptance criteria can be turned into automated rules, which can check the information.

There are four resources that provide project-wide rules to govern how the information requirements are defined, delivered and checked:

1. The project's information standard
2. The project's information production methods and procedures
3. Reference information
4. Shared resources.

These resources are referred to in ISO 19650-2 clauses 5.1.4, 5.1.5, 5.1.6.

These rules create a baseline for the acceptance criteria and ensure that the information delivered matches the original requirements before the information is then used by the appointing party or lead appointed party. In addition to the obvious rule that the required information has been delivered, other rules include that:

- The information is correctly constructed (for example, follows correct conventions/syntax, uses the correct case, is spelt correctly and the delimiters are correct)
- The metadata is correct (for example, value type and units)
- Any definition for a value, either precisely or by a range, is satisfied.

The robustness of these rules is dependent upon:

- Nomenclature (how things should be named)
- Industry standards/conventions
- Schemas
- Classification
- Dictionaries
- Metadata.

Tip: To support delivery teams in generating acceptable information it may be helpful to provide examples of what is expected.

Supporting information

Supporting information is covered in ISO 19650-2 clauses 5.2.1 d) and 5.4.3 e).

Supporting information should be provided to aid understanding of the contents of the EIR and the acceptance criteria. The more specific the detail that is made available to those tendering, the more chance they have of understanding exactly what needs to be delivered and will be accepted. For example, it is not helpful to copy and paste blocks of text from standards or other external references, when specific insight would be better.

3.4.5 Next steps

Once they are defined, the PIR become the high-level purposes which provide the basis for the more detailed EIR. This is where the project information needs are broken down to appointment level and combined with any project relevant AIR.

Figure 25 shows the relationship between the four types of information requirements in relation to the overall breakdown.

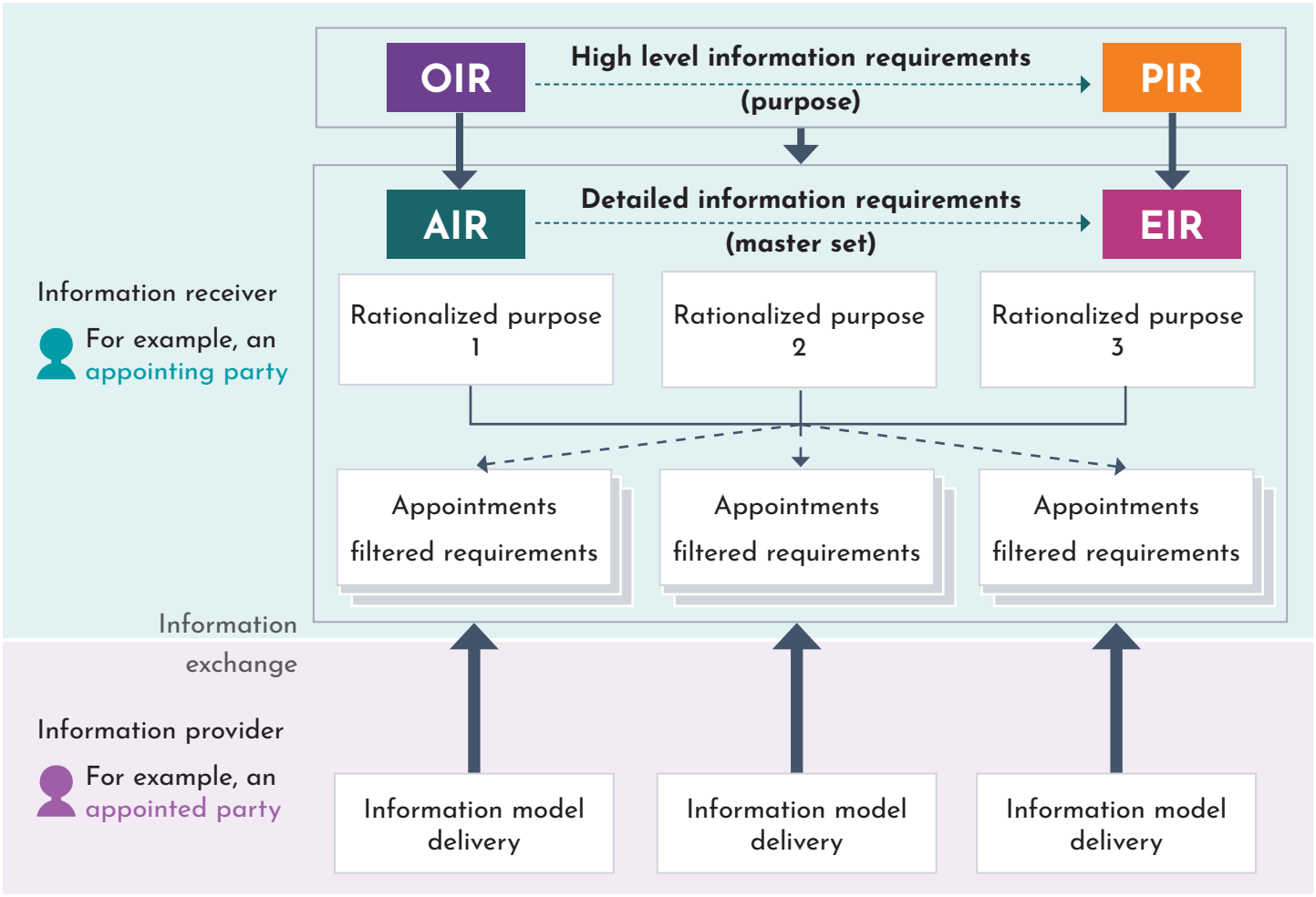

Figure 25: The four types of information requirements in the context of the breakdown of information requirements

3.5 Conclusion

Information requirements should always be based on purposes and defined in sufficient detail to enable each purpose to be effectively actioned. Collectively information requirements tell a story which precisely covers all the information required. When defining information requirements ask yourself "If I had to provide this information would I know what I had to deliver?"

Figure 26 amplifies part of figure 2 from ISO 19650-1 clause 5.1. It shows in more detail how the four different information requirements relate to one another.

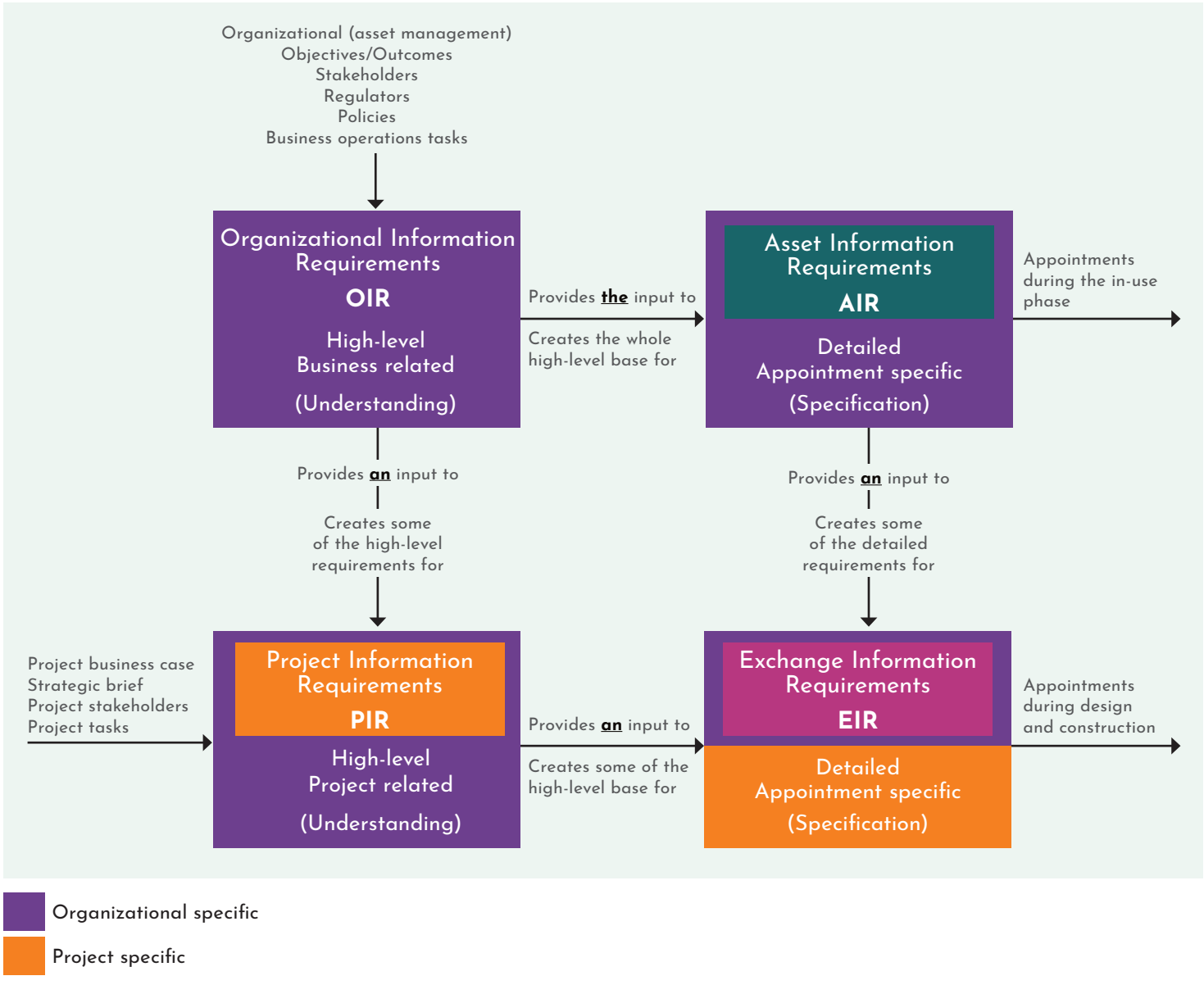

Figure 26: Hierarchy of information requirements extended

Information is needed throughout an asset's lifecycle. Although historically, the built environment sector has tended to concentrate on design and construction projects it is the in-use phase where information requirements are being used long-term and the AIM is updated (see figure 27). This must be rectified, and is addressed repeatedly in the ISO 19650 series.

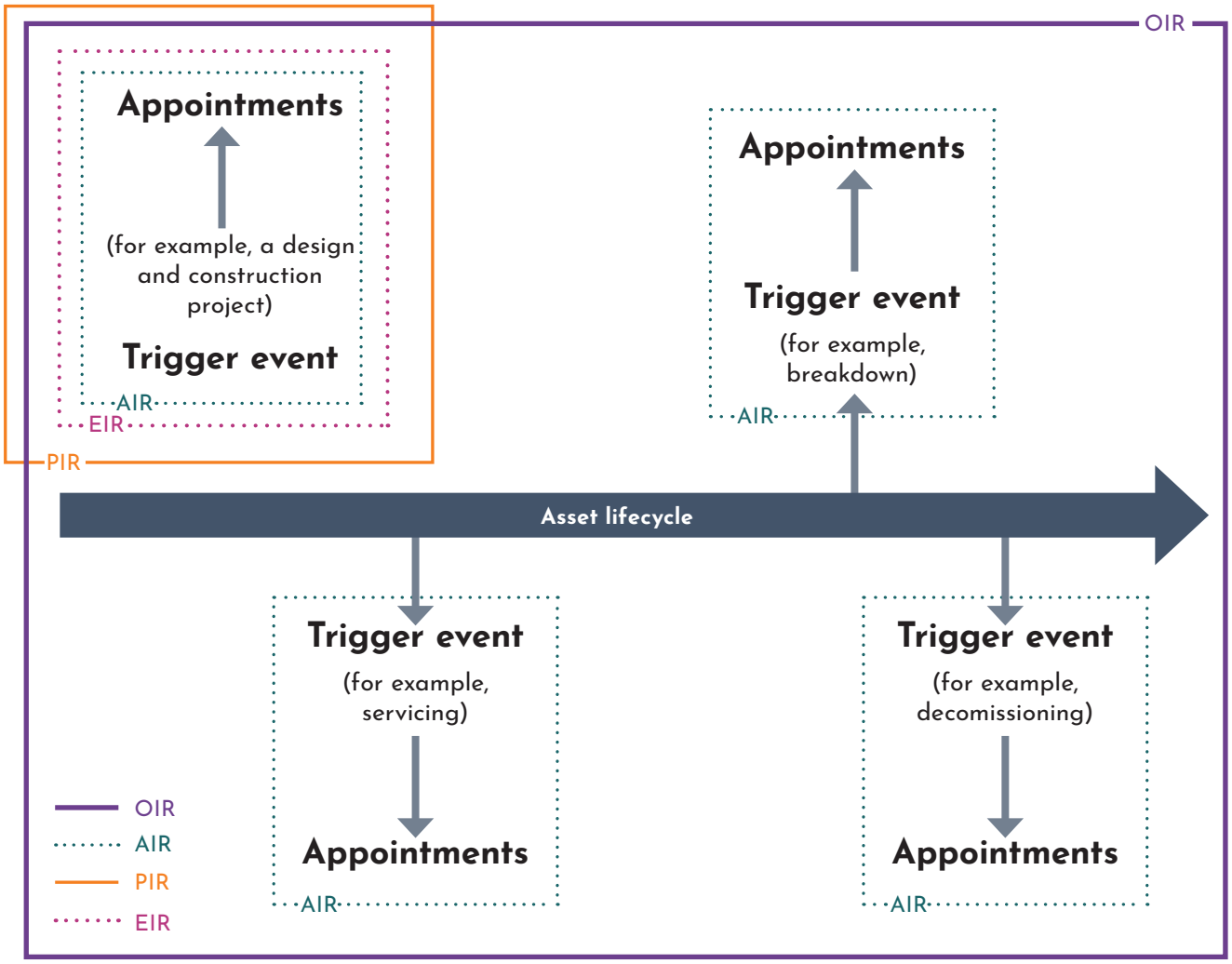

Figure 27: The dominance of the OIR and AIR throughout an asset's life

3.6 Checklist of actions/key points to consider

Information requirements are made up of two parts:

1. Why information is required (purpose)
2. What information is required.

✓ Purposes do not have to be shared with anyone outside the organization, they are simply a mechanism to allow the correct information requirements to be defined.

✓ There will be times when purposes are unknown. In this scenario, deal with those purposes which are known and make it clear in the information requirements that there could be others.

✓ The appointing party should only define information requirements for their own purposes and to their necessary level of information need, not encroaching on the remit of a delivery team. For example, specifying delivery software when there is no purpose in doing so.

✓ Purposes can also be in the form of questions which aid the definition of key performance indicators (KPIs) which are themselves information requirements.

✓ Do not include details in information requirements which should be in other information resources such as the information standard.

✓ Information is a broad term and can mean different things to different people. In this guidance, information is made up of four main facets but not all these need to be identified to define information effectively.

✓ Information requirements are important in the tendering process of all appointed parties (for example, consultants and contractors), to procure the appropriate delivery teams. Detailed information requirements should be developed in conjunction with other tender information prior to any appointments being tendered.

✓ The ISO 19650 series predominantly deals with the information requirements of an appointing party downwards. However, information requirements can exist in the opposite direction and between task/delivery teams, in fact every party within a project is likely to have them.

✓ Information requirements are particularly helpful to identify requirements which need to be emphasized. While they should include all the information the receiver is expecting, it is not helpful if the extensive listing of obvious requirements masks those that are particularly needed. Where it is possible to reference a generic group of information – set either by industry practice/standards or organizational procedures, to meet an information requirement this should be done. Some common sense is needed.

✓ People undertaking the information management function should have the appropriate skills to understand the different facets of information and to be able to break information requirements down correctly using standard schemas and classification systems.

✓ Information requirements have to be precisely defined; statements such as "Information requirements are to reflect the "UK BIM Framework" (or even the outdated term "BIM Level 2"), are not a means of specifying information requirements.

4.0 About the level of information need

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Mace

4.1 Introduction

Level of information need is a framework for defining the quality, quantity and granularity of information, as explained for the first time in ISO 19650-1 clause 11.2.

Historically in the UK, level of definition was the term used to refer to the aggregate of level of detail and level of information. In practice it has been found that understanding of the concepts and principles for defining information requires a clearer framework. This was the motivation for introducing the level of information need framework in the ISO 19650 series.

Note that, as stated in section 6.5.1 of ISO 19650 Concepts and Principles Guidance "level of information need" should not be abbreviated.

4.2 What is level of information need?

The level of information need is a framework to define the quality, quantity and granularity of information requirements.

The level of information need is used to communicate clearly the degree of information required according to its purpose; no more and no less.

The level of information need framework helps to define the minimum information requirements with respect to each purpose. Any additional information is considered waste and should not be defined by the appointing party, nor provided by any appointed party, as referred to in section 3.2.3.2.

The "over definition" or "under definition" of information requirements are both considered risky, as they do not support the efficient generation and use of information.

If we look at figure 13 in section 3.2.2 again, it is the level of information need framework that allows first the information receiver (appointing party or lead appointed party) to define the different "shapes" and "sizes" of the information deliverables in a standardized way. Using the level of information need, the information receiver can define the quality (green or purple circles, blue or pink triangles), quantity (two triangles and three circles) and granularity (small or big circles) of information.

Then the same framework should be used by the information provider (appointed party) as a reference/skeleton to provide the values to satisfy the information requirements, and therefore to produce information deliverables.

Thanks to the use of level of information need framework on both sides, the delivered information is structured in a consistent way to enable automated checking (as stated in section 3.2.4.2).

Different purposes might require different information deliverables; therefore, the level of information need should be different.

Defining the level of information need without a clear purpose is not in line with ISO 19650-1.

At the same delivery milestone, an information container should be the result of one or multiple information requirements defined for each purpose using the level of information need framework.

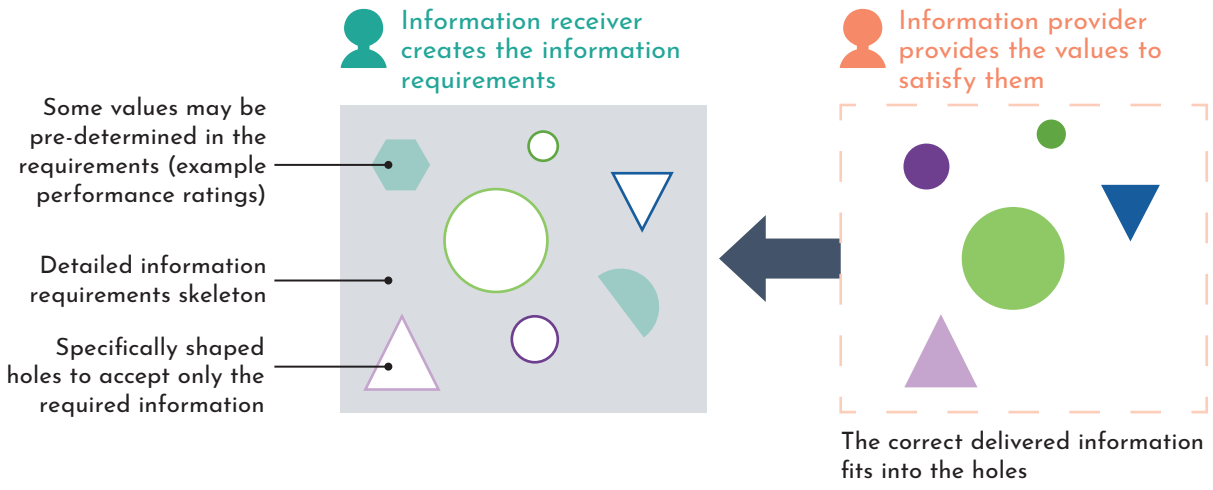

Figure 28: Information requirements skeleton (figure 13 guidance section 3.2.2)

4.3 Why is the level of information need framework important?

The level of information need framework is fundamental to enabling the successful information exchange of every information deliverable (as seen in section 3.2.3). But in practice, most of the time the information need is not defined at all, or it is too generic. It is therefore open to interpretation and difficult to check automatically.

As noted in section 4.1, the concept of "level of definition" was established in the UK as an aggregate of the "level of detail" and "level of information" for information deliverables. Metrics were set (from 1 to 7) and those numbers were used to indicate the geometrical representation and the alphanumerical requirements. But those metrics were too generic and could not be used to automatically check if information deliverables fulfilled the appointing party's needs in terms of quality, quantity and granularity. In addition, the definitions of those metrics were dissociated from the purpose of the information, contributing to poor information management and under/overproduction of deliverables.

For example, there are instances where the "level of information" of an air terminal during the construction phase of a project has been defined using the metric "4", without specifying for which purpose(s) the object will be used, or the associated alphanumerical information required (sound frequency, sound pressure, name of manufacturer). Thus, the metric "4" does not enable automated checking rules to be established and is open to interpretation, leading to increased risks for the project.

If the level of information need framework is not used, different parties will continue to specify poor information requirements, and this will increase project risks and wasteful production of information.

4.4 Who defines the level of information need?

The appointing party (client) defines the level of information need of each information deliverable.

Not all appointing parties will have the skills to define the level of information need framework in detail. In this case, the appointing party is required to define at least the purpose for which the information is needed.

ISO 19650-1 allows for an inexperienced appointing party to seek assistance with completing its information management activities. This could be from one of the prospective lead appointed parties or from an independent third party (see examples 3, 4, 5 in section 4.5) being careful not to create conflicts of interest.

For example, an asset owner might have to provide the quantity of embodied carbon of their asset to the building authority, but they do not have the skills to define in detail the level of information need required to fulfil this purpose. In this case, the asset owner may define the purpose "embodied carbon analysis" and they will seek assistance from the lead appointed party or an independent third party to define the level of information need required.

During design and construction, it is possible that a greater granularity is required than has been defined by the appointing party within the level of information need framework. In this instance, the lead appointed party should establish the appropriate granularity to support their work, but using the level of information need framework defined by the appointing party as a base.

4.5 When is level of information need defined?

Level of information need is defined every time an information requirement is established, either by the appointing party or the lead appointed party. This can happen at different stages throughout the life of an asset.

For example:

1. An appointing party (asset owner) can define the level of information need when defining their Asset Information Requirements (AIR)
2. An appointing party (client) can define the level of information need during a tender phase to specify the quality, quantity and granularity of information they need
3. A lead appointed party (designer) can define the level of information need during the preliminary design phase to define what is needed to perform accessibility analysis
4. A lead appointed party (main contractor) can define the level of information need during the construction phase to define what information is needed to perform health and safety analysis on site
5. A lead appointed party (specialist manufacturer for a heritage project) can define the level of information need during the production phase to define what is needed to 3D print a replacement component.

It is possible that the level of information need is defined by the same appointing party with a different granularity of information as the project progresses, decisions are made, and more information becomes available. But, it is vital that the whole definition of level of information need is made at the beginning of each appointment and it is not unnecessarily changed or developed part-way through.

For example, at the feasibility stage of a project, a quantity surveyor might require just the number of occupants to produce an order of cost estimate of a building typology (a school). At detailed design, instead, the quantity surveyor might require the gross internal floor area to perform more detailed cost planning.

4.6 How to define the level of information need?

The level of information need is a framework for defining information across the facets (purpose, content, form and format) described in section 3.2.4.2 of this guidance.

Information should be defined across the following three sub-divisions, as illustrated also in figure 11 of ISO 19650-1 for the Project Information Model (PIM) and the Asset Information Model (AIM):

1. Geometrical information
2. Alphanumerical information
3. Documentation.

Each sub-division of level of information need is defined in detail in the European standard EN17412-1. This standard is currently under publication and it should be available by Q4 2020.

In the meantime, an appointing party should specify their information requirements using the level of information need framework defining:

1. The purpose why information is needed

And then, if the aspect is applicable:

2. The Geometrical information to fulfil the purpose
3. The Alphanumerical information to fulfil the purpose
4. The Documentation to fulfil the purpose

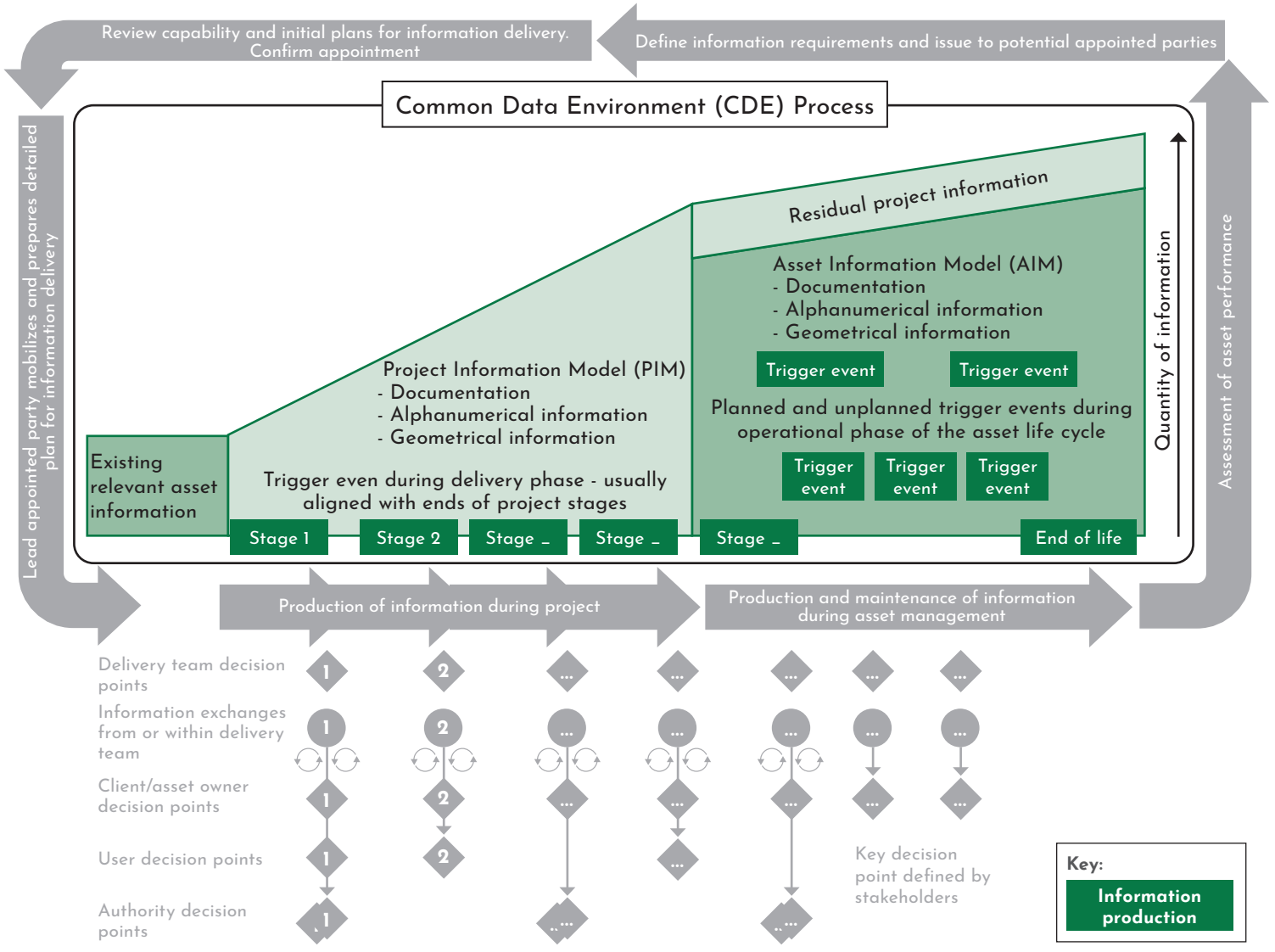

Figure 29: Overview and illustration of the information management process (ISO 19650-1 figure 11)

4.7 Where is the level of information need defined?

The level of information need framework is defined in the project's information standard, where its method of assignment is considered (see ISO 19650-2 clause 5.1.4 c).

In addition, the level of information need framework is used to communicate information requirements in the exchange information requirements (see ISO 19650-2 5.2.1 b) and section 3.4.4.4).

Finally, the level of information need framework is also used in task information delivery plans to record what is being done (see ISO 19650-2 clause 5.4.4) and section 6.4.3.3)

5.0 About the BIM execution plan

Author: Jack Dearlove
ISG

5.1 Introduction

To satisfy the requirements of ISO 19650-2, a BIM execution plan (BEP) must be provided by a prospective lead appointed party in their tender response (see ISO 19650-2 clause 5.3.2). In accordance with ISO 19650-2 the BEP is one of several resources developed by the lead appointed party on behalf of the delivery team to convey the information management approach.

Delivery team capability and capacity, mobilization planning, risk assessment and information delivery planning are dealt with as separate resources. How all this information is presented to the appointing party is up to the lead appointed party, unless the appointing party has given any firm instructions.

The resulting BEP is a succinct resource which is supplemented by additional resources to be used by the prospective delivery team if appointed.

Readers familiar with PAS 1192-2 will understand that the BEP under that standard was a single document that included all resources mentioned above.

5.2 Purposes of the BIM execution plan

The BEP has two different purposes in supporting the tender, appointment and information delivery activities:

1. To provide **evidence** to the appointing party that the prospective delivery team can manage project information in line with any information requirements provided to them. This is referred to in ISO 19650-2 as the "(pre-appointment) BEP"
2. To provide a **delivery tool** that the appointed delivery team will use to produce, manage and exchange project information during the appointment alongside other resources.

Consequently, although there is only one BEP for each delivery team there may be two early versions of it. The first version being the (pre-appointment) BEP and the second version offering an update so that it can fulfil its purposes as an appointment resource and one of the delivery team's tools for information management.

5.3 Commencing the development of a BIM execution plan

In developing the (pre-appointment) BEP, the prospective lead appointed party should be aware of three different scenarios:

1. A template is provided by the appointing party as a shared resource, see ISO 19650-2 clause 5.1.6 b) to support the tender and appointment process
2. There is no template BEP provided but the appointing party indicates the contents required to support its evaluation criteria see ISO 19650-2 clause 5.2.3
3. The appointing party is silent concerning the BEP and therefore the prospective lead appointed party has to respond with a (pre-appointment) BEP in accordance with ISO 19650-2 clause 5.3.2.

The appointing party may choose to adopt scenario 1 or 2 so that they can better assess and compare prospective delivery teams' proposals.

It is recognized that the scenario may exist where the appointing party does not issue exchange information requirements (EIR) or other information management resources thereby contravening ISO 19650. In this scenario it is advised that the prospective lead appointed party considers developing a BEP which anticipates the EIR (or other information management resources) to support a positive outcome for the project and appointing party.

It should be emphasized to the appointing party that in doing so the project is not following ISO 19650 and that action should be taken to resolve this in collaboration with the delivery team.

5.3.1 (Pre-appointment) BEP process

A simplified illustration of the (pre-appointment) BEP is included as part of figure 30:

Figure 30: Simplified process leading up to the (pre-appointment) BIM execution plan

Refer to the ISO 19650-2 resources map for the overall perspective.

Note: The same lead appointed party may be appointed multiple times throughout the life of a project (for example, in a 2-stage design and build scenario or where a single organization is appointed for differing scopes of services). In any of these scenarios, the (pre-appointment) BEP activity will be repeated but this should be proportionate to the changes necessary to reflect the different nature of the appointments.

5.3.2 Format of the (pre-appointment) BEP

ISO 19650-2 is not prescriptive about the format of the BEP and therefore it could take the form of, for example, a single word-based document or an interactive tool. The same document or tool could include several other tender response resources alongside the (pre-appointment) BEP.

The format of the BEP may be pre-determined by the appointing party. This may come in the form of a template which would be an example of a shared resource (ISO 19650-2 5.1.6) or as a list of headings to structure the BEP.

If no requirement has been set by the appointing party, then it is up to the prospective lead appointed party to determine the format of the BEP, ideally in collaboration with their delivery team.

5.3.3 Contents of the (pre-appointment) BEP

ISO 19650-2 recommends the contents of the (pre-appointment) BEP in clause 5.3.2 and sets out the key considerations in establishing the delivery team's BEP. This is done using the term 'shall consider'. This is in contrast to ISO 19650-2 clause 5.4.1 which stipulates the contents of the BEP contained in the appointment itself using the instruction in 'shall'.

ISO 19650-2 clause 5.3.2 recommends that the (pre-appointment) BEP covers seven different key information management considerations. These are as follows:

A) Provide the details of individuals undertaking the information management function. This is to provide assurance that the function will be fulfilled through adequately competent people. It also encourages the early consideration as to how this function will be resourced.

B) Proposed information delivery strategy. ISO 19650-2 Clause 5.3.2 b) sets out what this should contain:

- The approach to meeting the EIR.
  - The prospective lead appointed party should consider and work through each information requirement and respond to the level of information need, acceptance criteria and delivery dates set by the appointing party in accordance with ISO 19650-2 clause 5.2.1
- Objectives and goals to produce collaborative information.
- Organizational structure and commercial relationships of the delivery team.
- The split of the delivery team into task teams.
  - The relationship between appointed parties and task teams might be a straightforward one-to-one, or might be more complicated (multiple appointed parties forming a multi-disciplinary task team, or one appointed party providing several task teams) refer to figure 1.

C) The proposed federation strategy to be adopted by the delivery team. See Guidance Part 1: Concepts section 6.3.1 for details.

D) The delivery team's high-level responsibility matrix.

This matrix will list all appropriate elements within the information model and stipulate a responsible party and the deliverable required for each element. For example, an element of the information model might be the cost model, the deliverables associated with this element would be order of cost estimates and cost plans and the responsible party would be the prospective quantity surveyor.

E) Proposed adds/amends to project's information production methods and procedures (if there are any).

The (pre-appointment) BEP gives an opportunity for the delivery team to propose any additional methods and procedures that they require or would recommend over and above what is specified by the appointing party.

For example, the appointing party may not have considered information production methods and procedures for the capture and delivery of existing asset information for a refurbishment project. The (pre-appointment) BEP may set out proposed methods for this including security protocols.

F) Proposed adds/amends to project's information standard (if there are any).

The (pre-appointment) BEP gives an opportunity for the delivery team to propose any addition to the information standard that they require or would recommend over and above what is specified by the appointing party.

This could, for example, be a room and space referencing system.

G) Proposed schedule of software, hardware and IT infrastructure.

For example identifying a schedule listing the software versions, hardware and IT to be used by the delivery team. This is important to enable collaboration and interaction between the task teams, delivery teams and the appointing party. This is a fundamental consideration for wider interoperability.

5.4 The delivery team's BIM execution plan

In the process of finalizing the appointment for the lead appointed party, the (pre-appointment) BEP is revisited and updated as required. This might involve the review of how the content is presented relating to the project's information standard, the project's information production methods and procedures and the proposed federation strategy.

Any agreed alterations to the project's information standard should now be reflected in that project wide resource. The federation strategy should be aligned with the agreed project's information production methods and procedures and developed as necessary, to ensure it supports production of the detailed responsibility matrix and master information delivery plan.

There may be other delivery team information production methods and procedures which are consistent with but go beyond the project wide information production methods and procedures which need to be set out in the delivery team's BEP.

The BEP should be updated to confirm:

- The responsibility and the names of individuals who will undertake the information management function
- The schedule of software, hardware and IT infrastructure that the delivery team will use
- The delivery team's information delivery strategy (as required)
- The delivery team's high-level responsibility matrix (as required).

Note that these changes may be necessary for several reasons, such as time elapsed to complete the tendering process or contract type, or changes to the arrangement of task teams in the delivery team, or changes to the appointed parties.

This delivery team's BEP must be confirmed between:

- The appointing party and the lead appointed party (ISO 19650-2 clause 5.4.6), and
- The lead appointed party and each of the appointed parties (ISO 19650-2 clause 5.4.7).

As the BEP is a formal appointment resource it will need to be subject to a change management process throughout the duration of the appointment. For example, as more appointed parties join the delivery team.

See the ISO 19650-2 resources map to assist in the development of the structure of a BEP.

5.5 Checklist of actions/key points to consider

- ✓ The BEP is developed by the lead appointed party on behalf of its delivery team and ideally in collaboration with its delivery team.
- ✓ If you are a lead appointed party, develop the (pre-appointment) BEP as part of your tender response.
- ✓ If you are a (prospective) appointed party brought on board during the lead appointed party's tender period, contribute your ideas and knowledge to the development of the (pre-appointment) BEP.
- ✓ Consider the points a) to g) in ISO 19650-2 clause 5.3.2. Additional considerations for your BEP can be included – these might be stipulated by the appointing party, the nature of the project or by your own corporate policies and procedures.
- ✓ Review and confirm the BEP during the period between your appointment being indicated by the appointing party and the contract being signed.
- ✓ Keep your delivery team's BEP up to date throughout your appointment, using change management processes. 6.1 Introduction

Planning the delivery of information on projects is essential as every task on a project is supported by some form of information. Before any planning can take place, there must be clear information requirements to begin with so that all variables can be considered.

ISO 19650 Part 1 illustrates this defining of requirements and delivery planning process using a simple diagram shown in figure 31 below.

The ISO 19650 series demonstrates that the planning of information delivery, becomes the responsibility of each lead appointed party and appointed party (see ISO 19650 -1 clause 10.1 and ISO 19650-2 clause 5.4). This is noted as the second process step in figure 30 and comes after requirements have been defined

The output from an information delivery planning exercise for each appointed party is the production of a task information delivery plan (TIDP). This is because each appointed party has tasks to perform which must be reflected in the TIDP for each task team (see ISO 19650-2 clause 5.4.4). To understand the relationship between appointed parties and task teams, refer to guidance section 1.4. The lead appointed party, who manages the delivery of information across their delivery team must coordinate and compile each of the TIDPs into a master information delivery plan (MIDP).

The following section describes the information delivery planning process in more detail, including the TIDP and MIDP outputs, to give you a better understanding of its purpose and benefits. Information about responsibility matrices will be provided in edition five of this guidance.

6.0 About information delivery planning

Author: John Ford
Galliford Try

6.1 Introduction

Planning the delivery of information on projects is essential, as every task on a project is supported by some form of information. Before any planning can take place, there must be clear information requirements to begin with so that all variables can be considered.

ISO 19650 Part 1 illustrates this defining of requirements and delivery planning process using a simple diagram shown in figure 31 below.

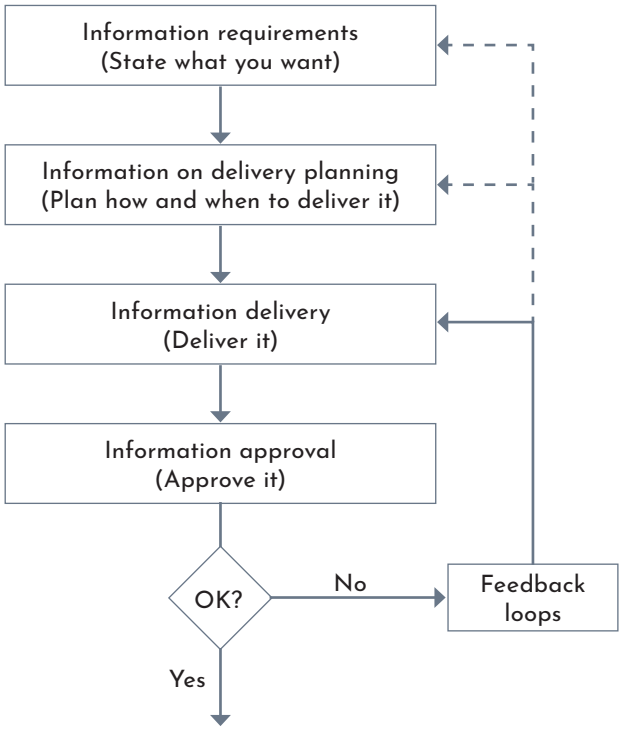

Figure 31: Information delivery process (ISO 19650-1 figure 4)

The ISO 19650 series demonstrates that the planning of information delivery becomes the responsibility of each lead appointed party and appointed party (see ISO 19650 -1 clause 10.1 and ISO 19650-2 clause 5.4). This is noted as the second process step in figure 31 above and comes after requirements have been defined.

The output from an information delivery planning exercise for each appointed party is the production of a task information delivery plan (TIDP). This is because each appointed party has tasks to perform, which must be reflected in the TIDP for each task team (see ISO 19650-2 clause 5.4.4). To understand the relationship between appointed parties and task teams, refer to guidance section 1.4. The lead appointed party, who manages the delivery of information across their delivery team, must coordinate and compile each of the TIDPs into a master information delivery plan (MIDP).

The following section describes the information delivery planning process in more detail, including the TIDP and MIDP outputs, to give you a better understanding of its purpose and benefits. Information about responsibility matrices will be provided in edition five of this guidance.

6.2 Background context

It is important to remember that projects have always needed to understand what information is required from members of the project team so that tasks can be completed. The information delivery planning process and the outputs often take the form of tangible plans; they are nothing new.

Did you know the use of co-ordinated project information being a contractual requirement was a recommendation of the 1994 report, Constructing the Team, by Sir Michael Latham? This requirement was included in the form of the information release schedule, in the JCT 1998 Design and Build form of construction contract.[6]

The information release schedule has many of the characteristics of the TIDP and MIDP outputs, as defined in ISO 19650-2. Table 14 is an example of an information release schedule - an early form of information delivery plan. You will note that the schedule defines:

- The name of the information to be released/issued
- The author of the information
- The dates for when the information is to be released
- Some key milestones that also contain a note of level of information need.

Table 14: A condensed example of an information release schedule; early form of information delivery plan

Information Release Schedule				
Works Information	**Responsibility**	**Issued for Contractor Procurement**	**Issued for Client Submission**	**Issued for Construction**
Substructure				
Piling Layout Plans (1:100)	Structural Eng	06 June 2008	02 August 2008	16 August 2008
Piling Schedule	Structural Eng	06 June 2008	02 August 2008	16 August 2008
Ground Bearing Slab Plans and Details	Structural Eng	24 May 2008	02 August 2008	16 August 2008
Superstructure				
Rebar Schedule	Structural Eng	06 June 2008	09 July 2008	23 July 2008
Precast Frames	Structural Eng	06 June 2008	09 July 2008	23 July 2008
Slab and Details Level 1	Structural Eng	24 May 2008	09 July 2008	23 July 2008
Slab and Details Level 2	Structural Eng	24 May 2008	09 July 2008	23 July 2008
Slab and Details Level 3	Structural Eng	24 May 2008	09 July 2008	23 July 2008
Slab and Details Level 4	Structural Eng	24 May 2008	09 July 2008	23 July 2008
Stair Lift Core 1	Structural Eng	15 April 2008	02 July 2008	16 July 2008
Stair Lift Core 2	Structural Eng	15 April 2008	02 July 2008	16 July 2008
Site				
Site Location Plan	Architect	14 January 2008	21 January 2008	04 February 2008
Existing Site Plan	Architect	14 January 2008	21 January 2008	04 February 2008
Proposed Site Plan	Architect	14 January 2008	21 January 2008	04 February 2008

6 If you want to understand more about this, useful references include: The Latham Report 1994 – "Constructing the Team"; "Contractual procedures in the construction industry" by Allan Ashworth - 4th edition 2001; "Improving Design Management in the Building Industry" by A. N. Baldwin, S. A. Austin, M. A. P. Murray 1998 and the "Design Manager's Handbook" by John Eynon 2013.

6.3 Modern ISO 19650 approach

From the UK's perspective, the ISO 19650 series builds on the concept of the information release schedule by providing consistency of approach and terminology for information delivery planning. Specifically, ISO 19650-2 identifies:

- When the information delivery planning process should start
- Who is involved, and
- What outputs are expected.

The two primary outputs of the information delivery planning process for each delivery team are a set of TIDPs and their corresponding MIDP. The ISO 19650 series also states a minimum requirement for these outputs to ensure the points listed above are included consistently in each plan.

6.4 Task information delivery plan (TIDP)

6.4.1 Expectation

ISO 19650-2 clause 5.4.4 states that every team responsible for a task (a task team) must produce a delivery plan for the information relating to their respective works. This plan is referred to as the TIDP. Clause 5.4.4 also defines what the task team must consider when developing their TIDP. Considerations include the information requirements assigned to them, their defined responsibilities and timescales.

According to clause 5.4.4, the TIDP must then schedule out an agreed list of information containers to be delivered, identifying for each one its:

- Name and title
- Predecessors or dependencies
- Level of information need
- Estimated time required for production
- Author
- Delivery milestones.

6.4.2 Format

6.4.2.1 Form and function

ISO 19650-2 does not mandate a template approach for presentation of TIDPs. It is left open to the delivery team to define how the TIDPs are developed to enable them to facilitate compilation of the MIDP by the lead appointed party. Furthermore, ISO 19650-2 does not identify the TIDP as a document; rather it is a resource that could be provided using various solutions such as: spreadsheets; project management programme tools; and/or other digital management tools.

It is possible to produce a TIDP collaboratively between the task team and the lead appointed party. This may be in the form of a meeting, capturing the agreed outcomes in a schedule that all parties are happy with. This can be better than simply asking a task team to produce a TIDP in isolation. Such an approach without a mutual collaborative involvement could result in a poor, non-specific delivery plan.

As noted in section 6.2, it is sensible to review traditional processes and tools like the information release schedule to build on and improve what is already established and understood by the delivery team. This can help the team's acceptance of the ISO 19650-2 process and minimize disruption, while ensuring compliance with ISO 19650-2 clause 5.4.4.

Figure 32 illustrates two approaches (a and b) for how information containers could be listed in a TIDP. The figures adopt a colour-coded key to illustrate the alignment of each aspect of the TIDPs with the ISO 19650-2 requirements noted in section 6.4.1.

Figure 32a illustrates a tabulated approach, figure 32b a Gantt chart approach. These are for illustration purposes only (reflecting just two ways to approach a TIDP), and each delivery team should develop its own approach appropriate to its appointment.

Task	Team	Date Agreed	Version
Structural Engineering	Smart Structures Ltd	1/01/20	C01

Name	Title	Potential Assigned ID	Dependant on	Level of information need (information container)			
				Form/Type	Scale	Format	Notes
Piling Layout	Piling Layout Plan 1 of 2	HC101-SSI-11-SL-DR-X-0001	Architectural Site Information	Drawing	1:100	PDF	Pile types to be noted
Piling Layout	Piling Layout Plan 2 of 2	HC101-SSI-11-SL-DR-X-0002	Architectural Site Information	Drawing	1:100	PDF	Pile types to be noted

continued...

Name	Title	Production Duration	Delivery Milestones						
		Late Dependency Risk	S3	S4	A2	A3	A4	A5	A6
Piling Layout	Piling Layout Plan 1 of 2	At least 28 days delay	1/01/20	1/02/20	1/03/20	1/04/20	1/05/20	1/06/20	1/07/20
Piling Layout	Piling Layout Plan 2 of 2	At least 28 days delay	1/01/20	1/02/20	1/03/20	1/04/20	1/05/20	1/06/20	1/07/20

Figure 32a: Tabulated approach

Name/ Title	Author	Level of information need (information container)				Week 1					Week 2					Week 3					Week 4					Week 5				
		Form/ Type	Scale	Format	Notes	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
Architectural Site Plan	Architects R Us	n/a	n/a	n/a	n/a																								
Piling Layout Plan 1 of 2	Smart Structures Ltd	Drawing	1:100	PDF	Pile types to be noted											S3										S4				
Piling Layout Plan 2 of 2	Smart Structures Ltd	Drawing	1:100	PDF	Pile types to be noted											S3										S4				

Figure 32b: Gantt chart approach

Key

A. The name and title of each container
B. Predecessors or dependencies
C. Level of information need
D. Estimated production duration
E. Responsible Information production author
F. Delivery milestones

Figure 32: Examples of inclusion of information containers in TIDPs

6.4.2.2 Format challenges

When considering an ISO 19650-2 TIDP approach, there are some challenges or common pitfalls to be considered.

ISO 19650-2 requires that the TIDP lists information containers to be generated by each task team. However, the definition of "Information container" tends to be misunderstood, and wrongly associated only with files. "Information container" is defined in ISO 19650-1 clause 3.3.12 as a "...set of information retrievable from within a file, system or application storage hierarchy." It is also noted that an information container can take the form of a sub-directory, a file or a distinct subset of a file such as a chapter, section layer or symbol.

Understanding this distinction is important because it will influence your approach to the TIDP. Two approaches are described, as follows.

TIDP approach 1: Focus on files

This approach considers information containers as files only and therefore lists the drawings, documents and other files that the task team expects to issue. Because the files are the focus, IDs are often predicted using the ISO 19650-2 National Annex clause NA.2.

File-based TIDP	
Information Container Name (File ID)	Information Container Description
HC101-SSI-ZZ-DR-A-0001	Party Wall Interface Detail
HC101-SSI-ZZ-DR-A-0002	Partition Setting Out Plan - First Floor
HC101-SSI-ZZ-DR-A-0003	Fire Strategy Layout - First Floor

Figure 33: File-based-only approach to listing information containers within a TIDP

This file-based approach is challenging because it is difficult to plan the extent of files to be generated at the outset of an appointment.

It forces a focus on the presentation of the information, not the information itself. For example, that a wall interface detail will be presented as a single drawing, without understanding either the scope or complexity of the information actually required. It is entirely possible that this interface detail has to be conveyed in several drawings to aid construction understanding. In this scenario, the TIDP would have to be updated via a change control process. This creates two issues:

1. The maintenance of unique IDs because they will need to be added, withdrawn or re-assigned
2. The volume of change control. This scenario is likely to repeat dozens, if not hundreds, of times.

Both of these create a significant administrative burden.

TIDP approach 2: Focus on information production tasks

This second approach, illustrated by figure 34, concentrates on the information needed, rather than the specific file/presentation format (it does not necessarily focus on the type of file to be produced or the number of files to be produced). It therefore does not require every predicted file to be listed and consequently will not result in changes to the TIDP if one file needs to become six, or if six need to become one.

Retrievable information within files-based TIDP	
Information Container Name	Information Container Description
All party wall interface detail	Detail of the north party wall at a scale of 1:20
Partition plan for the whole first floor	Plan defining partition types and acoustic ratings
Fire strategy for the first floor	Fire strategy defining wall and door fire ratings, equipment and escape routes

Figure 34: Non-file-based TIDP approach

This alternate approach is looser but it still acts as a clear guide of what is expected with a clear name and description. In figure 34 it is evident that a party wall interface detail must be created, but there is no definition of the presentation form it may take at this point, whether this is one or more drawings.

With both TIDP approaches, the lead appointed party has the same job to do, in that they must ensure that what they receive contains the relevant party wall detail information they expected and that they will receive it at the intended point in time.

Both TIDP approaches have their advantages and disadvantages and both should be considered (alongside others) to ensure the adopted approach is efficient and practical and retains a focus on what is needed, keeping the process as lean as possible.

6.4.3 Process

The principle purpose of the TIDP is to define clearly what each task team, and the authors within it, will produce, and when, noting that the TIDP will form part of the appointment between the lead appointed party and appointed party (see ISO 19650-2 clause 5.4.7). It is therefore important to remember that planning information deliverables is a collaborative effort.

A number of key components must be integrated into the TIDP production process, as follows:

6.4.3.1 Name and title

The name and title of an information container (which has to be stated in accordance with ISO 19650-2 clause 5.4.4) is not necessarily the same as its unique ID (ISO 19650-2 National Annex clause NA.2).

ISO 19650-2 is explicit that each planned information container must be recorded along with its name and title as part of the TIDP. The name and title should be clear so as to define what the output shall be from the task team.

6.4.3.2 Dependencies and predecessors

To agree delivery milestones and production durations, as required by ISO 19650 and as noted in section 6.4.1, the task team and lead appointed party must be aware of other dependency and predecessor information agreed with other task teams.

Figure 32 (a and b) illustrates two ways in which a dependency can be recorded in a TIDP. In figure 32a (tabulated format), the "piling task team" identified that architectural site information was required but did not note when they would receive the information. The Gantt chart example (figure 32b) also indicates a dependency on a specific architectural deliverable, but in addition shows the date it will be received. This indicates that the "piling task team" either:

- Coordinated with the lead appointed party to confirm a delivery date, or
- Highlighted via a placeholder in their programme, when they needed the information to arrive.

This shows they have allowed five days for review before sharing their first piling layout plan.

6.4.3.3 Level of information need

ISO 19650-2 clause 5.4.4 states that the TIDP must also record level of information need for each information container. The purpose of this is to define the scope of contents of the information container.

One example could be in relation to a piling layout, as illustrated in figure 32b, whereby the pile types are a mandatory prerequisite of the issue, potentially determined by the exchange information requirements (EIR) that formed part of the author's piling requirements.

Another example could be in reference to a door schedule, whereby the author defines the scope of the door schedule key contents at the point of issue, which may include "Fire Ratings". Another common example could be in relation to an equipment schedule used in operation and maintenance submittals. The TIDP may reference a specification that defines the contents.

The primary benefit for the task team in defining the level of information need in the TIDP is to make it clear what will and will not be included within the information container at its various milestones.

6.4.3.4 Production durations

It is important to identify information production duration in the TIDP. This is particularly relevant if there are dependencies, such as information that is needed from, or by, another task team or allowing for a review period.

6.4.3.5 Author

There are a few ways to approach the "information author" content in the TIDP.

- Depending on the organizational structure of the task team or the approach to the TIDP, it may be sufficient to define the whole authoring organization as the key author for all deliverables
- If a task team has a complex structure, for example, it has two distinct disciplines, it may be pragmatic to list the discipline leads specifically
- If the TIDP contains listed dependencies from other task teams, it may be advisable to list these under a dedicated author, as illustrated in figure 32b.

6.4.3.6 Milestones

It is important to consider all milestones when producing the TIDP. Milestones include those identified in the appointment EIR, as well as those determined by the task team. A milestone could be based on the purpose for issue such as, for comment with status S3 or when published within stage 4 with the status A4.

6.4.4 Appointment significance

ISO 19650-2 clause 5.4.7 requires that each appointed party appointment includes the relevant TIDP(s) – see guidance section 1.4. This ensures a contractual obligation to deliver the required information. Updates to the TIDP following appointment should comply with agreed change control procedures.

6.5 Master information delivery plan (MIDP)

6.5.1 Expectation

ISO 19650-2 clause 5.4.5 states that the lead appointed party shall aggregate their appointed parties' TIDPs to form the delivery team's MIDP. Clause 5.4.5 defines what the lead appointed party shall consider when developing this aggregated plan, including:

- The assigned responsibilities within the detailed responsibility matrix
- Predecessor and dependency between the task teams
- Appointing party and lead appointed party review durations.

Once the TIDPs have been aggregated, and taking the above into consideration, the lead appointed party must:

- Baseline the deliverables and dates within the MIDP
- Notify each task team of changes
- Inform the appointing party of any risks.

6.5.2 Format

ISO 19650-2 does not mandate a template approach for presentation of the delivery team`s MIDP. It is left to the lead appointed party to determine this. If the appointing party does have a specific template to be adopted, then this would take the form of a shared resource. Furthermore, ISO 19650-2 does not identify the MIDP as a document, rather, it identifies it as a resource that could be provided using various solutions such as: spreadsheets; project management programme tools; and/or other digital management tools.

As noted in section 6.2, it is sensible to review traditional processes and tools used by lead appointed parties to build on and improve what is already established and understood by the lead appointed party organization. This can help their acceptance of the ISO 19650-2 process and minimize disruption, while ensuring compliance with ISO 19650-2 clause 5.4.5.

6.5.3 Process

The principal purpose of the MIDP is to define clearly what information the delivery team expects to deliver. This should be set against a coordinated programme that takes account of predecessors, dependencies, specific responsibilities and review and sign-off durations that the lead appointed party is responsible for managing on behalf of their delivery team.

The following three actions must be performed once the TIDPs have been aggregated, as defined in ISO 19650-2, clause 5.4.5:

1. Baseline the deliverables and dates

   Projects are governed by scope and deadlines, and each information container to be delivered must be recorded according to a programme to measure the delivery team's progress and the overall performance.

   This baselined MIDP should be shared, understood and agreed by the whole delivery team so that the lead appointed party can be confident in meeting its appointment obligations.

2. TIDP feedback

   Projects are rarely static, with change being commonplace. Change may be minor, ranging from a few additional information deliverables being required, to significant change. Whenever there is a change to the scope of the lead appointed party's appointment, information deliverables and TIDPs should be reviewed. Any likely changes must be collaboratively approached to ensure that amended TIDPs are coordinated with one another and reflected in the lead appointed party`s MIDP.

3. Risk management

   ISO 19650-2 clause 5.3.6 states that a risk register must be established by the lead appointed party. Any risks that impact information delivery and information delivery milestones should be recorded in this risk register.

   Unrealistic deadlines, resource issues or even concerns outside the lead appointed party's control (for example, milestones that the lead appointed party and their delivery team cannot meet without reference information from the appointing party) should be considered and reported. This gives all parties oversight of the risks and creates a mechanism to implement appropriate risk-mitigation measures.

6.5.4 Appointment significance

ISO 19650-2 clause 5.4.6 requires that each lead appointed party appointment include the relevant MIDP – see guidance section 1.3. This ensures a contractual obligation to deliver the required information. Updates to the MIDP following appointment should comply with agreed change control procedures.

7.0 About open data and buildingSMART

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7.1 Context

Innovations around information within the built environment have typically been developed from a software-centric mind-set using proprietary structures and schema. Consequently, these innovations inadvertently introduce barriers hindering the open exchange of information. As identified within Data for the Public Good (2017), using open data gives the UK an annual economic benefit of ~ £8.9bn. This report also recommends further improvements in both the quality and openness of data to enable better collaboration. As such, innovations should start from a common base, utilizing non-proprietary structures.

Throughout a design and construction project, information will pass through multiple software solutions. During these exchanges it is the information, not the software used, that provides value. The software is merely a tool. As we digitally transform the built environment through initiatives such as the UK BIM Framework and National Digital Twin Programme, the tools used by our sector will change, while information needs to remain accessible and interpretable for the whole life of an asset.

Without considering the structure of this information, there is a risk that it will not be interoperable. This may introduce the need for configuration, which could result in additional costs, loss of information quality or degradation. By ensuring that information is structured in an open and consistent manner from the outset of a project, these issues can be mitigated.

It is for this reason that for almost a decade, open data has been cited within UK Government strategies. For example, as part of the UK Government's BIM Working Party's Strategy Paper (2011), a key hypothesis was outlined:

Government as a client can derive significant improvements in cost, value and carbon performance through the use of open shareable asset information.

Since this initial hypothesis, the formal requirements and recommendations around building information modelling (BIM) and information management have developed, with open data at their centre. The need for open data is acknowledged within the ISO 19650 series. ISO 19650-1, clause 6.1 outlines the principles of the information delivery cycle, stating that information exchanges should be done using open standards whenever possible. This is also reiterated within ISO 19650-2, clause 5.1.6 and the UK-specific national annex.

7.2 Open data

Generally, data produced within software can be categorized as proprietary data or open data. Open data can be defined as:

> **Open data**
>
> data available/visible to others and that can be freely used, re-used, re-published and redistributed by anyone[7]

Put simply, the ability to read open data is not restricted while proprietary data is restricted to specific software solutions.

For example, this distinction is significant for archiving purposes because it will affect how to record and store information. Assets, including building and infrastructure works, can be designed and constructed for significant lifespans. There is no guarantee that future software solutions will have the ability to access and interpret proprietary information about these assets. Using open data will resolve this issue.

In reality, open data is more prevalent than might be thought. Examples of file formats that utilize open data, known as open formats, include: HTML, PDF, DOCX, XLSX, PPTX, ODT, ODS, ODP, IFC, PNG, GIF, MP3, CSV, and ZIP.

7.3 buildingSMART

Within the built environment, there is an international organization that champions open data, buildingSMART:

> buildingSMART is the worldwide industry body driving the digital transformation of the built environment. buildingSMART is committed to delivering improvement by the creation and adoption of open, international standards and solutions for infrastructure and buildings. buildingSMART is the community for visionaries working to transform the design, construction, operation and maintenance of assets. buildingSMART is an open, neutral and international not-for-profit organization. buildingsmart.org/

buildingSMART has developed a series of standardized solutions to support the built environment in its use of open data:

- **Industry Foundation Classes (IFC):** An industry-specific schema, extension and file format definition. IFC is specified within ISO 16739.

  For example, IFC datasets can be used to share information consistently; enabling information exchanges across a wide array of software solutions and databases.

- **Information Delivery Manual (IDM):** A methodology for defining and documenting business processes and information requirements. IDM is specified within ISO 29481-1.

  For example, common processes such as the checking, reviewing and approval of information should be articulated as an information delivery manual.

- **Model View Definition (MVD):** buildingSMART sanctioned implementation of the IFC schema to satisfy a specific purpose.

  For example, the IFC coordination view MVD could support spatial coordination by reducing larger geometrical models to the relevant information, which is filtered into IFC datasets.

- **BIM Collaboration Format (BCF):** A model-based software-independent communication protocol.

  For example, issues raised during spatial coordination, site inspections or snagging could be communicated using the BIM Collaboration Format, as opposed to a lengthy email chain.

- **buildingSMART Data Dictionary (bSDD):** A standard library of general definitions of asset-related objects and their properties. bSDD has been developed following the requirements within ISO 12006-3.

  For example, properties required as part of an information requirement could be linked to properties within the buildingSMART Data Dictionary to prevent any ambiguity around the naming of properties or the type of data expected within them.

Links to the requirements and recommendations that constitute these solutions can be accessed from buildingSMART.org

7.4 buildingSMART standards and the ISO 19650 series

The buildingSMART solutions support conformity to the ISO 19650 series. For ISO 19650-2 the way this can be accomplished is illustrated in the examples below:

ISO 19650-2 clause 5.1 Assessment and Need

5.1.2 Establish the project's information requirements. Using the IFC schema, these requirements could be structured in a machine-interpretable and machine-testable manner.

5.1.4 Establish the project's information standard. Requirements for information exchange within this resource could reference MVDs. An example of an MVD is COBie 2.4.

5.1.5 Establish the project's information production methods and procedures. This resource could use IDMs to articulate methods and procedures.

5.1.6 Establish the project's reference information and shared resources. These resources could be the IFC schema itself, or project information shared as IFC datasets.

ISO 19650-2 clause 5.2 Invitation to Tender

5.2.1 Establish the appointing party's exchange information requirements. Using the IFC schema, these requirements could be structured in a machine-interpretable and machine-testable manner.

ISO 19650-2 clause 5.3 Tender Response

5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan. Elements of this resource, such as the high-level responsibility matrix and the federation strategy, could utilize the classes within the IFC schema.

ISO 19650-2 clause 5.4 Appointment

5.4.2 Establish the delivery team's detailed responsibility matrix. Further development of this resource could utilize classes, property sets and properties within the IFC schema and the buildingSMART Data Dictionary.

5.4.3 Establish the lead appointed party exchange information requirements. Using the IFC schema, these requirements could be structured in a machine-interpretable and machine-testable manner.

ISO 19650-2 clause 5.5 Mobilization

5.5.3 Test the project's information production methods and procedures. By using MVDs and IDMs, a measurable and testable methodology and delivery mechanism can be established.

ISO 19650-2 clause 5.6 Collaborative Production of Information

5.6.2 Generate Information. Information generated could be delivered as IFC datasets. In addition, information generated relating to issues throughout the design process could be exchanged using the BCF.

5.6.3 Undertake quality assurance check. The methodology for checking the quality of information could be described as an IDM. The use of the IFC schema and/or IDMs could also support the partial automation of this activity through the establishment of rule-based checking. Such rules could test information against the relevant MVDs.

5.6.4 Review information and approve for sharing. The methodology used for reviewing information could be described as an IDM. The use of the IFC schema and/or IDMs could also support the partial automation of this activity through the establishment of rule-based checking. Such rules could test information against the relevant MVDs.

ISO 19650-2 clause 5.7 Information Model Delivery

5.7.2 Review and authorize the information model and

5.7.4 Review and accept the information model. The methodology used for reviewing information models could be described as an IDM. The use of the IFC schema and/or IDMs could also support the partial automation of this activity through the establishment of rule-based checking. Such rules could test information against the relevant MVDs.

7.5 Summary

To realize the value of open data, it should be used in a manner that supports organizational activities. The UK has demonstrated its ability to generate economic value by using open data. Within the built environment, the development of the UK BIM Framework is underpinned by an expectation of utilizing open data. The application of open data to support the whole life of an asset in the built environment can be achieved through the use of buildingSMART solutions. These can directly support activities specified within the ISO 19650 series.

When looking at how an organization plans to remain resilient and innovative, it is important to keep both minds and data open.

8.0 ISO 19650-2 clause 5: analysis and activities

Authors: Please see Acknowledgments on page 5

ISO 19650-2 clause 5.1 Assessment and need

Clause: 5.1.1 Appoint individuals to undertake the information management function

The primary party active within the clause:

Appointing party

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

As early as possible

The level of the activity:

Project

Insight:

The appointing party is responsible for identifying and engaging one or more individuals (from within their organization or from a third party) to undertake the information management function in respect of the project.

The scope of the information management function to be undertaken by the individual(s) is also determined by the appointing party. Collectively this scope covers all of the appointing party's activities as described in ISO 19650-2.

It is important that whoever undertakes the information management function has the appropriate knowledge and skills required.

A lead appointed party could in theory, carry out some or all of the information management function. It is suggested that an individual (or individuals) carrying out the information management function on behalf of the appointing party should not be carrying out the lead appointed party's own information management function.

The Information Management Assignment Matrix in ISO 19650-2 Annex A offers a template for clarifying which activities will be undertaken by the individual(s) engaged to undertake the information management function.

Note: Where there is limited knowledge and capability internally, it may be preferable to appoint a third party in an advisory role to support the information management function. Ownership should however remain with individuals within the appointing party's organization who understand the business operating model and desired outcomes

Summary of activities within the clause:

- Consider the scope of the information management function
- Determine how the scope will be resourced
- Complete the information management assignment matrix to appropriately allocate appointing party responsibilities and activities
- Where the information management function is to be delivered by a third party or a lead appointed party, ensure that the scope of their appointment suitably reflects the activities and responsibilities assigned to them

ISO 19650-2 related clauses

5.1 Information management process – Assessment and need
5.2 Information management process – Invitation to tender
5.3.1 Nominate individuals to undertake the information management function
5.4.1 (e) Confirm the delivery team's BIM execution plan
5.4.5 Establish the master information delivery plan
5.4.6 Complete lead appointed party's appointment documents
5.5.2 Mobilize information technology
5.7.4 Review and accept the information model
5.8 Information management process – Project close-out
Annex A

Clause: 5.1.2 Establish the project's information requirements

The primary party active within the clause:

Appointing party

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

Before tendering the first lead appointed party appointment

The level of the activity:

Project

Summary of activities within the clause (as appropriate)

- Reflect on ISO 19650-1 clause 5.4 (not clause 5.3 as suggested in clause 5.1.2)
- Consider the points as set out in ISO 19650-2 clause 5.1.2
- Conclude which points are relevant
- Generate text to reflect content for each relevant consideration

Insight:

Project information requirements (PIR) are defined by the appointing party. They identify the information needed to satisfy strategic objectives at key decision points during a design and construction project. They inform the exchange information requirements (EIR), which are appointment, not project based. It is important that PIR are appropriately defined since they are fundamental to the robustness of the EIR and the delivery of the information needed. Note that the PIR are not expressed in tender or appointment content.

During the project the appointing party needs to understand:

a. The purposes for which information is required. For example to support the organization or the asset to function or to enable the design and construction project to progress to the next stage
b. The information which will be required for those purposes

The way that the information is identified might depend on the knowledge of the appointing party and the nature of the decisions that are to be made. The appointing party may know precisely what information is required but equally they might not.

For example if a key decision to progress to the next stage is related to whether construction can be completed by a specific date, the PIR might identify that construction programme information is required for board review. Alternatively, if the decision to progress to the next stage is related to a broader area, say: the safe construction and operation of the asset, then the PIR might identify that information is needed to demonstrate that the design is safe to construct and operate.

Clause 5.1.2 lists seven points of consideration for establishing project information requirements:

1. The project scope
   Basic information about the project.
2. The intended purpose for which the information will be used by the appointing party
   The reasons why information is required by the appointing party during the project. A list of possible purposes is set out in ISO 19650-1 clause 5.1.
3. The project plan of work
   How the project will be broken down into stages or intervals.
4. The intended procurement route
   How appointments/contracts will be structured, the relationships between parties and the rules that govern a project.
5. The number of key decision points throughout the project
   The points during a project where the appointing party requires information to make informed decisions.
6. The decisions that the appointing party needs to make at each key decision point
   Decisions that an appointing party may be required to make during a project to achieved the desired outcomes, ensure project progression and/or to feed back into wider organization strategies.
7. The questions to which the appointing party needs answers, to make informed decisions
   These questions provide a check to ensure that decisions can be made using the information provided.

If the appointing party concludes that some of these points are not relevant or do not aid beneficial communication of the PIR then there is no requirement to do anything beyond 'consider' and document that no further action is needed.

ISO 19650-2 related clauses:

5.1.3 Establish the project's information delivery milestones
5.1.4 Establish the project's information standard
5.1.5 Establish the project's information production methods and procedures
5.2.1 Establish the appointing party's exchange information requirements

Clause: 5.1.3 Establish the project's information delivery milestones

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering the first lead appointed party appointment

The level of the activity:
Project

Insight:

Information delivery milestones are defined to determine when information models will be exchanged from the delivery team to the appointing party and/or between delivery teams.

Clause 5.1.3 identifies four key considerations for determining information delivery milestones. They require the appointing party to think about the information needed for their own purposes plus information delivery obligations they might have themselves. The latter is particularly relevant where a programme of works is being delivered, where a project might consist of separate enabling works and construction contracts or where a traditional procurement approach is adopted.

Information delivery milestones should be programmed such that they support key decision points and project progression. However, given the point at which milestones are determined they are unlikely to be date specific. It may be appropriate to position the milestones within or at the end of project stages.

Summary of activities within the clause (as appropriate)
n/a

ISO 19650-2 related clauses
5.2.1 Establish the appointing party's exchange information requirements
5.2.4 Compile invitation to tender information
5.3.6 Establish the delivery team's risk register
5.4.2 Establish the delivery team's detailed responsibility matrix
5.4.3 Establish the lead appointed party's exchange information requirements
5.4.4 Establish the task information delivery plan(s)
5.4.5 Establish the master information delivery plan
5.5.1 Mobilize resources

Clause: 5.1.4 Establish the project's information standard

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering the first lead appointed party appointment

The level of the activity:
Project

Insight:

When establishing the information standard, the appointing party considers:

Exchange of Information: What standardized elements for exchanging information have been established for the project.

For example, the information standard may establish project-specific codes to support the national annex information container naming convention and the permitted values for metadata fields. It may also specify the naming and numbering systems for elements such as: Components, Types, Systems, Storeys, and Spaces.

Structuring and classification of Information: What work breakdown structures and classification system(s) have been established for the project.

For example, the information standard may establish a work breakdown structure based on a classification system (such as Uniclass 2015), a schedule of packages, or other criteria.

Method of specifying level of information need: What method of describing the level of information need has been established for the project.

For example, the information standard may establish that the NBS level of definition convention shall be used. In which case it will likely either cross-reference to an external source or include the textual description and an associated code for each level of detail and level of information.

Use of information during the operational phase: What standardized elements for operational use have been established for the project.

For example, the information standard may establish additional information that should be incorporated such as the use of NRM3 codes in addition to Uniclass 2015 classification.

It should be noted that as the information standard is project-specific, some of the established information standards may not be applicable depending on the nature of the appointment.

For example, additional handover information may be included within the information standard which are not relevant for an appointment to produce a concept design.

Remember that the information standard is set out at a project rather than appointment level. Its amalgamation with the information production methods and procedures may prove beneficial as both are project-specific and often used in tandem (unlike the exchange information requirements, which is an appointment specific resource).

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:

5.3.2 Establish the appointing party's exchange information requirements
5.2.4 Compile invitation to tender information
5.3.6 Establish the delivery team's risk register
5.4.1 Confirm the delivery team's BIM execution plan
5.4.3 Establish the lead appointed party's exchange information requirements
5.4.6 Complete lead appointed party's appointment documents
5.4.7 Complete appointed party's appointment documents
5.6.2 Generate information
5.6.3 Undertake quality assurance check

Clause: 5.1.5 Establish the project's information production methods and procedures

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering the first lead appointed party appointment

The level of the activity:
Project

Insight:

When establishing the information production methods and procedures, the appointing party considers:

Capture of existing asset information: How existing information will be captured.

For example, the information production methods and procedures may establish what properties need to be captured about existing asset information, the permitted values, or measurement units. It may also specify which information container(s) this information is captured within.

Generation, review or approval of new information: How information is produced, reviewed or approved.

For example, the information production methods and procedures may establish that information should be produced within a specified software application. It may also specify how to review information by providing a procedure or a specific workflow to be followed.

Security or distribution of information: How to implement specific security requirements or how to share information.

For example, the information production methods and procedures may establish that additional meta-data relating to a security rating should be applied to all information containers. It may also specify the common data environment (CDE) solution to be used for the distribution of information.

Delivery of information to the appointing party: How information is provided to the appointing party.

For example, the information production methods and procedures may establish what procedure to follow when delivering information such as whether additional checks are required or if an additional CDE solution is to be used.

It should be noted that as the information production methods and procedures are project-specific, some of the established production methods and procedures may not all apply to all appointed parties.

For example, additional handover procedures may be included within the information production methods and procedures which are not relevant for an appointment to produce a concept design.

Remember that the information production methods and procedures are set out at project rather than appointment level. Its amalgamation with the standard may prove beneficial as both are project-specific and often used in tandem (unlike the exchange information requirements, which is an appointment specific resource).

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.2.1 Establish the appointing party's exchange information requirements
5.2.4 Compile the invitation to tender information
5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan
5.6.2 Generate information
5.6.3 Undertake quality assurance check
5.6.4 Review information and approve for sharing
5.6.5 Information model review
5.7.4 Review and accept the information model
5.8.1 Archive the project information model

Clause: 5.1.6 Establish the project's reference information and shared resources

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering the first lead appointed party appointment

The level of the activity:
Project

Insight:

The appointing party considers existing reference information and shared resources to support tender of all appointed parties.

Reference information could be relevant to the overall project, such as Ordnance Survey mapping or information relating to adjacent assets and/or utilities owned by other organizations. Reference information could also be selected information from the existing asset information model, such as low-temperature hot water and chilled water schematics or layouts to be used in an office refurbishment project.

In addition, reference information may include the information delivered during a preceding appointment, usually by a different delivery team. For example, performance specifications prepared by the appointing party's design team for tendering a design and build contract. It is possible for a prospective lead appointed party to receive reference information that it produced itself in a previous appointment, for example a masterplan produced by multi-disciplinary practice X would be reference information for the subsequent design development package that the same practice is bidding for along with a number of other practices.

Not providing reference information means that prospective lead appointed parties are likely to either include costs to generate it themselves, or include a risk allowance in their pricing, or both. Alternatively, in ignorance, they may proceed on the basis of incomplete reference information which may ultimately impact the quality of their deliverable, through no fault of their own. These are the kinds of unnecessary costs and pitfalls that information management according to the ISO 19650 series is intended to avoid.

Shared resources can take many forms, such as document templates, 3D object libraries or custom line styles and clause 5.1.6 provides examples.

To provide a practical illustration the client might provide a template for the BIM execution plan, to be used by all prospective lead appointed parties, to make sure that this part of each tender submission is structured in the same way and can be consistently evaluated.

Finally, an important consideration for both reference information and shared information is the use of open data standards.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.2.1 (c) Establish the appointing party's exchange information requirements
5.2.2 Assemble reference information and shared resources
5.2.4 Compile invitation to tender information
5.4.3 Establish the lead appointed party's exchange information requirements
5.6.1 Check availability of reference information and shared resources

Clause: 5.1.7 Establish the project's common data environment

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering the first lead appointed party appointment

The level of the activity:
Project

Summary of activities within the clause (as appropriate):

- Appointing party to determine whether they have the in-house capability to deliver a CDE solution or whether it has to be delivered by a third party
- Configure the CDE to implement the project's information standard and information methods and procedures

Insight:

Before any information can be exchanged between the appointing party and their delivery team(s), a set of workflows and exchange solutions must be agreed and implemented that form the common data environment (CDE). A workflow may for example, include the approval process and timescales, a solution may be a file management system.

The appointing party is accountable for ensuring this CDE is implemented, configured and supported throughout the project. They may delegate this to a third party but it should be in place to enable tender information to be shared (and therefore before issuing tender information to any prospective lead appointed party). It is therefore not practical to delegate this activity to a prospective lead appointed party at this stage.

It is however, acceptable to transition hosting, managing and supporting of the CDE to a lead appointed party after appointment but "transitioning" is the operative word as it must be functional before transitioning.

When implementing the CDE, it must enable:

- Each information container to have a unique ID, based upon an agreed and documented convention comprised of fields separated by a delimiter

For example: ensuring the chosen CDE solution is configured in line with the UK National Annex clauses NA.2 and NA.3 contained in ISO 19650-2

- Each field to be assigned a value from an agreed and documented codification standard

For example: the CDE solution helps users find information quickly like model files by searching for the Type M3 or CR (refer to National Annex clause NA.3.6 contained in ISO 19650-2)

- Each information container to have the following attributes assigned; 1) status 2) revision 3) classification

  Note: the CDE solution allows additional data to be tagged to information containers beyond the information container unique ID to assist the project team in their understanding of what is the latest information and how it can be used

- The ability for information containers to transition between states and the recording of the name of user and date when information container revisions transition between each state

  Note: the CDE workflow can keep a detailed audit trail of each information container's content, status and revision activity. This can also provide clarity about what and when sign off is required before a transition can take place.

- Controlled access at an information container level

For example: the CDE solution and workflow can allow configuration that restricts access to information containers that have not reached a sufficient level of maturity or are too sensitive for specific organizations or individuals to have access to them

ISO 19650-2 related clauses:
5.1.4 Establish the project's information standard
5.1.5 Establish the project's information production methods and procedures
5.1.8 Establish the project's information protocol
5.2.2 Assemble reference information and shared resources
5.6.1 Check availability of reference information and shared resources
5.6.2 Generate information
5.6.3 Undertake quality assurance check
5.6.4 Review information and approve for sharing
5.7.1 Submit and authorize the information model
5.7.3 Submit information model for appointing party acceptance
5.7.4 Review and accept the information model
5.8.1 Archive the project information model
National Annex

Clause: 5.1.8 Establish the project's information protocol

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering the first lead appointed party appointment

The level of the activity:
Project

Insight:

Each appointment must contain an information protocol, i.e. all lead appointed party's appointments and all appointed parties' appointments.

The lead appointed party's appointment will contain the project's information protocol, and this will be included in the appointed party's appointment documents with any appropriate differences to reflect each appointment. Note that the standard form protocols currently available (such as the CIC BIM Protocol 2nd Edition), are not compliant with the ISO 19650 series and will need to be amended to be compliant if they are used.

An information protocol that is compliant with BS EN ISO 19650 series is in the process of being finalized. In the meantime, reference can be made to Annex C of the BS EN ISO19650 Guidance Part 1: Concepts, which contains guidance and suggestions on aligning existing standard form protocols with the BS EN ISO 19650 series.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.2.4 Compile invitation to tender information
5.3.6 Establish the delivery team's risk register
5.4.6 Complete lead appointed party's appointment documents
5.4.7 Complete appointed party's appointment documents

ISO 19650-2 clause 5.2 Invitation to tender

Clause: 5.2.1 Establish the appointing party's exchange information requirements

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering a lead appointed party appointment

The level of the activity:
Appointment

Insight:

Comprehensive and properly managed exchange information requirements (EIR) are fundamental to successful information management. They provide the framework for each and every delivery team active within a project.

Each EIR is a specification detailing the information required by the appointing party for all information exchanges with a lead appointed party.

There are several activities in clause 5.2.1 which the appointing party needs to work through to ensure each EIR is fully defined.

Each EIR is derived from the project information requirements (PIR) (which includes the organizational information requirements) and the asset information requirements (AIR).

Once the PIR and the AIR are identified, they are broken-down to a more granular level as EIR relative to the lead appointed party's scope of works, and each information requirement is associated with a level of information need. This enables the appropriate facets of information to be defined. In addition, the EIR establishes information exchange dates relative to delivery milestones to ensure information is delivered at the right time.

Each EIR is appointment specific and included within invitation to tender documentation. An EIR is read in conjunction with the project's information standard and information production methods and procedures (see ISO 19650-1 clause 5.5).

For example: as part of the PIR (see insight clause 5.1.2) one of the purposes for information is to support the ongoing progression of the project. Within the EIR the appointing party identifies that the information required is a construction programme report which summarizes where the programme is ahead/ behind schedule in PDF format.

For example: from the AIR the appointing party requires asset information for maintenance purposes which will feed into their facilities management system. For this they specify in the EIR the exact information required against the relevant asset(s) which enables it to be imported into their system.

During project delivery each EIR provides the mechanism for reviewing and accepting information models for the duration of the associated lead appointed party appointment.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.1.2 Establish the project's information requirements
5.1.3 Establish the project's information delivery milestones
5.1.4 Establish the project's information standard
5.1.5 Establish the project's information production methods and procedures
5.2.3 Establish tender response requirements and evaluation criteria
5.2.4 Compile invitation to tender information
5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan
5.3.3 Assess task team capability and capacity
5.3.6 Establish the delivery team's risk register
5.4.3 Establish the lead appointed party's exchange information requirements
5.5.1 Mobilize resources
5.7.2 Review and authorize the information model
5.7.4 Review and accept the information model

Clause: 5.2.2 Assemble reference information and shared resources

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering each lead appointed party appointment

The level of the activity:
Appointment

Insight:

Reference information and shared resources should be provided in appropriate information containers via the project's common data environment (CDE).

During the tender process, access to these information containers by prospective lead appointed parties has to be managed by the appointing party. This is to make sure that prospective lead appointed parties do not have inappropriate access to any other information being shared by existing delivery teams on the project. The information containers in the CDE should have status codes (to identify the permitted use of the information), revision codes and classification codes to help prospective lead appointed parties use them correctly.

Summary of activities within the clause (as appropriate)

- Upload reference information and shared resources to the CDE in accordance with the project's information standard and production methods and procedures and give prospective lead appointed parties appropriate access and permissions to that content
- Revoke CDE access for prospective lead appointed parties who are not successful in their tender response.

ISO 19650-2 related clauses

5.1.6 Establish the project's reference information and shared resources

5.6.1 Check availability of reference information and shared resources

Clause: 5.2.3 Establish tender response requirements and evaluation criteria

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering each lead appointed party appointment

The level of the activity:
Appointment

Insight:

The appointing party determines the minimum requirements that the prospective lead appointed party is to meet and communicate in their tender response. At the same time, the appointing party establishes how they will evaluate the effectiveness with which these minimum requirements are addressed in tender responses received.

This provides the prospective lead appointed party with a degree of direction about what they should detail in their tender response and enables consistent and fair evaluation of tenders received.

Key considerations are likely to be:

- The required content of the (pre-appointment) BIM execution plan

For example: does the BIM execution plan sufficiently detail the delivery team's proposed federation strategy, is it feasible and practical?

- The competency, capability and capacity of the prospective lead appointed party to deliver the information requirements

For example: does the prospective lead appointed party have suitable skills to manage and deliver the information requirements and crucially are the people with those skills available for the duration of the appointment?

- How the project delivery team will be mobilized, thinking about getting resources and technology ready to go. The appointing party will want to establish that the lead appointed party has a mobilization plan in place to get the delivery team up and running so that information can be produced in a co-ordinated and collaborative manner in support of the delivery team's programme. The appointing party will also want to establish that delivery will not begin until the plan has been fully enacted.
- The prospective lead appointed party's consideration of information delivery risk. This is communicated via a risk register, compiled by the prospective lead appointed party in respect of the delivery team.

Minimum requirements might take the form of questions to be addressed in the tender response.

For example: please explain how you will manage and mitigate risk associated with information delivery?

Ensure use of appointment specific questions that are relevant to the appointment within the context of the project, and the scope of works to be undertaken by the delivery team. Evaluation criteria should be measurable.

Summary of activities within the clause (as appropriate):

- Establish minimum requirements to be addressed within the prospective lead appointed party's tender response
- Identify how the tender response will be evaluated

ISO 19650-2 related clauses:

5.2.3 Compile invitation to tender information

Clause: 5.2.4 Compile invitation to tender information

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Before tendering each lead appointed party appointment

The level of the activity:
Appointment

Insight:

The tender contents for information management should be combined with other tender information being issued to the same prospective lead appointed party, such as technical specifications for the works and the requirements for completing technical proposals.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.2.1 Establish the appointing party's exchange information requirements
5.2.2 Assemble reference information and shared resources
5.2.3 Establish the tender response requirements and evaluation criteria
5.1.3 Establish the project's information delivery milestones
5.1.4 Establish the project's information standard
5.1.5 Establish the project's information production methods and procedures
5.1.8 Establish the project's information protocol
5.3.7 Compile the delivery team's tender response

ISO 19650-2 clause 5.3 Tender response

Clause: 5.3.1 Nominate individuals to undertake the information management function

The primary party active within the clause:

Prospective lead appointed party [please note there is a typographical error in clause 5.3.1 paragraph 3, which should refer to the lead appointed party not the appointing party]

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

During tender response

The level of the activity:

Appointment

Insight:

Clause 5.3.1 is the appointment level equivalent of clause 5.1.1 (the project-wide appointment of individuals to undertake the information management function). This part of the information management function describes the activities and tasks undertaken within a delivery team.

The activities making up the information management function vary in complexity and effort. Therefore, it may be appropriate to break down more demanding activities into tasks so more than one individual can be nominated with responsibility for the delivery of the activity. It is important that the individuals nominated have the appropriate knowledge and skills required to undertake the activities assigned.

The aim should be to upskill and self-deliver wherever possible to ensure information management capabilities mature within organizations. However, this clause does allow for a lead appointed party to appoint another organization (an appointed party or a third party) to do this on their behalf.

If the prospective lead appointed party has already been appointed by the appointing party to undertake some or all of its information management function, then the potential conflict of interest has to be avoided, for example by employing different individuals.

Summary of activities within the clause (as appropriate):

n/a

ISO 19650-2 related clauses:

5.1.1 Appoint individuals to undertake the information management function (project level)
5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan
5.3.4 Establish the delivery team's capability and capacity
5.3.5 Establish the delivery team's mobilization plan
5.3.6 Establish the delivery team's risk register
5.3.7 Compile the delivery team's tender response

Clause: 5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan

The primary party active within the clause:
Prospective lead appointed party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
Any prospective appointed parties that are known at this time

The level of the activity:
Appointment

Insight:

The BIM execution plan is defined in ISO 19650-2 clause 3.1.3.1. The (pre-appointment) BIM execution plan is established by a prospective lead appointed party on behalf of the delivery team and is included in their tender response. The provision of the (pre-appointment) BIM execution plan is a requirement of ISO 19650-2.

Clause 5.3.2 identifies seven areas that the prospective lead appointed party should consider in establishing their (pre-appointment) BIM execution plan. However, it is important to understand what the appointing party expects the (pre-appointment) BIM execution plan to contain and to cover this accordingly. Note that the appointing party may have their own BIM execution plan template, which should comply with ISO 19650-2. Assuming this is the case, this template should be made available as part of the invitation to tender documentation.

Establishing the (pre-appointment) BIM execution plan should involve collaboration with prospective appointed parties (anticipated members of the delivery team) where known, so that it reflects what the delivery team as a whole will do, not simply what the lead appointed party will do, or would like prospective appointed parties to do.

The (pre-appointment) BIM execution plan provides an opportunity for the prospective lead appointed party to identify additions and/or amendments to the project's production methods and procedures and its information standard. This might be needed so that:

- Information can be effectively generated, reviewed, approved, authorized and exchanged by the different parties involved, and
- Distribution and delivery of information is secure and effective

Summary of activities within the clause (as appropriate):

- Understand the appointing party's minimum requirements for the (pre-appointment) BIM execution plan and how it will be evaluated
- Establish if the appointing party has a BIM execution plan template that should be populated
- Check the project's production methods and procedures and its information standard. Identify any required additions or amendments
- Consider the contents requirements as set out in ISO 19650-2 clause 5.3.2
- Collaborate with prospective appointed parties so that the contents of the (pre-appointment) BIM execution plan reasonably reflects what the delivery team will do
- Populate the BIM execution plan

ISO 19650-2 related clauses:

5.1.6 (b)Establish the project's reference information and shared resources
5.2.3 Establish tender response requirements and evaluation criteria
5.3.3 Assess task team capability and capacity
5.3.7 Compile the delivery team's tender response
5.4.1 Confirm the delivery team's BIM execution plan

Clause: 5.3.3 Assess task team capability and capacity

The primary party active within the clause:
Prospective task team(s)/ appointed parties

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
During (or prior to) preparation of the tender response

The level of the activity:
Appointment

Insight:

When assessing their capability and capacity, each task team shall consider:

The task team's capability and capacity to manage information

For example: the BIM execution plan's information delivery strategy identifies the use of a specific software package to manage information. Do the members of the task team have experience in managing their information using this software?

The task team's capability and capacity to produce information

For example: the project's information production methods and procedures describe several production methods including space, object type and object component naming conventions. Do the members of the task team have experience in producing their information following these methods?

The availability of IT within the task team

For example: can the hardware, software and IT infrastructure available to the task team meet the information delivery strategy? If not, the task team would need to describe how they intend to meet the information delivery strategy.

It is important to accurately assess task team capability and capacity and to be able to provide evidence if necessary.

In addition, while ISO 19650-2 identifies this as a task team activity, task teams can seek certification as a means of demonstrating capability through an independent third party.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.3.4 Establish the delivery team's capability and capacity

Clause: 5.3.4 Establish the delivery team's capability and capacity	
The primary party active within the clause: Prospective lead appointed party	**Insight:** There is no Insight for this clause
Contributing parties to the clause: Prospective task teams/ appointed parties	
When the activity within the clause should be carried out: During preparation of the tender response	
The level of the activity: Appointment	
Summary of activities within the clause (as appropriate): n/a	
ISO 19650-2 related clauses: 5.3.3 Assess task team capability and capacity 5.4.2 Establish the delivery team's detailed responsibility matrix 5.5.1 Mobilize resources	

Clause: 5.3.5 Establish the delivery team's mobilization plan

The primary party active within the clause:

Prospective lead appointed party

Contributing parties to the clause:

Prospective task teams/ appointed parties

When the activity within the clause should be carried out:

During preparation of the tender response

The level of the activity:

Appointment

Insight:

The mobilization plan serves two purposes:

1. It informs the appointing party of the lead appointed party's approach to information management mobilization.

2. It is a tool for the lead appointed party to sufficiently plan out their mobilization phase for information management after appointment.

The mobilization plan may take different forms for example: a schedule, a table or even a Gantt chart.

ISO 19650-2 requires the lead appointed party to consider 11 elements covering testing of information exchange and delivery, common data environments, other software and hardware requirements and training and education. The plan may include:

- Ensuring export file formats are consistent and coherent.
- Testing that the delivery team's common data environment (CDE) solutions perform as expected and that all appointed parties and task teams can access the CDE appropriately.
- Testing that project CDE solutions perform as expected and that all key parties can access it as required. Project CDE solutions should also support all CDE workflows including ensuring acceptance mechanisms work as anticipated
- Testing how information containers may manually or automatically exchange between solutions depending on workflow to reduce review waiting times
- Ensuring site office ICT infrastructure including network lines are in place to allow site staff to access information.
- Producing information management plans or guides to help users operate the CDE solutions
- Educating the delivery team on the project goals and the journey to get there and training the delivery team on the use of any mandatory solutions being provided by the appointing party
- Recruiting of members that play a vital role in the management of information including document/design managers and consultants
- Supporting individuals and organizations that join the delivery team during the appointment

For example – the mobilization plan could describe a series of information management workshops with new appointed parties as part of their project induction

Summary of activities within the clause (as appropriate):

n/a

ISO 19650-2 related clauses:

5.4.1 Confirm the delivery team's BIM execution plan

5.5.1 Mobilize resources

5.5.2 Mobilize information technology

5.5.3 Test the project's information production methods and procedures

Clause: 5.3.6 Establish the delivery team's risk register

The primary party active within the clause:

Prospective lead appointed party

Contributing parties to the clause:

Prospective task teams/ appointed parties

When the activity within the clause should be carried out:

During preparation of the tender response

The level of the activity:

Appointment

Insight:

ISO 19650-2 sets out the criteria for the prospective lead appointed party to include in their delivery team's risk register.

For example: the appointing party could specify submission of a sub selection of red risks from the delivery team's risk register. The appointing party may wish to share their current perceived risks that are relevant to delivery as part of the invitation to tender.

Note that all parties may have internal risk registers that highlight their own perceived risks. These may have additional risks listed relevant to that party's internal operations and risk management.

For example, a lead appointed party may have a corporate risk register that outlines the commercial risks of delivering a common data environment (CDE) and committing to service level agreements. This aspect could be reflected in the delivery team's risk register.

It is suggested that an integrated risk register is generated which includes the information management risks alongside other appointment related risks.

Risks to consider including in the delivery team's risk register could, for example, include the following:

Assumptions

1. Existence, gaps and adequacy of the EIR received, and the steps needed to address these concerns.
2. Impact of roles and responsibilities for information management and how appointing party information requirements are being captured.
3. Information related risks should be integrated into a single risk register. For example, the BEP should not feature a supplementary risk register.

Milestones

1. Consider whether there is sufficient capability and capacity to meet the delivery milestones.
2. Consider project specific procurement risks. Such as the procurement lead times of telecommunications for project sites.

Information Protocol

1. Consider whether the rights and responsibilities in the protocol are acceptable from legal and commercial perspectives.
2. Existence, gaps and adequacy of the protocol addressing elements listed in clause 5.1.8.

Information Delivery Strategy

1. Consider whether an appropriate CDE has been established and its capability to deliver the information delivery strategy
2. That all relevant documentation has been agreed by the delivery team and appointing party and communicated to all task teams as appropriate
3. That the level of information need is defined and agreed for each information exchange requirement
4. Impact of the information model federation strategy and its configuration within the CDE
5. Consider whether the mobilization phase includes all configured production templates is undertaken, tested and confirmed.

Clause: 5.3.6 Establish the delivery team's risk register

Insight continued:

Methods, Procedures and Information Standards

1. Consider the proposed methods and procedures against existing organization/ internal procedures.
2. Consider the impact of any deviations from existing processes.
3. Consider whether the proposed methods and procedures are feasible and achievable.
4. Assess whether the appointment / invitation to tender manages change appropriately, including ongoing amendment to appointment information management documentation.
5. Consider whether compliance criteria are measurable.

Mobilization, capability and capacity

1. Assess the impact of communication of the mobilization plan.
2. Ensure consideration for lead times is included in mobilization, for example:
    a. CDE procurement
    b. Internet connections / Internet service provision
    c. System configuration
    d. Training providers
    e. CDE testing
3. Assess the impact of a negative outcome from testing information production methods and procedures.

The actual list will depend on the specific requirements of the appointment.

Summary of activities within the clause (as appropriate):

- Identify and assess risks associated with information management and information production
- Decide how to combine information management risks with the other risks being identified

ISO 19650-2 related clauses:

5.3.7 Compile the delivery team's tender response

5.4.5 Establish the master information delivery plan

Clause: 5.3.7 Compile the delivery team's tender response	
The primary party active within the clause: Prospective lead appointed party	**Insight:** There is no Insight for this clause
Contributing parties to the clause: n/a	
When the activity within the clause should be carried out: During preparation of the tender response	
The level of the activity: Appointment	
Summary of activities within the clause (as appropriate): n/a	
ISO 19650-2 related clauses 5.2.4 Compile invitation to tender information 5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan 5.3.4 Establish the delivery team's capability and capacity 5.3.5 Establish the delivery team's mobilization plan 5.3.6 Establish the delivery team's risk register	

ISO 19650-2 clause 5.4 Appointment

Clause: 5.4.1 Confirm the delivery team's BIM execution plan

The primary party active within the clause:
Lead appointed party

Contributing parties to the clause:
Appointing party and appointed parties

When the activity within the clause should be carried out:
During completion of the appointment

The level of the activity:
Appointment

Insight:

The BIM execution plan should be developed and agreed with each appointed party, both those known to the lead appointed party and those that will be appointed during the delivery team's work. This is to ensure that it reflects their activities, their use of IT and that they can work in accordance with the overall delivery team requirements.

Development of content may also require engagement with the appointing party to agree any necessary additions or amendments to the project's information standard or the project's information production methods and procedures.

Note that the language of this clause is different from clause 5.3.2 (pre-appointment BIM execution plan). Clause 5.3.2 lists items to be 'considered', but clause 5.4.1 lists items that the lead appointed party 'shall' do. Some of the items are 'as required', and this means: check what was in the (pre-appointment) BIM execution plan and update it if the information no longer reflects the current/planned delivery team approach.

It is also important to make sure the BIM execution plan meets the minimum content requirements of the appointing party and fits into their template (clauses 5.1.6 (b) and 5.2.4) if they have one.

A BIM execution plan is likely to evolve over the life of the delivery team as additional parties are appointed. The lead appointed party is responsible for maintaining the delivery team's BIM execution plan so that it continues to represent the team's information management approach. As the BIM execution plan is an appointment (contract) document it will need to be subject to a process of formal change control with changes agreed with the appointing party and the appointed parties.

A key recommendation is that the BIM execution plan is simple and concise so that it can be easily understood, implemented, assured and maintained.

Summary of activities within the clause (as appropriate):

- Reference back to the (pre-appointment) BIM execution plan. Reflect on the content and any feedback from the appointing party generated through the tender evaluation process and change as necessary
- Check the project's information standard
- Collaborate with appointed parties to ensure you collectively agree on the:
  - information delivery strategy
  - responsibility matrix,
  - the information standard, and the
  - proposed information production methods and procedures

At this point you should also confirm IT proposals

- Engage with the appointing party to agree any additions or amendments to the project's information standard or information production methods and procedures
- Update the information delivery strategy and high-level responsibility matrix as required
- Submit to the appointing party for inclusion in the appointment documents

ISO 19650-2 related clauses:

5.1.6(b) Establish the project's reference information and shared resources

5.2.3 Establish tender response requirements and evaluation criteria

5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan

5.3.7 Compile the delivery team's tender response

5.4.6 Complete lead appointed party's appointment documents

5.4.7 Complete appointed party's appointment documents

Clause: 5.4.2 Establish the delivery team's detailed responsibility matrix

The primary party active within the clause:
Lead appointed party

Contributing parties to the clause:
Appointed parties

When the activity within the clause should be carried out:
During completion of the appointment

The level of the activity:
Appointment

Insight:

Produced from the initial high-level responsibility matrix, a detailed responsibility matrix identifies:

What information is to be produced;

For example: the detailed responsibility matrix may identify, based on the information container breakdown structure, that information about doors should be provided and quantify how much information is required

When the information is to be exchanged and with whom;

For example: the detailed responsibility matrix may identify which delivery milestone this information is needed by; taking into account any dependencies identified by the delivery team.

Which task team is responsible for its production.

For example: the detailed responsibility matrix may show that "ABC Architects" is responsible for providing this information.

Whilst preparing the detailed responsibility matrix, it is important to bear in mind that the task information delivery plans and master information delivery plan are governed by the rules set by the matrix, but will be working at an information container level.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.4.4 Establish the task information delivery plan(s)
5.4.5 Establish the master information delivery plan

Clause: 5.4.3 Establish the lead appointed party's exchange information requirements

The primary party active within the clause:
Lead appointed party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
During completion of the appointment

The level of the activity:
Appointment

Insight:

The lead appointed party should define a set of exchange information requirements (EIR) for each appointment it makes just like the appointing party does (see ISO 19650-2, 5.2.1).

Each EIR should detail the information required by the lead appointed party from the appointed party. This may include relevant aspects of appointing party's EIR, creating a cascade throughout the supply chain. These are detailed requirements and should be defined around the concept of the level of information need to ensure all facets of information are captured.

For example: a tier 1 contractor manages programme and cost; therefore, they may require specific information from certain sub-contractors to enable them to carry out these tasks.

In addition, the appointing party may require asset information for maintenance purposes which will be delivered by certain sub-contractors.

This information is included within the lead appointed party's exchange information requirements and hence the tender information for the relevant sub-contractors.

During project delivery the exchange information requirements provide the mechanism for the lead appointed party to authorize information models.

Summary of activities within the clause (as appropriate):
Clause 5.4.3 provides step by step detail of activities required

ISO 19650-2 related clauses:
5.2.1 Establish the appointing party's exchange information requirements
5.3.3 Assess task team capability and capacity
5.4.1 Confirm the delivery team's BIM execution plan
5.4.2 Establish the delivery team's detailed responsibility matrix
5.4.4 Establish the task information delivery plan(s)
5.4.7 Complete appointed party's appointment documents
5.5.1 Mobilize resources
5.5.2 Mobilize technology
5.6.4 Review information and approve for sharing
5.7.2 Review and authorize the information model

Clause: 5.4.4 Establish the task information delivery plan(s)

The primary party active within the clause:
Appointed party

Contributing parties to the clause:
n/a

When the activity within the clause should be carried out:
During completion of and then throughout the appointment

The level of the activity:
Appointment

Insight:

A Task Information Delivery Plan (TIDP) is a detailed plan for how a particular task team is going to deliver the information it has been asked to provide (models, documents, schedules, calculations, and so on).

There is no prescribed format for the TIDP. It lends itself to being produced as a table, or in a spreadsheet, database or even in an annotated Gantt chart.

A TIDP has certain minimum contents, defined in ISO 19650-2 clause 5.4.4 paragraph 3. These details are provided for each information container that the task team will be delivering. Because of this, a TIDP could be a lengthy resource, with details covering the "what", and the potential multiple "when's", if information containers are to be shared repeatedly during their development.

The purpose of doing this activity from the task team's perspective is to enable them to clarify what they will and will not deliver as part of their scope and what information will need to be exchanged between them and other task teams to allow timely coordination and progress across the delivery team.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.4.2 Establish the delivery team's detailed responsibility matrix
5.4.5 Establish the master information delivery plan

Clause: 5.4.5 Establish the master information delivery plan

The primary party active within the clause:
Lead appointed party

Contributing parties to the clause:
Appointed parties

When the activity within the clause should be carried out:
During completion of and then throughout the appointment

The level of the activity:
Appointment

Insight:

The master information delivery plan (MIDP) is the compilation of all the task information delivery plans (TIDPs) within a delivery team. Its purpose is to allow the lead appointed party to check the delivery plans across different task teams, to make sure these fit with the overall delivery team schedule of activities and to make sure that any related deliverables are in the right logical sequence.

There is no minimum list of contents for an MIDP provided in ISO 19650-2. However, as an MIDP is a collation of TIDPs then the contents list of a TIDP is a good starting point. Whilst the information author responsible for an information container production is specified, the task team actually responsible for each information container could also be a valuable feature to add to the MIDP contents list.

A delivery team's MIDP has to be kept up to date with any changes in the individual TIDPs that form part of it. It should also be updated to include additional TIDPs from new appointed parties/task teams joining the delivery team.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.4.2 Establish the delivery team's detailed responsibility matrix
5.4.4 Establish the task information delivery plan(s)

Clause: 5.4.6 Complete lead appointed party's appointment documents

The primary party active within the clause:
Appointing party

Contributing parties to the clause:
Lead appointed party

When the activity within the clause should be carried out:
During completion of the appointment

The level of the activity:
Appointment

Insight:
It is important that each of the five resources listed are included within the lead appointed party's appointment documents. The appointing party may find it helpful to clarify to its legal representatives preparing the appointment that some of the resource content may changing/evolve throughout the appointment so this can be incorporated correctly within the appointment documents.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
5.2.1 Establish the appointing party's exchange information requirements
5.1.4 Establish the project's information standard
5.1.8 Establish the project's information protocol
5.4.1 Confirm the delivery team's BIM execution plan
5.4.5 Establish the master information delivery plan

Clause: 5.4.7 Complete appointed party's appointment documents	
The primary party active within the clause: Lead appointed party	**Insight:** It is important that each of the five resources listed are included within the appointed party's appointment documents. The information protocol contained in the appointed party's appointment documents will usually be the same as that in the lead appointed party's appointment documents, with any relevant changes to reflect their particular appointment.
Contributing parties to the clause: Appointed party	
When the activity within the clause should be carried out: During completion of the appointment	
The level of the activity: Appointment	
Summary of activities within the clause (as appropriate): n/a	
ISO 19650-2 related clauses: 5.4.3 Establish the lead appointed party's exchange information requirements 5.1.4 Establish the project's information standard 5.1.8 Establish the project's information protocol 5.4.1 Confirm the delivery team's BIM execution plan 5.4.4 Establish the task information delivery plan	

ISO 19650-2 clause 5.5 Mobilization

Clause: 5.5.1 Mobilize resources

The primary party active within the clause:
Lead appointed party

Contributing parties to the clause:
Task team(s)/appointed parties

When the activity within the clause should be carried out:
Before any information is generated within a task team

The level of the activity:
Appointment

Insight:

The alignment of an activity with a documented process is a common theme throughout the ISO 19650 series. The mobilization activities should therefore follow the mobilization plan submitted with the delivery team's tender response (see ISO 19650-2 clauses 5.3.5 and 5.3.7).

ISO 19650 clause 5.5.1 addresses the mobilization of resources covering individuals specifically. The mobilization activity should result in individuals being available, educated and trained such that they can generate information and deliver the information model for authorization and acceptance.

Mobilization of resources covers three core activities which are set out in clause 5.5.1.

Confirm the resource availability of each task team

For example: Are the individuals carrying out the information management function, as well as all the information authors named in the task information delivery plan (TIDP), available? Remember the hidden resources 'the back of house' needed to support, configure and procure systems. This includes administration of common data environment solutions and management teams.

There will be times when the intended team members are no longer available when the appointment starts. This situation needs to be managed, by identifying and upskilling new team members to take their place. The important aspect is to make sure that the new team members have equivalent or better skills than those they are replacing.

This activity should address gaps found in the assessment of task team capacity in 5.3.4 and where necessary will feed in to the next points on developing and delivering education and training.

Develop and deliver education

The intention of this activity is to develop appointed party knowledge about the information management resources, required processes and associated obligations.

Develop and deliver training

The intention here is to ensure that individuals are competent (skilled) to generate or manage information.

Tip: make sure that the time for mobilization confirmed in the mobilization plan is actually allocated to planning and implementing training. Time required could include the lead times for training providers/content providers.

Mobilization of resources may not be a one-off activity and will need to be repeated when new individuals join the delivery team and/or other circumstances change.

A successful outcome of 5.5.1 would be sufficient individuals who are knowledgeable and competent to generate or manage information.

Any risks generated through this mobilization activity should be recorded in the delivery team's risk register.

Clause: 5.5.1 Mobilize resources

Summary of activities within the clause (as appropriate):

- Review the mobilization plan
- Review each TIDP
- Establish the availability of individuals
- Implement education and training as required
- Update the risk register as required
- Repeat mobilization of resources as and when necessary

ISO 19650-2 related clauses:

5.3.4 Establish the delivery teams capability and capacity

5.3.5 Establish the delivery team's mobilization plan

5.3.6 Establish the delivery team's risk register

5.3.7 Compile the delivery team's tender response

5.4.7 Complete appointed party's appointment documents

5.5.2 Mobilize information technology

5.5.3 Test the project's information production methods and procedures

Clause: 5.5.2 Mobilize information technology

The primary party active within the clause:

Lead appointed party

Contributing parties to the clause:

Appointing party and task team(s)/appointed parties

When the activity within the clause should be carried out:

Before any information is generated within a task team.

The level of the activity:

Appointment

Insight:

As noted in the insight to clause 5.5.1, the alignment of an activity with a documented process is a common theme throughout the ISO 19650 series. The mobilization activities should therefore follow the mobilization plan submitted with the delivery team's tender response (see ISO 19650-2 clauses 5.3.5 and 5.3.7).

ISO 19650 clause 5.5.1 addresses the mobilization of technology – both hardware and software. It covers the common data environment (CDE) and any other technology underpinning the generation and exchange of information specifically.

The mobilization activity should result in technology being in place, configured and suitably tested to support the generation and exchange of information between all members of the project team. This is to ensure that information can be confidently exchanged between members of the delivery team and between the appointed parties and the appointing party.

Mobilization of information technology covers five core activities which are set out in clause 5.5.2.

Procure, implement, configure and test software, hardware and IT infrastructure

Mobilization of information technology is about more than just getting the hardware delivered - it also needs the software to be installed and it all needs to be tested. A further consideration is ensuring that software versions and add-ons do not impact on interoperability.

It is therefore important to ensure that the right technologies are in place and there is enough of them (in terms of licensing for example).

Tip: it is crucial that service level agreements and terms and conditions will effectively support the duration of the appointment (for example, consider the timing of renewal agreements).

Configure and test the project's common data environment (CDE)

Although the project's CDE solution is enabled by the appointing party, the lead appointed party has to ensure that it is tested and will support sharing and publishing of the delivery team's information. This requires co-operation of the appointing party.

For example, this might include testing delivery team specific work-flow, setting up access and administration permissions.

Configure and test the delivery team's CDE

When the delivery teams uses its own CDE solution, in addition to the project's CDE solution, then this too has to be configured and tested to support information sharing. Where this is the case a crucial area to address is the connectivity to the project's CDE solution.

Test information exchanges between task teams

Each part of the information exchange process should be tested to ensure that information can be effectively shared within the delivery team.

Test information delivery

Each part of the information delivery process should be tested from the delivery team's perspective. This is likely to require the co-operation of the appointing party.

A successful outcome of 5.5.2 would be assurance that information technology will support the generation and management of information.

Any risks generated through this mobilization activity should be recorded in the delivery team's risk register.

Clause: 5.5.2 Mobilize information technology

Summary of activities within the clause (as appropriate):

- Review the lead appointed party's appointment documents
- Review the mobilization plan
- Review each TIDP
- Review the available technologies already in place plus commercial arrangement for information technologies required or to be maintained
- Update the risk register as required
- Repeat mobilization of information technology as and when necessary

ISO 19650-2 related clauses:

5.3.5 Establish the delivery team's mobilization plan
5.3.6 Establish the delivery team's risk register
5.3.7 Compile the delivery team's tender response
5.4.7 Complete appointed party's appointment documents
5.5.1 Mobilize resources
5.5.3 Test the project's information production methods and procedures

Clause: 5.5.3 Test the project's information production methods and procedures

The primary party active within the clause:

Lead appointed party

Contributing parties to the clause:

Task team(s)/appointed parties

When the activity within the clause should be carried out:

Before any information is generated within a task team.

The level of the activity:

Appointment

Insight:

As noted in the insight to clause 5.5.1, the alignment of an activity with a documented process is a common theme throughout the ISO 19650 series. The mobilization activities should therefore follow the mobilization plan submitted with the delivery team's tender response (see ISO 19650-2 clauses 5.3.5 and 5.3.7).

Clause 5.5.3 is focussed on ensuring that the methods and procedures for information production and exchange are understood by all members of the delivery team and can be implemented from the outset of the information generation activities.

This will involve testing the project's information production methods and procedures.

For example, testing will include a review of the federation strategy and information container breakdown structure to establish that they remain appropriate. If this is not the case, refinement should be explored to ensure that the information container breakdown structure supports the federation strategy.

For example, testing the visibility of information containers and the information within them to ensure that security requirements for the management of sensitive information can be adhered to.

In thinking about information production, the lead appointed party may need to develop shared resources for use by the delivery team.

The final activity within this clause is to ensure that the project's information production methods and procedures are cascaded to every task team within the delivery team.

Although the activities within clause 5.5.3 are assigned to the lead appointed party, they should be undertaken in a collaborative manner including all delivery team members.

A successful outcome of 5.5.3 would be assurance that the project's information production methods and procedures will support the generation and management of information.

Any risks generated through this mobilization activity should be recorded in the delivery team's risk register.

Summary of activities within the clause (as appropriate):

- Review and test the project's information production methods and procedures
- Make refinements as required
- Communicate the project's information production methods and procedures to all task teams

ISO 19650-2 related clauses:

5.1.5 Establish the project's information production methods and procedures
5.3.5 Establish the delivery team's mobilization plan
5.3.6 Establish the delivery team's risk register
5.3.7 Compile the delivery team's tender response
5.4.7 Complete appointed party's appointment documents
5.5.1 Mobilize resources
5.5.2 Mobilize information technology

ISO 19650-2 clause 5.6 Collaborative production of information

Clause: 5.6.1 Check availability of reference information and shared resources

The primary party active within the clause:

Task team(s)/appointed parties

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

Prior to generating information

The level of the activity:

Appointment

Insight:

Access to reference information and shared resources should be checked by each task team (appointed party) when generation of information is about to start. Reference information and shared resources are initially provided by the appointing party (clause 5.2.2) and can then be reviewed and extended by the lead appointed party (clause 5.4.3 e).

Reference information and shared resources are held in the project's common data environment (CDE) and lack of access could be caused by a number of reasons, including:

- The relevant information was never shared through the CDE;
- The task team/appointed party has not been given access rights to the information, or these rights have lapsed or been revoked;
- Relevant information was shared, but has become obsolete; or
- New requirements for reference information or shared resources have arisen which are not covered by the information currently available.

Lack of access to reference information or to shared resources, for whatever reason, should be reported to the lead appointed party as soon as possible. Ideally this should be before the task team generates any of its own information. The task team should also assess any impact on its information delivery plan, and report this to the lead appointed party as well.

Summary of activities within the clause (as appropriate):

- Review what reference information and shared resources are accessible in the project's CDE, in sufficient time before technical work and generation of information starts, and then compare this with the task team's requirements.
- Report any shortfall to the lead appointed party.

ISO 19650-2 related clauses:

5.1.6 Establish the project's reference information and shared resources

5.2.2 Assemble reference information and shared resources

Clause: 5.6.2 Generate information

The primary party active within the clause:

Task team(s)/appointed parties

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

After mobilization and throughout the appointment

The level of the activity:

Appointment

Insight:

Individuals generating information (as with all members of the project team) have a responsibility for robust information management.

The task information delivery plan (TIDP) is the primary consideration in generating information as efficiently and effectively as possible in a collaborative manner. The TIDP identifies which information containers an author is responsible for generating. While generating this information, the project's information production methods and procedures (i.e. the process for information production) and the project's information standard should be carefully reviewed to ensure compliance from the outset.

Note that clause 5.6.2 (b) is explicit about information that should not be generated. This is to encourage the generation of appropriate, useful and useable information. For example it is wasteful to produce information that exceeds the level of information need and/or duplicates information generated by another task team.

An example of avoiding duplication would be the architectural task team referencing the structural engineering containers rather than recreating structural elements in their geometrical models.

As well as working in accordance with ISO 19650-2, it's important that there is effective communication between those individuals generating information and across the delivery team. This may be via the CDE or more informally for example, email, online meetings or just "picking up the phone".

When generating information that requires an element of co-ordination with other information it's good practice to establish regular exchanges between task teams via the CDE. For example, geometrical models requiring co-ordination might be exchanged on a fortnightly basis (although this frequency should be flexible depending on the requirements of the delivery team and the project). Any co-ordination issues should be resolved between task teams and if this is not possible, the issue should be escalated to the lead appointed party.

Summary of activities within the clause (as appropriate):

- Refer to the TIDP, the project's information production methods and procedures and the project's information standard
- Generate information taking account of the level of information need described in the TIDP
- Co-ordinate information as required
- Resolve co-ordination issues, escalate if necessary

ISO 19650-2 related clauses:

5.4.2 Establish the delivery team's detailed responsibility matrix
5.4.3 Establish the lead appointed party's exchange information requirements
5.4.4 Establish the task information delivery plan(s)5.5.1 Mobilize resources
5.6.1 Check availability of reference information and shared resources
5.6.3 Undertake quality assurance check
5.6.4 Review information and approve for sharing

Clause: 5.6.3 Undertake quality assurance check

The primary party active within the clause:

Task team(s)/appointed parties

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

Before an information container is shared

The level of the activity:

Appointment

Insight:

Checking the quality of the information container is in two parts. The first part is checking the information container from the outside (in essence the wrapper). The second part is checking the contents and this is dealt with in ISO 19650-2 clause 5.6.4.

The project's information production methods and procedures sets out the process for undertaking the "outside check". This activity might be aligned with the appointed party's ISO 9001 Quality Management System, if that was appropriate/agreed.

The project's information standard then determines the information container requirements considering its:

- Unique ID;
- Status;
- Revision; and
- Classification;

Some checks could be carried out automatically via common data environment workflow.

If the information container check is unsuccessful the information container should be rejected with the information author informed of corrective action required.

Once an information container has been successfully checked and has been marked as checked, its contents should be reviewed as set out in ISO 19650-2 clause 5.6.4.

Summary of activities within the clause (as appropriate):

- Review the project's production methods and procedures
- Review the project's information standard
- Undertake the check
- If the check is successful then mark the information container as checked
- If the check is unsuccessful reject the information container and advise the information author

ISO 19650-2 related clauses:

5.4.7 Complete appointed party's appointed documents
5.6.2 Generate information
5.6.4 Review information and approve for sharing

Clause: 5.6.4 Review information and approve for sharing

The primary party active within the clause:

Task team(s)/appointed parties

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

After the quality assurance check of an information container, and prior to sharing within the project CDE.

The level of the activity:

Appointment

Insight:

Checking the quality of the information container is in two parts. The first part is checking the information container from the outside (in essence the wrapper) and this is dealt with in ISO 19650-2 clause 5.6.3. The second part is checking the contents (this clause).

Following the successful quality assurance check of an information container (ISO 19650-2 clause 5.6.3), the task team undertakes a review of the information within the container. The objective of this review is to ensure the information that is going to be shared is in accordance with the lead appointed party's exchange information requirements and the task information delivery plan (TIDP).

Tip: the TIDP may record additional information containers beyond those needed to meet the lead appointed party's information requirements to support development and/or coordination activities by/with other task teams.

The lead appointed party, in agreement with the task team(s), should have established a consistent methodology for undertaking this review and will have recorded this within the project's information production methods and procedures.

Only when a review is complete and successful can the information (within the information container) be approved with the information container then assigned a suitable status code for sharing. In the UK, the recommended status codes for information containers are defined in ISO 19650-2 clause NA.4.2 (refer also to this guidance – About the Common Data Environment).

If the information review is unsuccessful the information container should be rejected. A record should be made of why the review was unsuccessful plus any amendments that need to be made to the information by the task team.

Summary of activities within the clause (as appropriate):

- Review the lead appointed party's exchange information requirements and the TIDP
- Review the project's information production methods and procedures
- Carry out the information check
- If the check is successful then approve the information container and assign the appropriate status code
- If the check is unsuccessful reject the information container and record why alongside the amendments needed

ISO 19650-2 related clauses:

5.4.7 Complete appointed party's appointment documents
5.6.2 Generate information
5.6.3 Undertake quality assurance checks
5.6.5 Information model review
NA.4.2 Status

Clause: 5.6.5 Information model review

The primary party active within the clause:

This is a delivery team (lead appointed party plus all appointed parties) wide activity

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

As required during information generation and then prior to information model authorization.

The level of the activity:

Appointment

Insight:

An important distinction between this clause and clauses 5.6.3 and 5.6.4 is that 5.6.5 is concerned with the delivery team's information model. The preceding two clauses are concerned with individual information containers.

Delivery teams should plan and undertake timely information model reviews to ensure the delivery team's information model is continuously coordinated. The review is repeated, as necessary, until the information model is ready for authorization by the lead appointed party.

Each review will consider the appointing party's exchange information requirements, acceptance criteria and the master information delivery plan (MIDP). It will be carried out in accordance with the processes set out in the project's information production methods and procedures.

If the information containers in the information model do not align with the MIDP, this will indicate a breakdown in the appointment's change control process.

It is important that the logistics to deliver and manage all information model reviews for each information delivery milestone, are established and reflected in the project's information production methods and procedures, the BIM execution plan and the MIDP.

Summary of activities within the clause (as appropriate):

- Review the project's information production methods and procedures
- Review the BIM execution plan
- Review the MIDP
- Identify the information containers for review using the information container status code
- Review the information model

ISO 19650-2 related clauses:

5.4.6.Complete lead appointed party's appointment document
5.6.4 Review information and approve for sharing
5.7.1 Submit information model for lead appointed party authorization

ISO 19650-2 clause 5.7 Information model delivery

Clause: 5.7.1 Submit information model for lead appointed party authorization

The primary party active within the clause:

Task team(s)/appointed parties

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

At the start of a process of information exchange with the appointing party

The level of the activity:

Appointment

Insight:

This clause is the first step in the process of delivering the information model as an information exchange to the appointing party and having it accepted as Published information. Each task team seeks the lead appointed party's authorization of their relevant information containers.

The process of submission should be in accordance with project's information production methods and procedures.

In line with the UK National Annex, the information containers within the information model would have a status code of S6 or S7 depending on whether the information exchange is happening before or at Plan of Work stage 6 (Handover) – see BS 8536-1 for further information about the Plan of Work stages.

Summary of activities within the clause (as appropriate):

- Review the project's information production methods and procedures
- Assign a status code of S6 or S7 as appropriate to the information containers within the information model
- Submit the information containers

ISO 19650-2 related clauses:

5.4.7 Complete appointed party's appointment documents
5.7.2 Review and authorize the information model
NA.4.2 Status

Clause: 5.7.2 Review and authorize the information model

The primary party active within the clause:

Lead appointed party

Contributing parties to the clause:

Task team(s)/appointed parties

When the activity within the clause should be carried out:

During the process of information exchange with the appointing party

The level of the activity:

Appointment

Insight:

This clause is the second step in the process of delivering the information model as an information exchange to the appointing party and having it accepted as Published information. The lead appointed party reviews the information model to check that it is suitable to be submitted to the appointing party.

The information model is checked to make sure that it:

- addresses the exchange information requirements (both those set by the appointing party and those introduced by the lead appointed party)
- contains all the appropriate deliverables from the master information delivery plan
- meets the acceptance criteria set out by the appointing party, and that it
- meets the level of information need.

A successful review will mean that the information model is authorized which triggers each task team to submit their information containers to the appointing party (see clause 5.7.3).

An unsuccessful review will mean that the information model is rejected. In this case the task team is instructed on amendment and re-submission of their information.

Partial acceptance of the information model should be avoided. This is to prevent potential disputes arising within the delivery team or other delivery teams.

For example, if information model delivery is not complete, its output as reference information for another delivery team will be unreliable.

An information exchange that is just within the delivery team (because the information model is not being delivered to the appointing party) will be complete after successful conclusion of this step and will not involve ISO 19650-2 clauses 5.7.3 and 5.7.4.

Summary of activities within the clause (as appropriate):

- Review the exchange information requirements (appointing party and lead appointed party)
- Check the information model
- If the review is successful then move to clause 5.7.3 as appropriate
- If the review is unsuccessful, reject the information model and instruct task teams accordingly

ISO 19650-2 related clauses:

5.4.6 Complete lead appointed party's appointment documents
5.4.7 Complete appointed party's appointment documents
5.6.2 Generate information
5.7.1 Submit information model for lead appointed party authorization
5.7.3 Submit information model for appointing party acceptance

Clause: 5.7.3 Submit information model for appointing party acceptance

The primary party active within the clause:

Task team(s)/appointed parties

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

During the process of information exchange with the appointing party

The level of the activity:

Appointment

Insight:

This clause is the third step in the process of delivering the information model as an information exchange to the appointing party and having it accepted as Published information. The appointed party submits their information through the project's common data environment.

Summary of activities within the clause (as appropriate):

n/a

ISO 19650-2 related clauses:

5.7.2 Review and authorize the information model

5.7.4 Review and accept the information model

Clause: 5.7.4 Review and accept the information model

The primary party active within the clause:

Appointing party

Contributing parties to the clause:

n/a

When the activity within the clause should be carried out:

During the process of information exchange with the appointing party

The level of the activity:

Appointment

Insight:

This clause is the fourth and final step in the process of delivering the information model as an information exchange to the appointing party and having it accepted as Published information.

The appointing party reviews the information submitted by an appointed party. In doing this, the appointing party is concerned to check that the information has been delivered according to the project's information production methods and procedures (such as, abiding by the security procedures).

The appointing party should, where relevant, be checking the contents of the information container against:

- its exchange information requirements (EIR) including any acceptance criteria specified in the EIR
- the dates recorded in the master information delivery plan (MIDP), and against
- the degree of information required defined through the level of information need.

If the review is successful the information model will be accepted by the appointing party and will transition to the Published state - the appointed party(ies) will publish the information container(s) with an A status code – see ISO 19650-2 clause NA 4.2.

If the review is unsuccessful, the information model will be rejected and one, some or all of the information containers will need to be revised. Although ISO 19650-2 says that "... the appointing party shall ... instruct the lead appointed party to amend the information and resubmit for appointing party's acceptance", it is understood that the amendment to any information container is actually carried out by the relevant appointed party, under the direction of the lead appointed party.

Partial acceptance of the information model should be avoided. This is to prevent potential disputes arising within the delivery team or other delivery teams.

For example, if information model delivery is not complete, its output as reference information for another delivery team will be unreliable.

The published information will then be available as reference information for other delivery teams. This may then trigger a new appointment process.

Summary of activities within the clause (as appropriate):

- Review the project's information production methods and procedures, the EIR, the MIDP and level of information need for each information requirement
- Review each information container in accordance with these resources
- If the review is successful, accept the information model
- If the review is unsuccessful, reject the information model and instruct the lead appointed party accordingly

ISO 19650-2 related clauses:

5.2.1 Establish the appointing party's exchange information requirements (where a new appointment is triggered)
5.4.6 Complete lead appointed party's appointment documents
5.6.2 Generate information
5.8.1 Archive the project information model
5.8.2 Capture lessons learned for future projects (in reality this applies at an appointment level as well as at project level)

ISO 19650-2 clause 5.8 Project close-out

Clause: 5.8.1 Archive the project information model	
The primary party active within the clause: Appointing party	**Insight:** Although individual information containers are added to the common data environment archive during information production, this particular requirement relates to archiving the whole project information model as part of project close-out. This is to ensure that there is a definitive final version of the project information model available in case it needs to be referred to by the appointing party after the project has been completed.
Contributing parties to the clause: n/a	
When the activity within the clause should be carried out: At project close-out	
The level of the activity: Project	
Summary of activities within the clause (as appropriate): n/a	
ISO 19650-2 related clauses: n/a	

Clause: 5.8.2 Capture lessons learned for future projects

The primary party active within the clause:
Appointed party

Contributing parties to the clause:
Lead appointed party

When the activity within the clause should be carried out:
Throughout the project, but particularly at close-out

The level of the activity:
Project and appointment

Insight:

The opportunity to capture, store and disseminate lessons learned from one project to the next (and from one appointment to the next), supports continuous improvement of the briefing, delivery and operational outcomes of future projects. Although this is noted as a project close-out activity, capture of lessons learned might also improve processes within the duration of an appointment.

It is paramount that sufficient time and resources are allowed to identify, record and understand the implications of these lessons. A robust process will ensure information collected is appropriately structured and in a consistent format to enable analysis, storage and onward utilization.

Capture of lessons learned is also an activity referenced in the BS 8536 series (which remains within the UK BIM Framework), as part of soft landings. Soft landings provide a structured methodology whereby lessons can be captured.

The key objective of capturing lessons learned is to support future projects from briefing through to the operational stages. Therefore, consideration should be made to engage with stakeholders across the project life cycle to best inform the lessons and in doing so future projects. Through a soft landings approach, the implementation of suitably developed Post Project Evaluations (PPE) and Post Occupancy Evaluations (POE) provide the platform upon which project lessons can be captured from a variety of project stakeholders (Design Team, FM Teams, Contractor, user etc).

It is equally important that the obligations to actively participant within the lessons learned process are clearly embedded within stakeholders appointments. The project stakeholders should be engaged and encouraged to contribute to the lessons learned, considering what was done well, what could have been done better and areas for further consideration. Both quantitative and qualitative information may be collected and suitable provisions for the analysis and dissemination of this information should also be considered within the organization. Typical assessment criteria that may be considered within a lessons learned exercise include:-

- Assess if the project/investment delivered the required outcomes.
- Assess any pre-determined performance metrics.
- Did the project delivery meet required budget and programme?
- Did the procurement process satisfy all parties?
- Did the information management process deliver its required outcomes?
- What is the asset users' feedback?
- What are the final commercial costs for the project for benchmark purposes?
- Does the operational asset perform as designed?
- What were the social benefits/values delivered by the project?
- What was the carbon impact of the investment?

The list is not exhaustive but provides examples criteria to be considered.
Defining the criteria at the outset for the project will best support the delivery team meet these project outcomes.

Summary of activities within the clause (as appropriate):
n/a

ISO 19650-2 related clauses:
n/a

9.0 Information management process summary

The summary provides a helicopter view of the processes according to ISO 19650-2 (although it should be noted that it does not indicate every possible instance of involvement across the parties).

The following pages show the process in each stage in more detail.

Key:

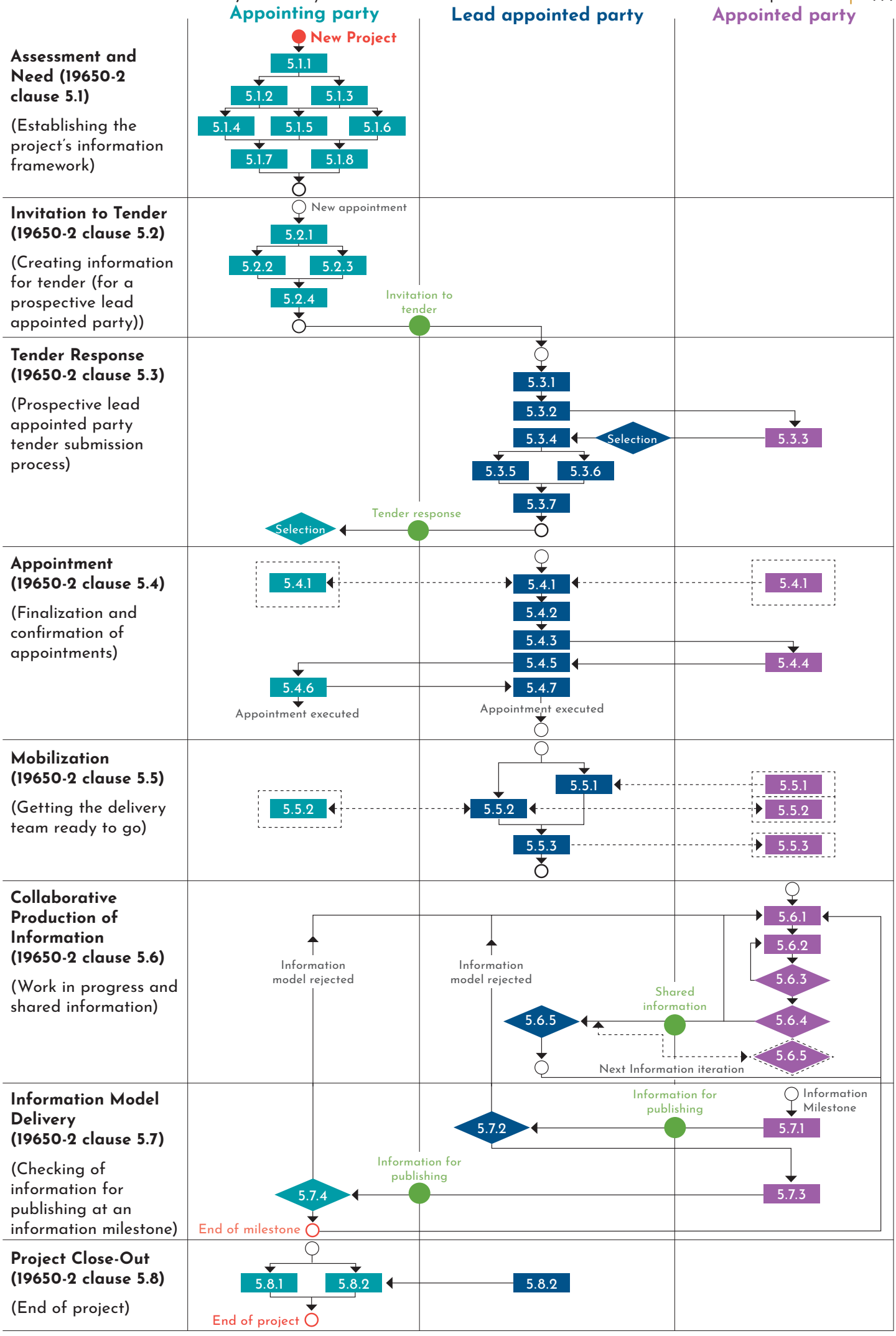
Activity to be undertaken

Decision point

Information exchange

Sequence flow

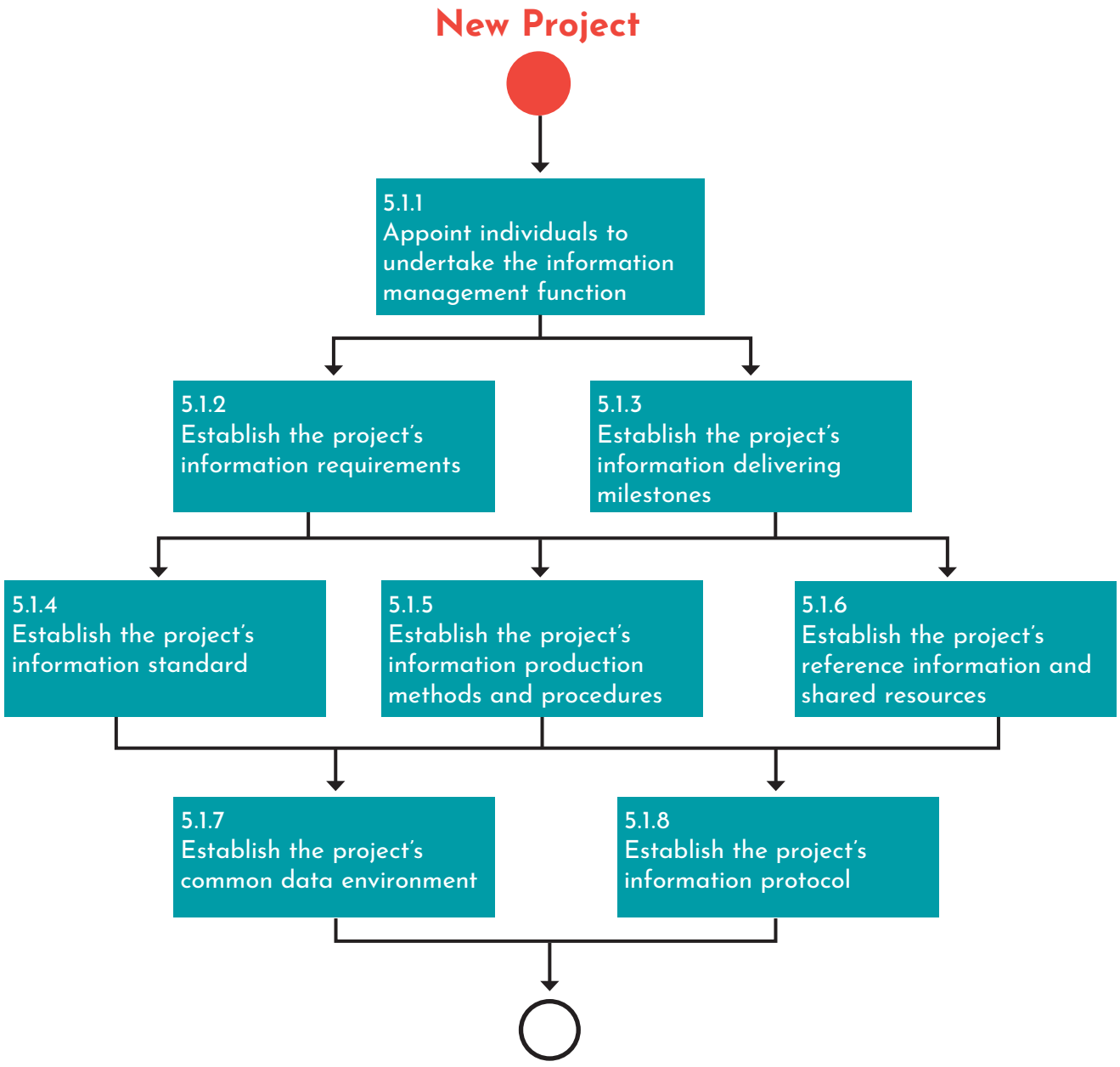
May contribute to or be informed of


Appointing party
Lead appointed party
Appointed party
Assessment and Need (19650-2 clause 5.1)
(Establishing the project's information framework)
New Project
5.1.1
5.1.2
5.1.3
5.1.4
5.1.5
5.1.6
5.1.7
5.1.8
Invitation to Tender (19650-2 clause 5.2)
(Creating information for tender (for a prospective lead appointed party))
New appointment
5.2.1
5.2.2
5.2.3
5.2.4
Invitation to tender
Tender Response (19650-2 clause 5.3)
(Prospective lead appointed party tender submission process)
5.3.1
5.3.2
5.3.3
5.3.4
Selection
5.3.5
5.3.6
5.3.7
Tender response
Selection
Appointment (19650-2 clause 5.4)
(Finalization and confirmation of appointments)
5.4.1
5.4.2
5.4.3
5.4.4
5.4.5
5.4.6
5.4.7
Appointment executed
Appointment executed
Mobilization (19650-2 clause 5.5)
(Getting the delivery team ready to go)
5.5.1
5.5.2
5.5.3
Collaborative Production of Information (19650-2 clause 5.6)
(Work in progress and shared information)
5.6.1
5.6.2
5.6.3
5.6.4
5.6.5
Information model rejected
Information model rejected
Shared information
Next Information iteration
Information Model Delivery (19650-2 clause 5.7)
(Checking of information for publishing at an information milestone)
Information for publishing
Information Milestone
5.7.1
5.7.2
5.7.3
5.7.4
Information for publishing
End of milestone
Project Close-Out (19650-2 clause 5.8)
(End of project)
5.8.1
5.8.2
End of project

Assessment and Need (19650-2 clause 5.1)

(Establishing the project's information framework)

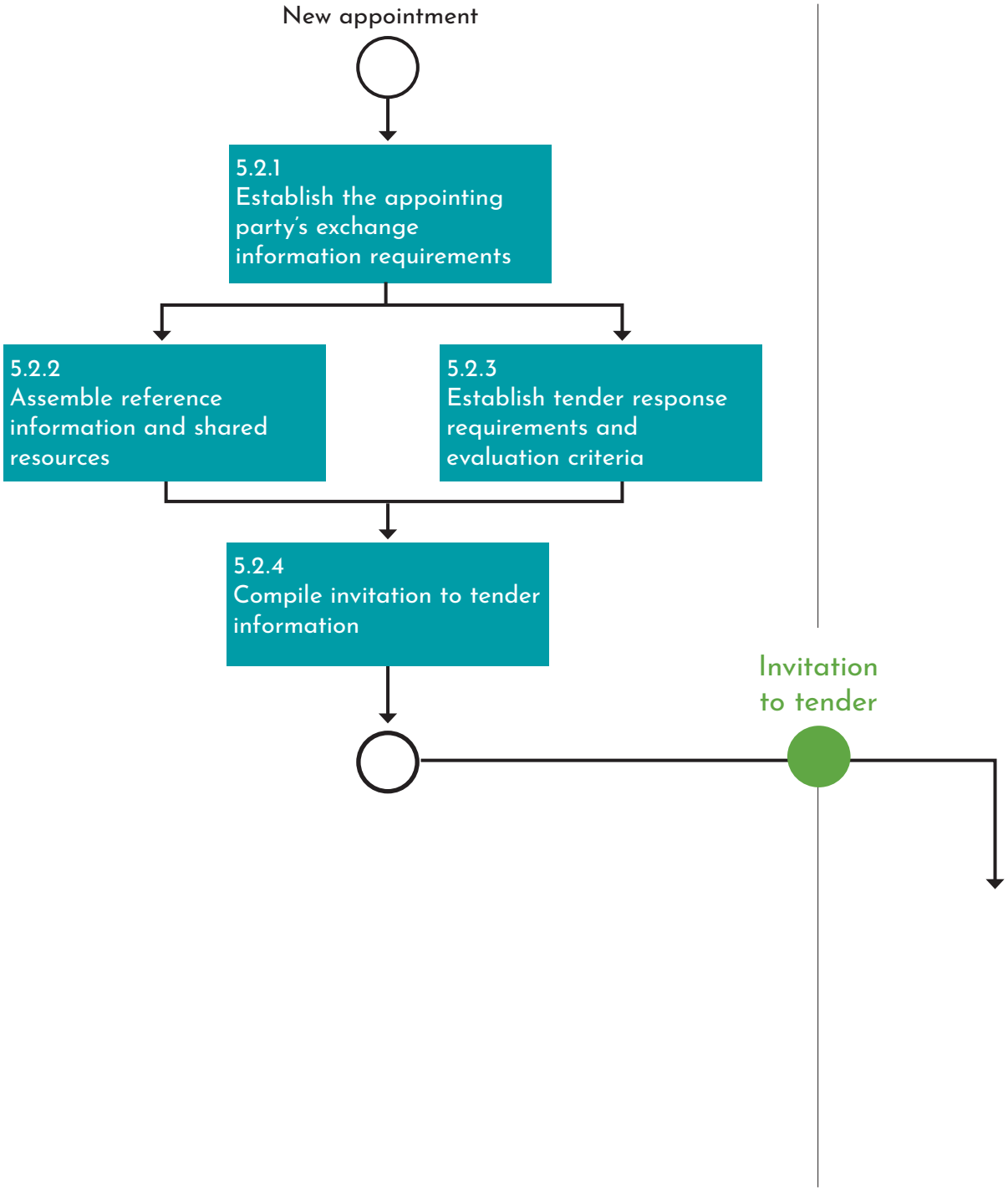
Appointing party



Invitation to Tender (19650-2 clause 5.2)

(Creating information for tender (for a prospective lead appointed party))

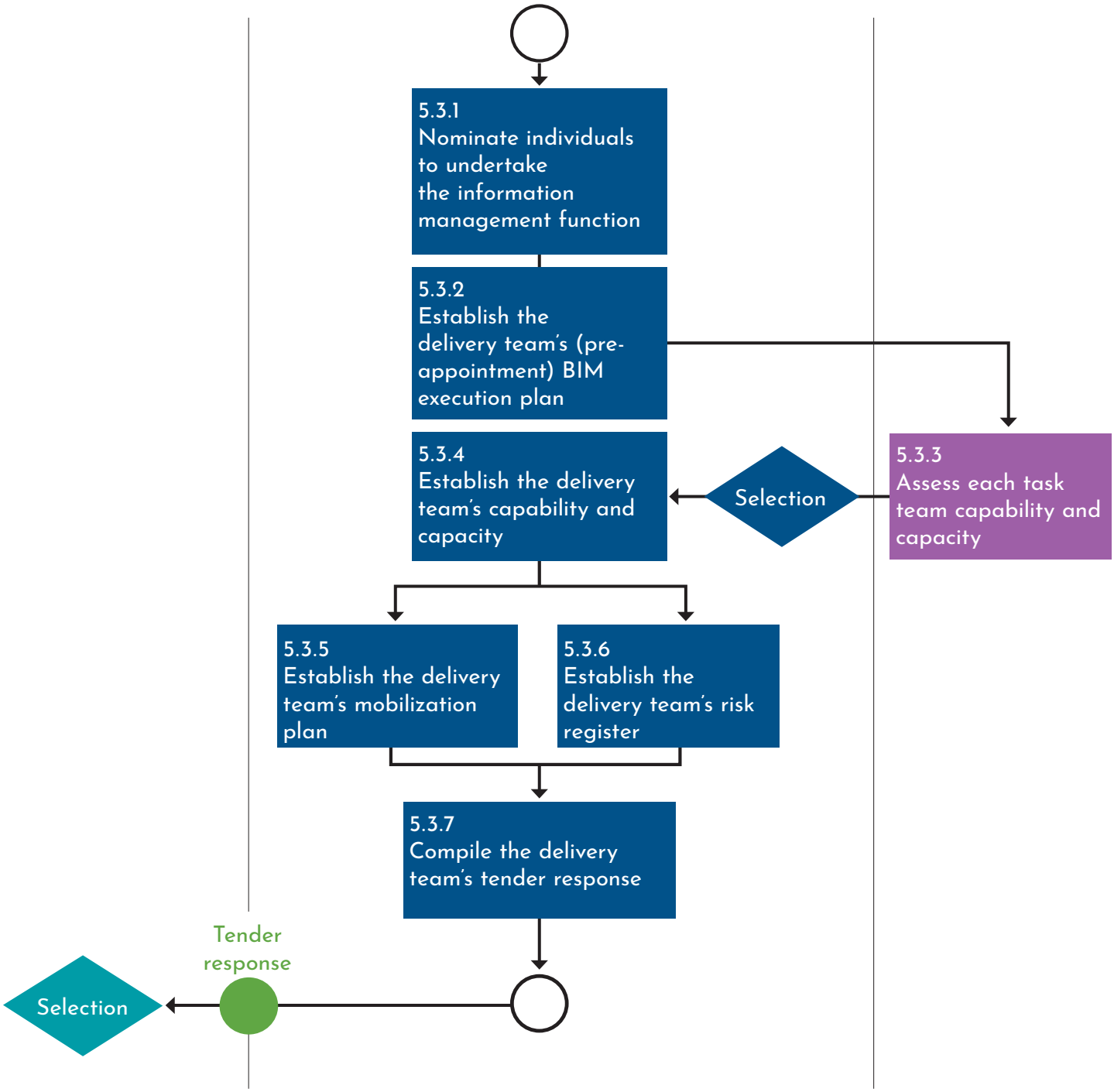
Appointing party



Tender Response (19650-2 clause 5.3)

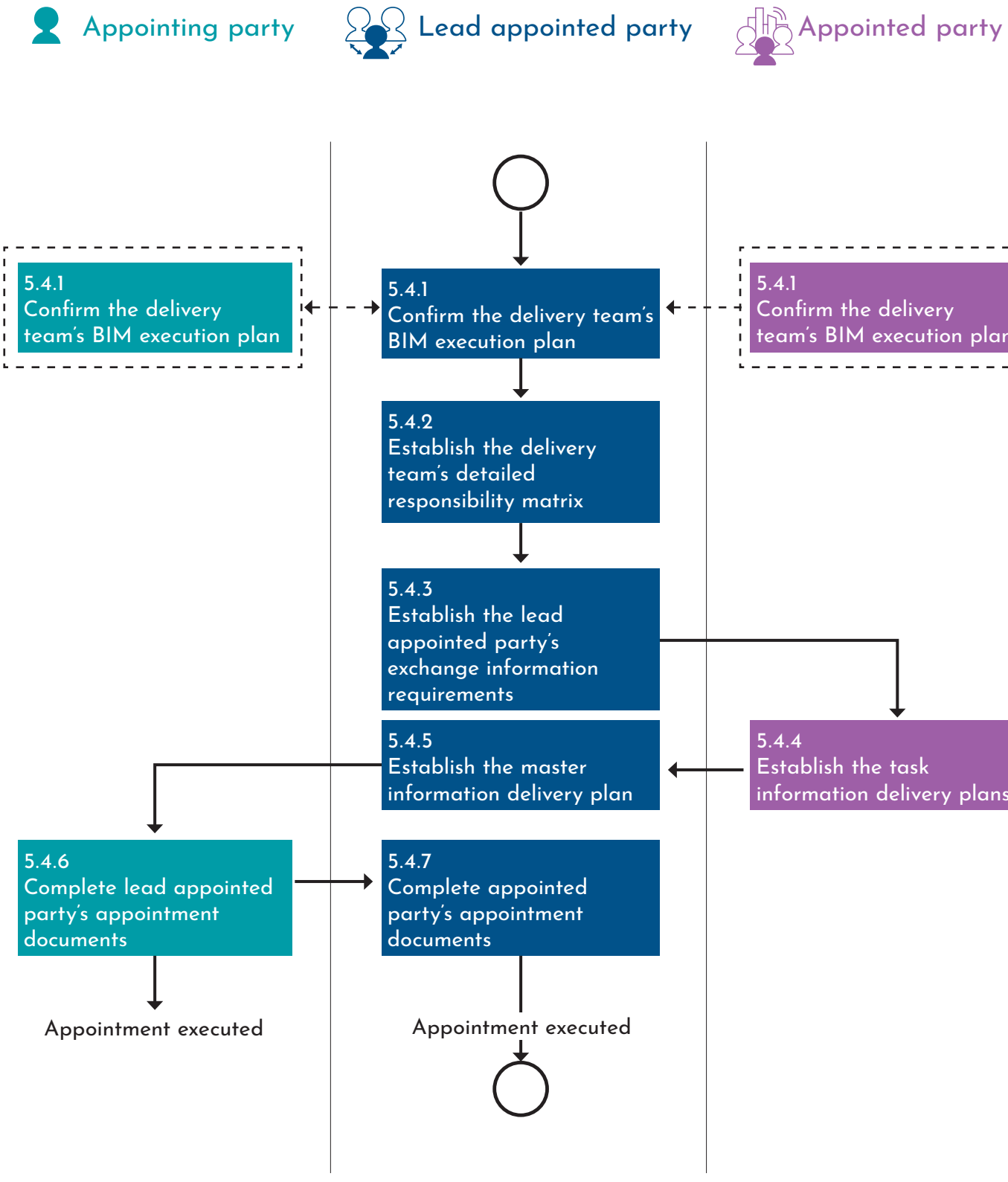
(Prospective lead appointed party tender submission process)

Appointing party Lead appointed party Appointed party



Appointment (19650-2 clause 5.4)

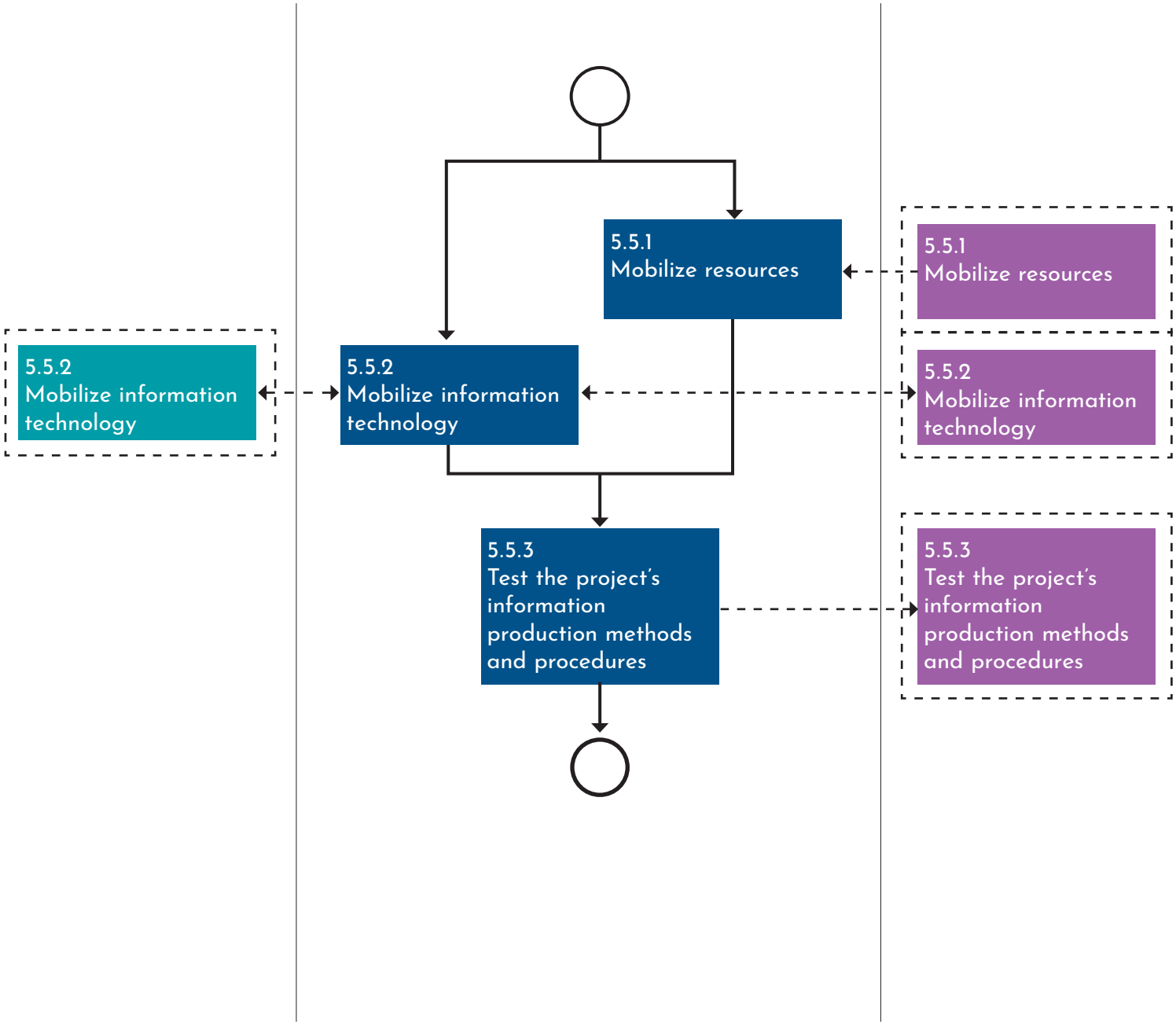
(Finalization and confirmation of appointments)



Mobilization (19650-2 clause 5.5)

(Getting the delivery team ready to go)

Appointing party Lead appointed party Appointed party

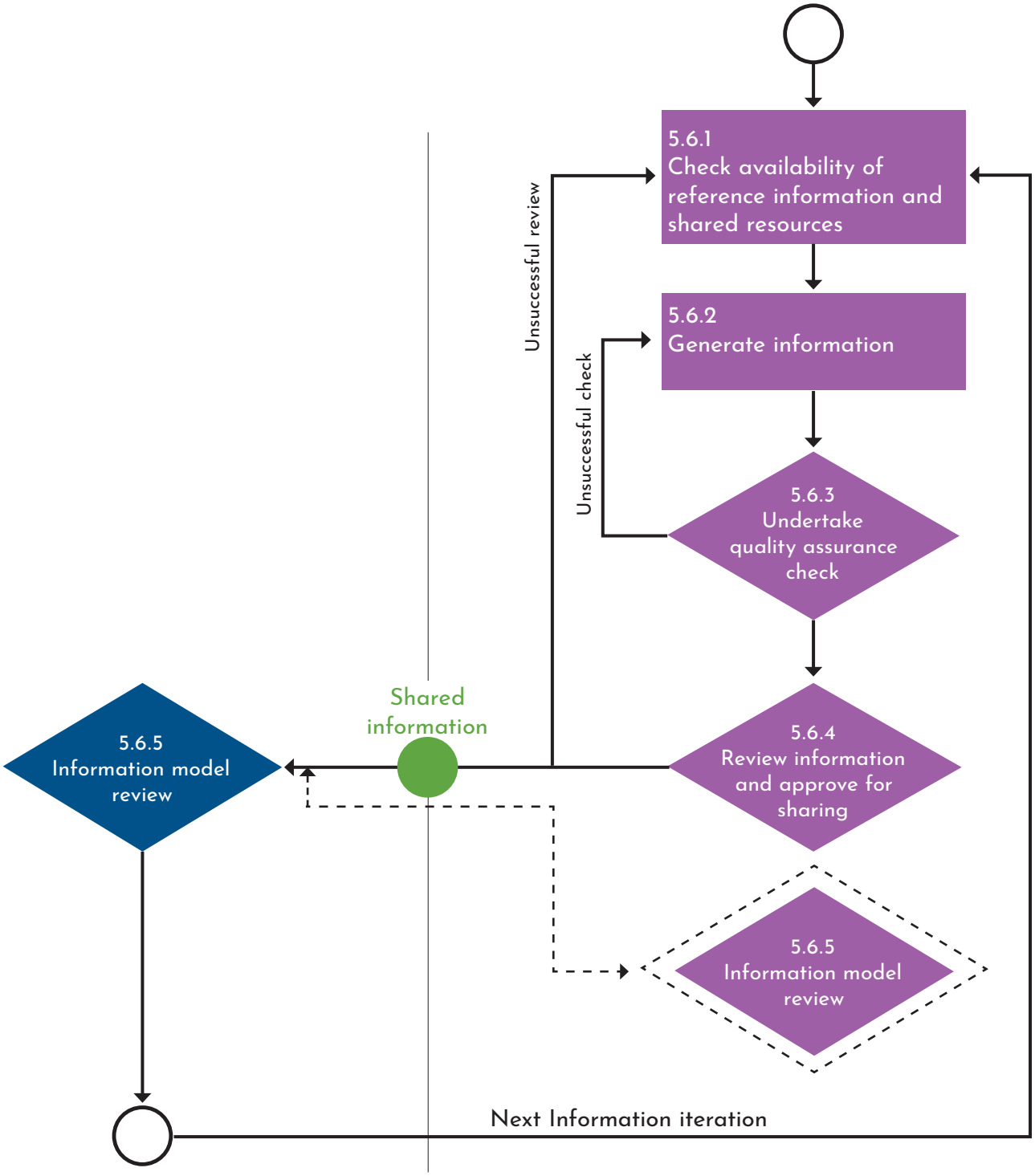


Collaborative Production of Information (19650-2 clause 5.6)

(Work in progress and shared information)

Lead appointed party

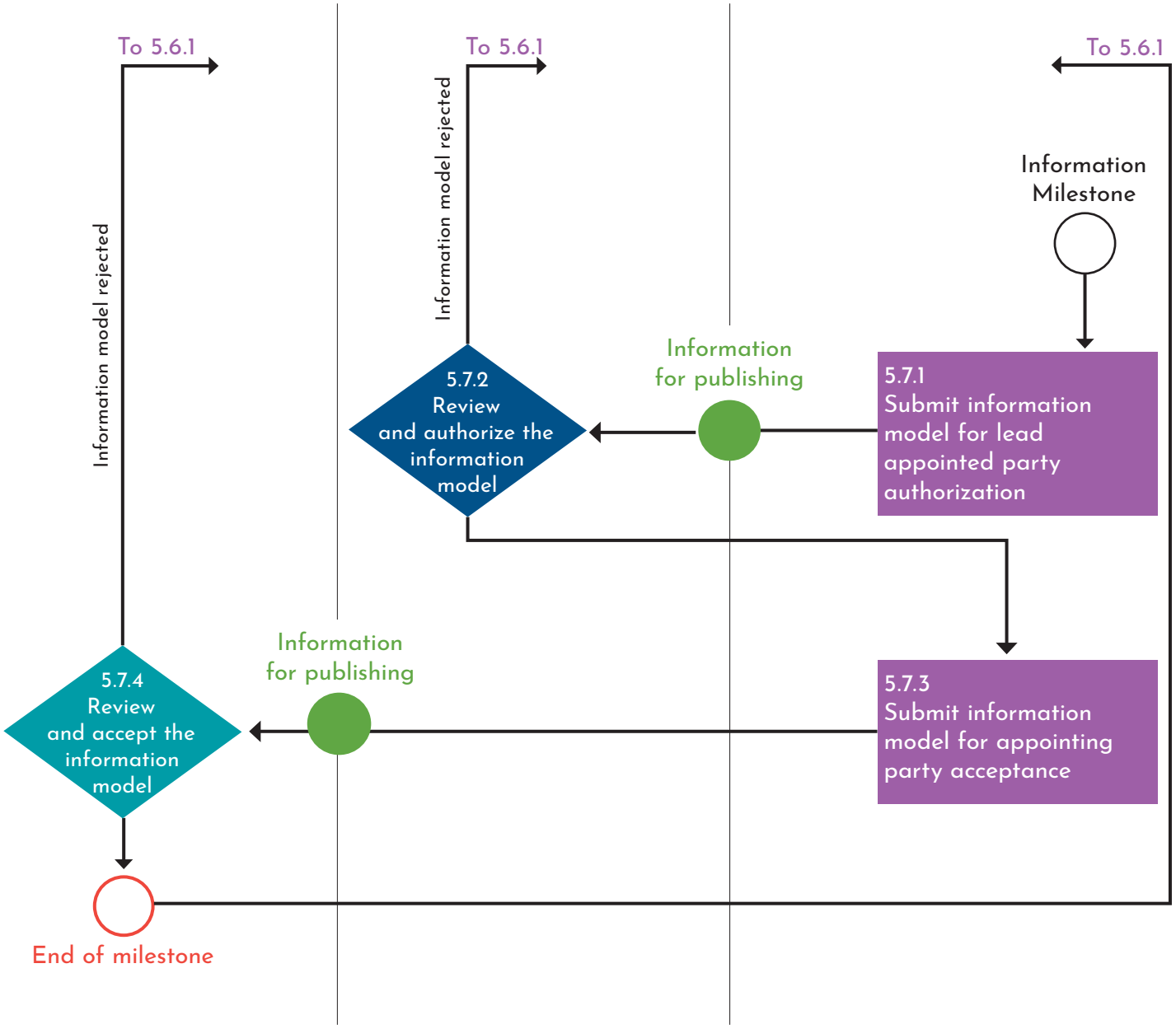
Appointed party



Information Model Delivery (19650-2 clause 5.7)

(Checking of information for publishing at an information milestone)

Appointing party Lead appointed party Appointed party

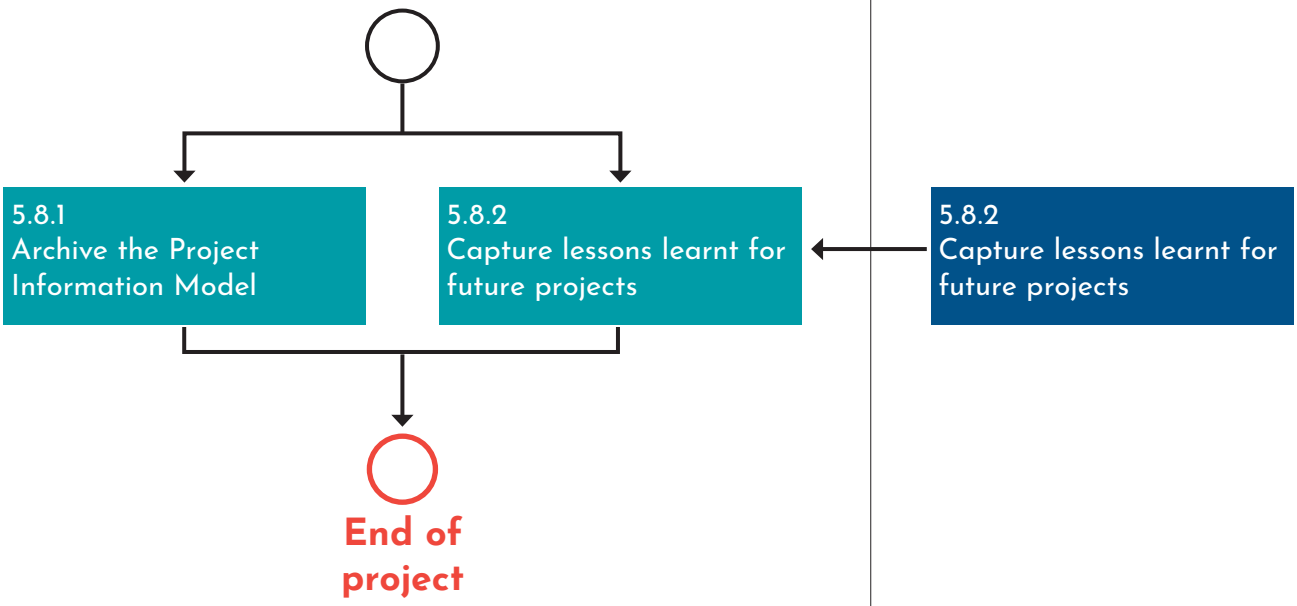


Project Close-Out (19650-2 clause 5.8)

(End of project)

Appointing party

Lead appointed party



10.0 Summary

The fourth edition of this process-level guidance has provided further insight into information requirements, the level of information need, information delivery planning and open data and buildingSMART.

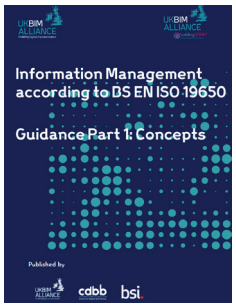
It should be referred to by practitioners and those implementing the ISO 19650 series across a project, within an appointment or within an organization.

As noted in the Concepts guidance, the ISO 19650 series is still new, albeit based on former UK standards. As experience of implementing the standard is gained over the coming months and years, this guidance will be updated to reflect both this experience and any comments/ feedback received from users. It will also develop to provide insight into more of the information management themes within the ISO 19650 series.

Please do let us have your feedback by emailing us at guidancefeedback@ukbimalliance.org.

Please remember that you can get to the ISO 19650 standards at

And Guidance Part 1: Concepts at



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Annex A - Examples of information requirements

The examples provided here are to demonstrate what information requirements could look like, and the contents shown are for illustrative purposes only. For this fourth edition, examples cover organizational asset and project information requirements.

Examples to cover exchange information requirements will be included in the fifth edition of the guidance.

We welcome your feedback on this content so that it can be developed further.

A.1 Organizational information requirements

In the examples below, the organizational information requirements (OIR) refer to physical/built assets. In reality, every part of a business will have OIR.

This list is only an example of how OIR could be documented and those defining the requirements may want to look at different methods for recording them. The purposes and reasons for requiring information do not have to be passed on to the appointed parties, all they need to know is what information they need to deliver through the AIR or EIR.

Note the headings and sub-headings relate back to the high-level activities and purposes respectively in section 3.3.2.4

Examples:

Maintenance and repairs

- **Policy:** Maintenance Policy.

  OIR: *"The organization wants to remove the backlog of reactive maintenance; all new assets are to be designed with more proactive methods of maintenance in mind"*

  OIR: *"New build projects should avoid manufacturers' maintenance contracts to enable the best price to be found"*

  OIR: *"All new assets are to be delivered with a maintenance plan covering the first 50 years of operational life"*

Environmental management

- **Policy:** Environmental policy

  OIR: *"To align to the organization's 2030 energy targets, all new built assets must achieve an EPC 'A' rating"*

- **Policy:** Carbon policy

  OIR: *"All new assets are to have an embedded carbon value which is lower than the corporately defined value for that asset type"*

- **Policy:** Sustainability policy.

  OIR: *"All wood used must be from sustainable sources"*

Asset operations

- **Business operations task:** Insurance renewal

  OIR: Information required to renew buildings and contents insurance

- **Business operations task:** Emergency repairs.

  OIR: Information required to deliver emergency in-situ repairs to a failing asset

Capital investment and lifecycle costing

- **Business operations task:** Strategic Asset Management Portfolio

  OIR: Financial actuals, full year and full project forecasts to be delivered monthly

- **Business operations task:** Purchasing of specialist equipment.

  OIR: The purchasing of specialist equipment will be conducted by the estates department and form part of corporate reporting

A.2 Asset information requirements

Taking the examples from Annex A.1 (the OIR), more detail is added to form the AIR.

Note, the examples below have been listed to demonstrate the thinking which needs to be undertaken. This is **not** the prescribed way in which they should be defined as it could get overwhelming very quickly, especially when defining alphanumerical information. In reality, this will have to be recorded in more structured ways such as through using databases or spreadsheets and then rationalized. This is why starting with industry recognized schemas is important.

All schemas should be completed according to their rules and the examples below are for indicative purposes only.

Note the headings and sub-headings relate back to the high-level activities and purposes respectively in section 3.3.2.4

Maintenance and repairs

- **Policy:** Maintenance Policy.

  OIR: *"The organization wants to remove the backlog of reactive maintenance, all new assets are to be designed with more proactive methods of maintenance in mind"*

  AIR: Installation and warranty information required for all building services, including annual check information, this is explicitly stated and structured in accordance with the following:

  - Geometrical – schematic drawings showing main risers and service routes, 3D low level geometry model showing location assets. Refer to xxx for a list of maintainable assets
  - Alphanumerical – use of a CAFM system will require attributes; (example, in accordance with BS1192-4) InstallationDate, WarrantyStartDate, WarrantyGuarantorParts, WarrantyGuarantorLabor, WarrantyDurationParts, WarrantyDurationLabor. Drawings and models to contain the same identification information (like Name) as the dataset
  - Documentation – information exchange file in a XLSX format, drawings in PDF format, geometrical model in an open format.

  OIR: *"New build projects should avoid manufacturer's maintenance contracts to enable best price to be found"*

  AIR: Planned maintenance equipment to be identified and asset register issued x weeks before handover, this is explicitly stated and structured in accordance with the following:

  - Geometrical - refer to x for a list of maintainable assets
  - Alphanumerical – attributes required; (example, in accordance with BS1192-4) (Type)Name, (Type)Description, Category, Manufacturer, ModelNumber
  - Documentation – information exchange file in XLSX format.

  OIR: *"All new assets are to be delivered with a maintenance plan covering the first 50 years of operational life"*

  AIR: Maintenance plans should form part of section x of the O&M manual with the order based on the asset type not on the sub-contractor. The contents should include the following:

  - Geometrical – relevant diagrams
  - Alphanumerical – information about maintenance duration, instructions on how the asset should be serviced (if required)
  - Documentation – in PDF format.

Environmental management

- **Policy:** Environmental policy

  OIR: *"To align to the organization's 2030 energy targets, all new built assets must achieve an EPC 'A' rating"*

  AIR: This needs evidence including

  - Geometrical - n/a
  - Alphanumerical – the value of the EPC rating must be equal to or better than A
  - Documentation – delivery team to propose (must be openable with standard software)
  - Policy: Carbon policy.

OIR: *"All new assets are to have an embedded carbon value which is lower than the corporately defined value for that asset type"*

AIR: This needs evidence providing for all new assets. Proposed value to be compared to benchmark value at each information delivery milestone

Asset Information Requirement:

- Geometrical - n/a
- Alphanumerical – attribute required; EmbeddedCarbon
- Documentation – PDF report.

- **Policy:** Sustainability policy.

  OIR: *"All wood used must be from sustainable sources"*

  AIR: This needs evidence providing for all new assets. Certification that the project is FSC complaint

  Asset Information Requirement:

  - Geometrical - n/a
  - Alphanumerical – certificate code and licence code
  - Documentation – certificate.

Asset operations

- **Business operations task:** Insurance renewal

  OIR: *"Information required to renew buildings and contents insurance"*

  AIR: A list of all the built assets in the estate with identification information, total GIA, number of storeys

  - Geometrical - n/a
  - Alphanumerical – attribute (in accordance with BS 1192-4) (Building)Name, (Building) Description, SiteName, SiteDescription, Category, [number of floors], TotalGIA (as an attribute)
  - Documentation – information exchange file in XLSX format.

- **Business operations task:** Emergency repairs.

  OIR: *"information required to deliver emergency in-situ repairs to a failing asset"*

  AIR: Emergency plans should form part of section x of the O&M manual with the order based on the asset type not on the sub-contractor. The contents should include the following:

  - Geometrical – relevant diagrams
  - Alphanumerical – information related to trouble shooting, short-term repair and emergency contact details
  - Documentation – O&M manual in PDF format.

Capital investment and lifecycle costing

- **Business operations task:** Strategic Asset Management Portfolio

  OIR: *"Financial actuals, full year and full project forecasts to be delivered monthly"*

  AIR: Monthly financial Information to include:

  - Geometrical – n/a
  - Alphanumerical – capital investment, actual operating costs, life expectancy forecasts
  - Documentation – cost report in PDF.

- **Business operations task:** Purchasing of specialist equipment.

  OIR: *"The purchasing of specialist equipment will be conducted by the estates department and form part of corporate reporting"*

  AIR: Monthly financial Information to include:

  - Geometrical – n/a
  - Alphanumerical – attribute (in accordance with BS 1192-4) (Type) Name, ModelNumber, Manufacturer, ModelReference, ReplacementCost, NominalWidth, NominalLength, NominalHeight
  - Documentation – information exchange file in XLSX format.

A.3 Project information requirements

In the following examples, the grouping is derived follows the OIR examples in A.1 and extended with PIR. Once completed it may be beneficial to group all information requirements by key decision points. How this is structured is specific to an organization.

This list is only an example of how PIR could be documented and those defining the them will want to look at different methods for recording them. The purposes and reasons for requiring information do not have to shared with appointed parties. Taken literally, all they need to know is what information they need to deliver. However, there may be good reason to provide this background and careful consideration should be given to whether this increases efficiency and understanding and if it adds value to the project.

Note the headings and sub-headings relate back to the high-level activities and purposes respectively in section 3.3.2.4 and purposes in section 3.4.2.4.

Maintenance and repairs

- **Policy:** Maintenance Policy.
  OIR: *"The organization wants to remove the backlog of reactive maintenance; all new assets are to be designed with more proactive methods of maintenance in mind"*

  OIR: *"New build projects should avoid manufacturers' maintenance contracts to enable best price to be found."*

  OIR: *"All new assets are to be delivered with a maintenance plan covering the first 50 years of operational life"*

Safety, health and environmental management

- **Policy:** Environmental policy
  OIR: *"To align to the organizations 2030 energy targets, all new built assets must achieve an EPC 'A' rating"*

- **Policy:** Carbon policy
  OIR: *"All new assets to have an embedded carbon value which is lower than the corporately defined value for that asset type"*

- **Strategic brief:** 80% of the sub-contractors will be based within a 30-mile radius of the site.
  PIR: Evidence required at key decision point 4, 5 & 6 concerning the location of sub-contractor business

Asset operations

- **Business operations task:** Insurance renewal
  OIR: Information required to renew buildings and contents insurance

- **Business operations task:** Emergency repairs
  OIR: information required to deliver emergency in-situ repairs to a failing asset

- **Project business plan:** The operational energy costs of the facility should be no more than £X per year.
  PIR: Annual running costs to be estimated at key decision points 2, 3 and 4 during design

Capital investment and lifecycle costing

- **Business operations task:** Strategic Asset Management Portfolio
  OIR: Financial actuals, full year and full project forecasts to be delivered monthly

- **Business operations task:** Purchasing of specialist equipment
  OIR: The purchasing of specialist equipment will be conducted by the estates department and form part of corporate reporting

- **Project task:** Negotiate funding
  PIR Area/occupancy information and visualizations required at key decisions 1 and 2 to demonstrate to funders what the facility will look like

- **Project business plan:** The facility will need to generate £X turnover in the first year
  PIR: Area/occupancy information of retail departments and benchmark sales figures per m^2 to be provided at key decisions 1 and 2

- **Project business plan:** The investment target will be between £X-£Y.
  PIR: Project cost information to be provided at each key decision point

Statutory

- **Project Task:** Land registry application.
  PIR: Site location and area information

Procurement

- **Project task:** Issue the invitations to tender for the design team
  PIR: Tender package for key decision point 1a
- **Project task:** Issue the invitation to tender for the main contractor
  PIR: Tender packages for key decision point 2a
- **Project task:** Order the correct amount of stock for the new retail store.
  PIR: Shopfitting plans and schedules indicating lengths of shelving of different types

Design

- **Project task:** Strategic brief: The facility will provide a state-of-the-art lecture theatre for 150 occupants.
  PIR: Evidence required at each key decision point that performance and capacity requirements will be met

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