

```
isVideo = ( { type = "image" } || { type = "video" } || { type = "audio" } )
isUrl = ( { type = "url" } || { type = "http" } || { type = "https" } )
isElement = ( { type = "element" } || { type = "document" } )
isObject = ( { type = "object" } || { type = "array" } || { type = "function" } )
```

# Digital information handover for better asset management

// a case study perspective

```
$window: $window,
$body: $("body"),
$target: $target,
$object: $object,
visible: false,
resizeTimer: null,
touchTimer: null,
gallery: {
  active: false
}
```

## Project handover – initial observations:

- A building's handover stage is not an end point, rather a starting point with often complex needs and associated expectations.
- A building's reputation and success factors are linked to how well it can be managed and operated in a logical and safe way.
- To successfully measure, manage and operate our buildings we require complete, accurate, and up-to date information from the outset and across all lifecycle stages.

# Known Issues (consultation feedback)

Record information is missing, inaccurate or late at project handover.

It is often difficult to access information during the project delivery phase.

Clients are not specifying their project information requirements early enough.

Asset and manufacturer data is difficult to locate within the final O&M manual.

# Industry Failures

Recent building failures have highlighted further challenges on the knowledge and information we have of our estates.





Report of the Independent Inquiry into  
the Construction of Edinburgh Schools

February 2017

## 1. PROCUREMENT RECOMMENDATIONS

### Recommendation 1.5 - Quality of design and construction

Appropriate time and resource should be allocated by clients during the initial stages of a project and during the development of the brief in order to establish and clearly define these quality objectives and approaches to ensuring quality.

## 4. INFORMATION SHARING RECOMMENDATIONS

### Recommendation 4.2 - Provision of as-built drawings

The production, retention and updating of accurate construction and operational information and related documentation on projects should be regarded as a fundamental requirement and requires a systematic and disciplined approach by all parties to the contract.

Public bodies should establish a mandatory protocol for receipt and processing of all such project information within their own organisations.

Contractors should be required to put in place appropriate arrangements for the recording of all subsequent changes to final 'construction issues' drawings and arrange for the production of a final as-built set of documents to a standard suitable for issue to the client for retention as a permanent record of the detail of the project.

Contractors should also be required to certify that the 'as-built' documentation as provided is an accurate record of what has actually been built.

---

---

## Queen Elizabeth University Hospital Review

---

---

---

---

### Review Report

---

---

June 2020

timeframe of the project (Capital Accounting Manual 2007). The FBC stated the requirement for an Asset Register and the Employer's Requirements (Section 8.1.28) outlined the need for asset tags, covering "all elements of the Electrical, Mechanical, Public Health Medical Gases and Specialist systems" to be provided by the contractor.<sup>66</sup> The contractor eventually provided asset tags in 2017.<sup>67</sup> This hindered the process of putting a PPM in place due to the scale and complexity of the systems.

without NHS Estates management oversight. One set of documents that supports this observation is the number of 'As Built' drawings that do not match what was installed.<sup>77 78</sup> All of this constituted additional work for Estates and Facilities staff, essentially distracting them from implementing the PPM.

#### Commissioning Documentation

6.5.20. Under the terms of the contract, all technical testing and commissioning were to be made part of the O&M manuals, in both hard copy and digital format, uploaded to an online system; known as 'ZUTEC'. However, the Review has not seen hard copy O&M manuals and the ZUTEC system is missing a large proportion of testing and commissioning documentation. Supervisor meeting minutes contain multiple

#### 5.7. Recommendations

5.7.1. There should be greater use of digital technologies to create, log and store project documentation. This would allow relevant information to be shared with project partners. It would also facilitate governance, and review of project activities and decisions.

5.7.2. There should be a reliable system of retaining major project records, with greater use of digital technologies to record images and other documents, as evidence of critical 'hold points' for future checking.

6.7.5. Project Boards should place adequate value and invest resource in verification and smooth handover, in line with best practice and recent reports on testing, commissioning and certification, especially regarding water and ventilation systems; this should be considered separately from the requirements for design advice and on-site supervisor services with a realistic budget for both.



# Report of the Review Panel on Building Standards Compliance and Enforcement

June 2018

It should be a requirement for the relevant person to submit copies of accurate as-built drawings with the completion certificate. These drawings should be fully amended as necessary to reflect the completed building. It is recommended that these drawings should be required to be certified by contractors as being in full compliance with the approved warrant drawings or alternatively verifiers should be advised that amended warrant approval is required to changes in design identified on the drawings.

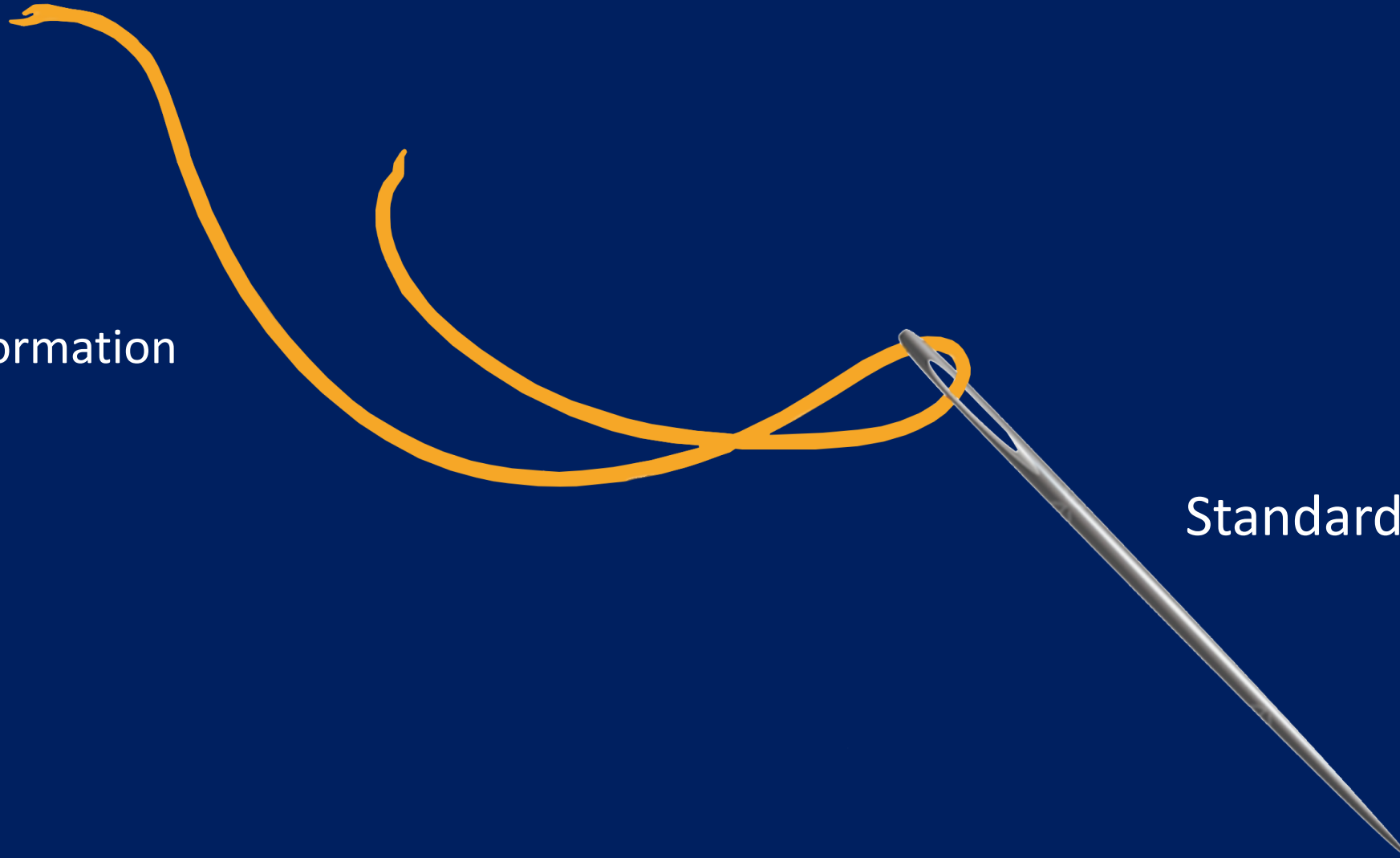
In advance of the introduction of more radical changes to the system, Building Standards services should immediately make it a requirement for the submission of digital photographic evidence with supportive documentation certifying the effectiveness of fire-stopping installations. Central guidance should be produced specifying these requirements.

There is a substantial opportunity for the greater use of digital technologies to share information between contractors and verifiers. Such data is now routinely collected by some larger contractors on projects for quality control purposes. Much of this data is relevant to compliance and can be part of the 'Reasonable Inquiry'. The Scottish Government should promote such innovation and work with industry and verifiers to develop the research, testing and development that is needed to develop platforms, protocols and certification systems to ensure that there is confidence in the data shared by all parties.

# The golden thread of ...

Information

Standards & Processes





# Industry Standards (project briefing & information delivery)

## BS 8536-1



BSI Standards Publication

### Briefing for design and construction –

Part 1: Code of practice for facilities management (Buildings infrastructure)

### Part 1: Briefing for design & construction: for FM

bsi.

...making excellence a habit™

## BS EN ISO 19650-2



BSI Standards Publication

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

### Part 2: Delivery phase of assets

bsi.

## BS EN ISO 19650-3



BSI Standards Publication

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

### Part 3: Operational phase of assets

bsi.

BRIEF

DESIGN

CONSTRUCT

HANDOVER

OPERATE

# Industry guidance & best practice (project handover & use)

UK BIM FRAMEWORK

## Government Soft Landings

Revised guidance for the public sector on applying BS8536 parts 1 and 2

Updated for ISO 19650

Published by

UK BIM FRAMEWORK


bsi. cabb UK BIM ALLIANCE

BSRIA

## BG 79/2020

### Handover Information and O&M Manuals

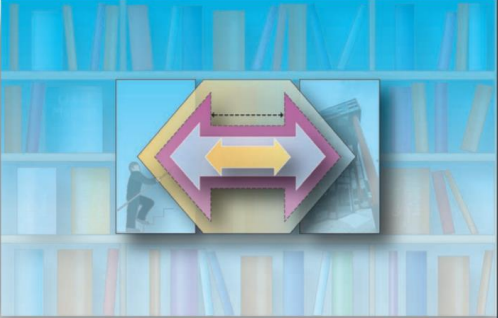
By Nick Blake



BSRIA

A BSRIA Guide [www.bsria.co.uk](http://www.bsria.co.uk)

## Building Manuals and Building User Guides



Guidance and worked examples  
By Jo Harris, Allan Wilson and Salim Deramchi

BG 26/2011

# Standard information management plan (based on ISO 19650-2&3)



as a **client**, I need **xx**,  
so I can **xx**

'**right** information, from the **right** party,  
at the **right** time'

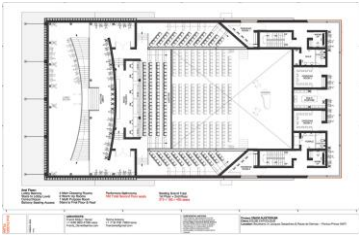
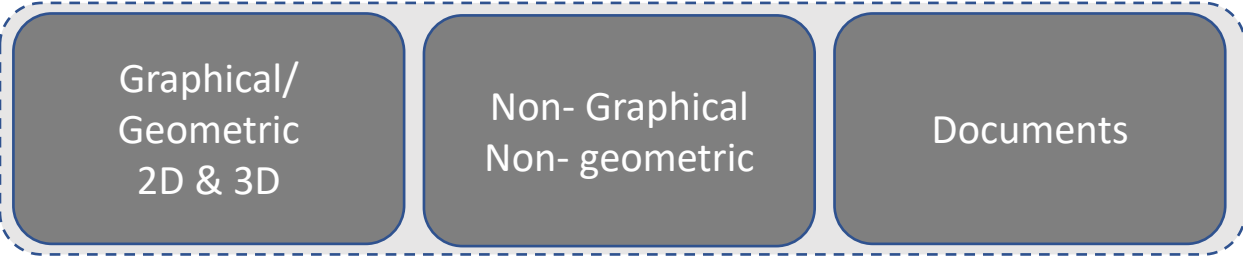
## Required Outcomes

- Having good structured data to manage and operate our building assets.
- Easy accessible and accurate record information in the event of failure.
- Creating information now that is fit for the future.



# Required Deliverables

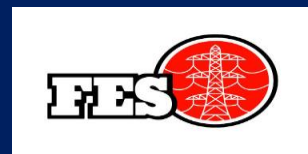
- 1. Validated 'as built/ as-constructed' 2D & 3D information model.
- 2. Validated digital O&M / H&S manual pre - handover.



1010001101011  
1010110101000  
101000111  
10100011



# Project information handover working group



# Proposed Outcome

A new **standard approach** for delivering project handover information for public sector clients within Scotland.

The handover information will be principally **digital**, providing an **accurate representation** and **quality record** of the completed building asset.

This will enable the building asset to be successfully managed and operated from the point of handover.

# Benefits

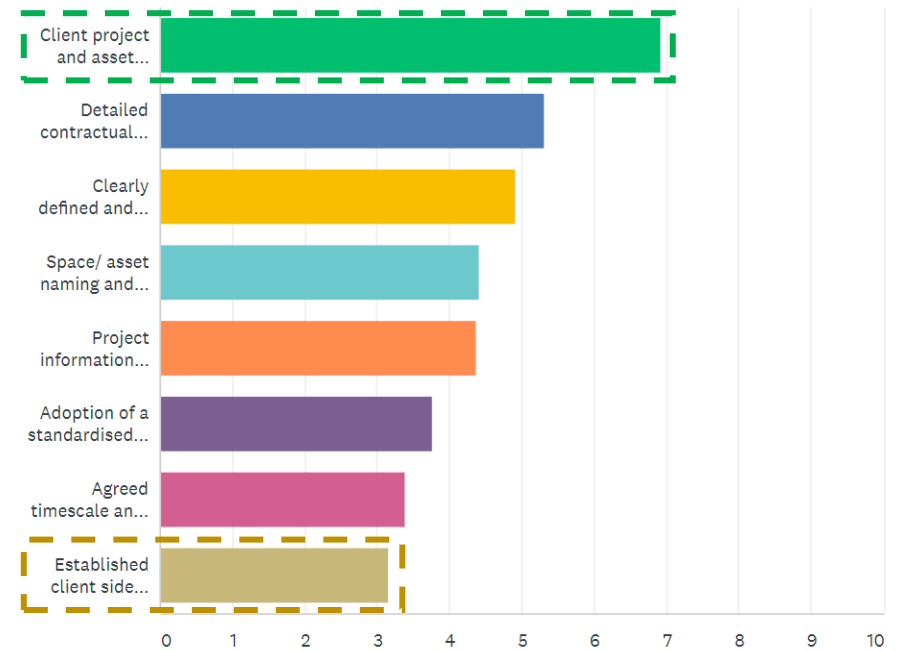
Benefits	Public Sector	Local Authority	Consultant/ Tier 1	Tier 2+
Provides clarity at national and regional levels on what is a standard, best practice approach to specifying project handover information requirements.	✓	✓	✓	✓
Reduces project risk resultant from poor information management practice, including the inaccurate delivery or non-delivery of information.	✓	✓		
Provides business confidence and certainty on what is required at bidding and delivery stages			✓	✓
Informs contractual and resource requirements at an earlier project stage			✓	✓
Enables industry to commit investment in supply chain up-skilling and training where needed			✓	✓



# Exploratory group work - survey

▼ Client project and asset information requirements specified at project outset	6.92
▼ Detailed contractual requirements in place between the client and contractor & their onward supply chain for project handover	5.31
▼ Clearly defined and established information delivery roles & responsibilities at the project outset	4.92
▼ Space/ asset naming and mapping requirements for client estate / CAFM system established at the project outset	4.42
▼ Project information checking, approval, handover protocols and timings agreed at the early stages of a project	4.38
▼ Adoption of a standardised industry recognised handover process (e.g. soft landings) & recognised O&M template (e.g. BSRIA BG 79)	3.77
▼ Agreed timescale and programme for the pre-handover of a draft O&M manual for client approval	3.38
▼ Established client side digital folder directory (e.g. Sharepoint) for information delivery / transfer at key project stages	3.15

SUGGESTED IMPROVEMENTS:- Rank in order of importance the following activities in how they improve the quality of project information handover deliverable's. (1 being most important, 8 being least important)



# Key group considerations

- Stakeholders (parties), roles & responsibilities
- Information need, types and accessibility
- Asset classification and naming conventions
- Information delivery, storage & system integration

# Information Users



**Owners**



**FM managers**



**Maintainers**



**Occupants**

# Reasons & requirements

- Compliance
- Assurance
- Performance



- Planning
- Delivery



- Servicing
- Replacement



- Accessibility
- Utilisation

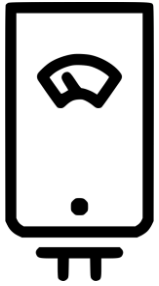
- Statutory / regulatory
- Company policy
- Budget

- Contractual
- Operations & records

- Continuity
- Optimisation

- Guidance
- Procedures

# Information need & access



What assets are in my building ?

What are they called ?

Where are they?

How do I operate them?

How do I maintain them?

How do I know they have been installed and maintained safely?

**Asset register**

**Asset naming & codes**

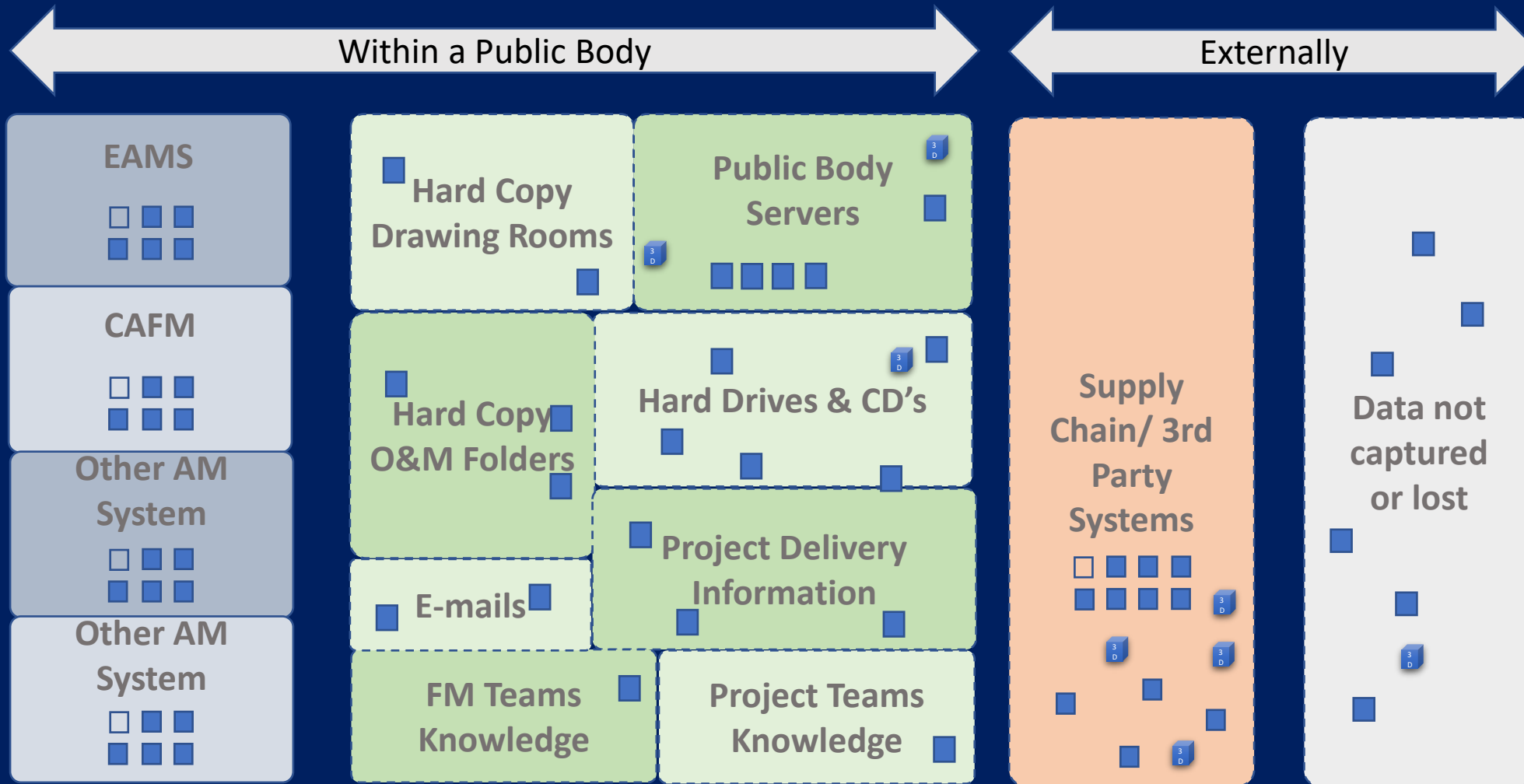
**Room ref, model spatial data linked to site tag**

**Building Manual & User Guide**

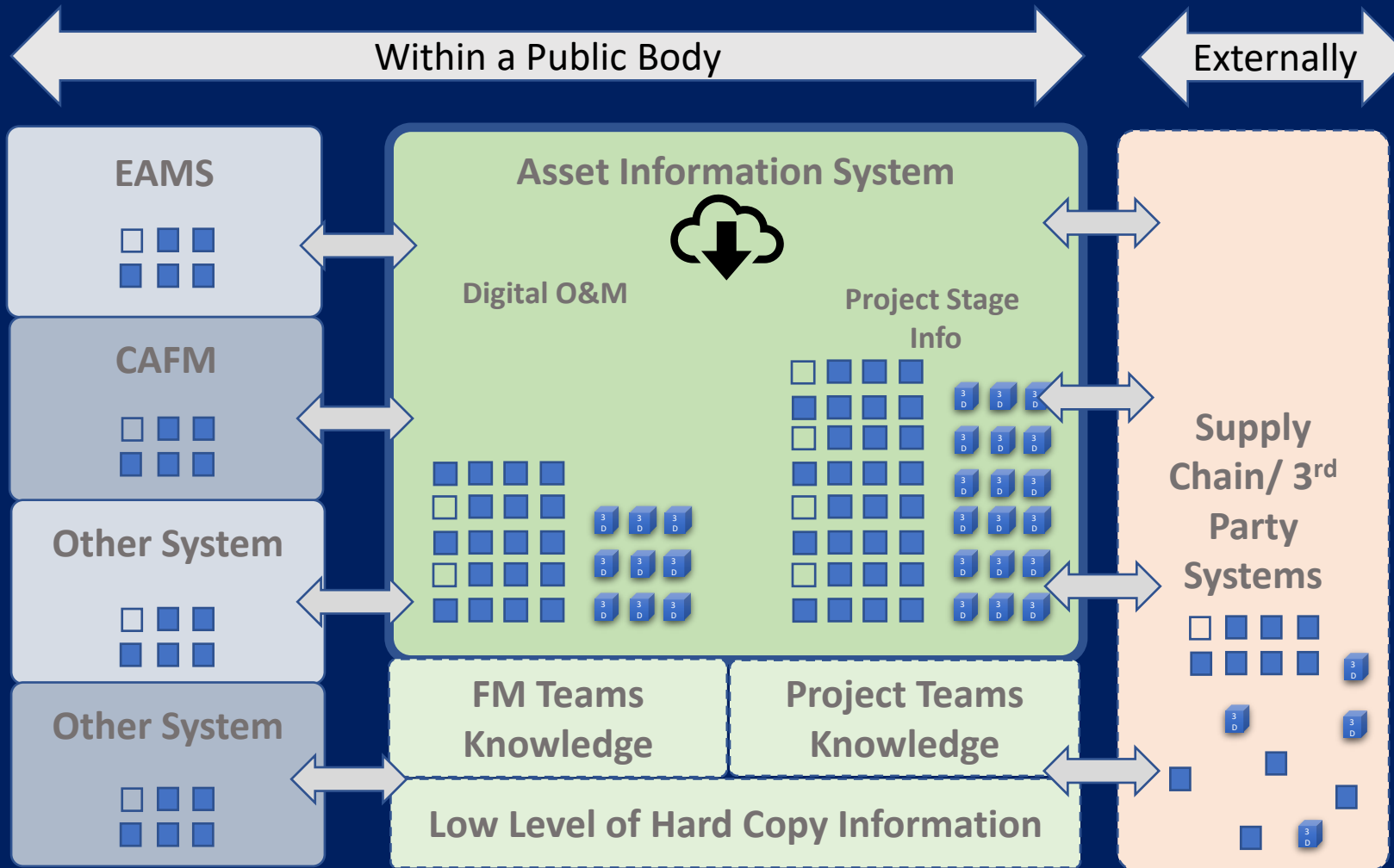
**O&M Manual information & maintenance calendar**

**O&M Manual records & log book**

# Current State - Information types & access

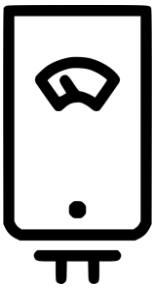


# Future State - Information types & access



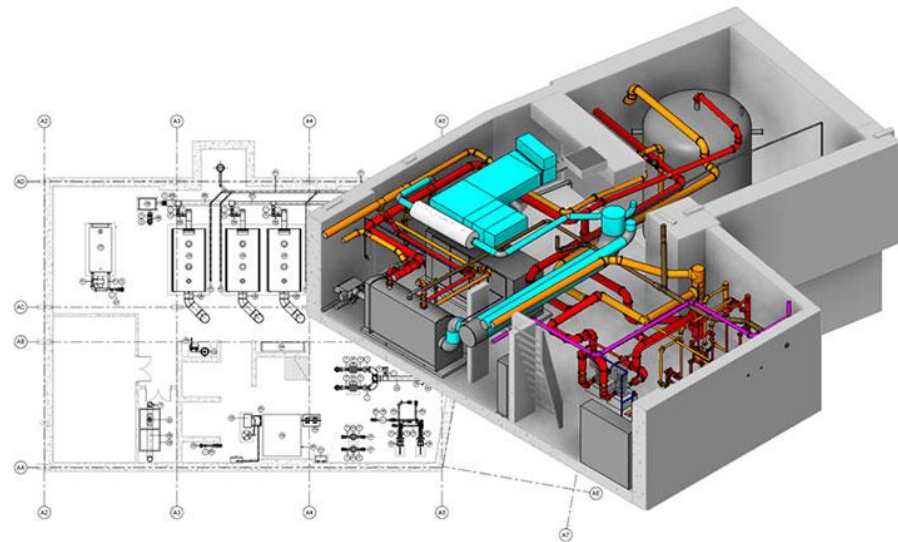
# Asset classification and naming conventions

Uniclass 2015



## Systems (Ss)

Ss\_65\_40



## Products (Pr)

Pr\_65\_67\_29\_52



[Location]-[Asset type ]-[Number]

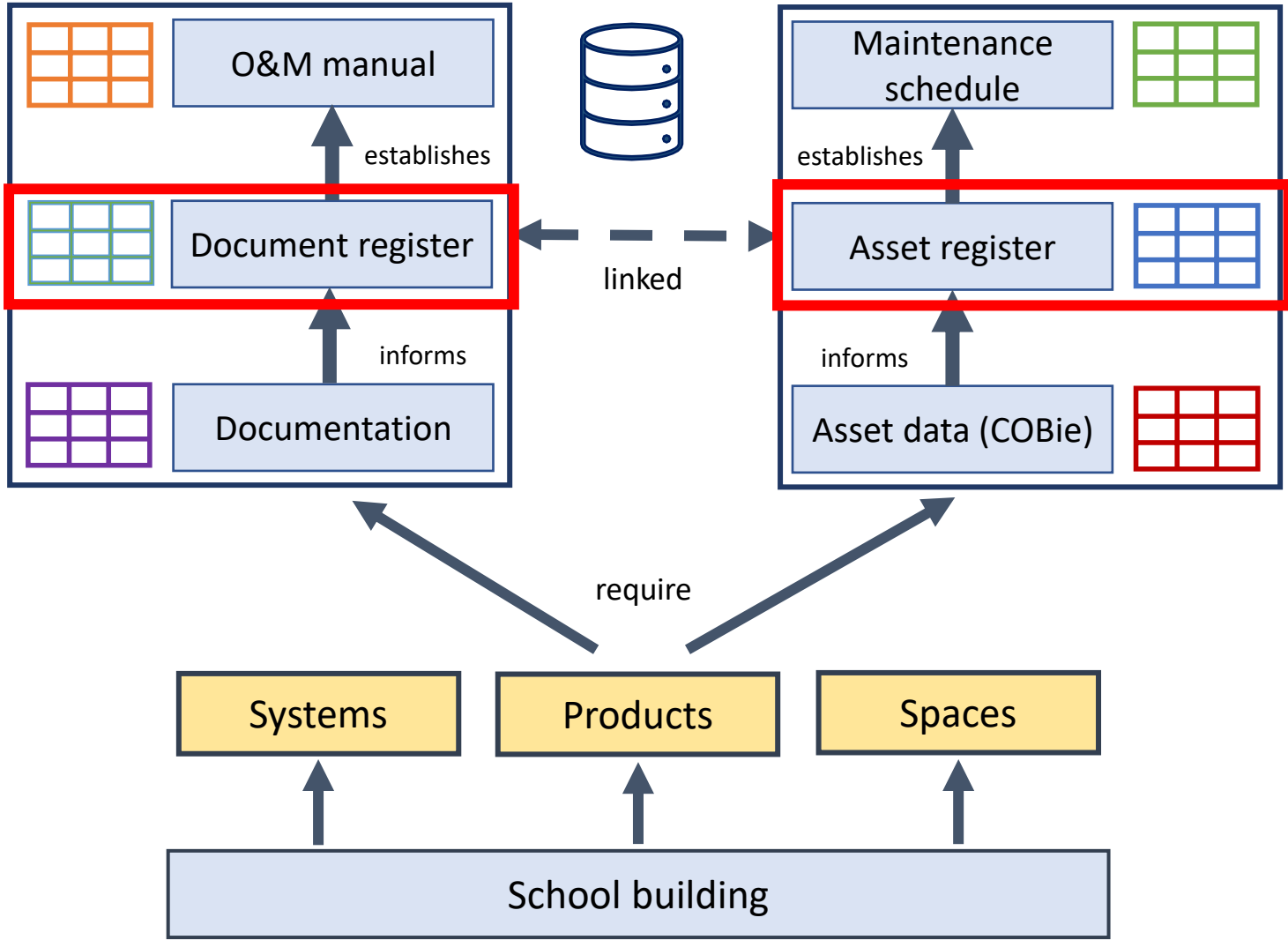


# Asset information - relational hierarchy

**As-Constructed/Handover**

**RIBA Stage 6: Handover**

- Project information
  - Client requirements
- Testing, commissioning and completion
  - Compliance and certificate documents
  - Testing information
  - Commissioning information
  - Completion information
  - Record information
  - Project assurance information
- Asset management information
  - Asset strategy, planning and manag info
  - Asset life cycle cost information
  - Emergency strategy information
  - Asset risk management information



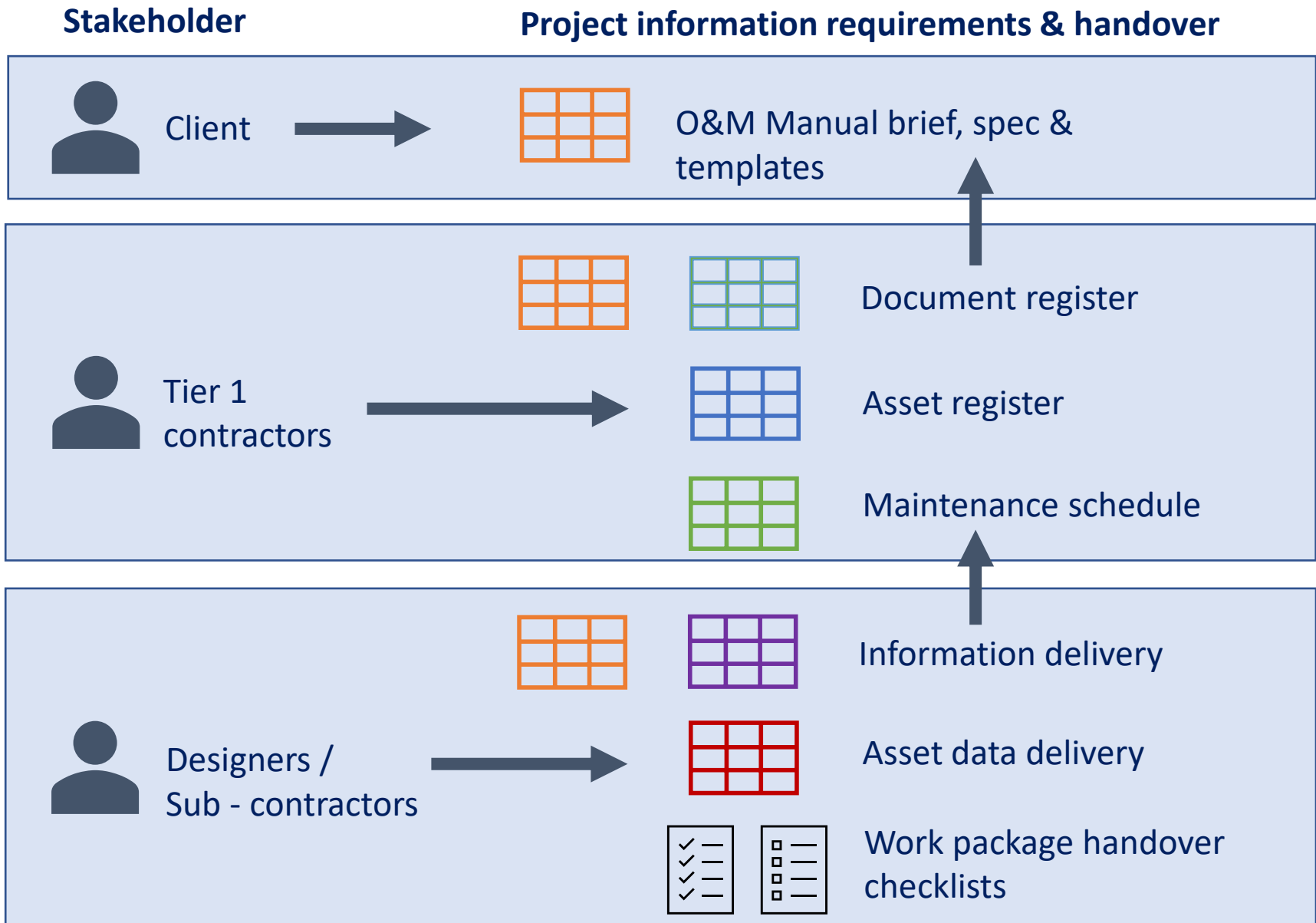
**Operation & Maintenance**

**RIBA Stage 7: Use**

- Project information
  - Client requirements
- Testing, commissioning and completion
  - Compliance and certificate documents
  - Testing information
  - Commissioning information
  - Completion information
  - Record information
- Asset management information
  - Asset strategy, planning and man info
  - Asset life cycle cost information
  - Emergency strategy information
  - Asset risk management information

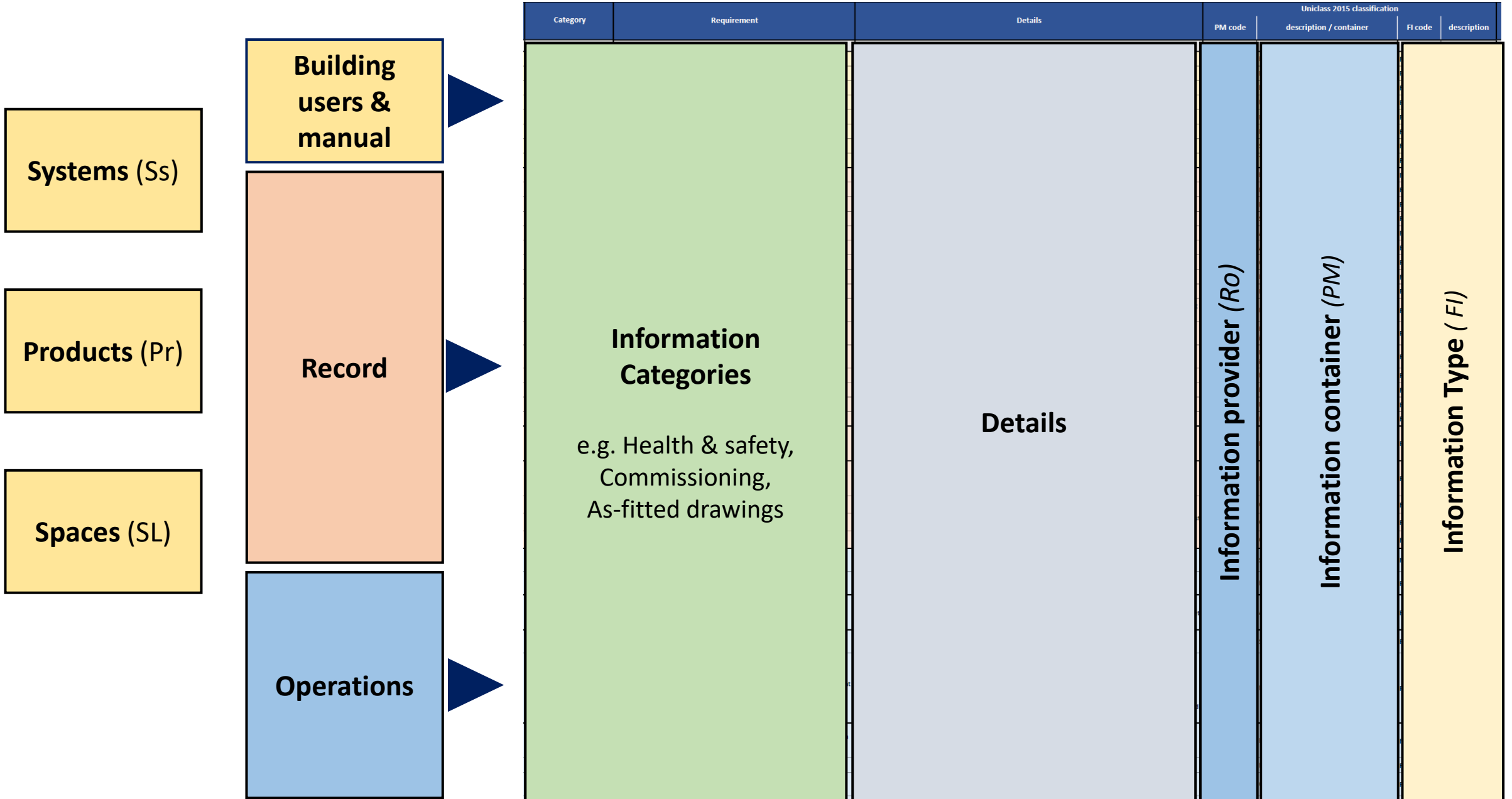


# Asset information - production & delivery

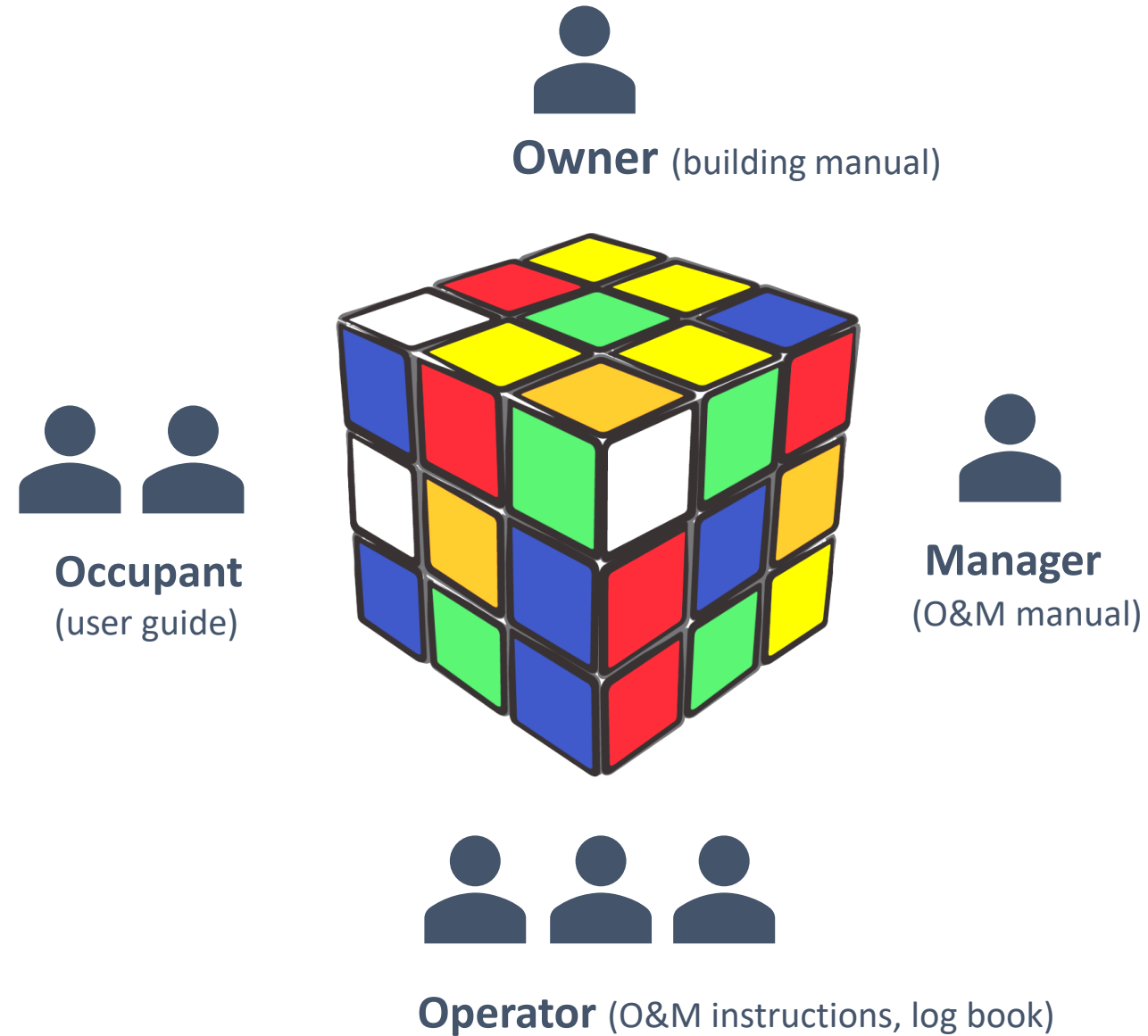
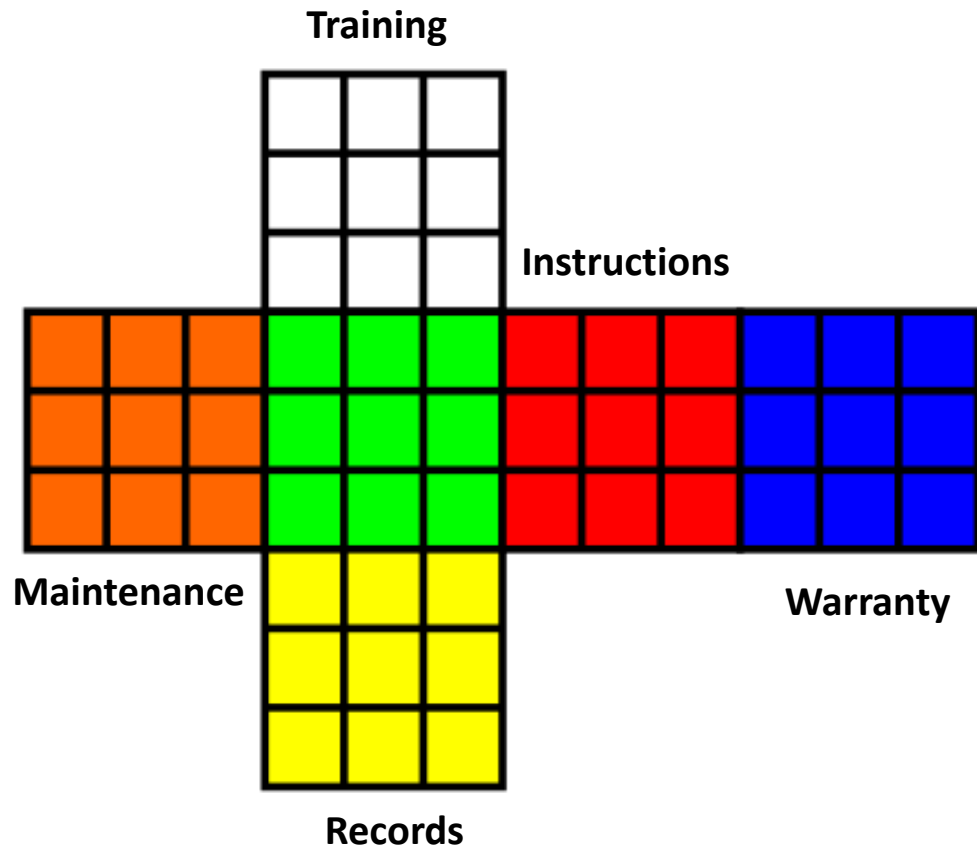


# **Standard O&M Manual & Asset register**

# O&M manual structure (based on BSRIA BG 26 & 79)



# Asset information handover & access





# Asset register (based on systems & products)

Products										Maintenance																			
<b>Associated Products</b> (Pr)	<b>O&amp;M manual information categories</b> (Y/N assigned)										<b>High-level maintenance tasks</b> (Y/N required)																		
	Asset Name / Ref (COBie)	Description (COBie)	Number of instances	Manufacture	Model number	Space	Serial number	Warranty & Expected life data	As-fitted documentation	Product / Manufacturers literature	Commissioning inc. certificates	Operations & control instructions	Health & Safety	<b>Condition survey</b>															
											<b>Statutory compliance</b>																		
											<b>Manufacturers requirements / PPM</b>																		
											<b>FREQUENCY KEY</b>																		
											x yr	A	BA	Q	M	BM	W	BW	D										

# Case studies

# Existing buildings - pilots & demonstrators


ap activePIM Wallyford Primary School Phase 1

- Home
- Estates
- Facilities
- Site
- Requirements
- Facility**
  - Details
  - Documents
  - Attributes
  - Required Data
  - Models
  - Floors
  - Spaces
  - Systems
  - Categories [Schedules]
  - Manufacturers
  - Components [Assets]

Dashboard > Facilities > Facility

### Details

Project Photo



**Facility [Code]:** WPS

**Description:** 2 Storey Primary School Development

### Space Details

**Key:** 00-003

**Requirement:** Default Space

**Floor Name:** Level 00

**Category:** SL\_40\_20 : Dining spaces

**Description:** Dining Area

**Room Tag:** 00-003

**Usable Height:** 4050

**Gross Area:** 422.65

### Details

**Phase:** 2. Concept Design

**Workstage:** [5] Construction

**Project Name:** Wallyford Primary School Phase 1

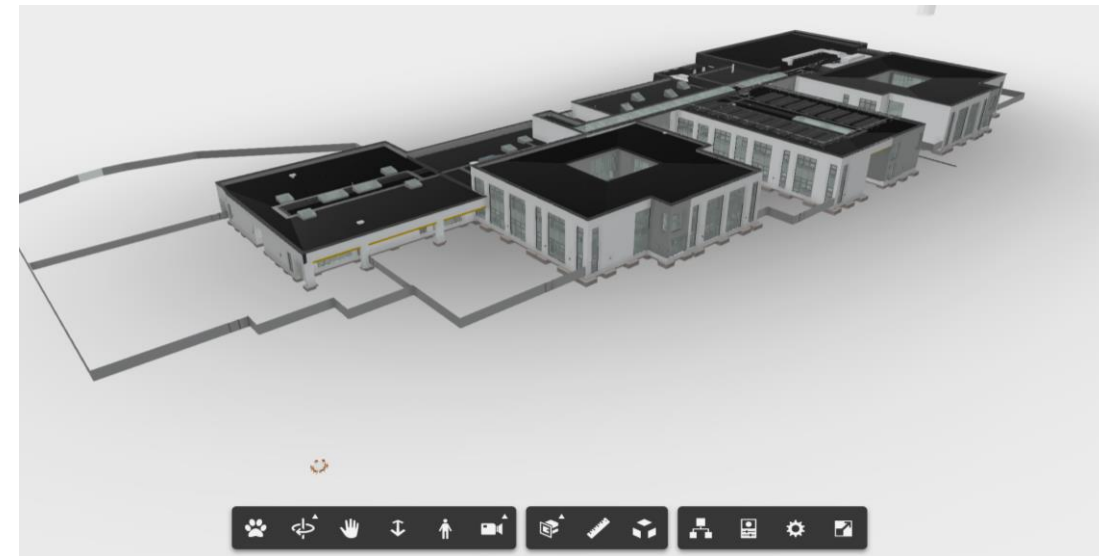
**Project Description:** Phase 1 of a 2 Phase project to accommodate 800 pupils in Phase 1 and 1200 by Phase 2

**Site Name:** Wallyford Primary School, Futures Way, Wallyford, MUSSELBURGH EH21 8FF

**Site Description:** Greenfield site on periphery of

### Summary


- Components: 165
- Systems: 0
- Categories: 30
- Asset Types: 55
- Models: 0
- Attributes: 0
- Documents: 0



Type: Passive\_Infrared\_Detector

Dashboard > Facilities > Facility > Types > Type

### Type Photograph



Photographs 1

Systems Type used in

**Key:** Passive\_Infrared\_J

**Requirement:** Default

**Is Product Library:** Tr

**Category:** Pr, (PIR) sensors

**Model Number:**

**Model Reference:** Du Detector - TMD15


**Manufacturer:**

**Asset Type:** Fix

**Template:**

**Description:** The TMD15® is a unique overlapping detectors, robust housing.

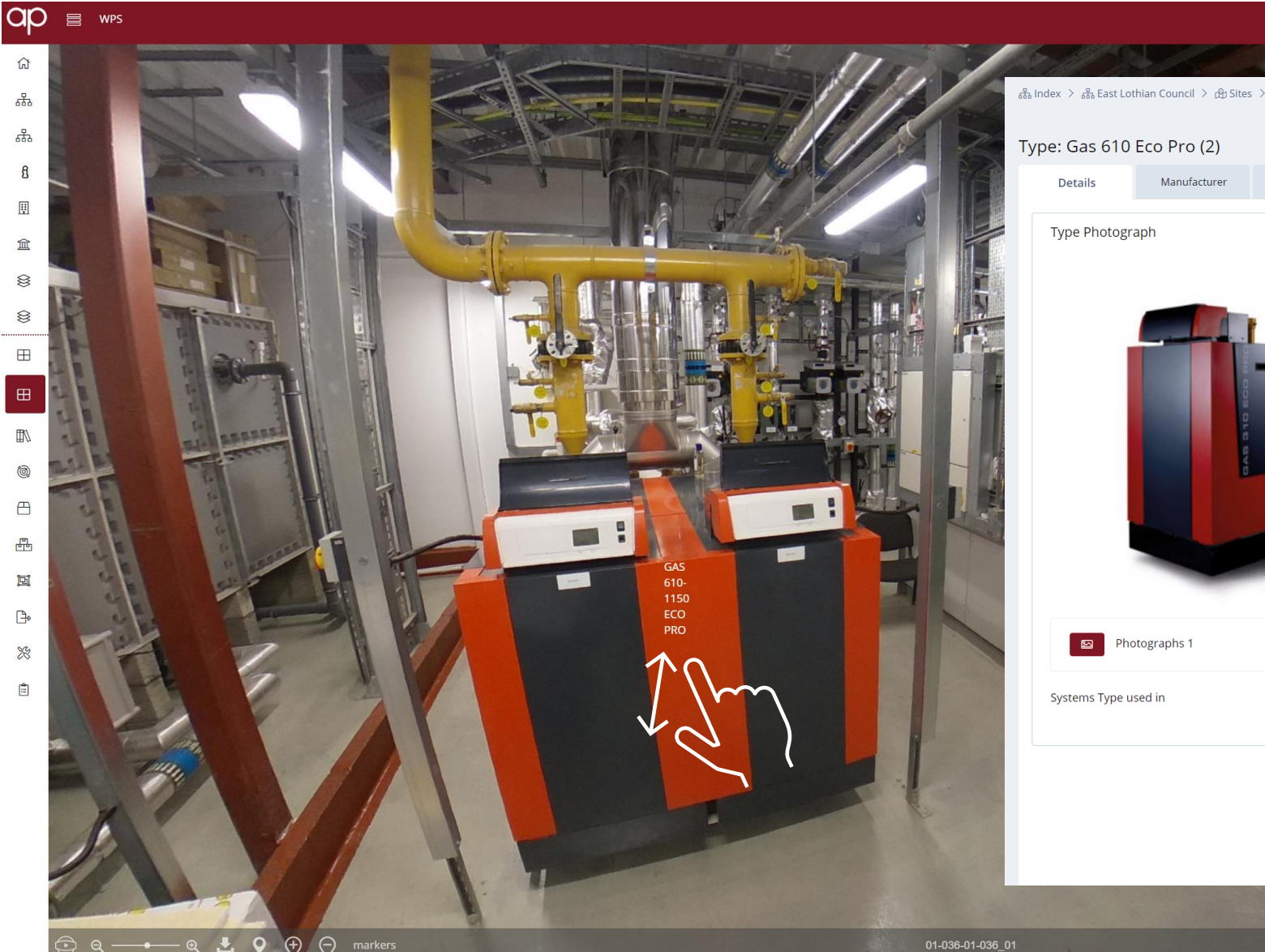
Attributes



A floor plan diagram of a building, with several rooms shaded in grey to indicate the location of the PIR detector. The diagram shows a complex layout of rooms and corridors.



# Existing buildings – retrospective 360 room capture



Index > East Lothian Council > Sites > Wallyford Primary School > Facilities > WPS > Categories > Pr\_60\_60\_08\_33 : Gas fired boi... > Types > GAS 610 ECO PRO (2)

## Type: Gas 610 Eco Pro (2)

Details | Manufacturer | Attributes | Required Data | Documents | Warranty | Maintenance | Spares

### Type Photograph



Photographs 1

Systems Type used in

Key:	Gas 610 Eco Pro (2)
Requirement:	Default Asset Type <span>100 %</span>
Is Product Library :	True
Category :	<a href="#">Pr_60_60_08_33 : Gas fired boilers</a>
Model Number :	GAS 610-1150 ECO PRO
Model Reference :	Gas Boiler 610 Eco Pro (2) - GAS 610-1150 ECO PRO
Manufacturer :	Remeha
Asset Type :	Fixed
Template :	
<b>Description</b>	The Gas 310/610 Eco Pro is specially designed for maximum versatility and energy efficiency. Available in five to ten sections, its compact design means it fits through any standard doorway. For restricted or awkward access, it can be disassembled into parts, reducing labour and time costs.
<a href="#">Attributes</a>	111
<a href="#">Documents</a>	7
<a href="#">Assembly Parts</a>	0
<a href="#">Maintenance Tasks</a>	0

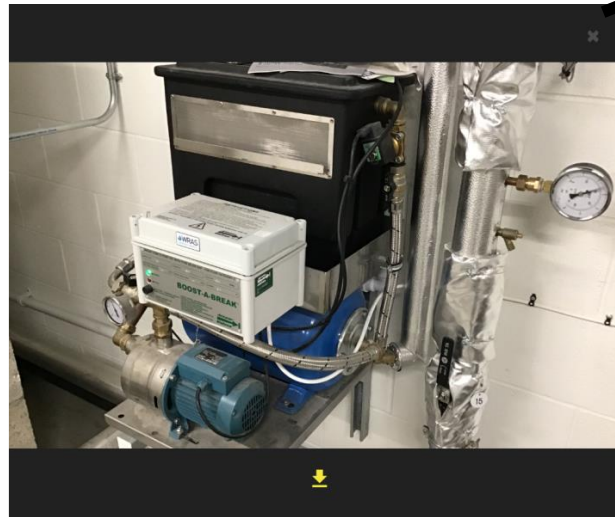
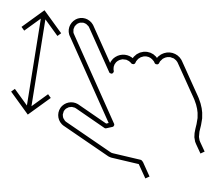
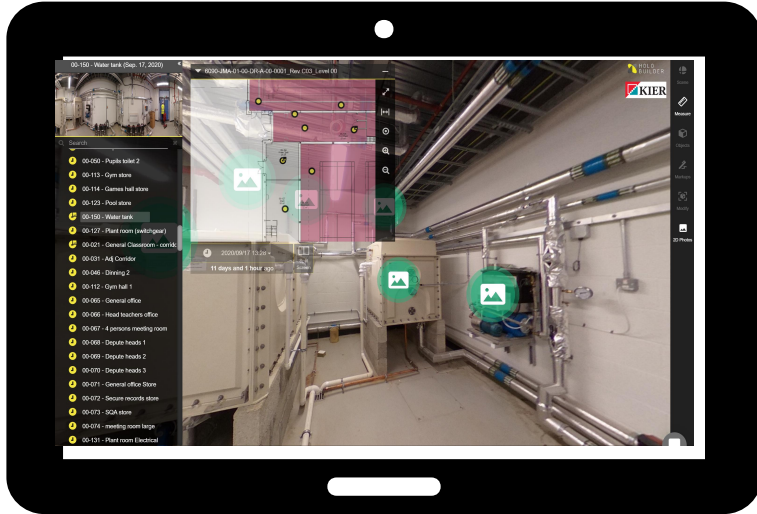
# Existing buildings – Operational use of construction data

The screenshot displays a BIM software interface with several key components:

- Top Left:** A 3D perspective view of a water tank installation, labeled "00-150 - Water tank (Sep. 17, 2020)".
- Top Center:** A 2D floor plan view of the installation area, labeled "6090-JMA-01-00-DR-A-00-0001\_Rev C03\_Level 00".
- Left Panel:** A search bar and a list of building elements. The "00-150 - Water tank" is highlighted in green, indicating it is the selected object.
- Center Panel:** A detailed technical datasheet for the "Boost-A-Break® - Break Tank & Booster Sets Model BTAB® - Fixed Speed Overview - Datasheet Page 1 of 4". The datasheet includes:
  - Overview:** Description of the unit's purpose for backflow protection and water boosting.
  - Applications:** A list of typical use cases such as waste bin washing, laboratories, and food preparation.
  - Water Regulations:** Information on compliance with UK water regulations.
  - Specification:** Technical details like pressure supply, vessel capacity, and temperature.
  - Materials:** List of compatible materials like stainless steel and copper.
  - Approval:** Reference to Water Regulations approval number 1501308.
- Right Panel:** A 3D view of the physical Boost-A-Break unit installed in a room, with a yellow arrow pointing from the unit in the 3D model to the physical unit.
- Right Edge:** A vertical toolbar with icons for Scene, Measure, Objects, Markups, Modify, and 2D Photos.

**ASSET INSTALLATION & LINKED O&M INFO**

# Existing buildings – Remote access to live asset data



### “Boost-A-Break®” - Break Tank & Booster Sets

**Model BTAB® – Fixed Speed Overview – Datasheet Page 1 of 4**

**Overview**  
Break Tank assembly with Fluid Category 5 protection by virtue of the integral Type AB air gap. The unit is supplied as a complete package on a stainless base ready for installation.

The primary purpose is to provide backflow protection in accordance with the latest Water Regulations. The BTAB unit also boosts the water pressure for elevated areas or where a high flow rate is required – e.g. wash-down.

The cistern has a screened overflow and weir, making it suitable for unorthodox applications, which require a “Hygienic Type AB air gap” – e.g. butchery and vegetable preparation.

The unit is quiet by virtue of a centrifugal pump, anti-vibration rubber feet and flexible stainless braided connection hoses.

*For higher flow rates and variable speed pumps see Variable Speed Datasheet and Dual Pump Datasheet.*  
*For domestic boosting use “Pent-A-Boost” model BTAF.*

**Applications**  
The following are Fluid Category 5 examples see Water Regulations (Table 6.1e) -

- Waste bin washing
- Hose union taps – non-domestic
- Wash-down – animals or any Fluid Category 5
- Underground or surface irrigation – see HUBG
- Laboratories
- Baths in health care premises
- Showers health care – see Care Shower
- Sinks with hoses
- Bidets
- Bedpan washing
- Vegetable washing
- Butchery & meat equipment / Slaughterhouse
- Clothes washing machines – healthcare premises
- Dish washing machines – healthcare premises
- Applications deemed to be Category 5 by water company

**Water Regulations**  
The assembly is fully Water Regulations approved & complies with the requirements of the Water Regulations when installed and used correctly. A Break Tank with a Type AB air gap provides protection against Fluid Category 5 risks - these risks are the highest level. “Boost-A-Break®” can therefore be used for all applications requiring backflow protection – use “Pent-A-Boost” for drinking water.

The Regulations require point of use protection. For example, it is not permissible to use the same Break Tank to serve a bedpan washer (Fluid Category 5) and a dishwasher. However several appliances of the same type can be served from the same Break Tank unit – e.g. irrigation network.

**Specification**

Pressure Supply min.	1.0 bar min. maintained (dynamic)
Pressure Supply max.	10 bar
Pressure Outlet	See flow graph – page 2
Pressure Gauge	63 dia. glycerine filled (except dual)
Vessel Capacity	24 Lt
Cistern Capacity	24 Lt
Inlet Size	See “Inlet Control” table
Outlet Size	See “Outlet Pressure Control” table
Temperature	30° max. ambient
Water Regulations Approval	1501308

**Model 1200 - Fixed speed**  
Stainless screened slot, drip tray, base, and hoses. Only 675 mm high  
Registered UK Design 4030013

**WRAS**  
APPROVED PRODUCT

**Materials**  
Base / drip tray / fasteners Stainless steel 304  
Pump (wetted parts) Stainless steel 304  
Pipes / fittings Copper / Brass / Stainless  
Cistern 24 Lt MDPE

**Optional Wall Brackets.**  
Code – BTBRA.  
Second set can be located underneath on floor.

**Arrow Valves Ltd**  
Tel: 01442 823123 Fax: 01442 823234  
www.arrowvalves.co.uk  
Arrow Valves Ltd reserve the right to change specifications, design and materials at any time without notice.  
All unit-less dimensions in mm.  
© Copyright Arrow Valves Ltd 2001-2020

**Arrow Valves**




3\Arrow Valves\Products\BT Break Tanks\BTAB Fixed Speed\btatfixeddatasheet.docx 2-Jan-20

e.g. top five information required by logged in user  
(facilities manager, operator)

## current / future group work

- Development of baseline set of asset info requirements for a group of typical school MEP systems. *(Pareto 80/20 rule)*
- Agree standard approach with contractors for linking systems & products to work packages deliverables.
- Agree standard specification for asset naming, space naming and linked site tagging *(options with typical costs)*
- Phase 1 outcomes embedded within the Standard Information Management Plan for deployment on LEIP schools programme.

## Q&A

**Email:** [Ryan.Tennyson@scottishfuturestrust.org.uk](mailto:Ryan.Tennyson@scottishfuturestrust.org.uk)

**Linked In:** [www.linkedin.com/in/rtennyson](http://www.linkedin.com/in/rtennyson)