

# Material Passports

## From Concept to Practice



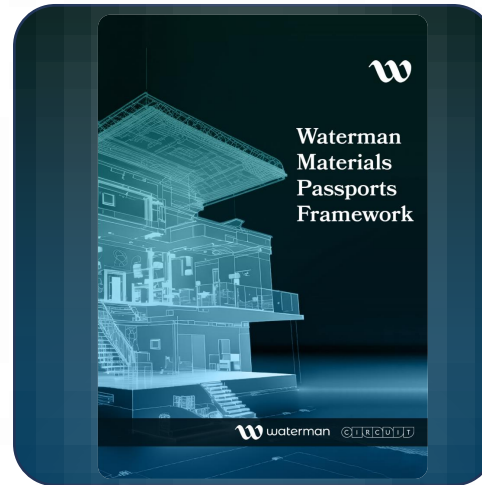
Anastasia Stella

14<sup>th</sup> May 2023

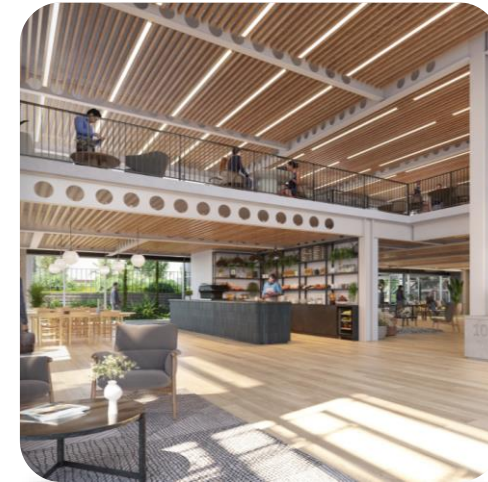
# Presentation Content



**Part A**  
**Introduction**



**Part B**  
**Waterman Materials**  
**Passports Framework**



**Part C**  
**Edenica**  
**Case Study**

# Waterman Group

**Waterman Group is a multidisciplinary consultancy providing sustainable solutions to meet the planning, engineering design and project delivery**

- Founded in 1952
- Leading engineering and environmental consultancy
- Offices throughout the UK, Australia and Ireland
- Property, infrastructure, environment and energy markets
- Part of CTI Engineering, a leading Japanese engineering consultancy

## Our Key Disciplines



**Our Vision**  
**Engineering a better environment for people and the planet**

# Presenter



## Anastasia Stella



Sustainability  
Associate



Co-founder &  
CEO

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**Expertise:** Circular Economy & Net Zero

**Current Focus Area:** Materials Passports

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Previous Roles:



Education: Architectural Engineering



# Part A: Introduction

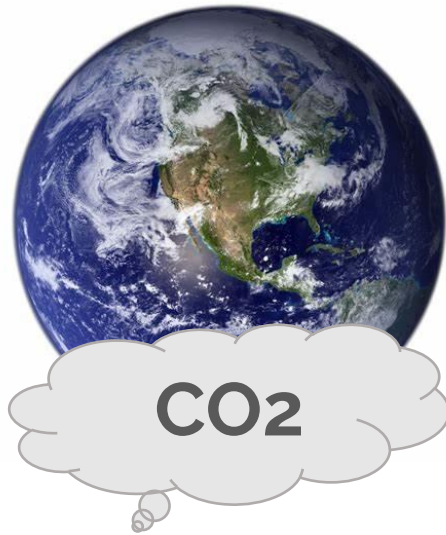
## Problem Statement & Importance of Circularity

The construction industry is one of the largest consumers of natural resources, and has a significant impact on the environment



# Impact of the Construction Industry

The Built Environment is responsible for:



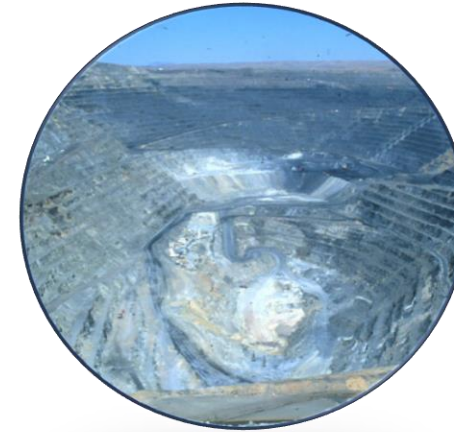
**40%**

of Global Emissions



**33%**

of the EU waste generation



**50%**

of all extracted materials

**62% of total UK Waste is generated from Construction, Demolition and Excavation generating 140 MT annually**

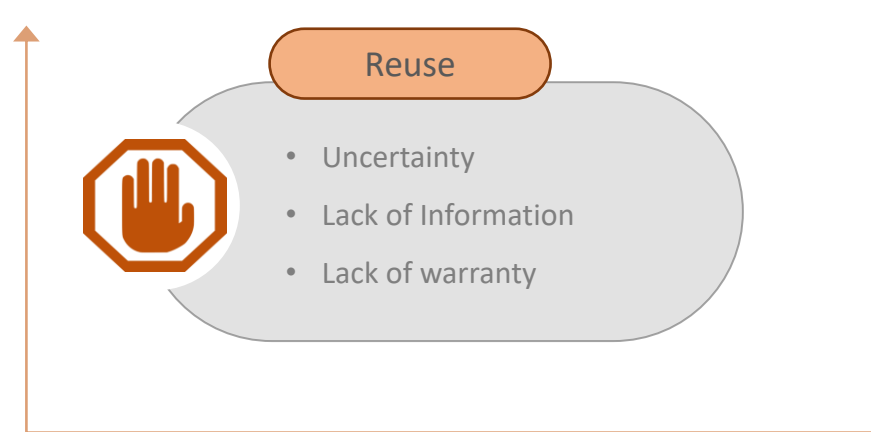
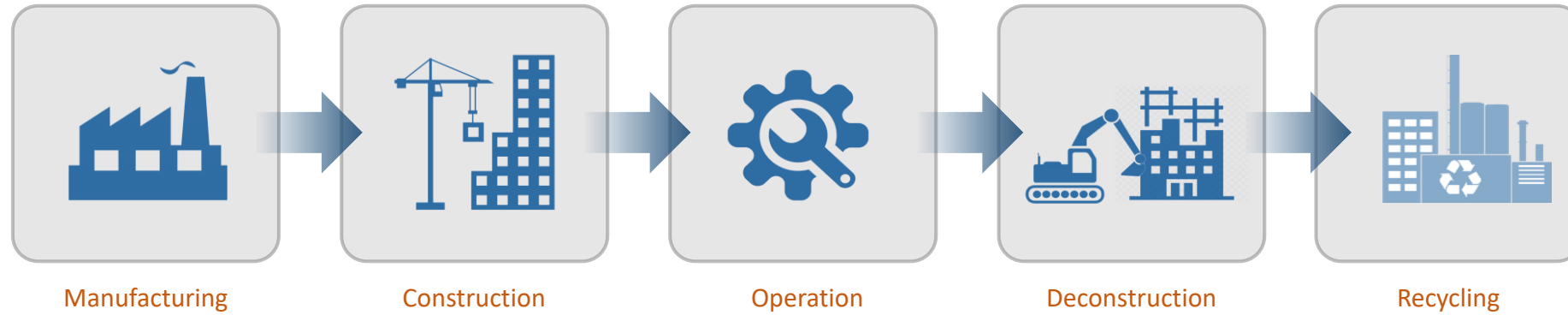


**The carbon footprint of producing building materials accounts for about 11 % of all global carbon emissions**



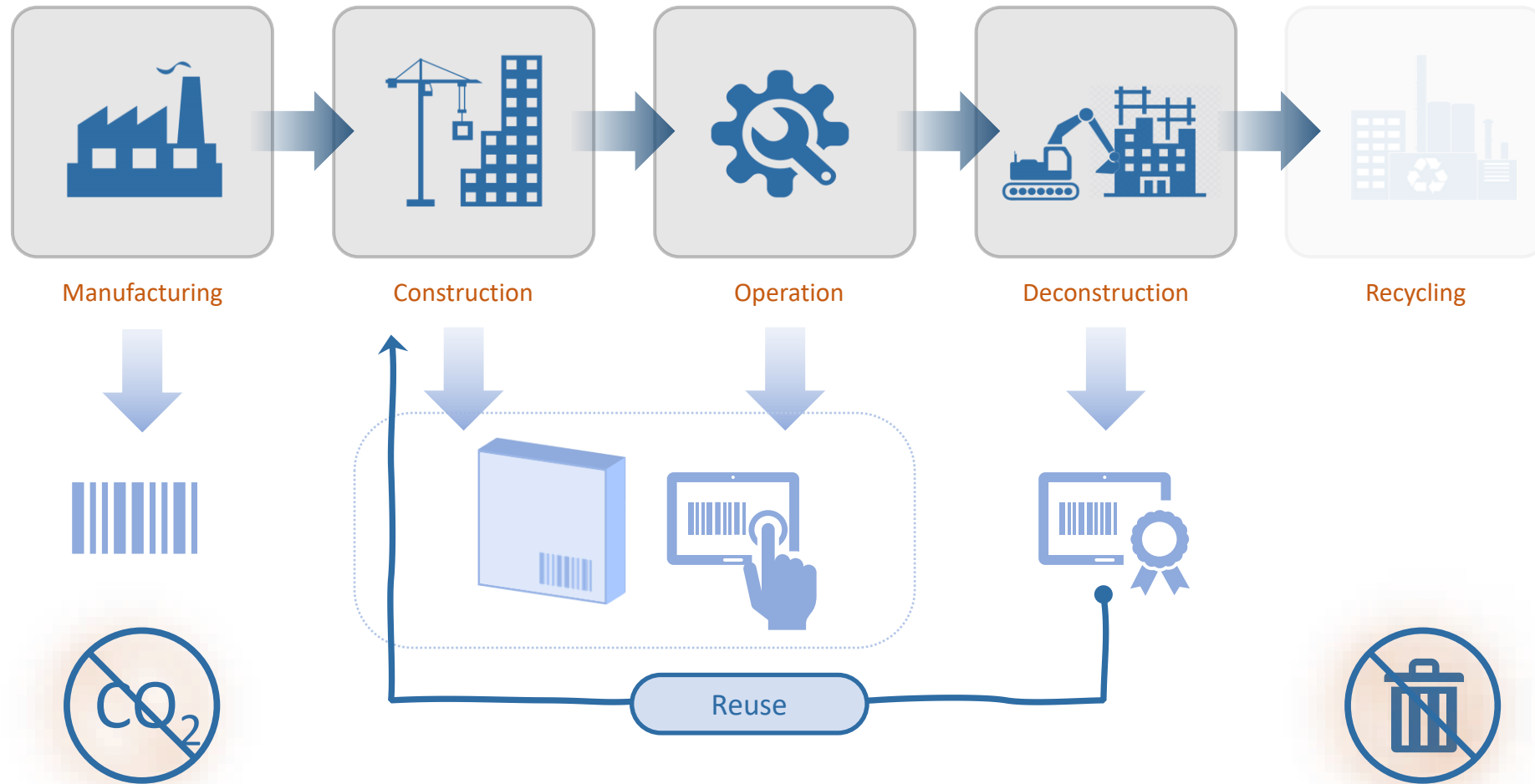
# ■ Problem Statement

## Linear Materials Life Cycle



# Solution

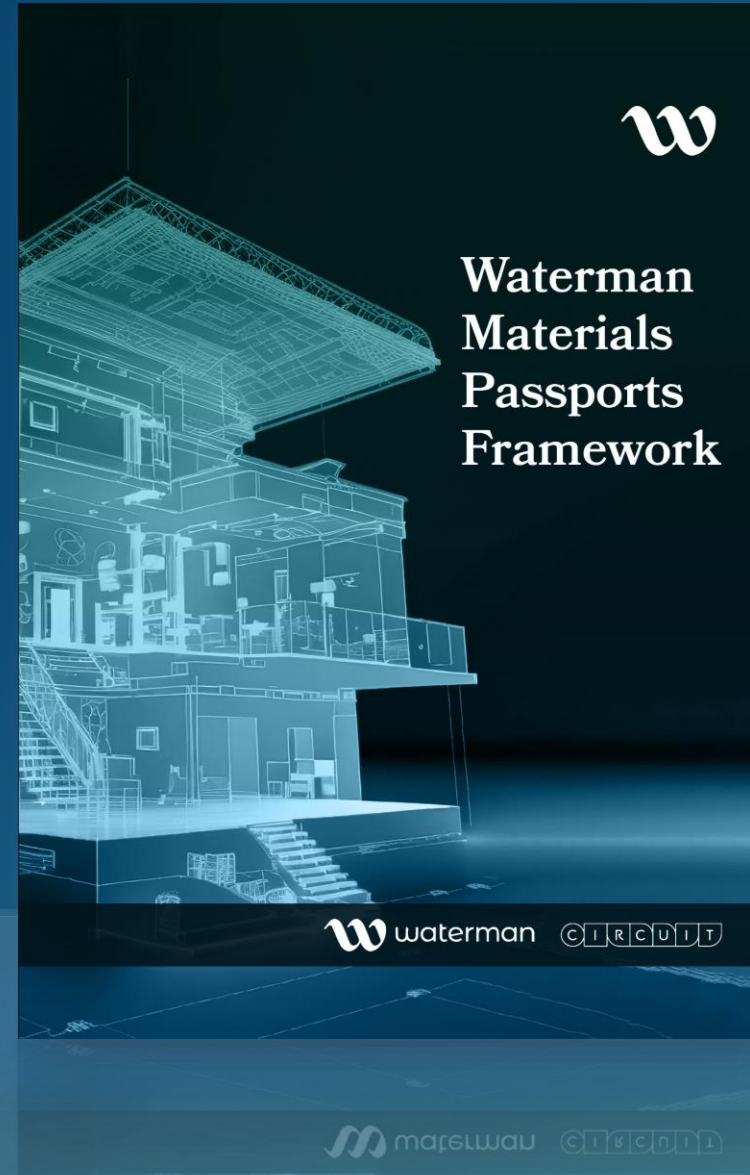
## Materials Life Cycle



# Waterman Materials Passports Framework

Introducing a Standardised Approach  
to Materials Passports  
In the Construction Industry

In collaboration with CIRCuIT and  
BRE as CIRCuIT project partners (London cluster)



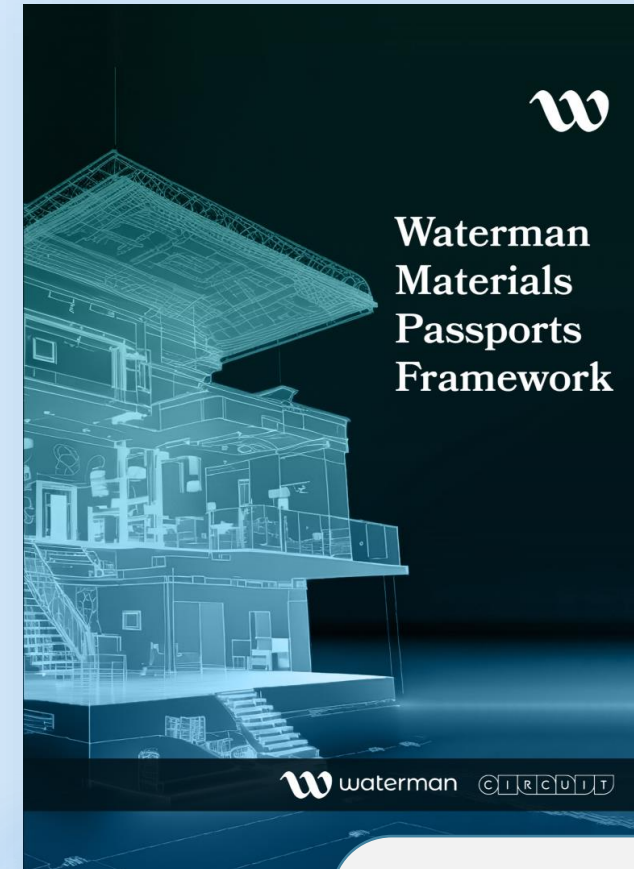
# Materials Passports Framework

In partnership with CIRCUIT and BRE  
(as the CIRCUIT project partners London cluster)  
to standardise:

1. What are Materials Passports
2. Benefits of Materials Passports
3. Materials Passports Levels
4. Content of Materials Passports
5. Links to Products and Buildings Passports
6. Links to BIM
7. Implementation Process



<https://www.watermangroup.com/watermanmaterialspassportsframework/>



Download

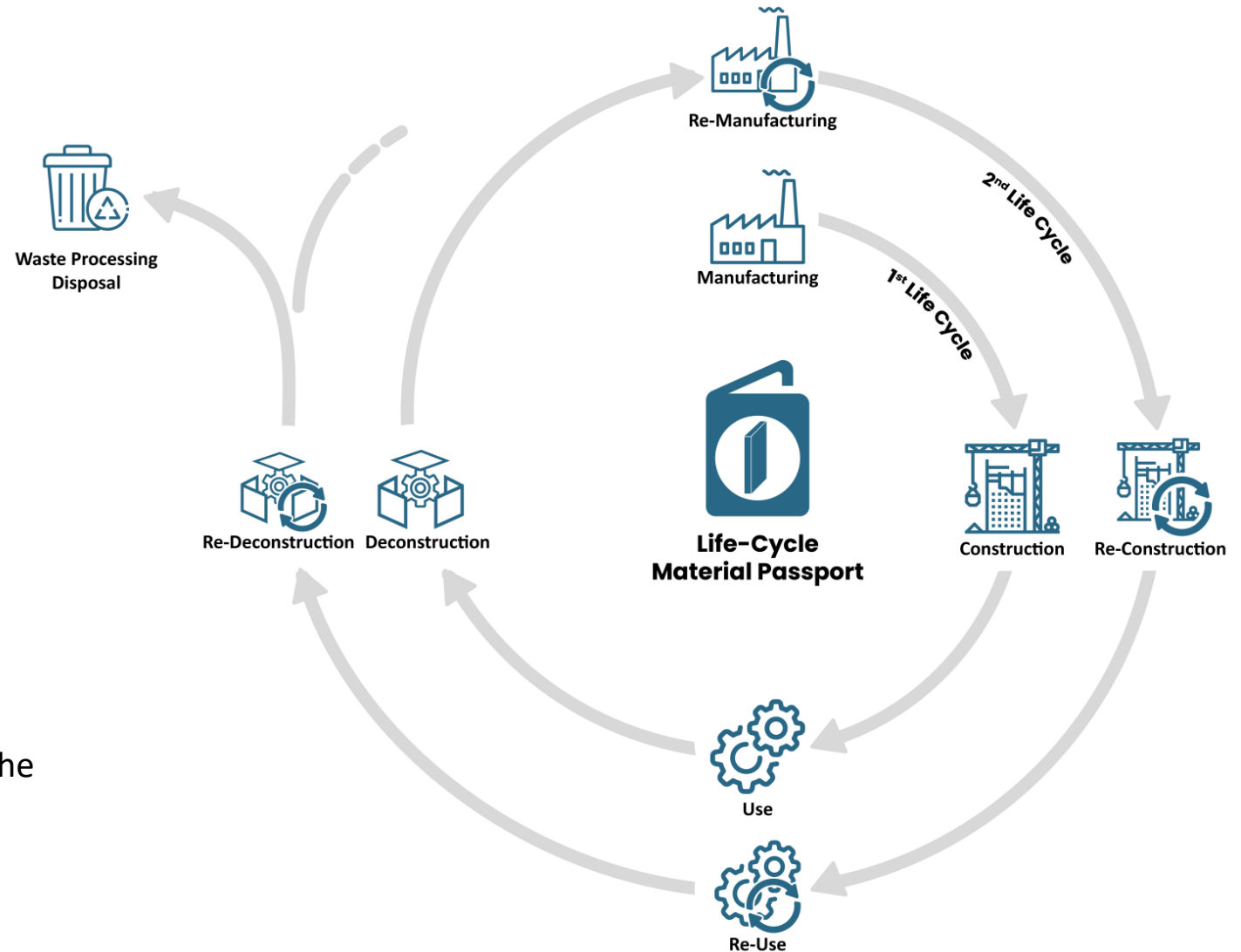


# What are Materials Passports

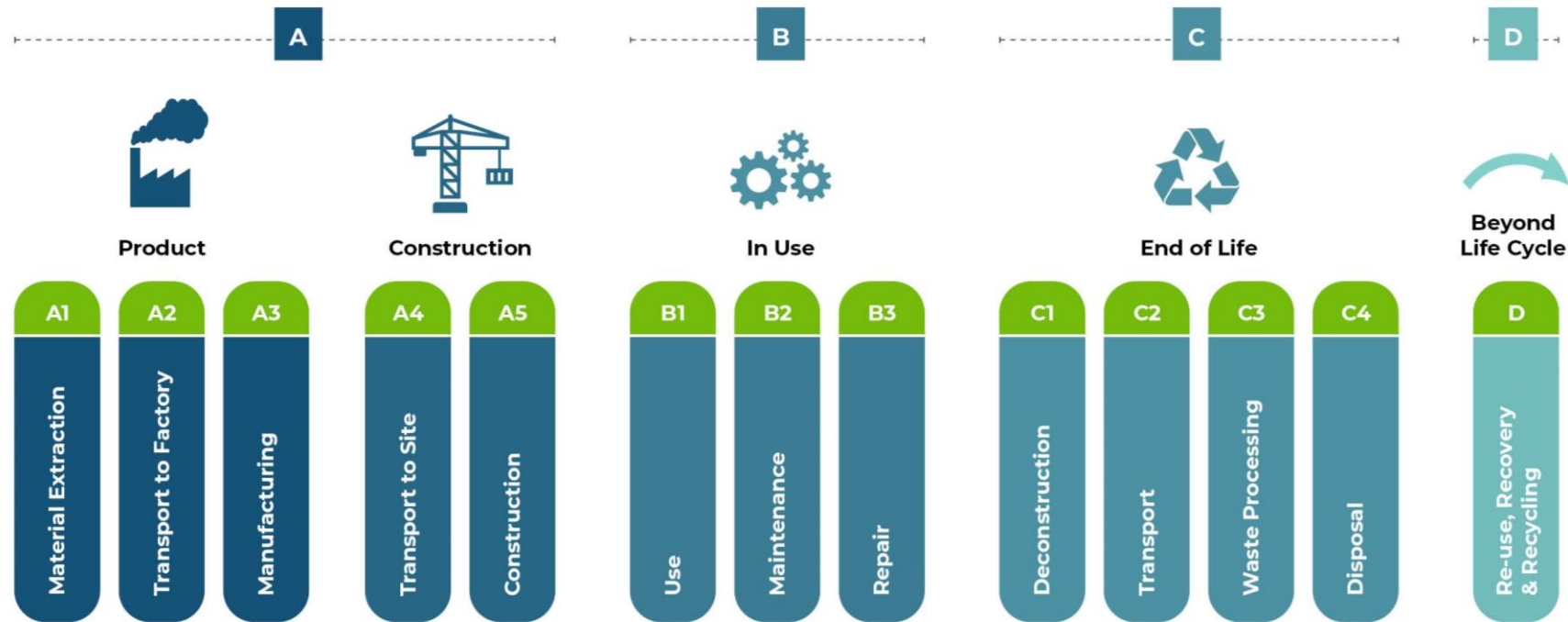
Materials Passports are:

**Digital** documents that document key information for construction **materials** and **elements** throughout their life-cycle,

- ✓ to enable their future **re-use**
- ✓ provide **robust data and benchmarks** for the construction materials stock across the industry
- ✓ support **health and safety** transparency,

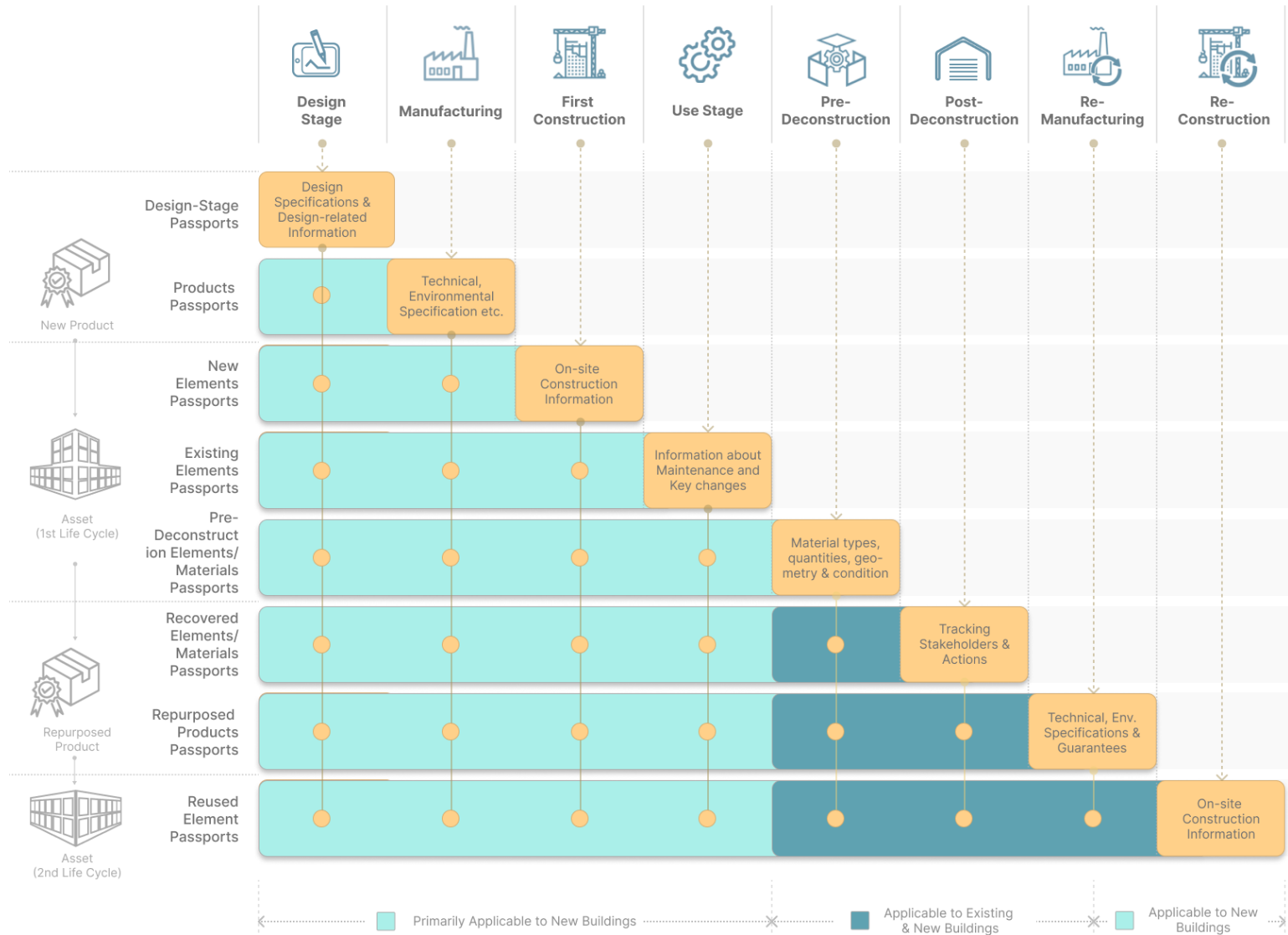


# Materials Passports Life Cycle Perspective

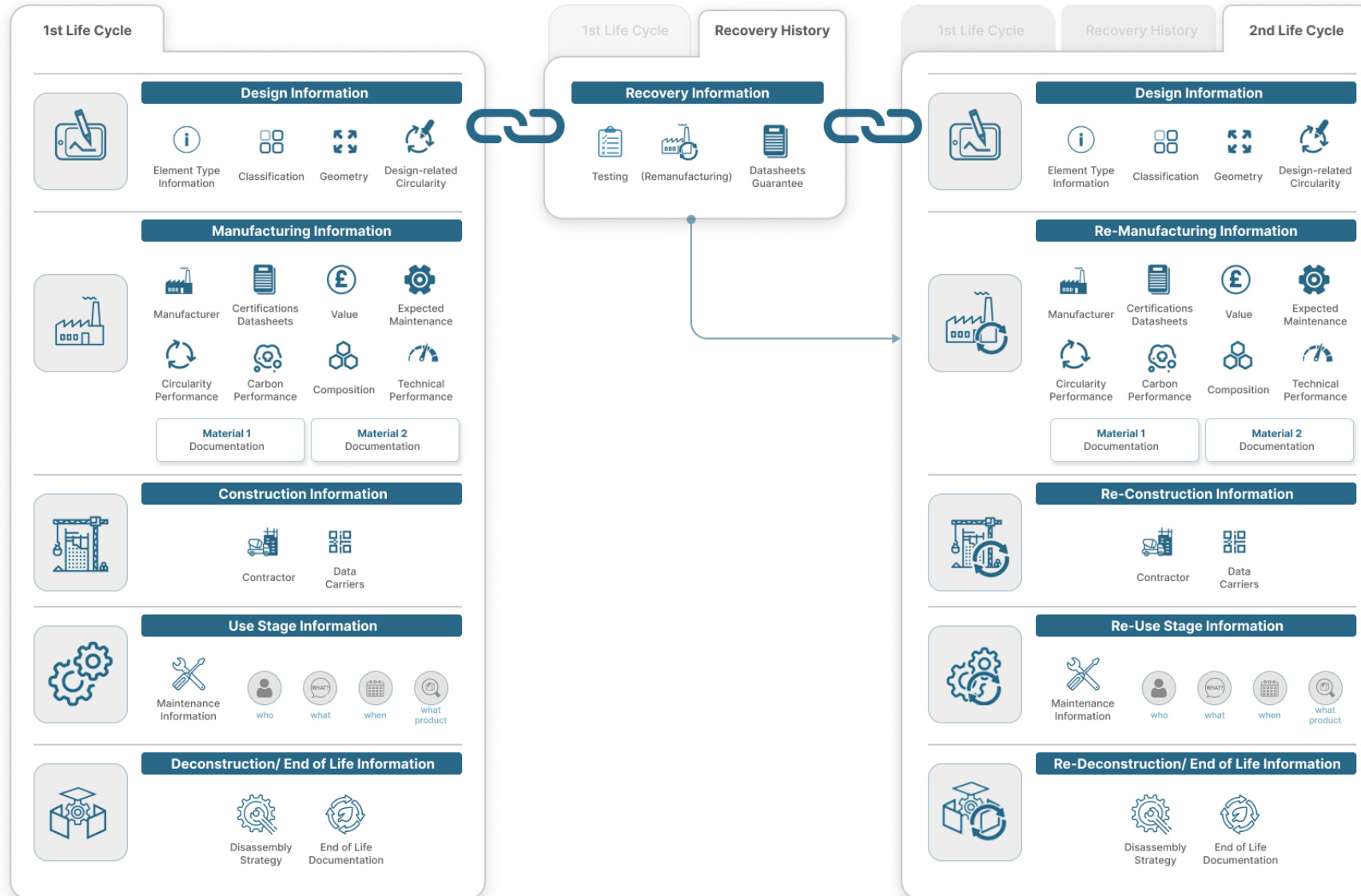


Lifecycle stages as defined by BS EN 15978:2011

# Materials Passports Life Cycle Perspective

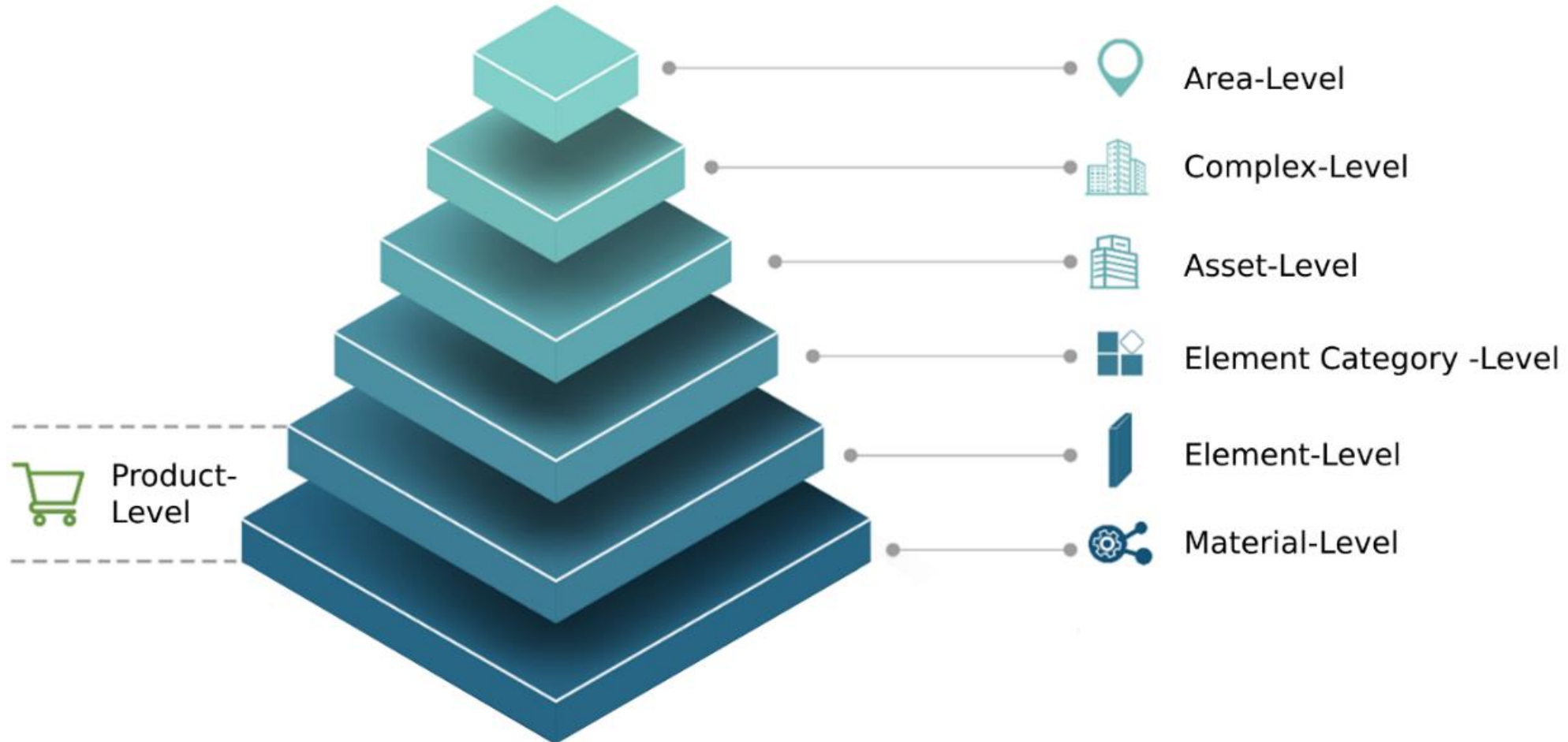


# Materials Passports Life Cycle Perspective

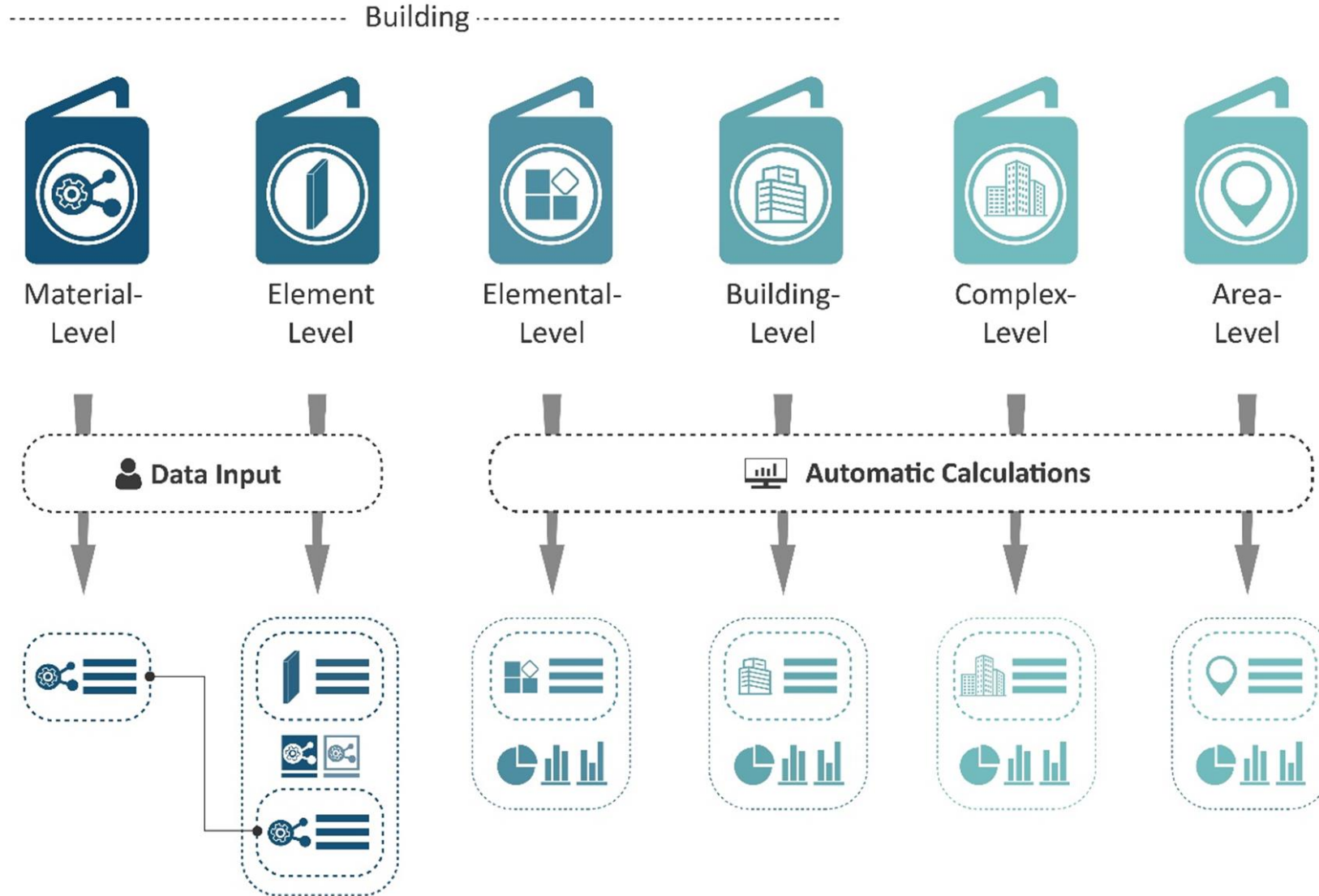




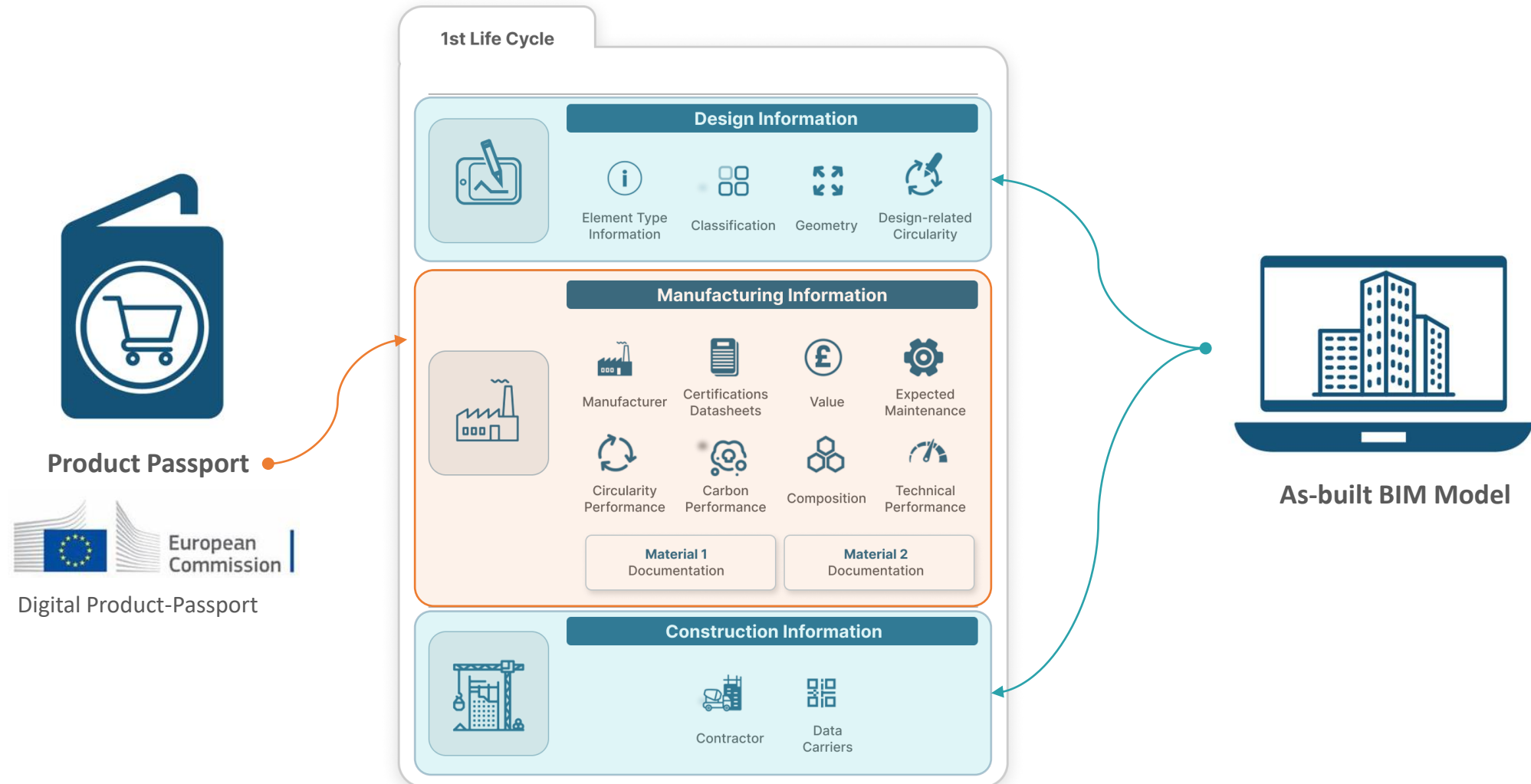
# Materials Passports Levels



# Materials Passports Levels



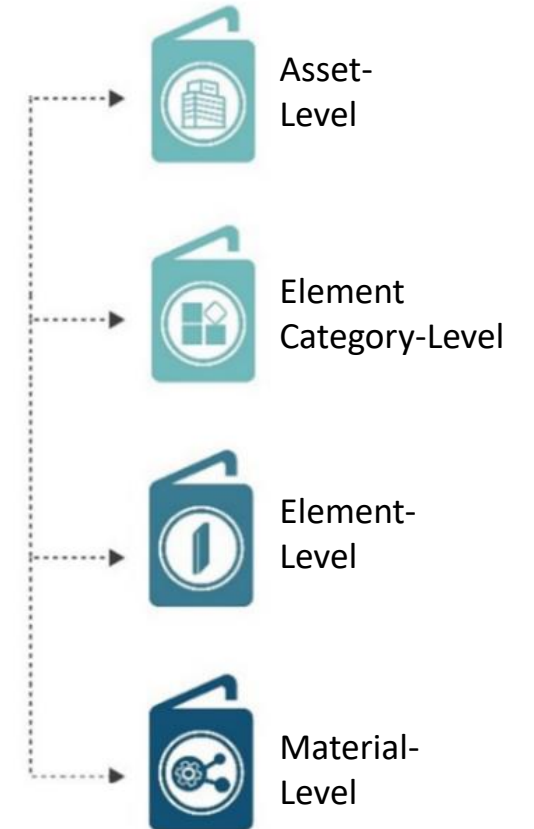
# Generation of Materials Passports – New Buildings



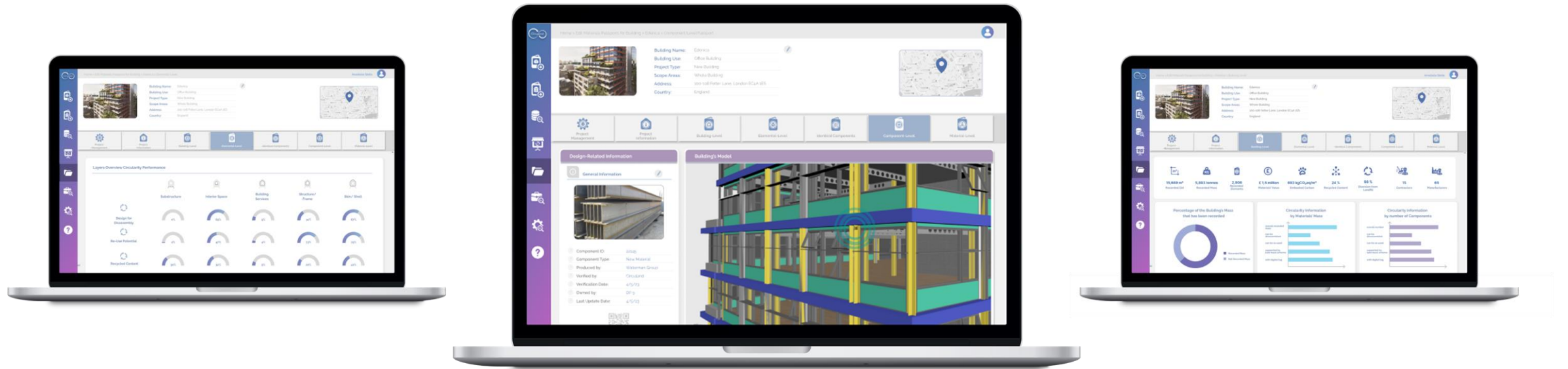
# Products Passports & BIM Model



Automation of Production of different Levels of Materials Passports



# Circuland Platform



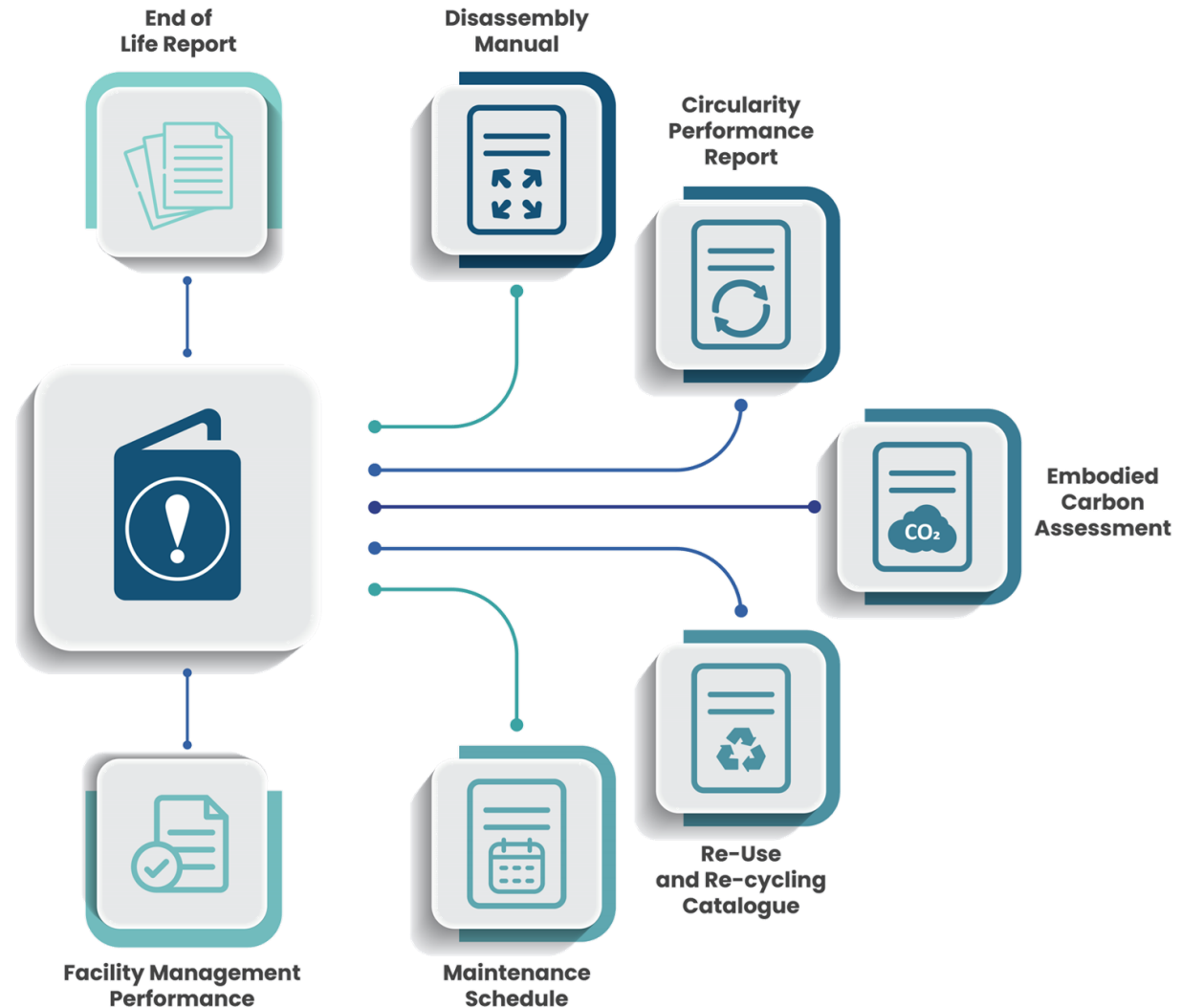
# Materials Passports Output



Materials Passports Model  
Life Cycle Management



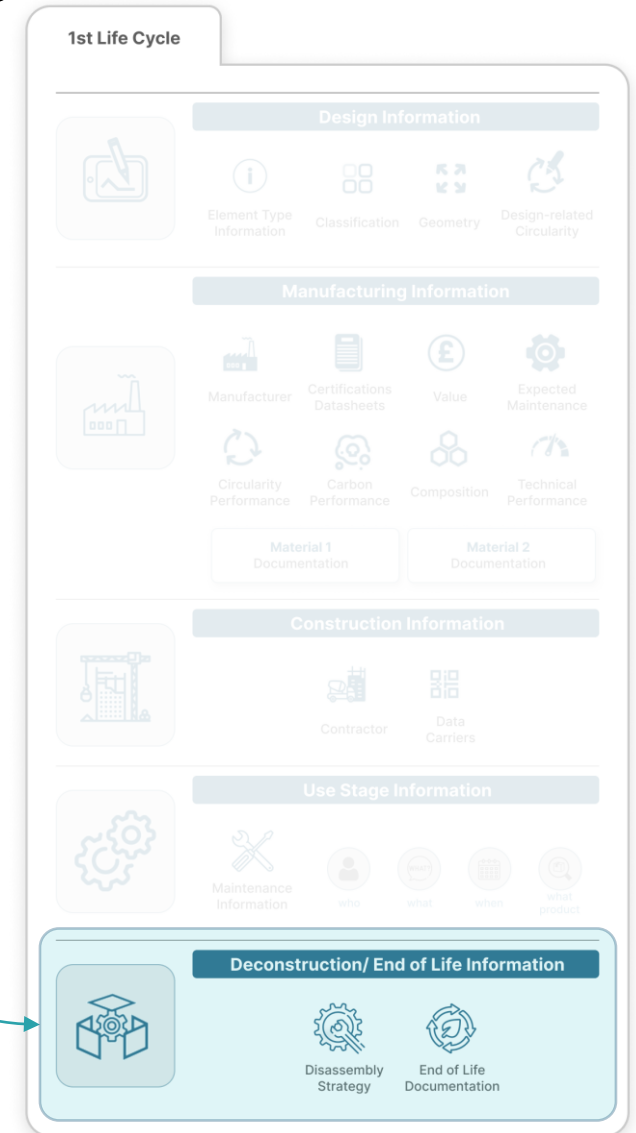
Mobile Views through  
Data Carriers



# Generation of Materials Passports – Existing Buildings

## Pre-demolition Audits - Pre-redevelopment Audits Surveys

- Material Types
- Material Quantities
- Remaining Lifespan
- Condition
- Disassembly Strategy



# Materials Passports Responsibilities



Designers  
**DESIGN-RELATED INFORMATION**



Manufacturers:  
**PRODUCTS PASSPORTS**



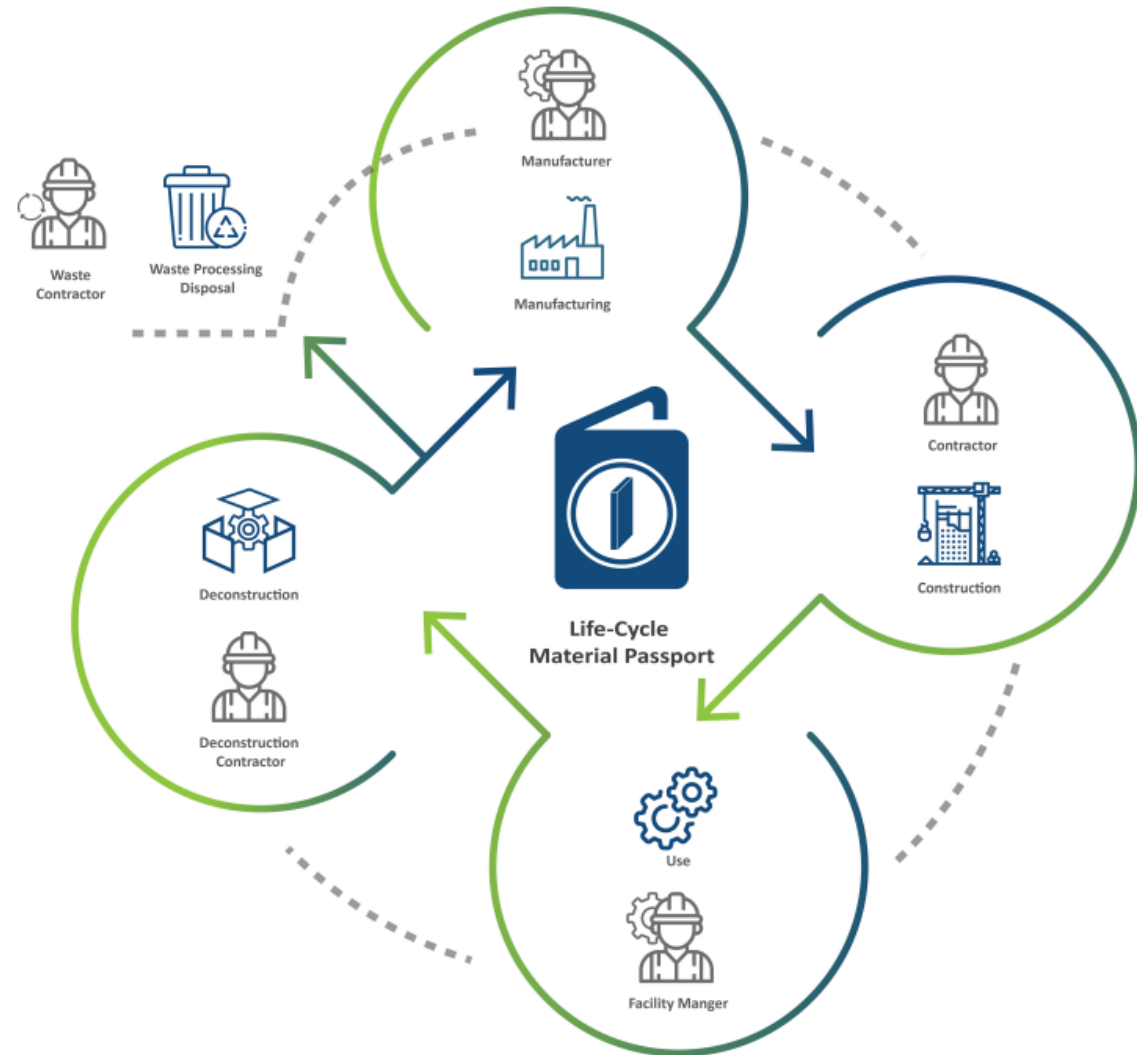
Contractors:  
**AS-BUILT INFORMATION**



Facility Managers  
**USE STAGE INFORMATION**

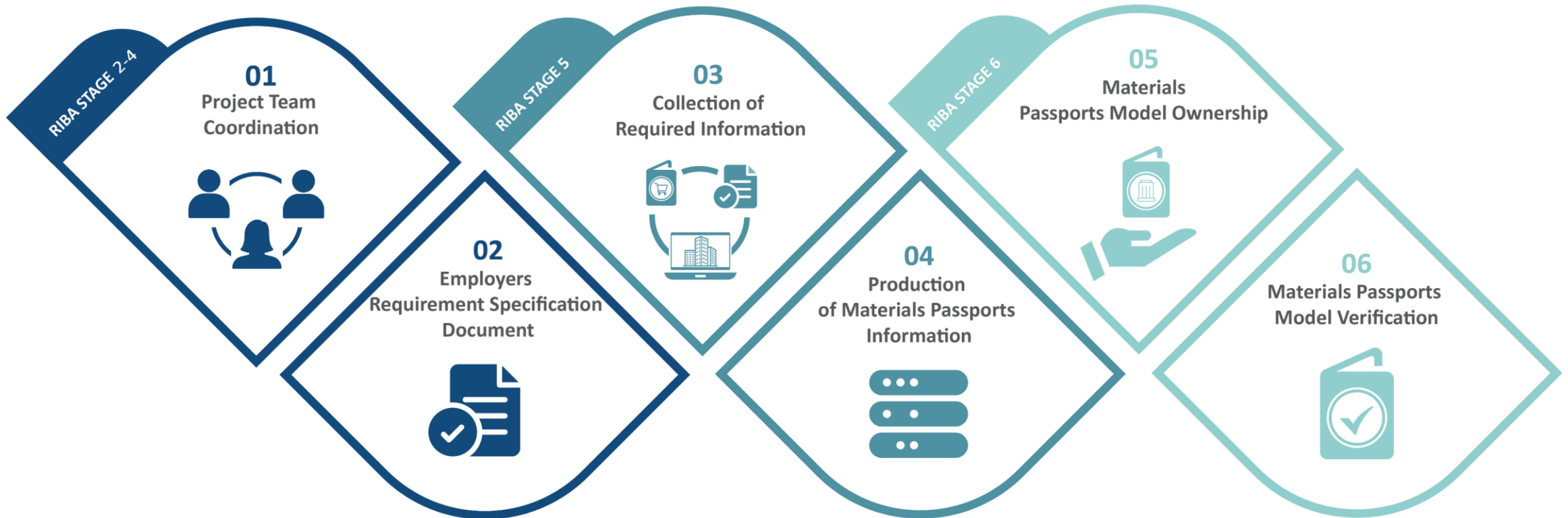


Deconstruction Contractors- Auditors  
**DECONSTRUCTION INFORMATION**





# Implementation Process

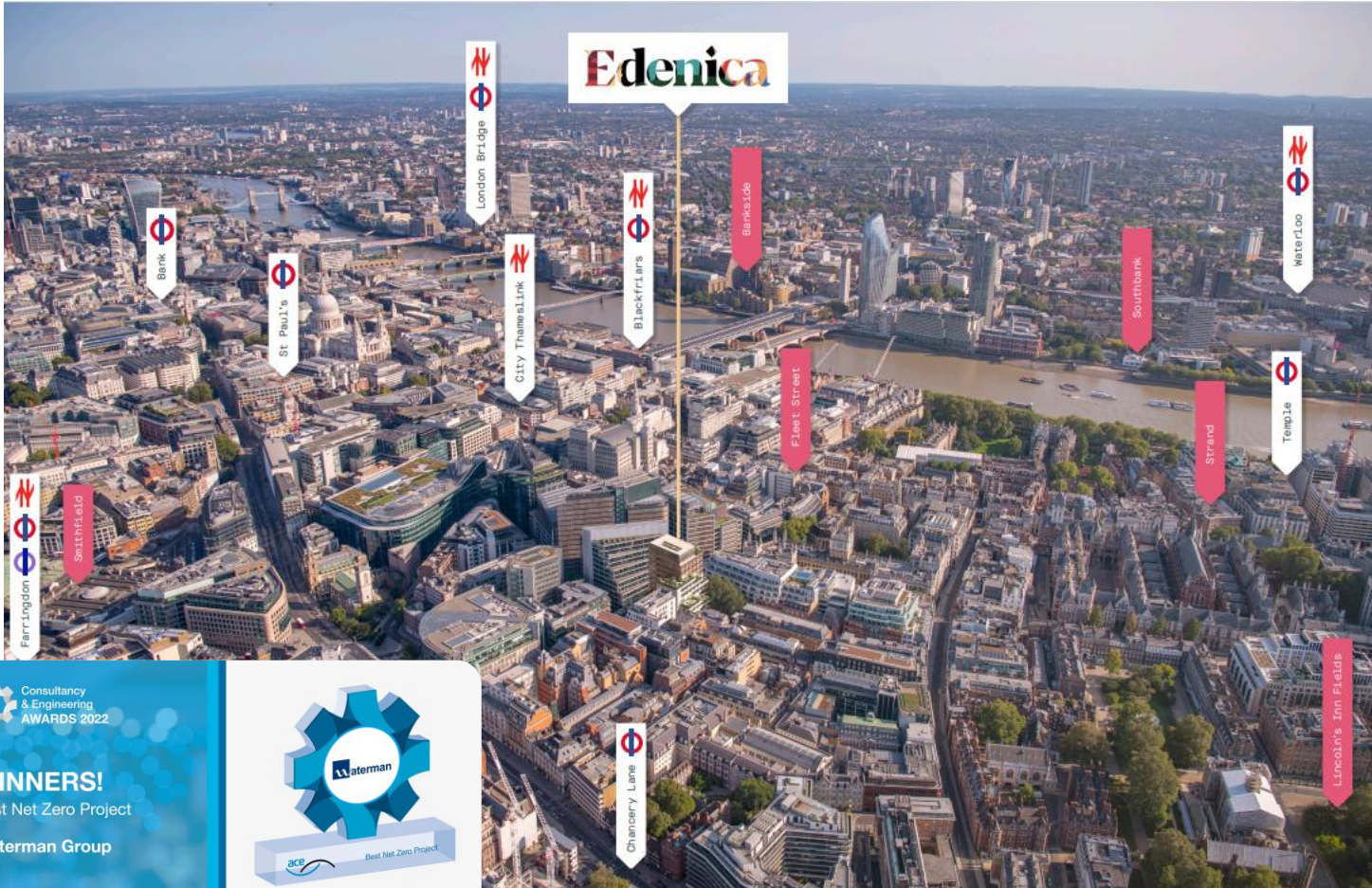


# Edenica Case Study

The first building in the City of London  
to officially adopt Materials Passports



# Edenica Case Study



Consultancy & Engineering AWARDS 2022

**WINNERS!**
  
 Best Net Zero Project

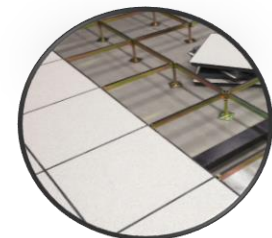
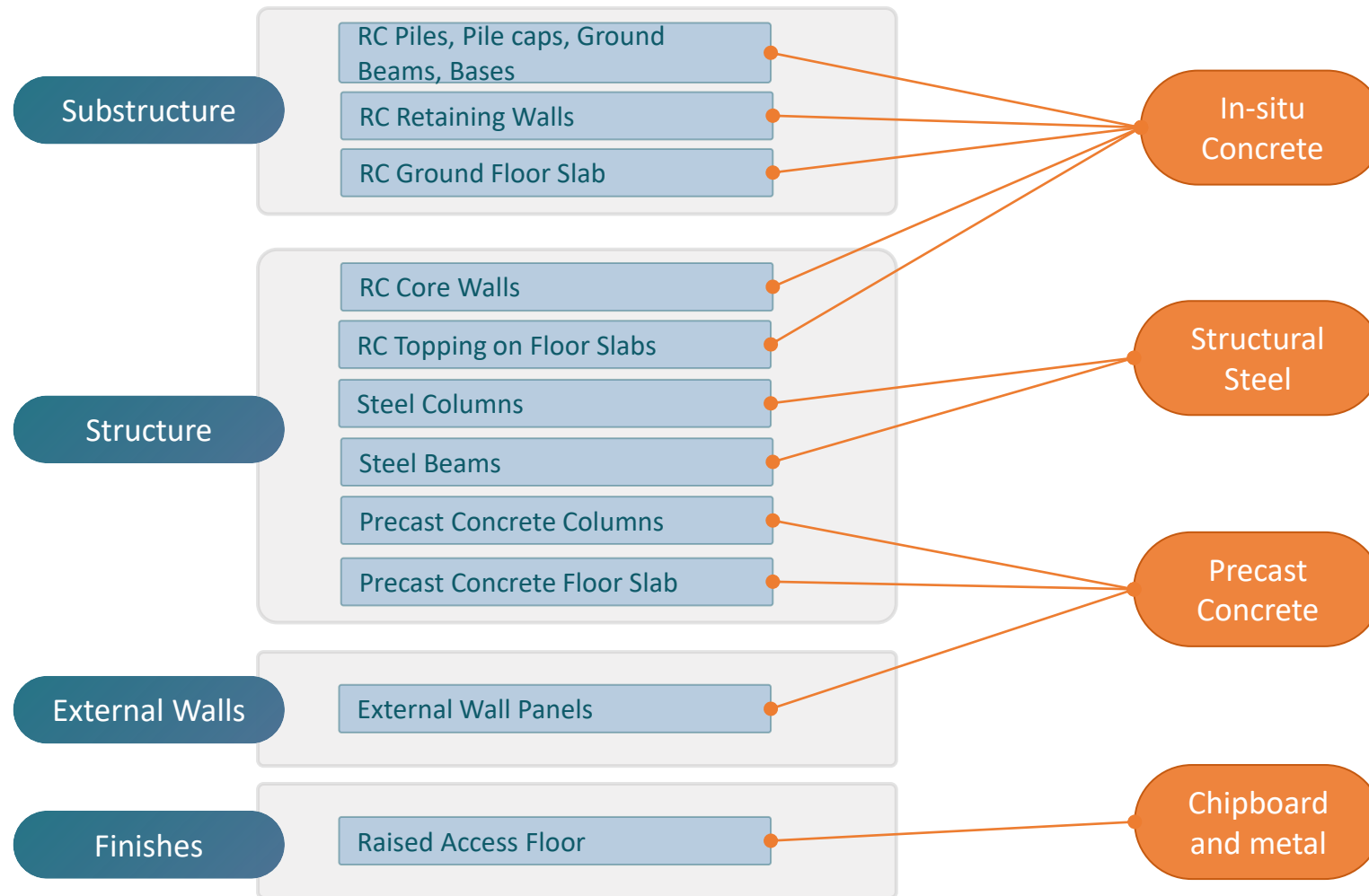
**Waterman Group**

Best Net Zero Project

becg

pscd

# In Scope Elements & Materials



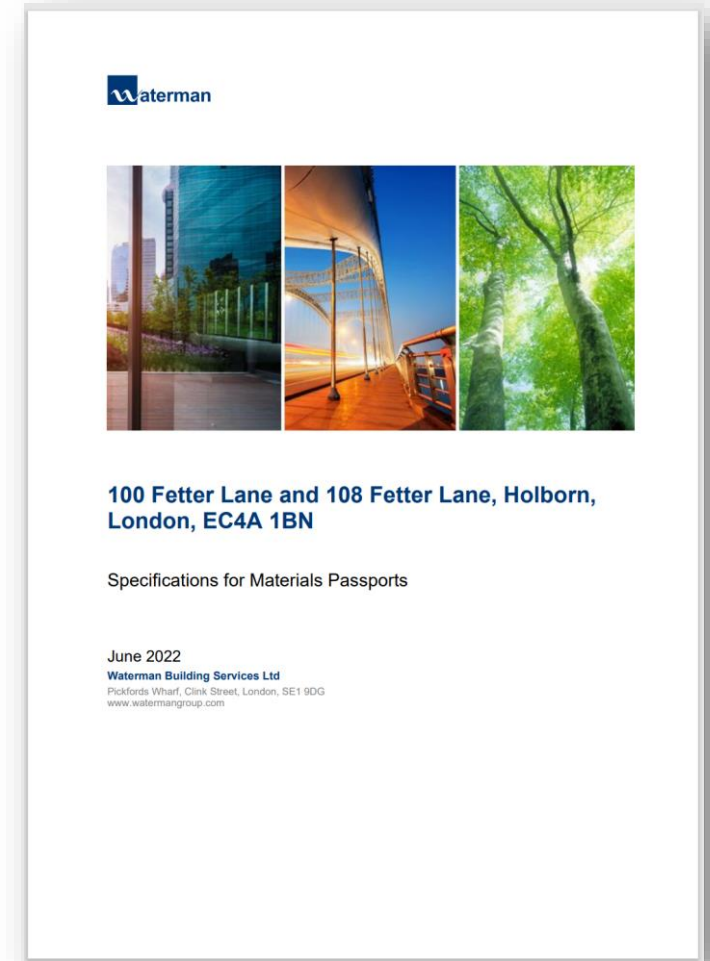
More than 80% of the Building's Mass

# ■ Coordination with the Contractors



The Materials Passports Specification Document specified:

- Scope of Materials Passports
- Application Overview
- Implementation Principles
- Implementation Process
- Materials Passports Database
- Employers Requirements



# Content – Key Categories

A Material Passport provides information about:



**Component's  
unique ID**



**3D  
Representation**



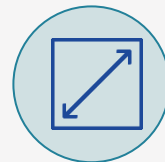
**Physical  
Stamp**



**Manufacturer's  
Information**



**Contractor's  
Information**



**Component's  
Dimensions,  
Mass, Volume**



**Material  
Information**



**Material  
Certificates**



**Circularity  
Information**



**Carbon  
Information**

# Materials Passports Content

Area of Information	Required Information
<b>1. Classification and Location</b>	<ul style="list-style-type: none"> <li>• Building Element Category- Level 1</li> <li>• Building Element Category- Level 2</li> <li>• Building Element Category- Level 3</li> <li>• Location- Floor</li> <li>• Location- Zone (based on the 3D models or drawings)</li> </ul>
<b>2. Size Information</b>	<p>(Dimensions type vary depending on the type of building element)</p> <ul style="list-style-type: none"> <li>• Dimension 1- Profile</li> <li>• Dimension 2- Height</li> <li>• Dimension 3- Width</li> <li>• Dimension 4- Length</li> <li>• Mass</li> <li>• Volume</li> <li>• Density</li> </ul>
<b>3. Circularity</b>	<ul style="list-style-type: none"> <li>• Design for Disassembly (Yes or no)</li> <li>• Reuse Potential (Yes or no)</li> <li>• Take back scheme (Yes or no)</li> </ul>
<b>4. Physical Stamp</b>	<ul style="list-style-type: none"> <li>• Location</li> <li>• Type</li> <li>• Information Recorded</li> </ul>

Area of Information	Required Information
<b>1. Type of Material</b>	<ul style="list-style-type: none"> <li>• Type of Material Level 1</li> <li>• Type of Material Level 2</li> </ul>
<b>2. Properties</b>	<p>(Vary depending on the type of building element and material. Appendix B provides clarity on the properties that should be recorded for each building element category)</p> <ul style="list-style-type: none"> <li>• Structural: Grade and subgrade (if steel) Strength and Type and percentage of Cement Replacement (if concrete)</li> <li>• Toxicity: Hazardous Constituents Class and % by mass</li> </ul>
<b>3. Circularity and Embodied Carbon</b>	<ul style="list-style-type: none"> <li>• Expected Lifespan</li> <li>• Recycled Content (%)</li> <li>• Expected Recycling rate (%)- end of life</li> <li>• Carbon Datasheet Type</li> <li>• Carbon Datasheet File</li> <li>• Functional Unit</li> <li>• Upfront Carbon</li> <li>• Total Carbon (A-C)</li> <li>• Biogenic Carbon</li> </ul>
<b>4. Certificates and Supporting Evidence</b>	<p>For each certificate/ supporting evidence:</p> <ul style="list-style-type: none"> <li>• Document Name</li> <li>• Document description</li> </ul>
<b>5. Manufacturer and Contractor Information</b>	<ul style="list-style-type: none"> <li>• Manufacturer Name</li> <li>• Manufacturer address</li> <li>• Contractor Name</li> <li>• Contractor Address</li> </ul>

# Materials Passports Content

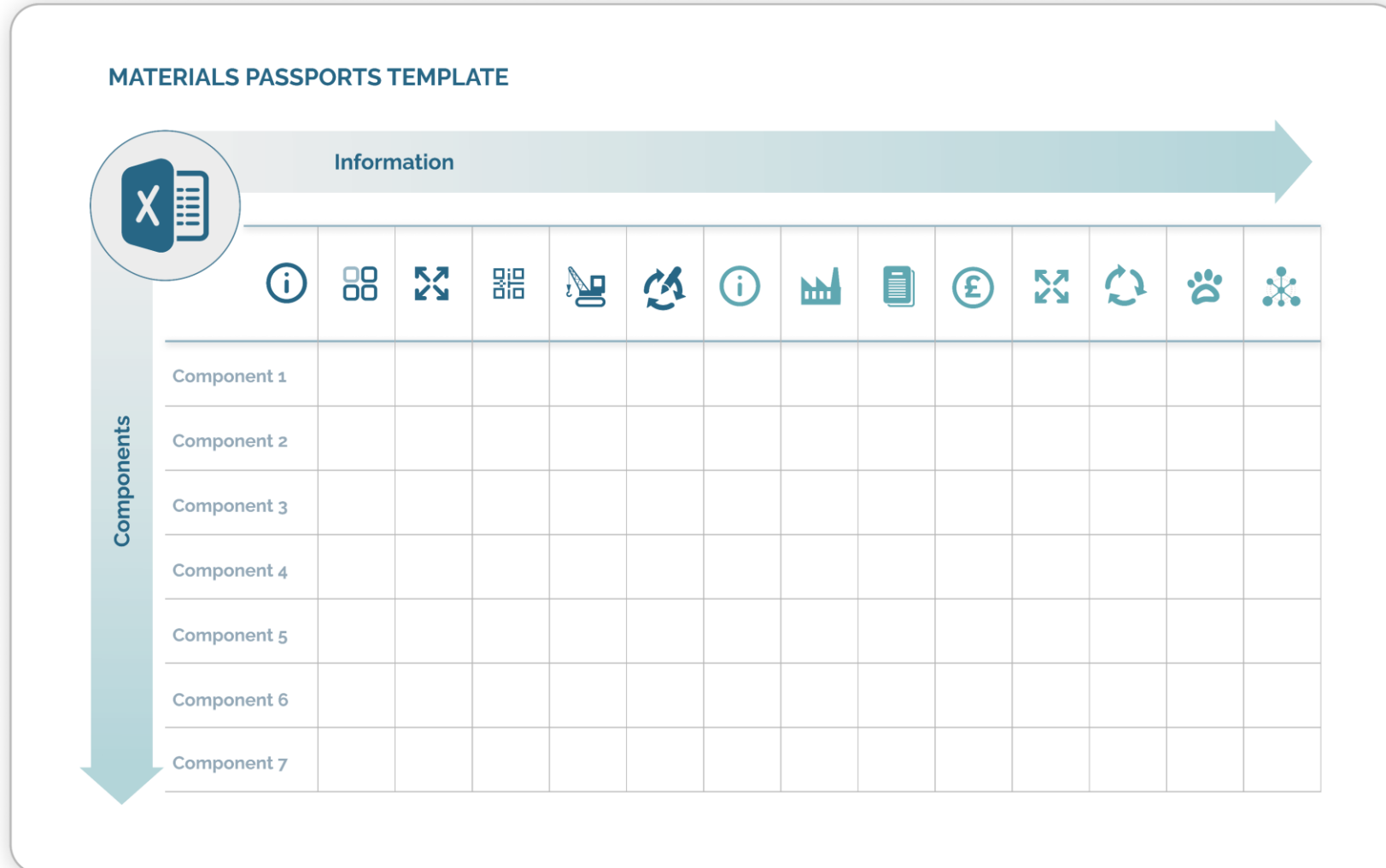
Table 5 Customised approach of the information that should be recorded for different building element categories and types of materials

Type of Material	Typical Dimensions	Properties	Materials
<b>In situ concrete</b>	<p>Varies depending on the building element:</p> <ul style="list-style-type: none"> <li>• <b>Piles:</b> length, radius</li> <li>• <b>Pile Caps:</b> length, width, height</li> <li>• <b>Core Walls:</b> length, thickness, height</li> <li>• <b>Ground Floor Slab &amp; Floor Slabs topping:</b> <ul style="list-style-type: none"> <li>- if rectangular space: thickness, width, length</li> <li>- otherwise: area outline and thickness</li> </ul> </li> </ul>	<p><b>Structural Concrete:</b></p> <ul style="list-style-type: none"> <li>• Concrete Mix</li> <li>• Concrete Strength</li> <li>• Cement Replacement Type</li> <li>• Cement replacement (%)</li> </ul> <p><b>Structural Reinforcement:</b></p> <ul style="list-style-type: none"> <li>• Type (hot rolled deformed steel bars, cold worked steel bars, mild steel plain bars, prestressing steel bars)</li> <li>• Diameter (in mm)</li> </ul>	<p><b>2 Materials:</b></p> <ul style="list-style-type: none"> <li>• Concrete</li> <li>• Reinforcement</li> </ul>
<b>Precast Concrete</b>	<ul style="list-style-type: none"> <li>• <b>Floor Slabs</b> <ul style="list-style-type: none"> <li>- if rectangular space: thickness, width, length</li> <li>- otherwise: area outline and thickness</li> </ul> </li> <li>• <b>Wall Panels</b> <ul style="list-style-type: none"> <li>length, thickness, height</li> </ul> </li> </ul>		
<b>Steel Frame</b>	<ul style="list-style-type: none"> <li>• <b>Columns:</b> profile, serial size, height</li> <li>• <b>Beams:</b> profile, width, depth, length</li> </ul>	<p><b>Structural Steel:</b></p> <ul style="list-style-type: none"> <li>• Grade</li> <li>• Subgrade</li> </ul> <p><b>Intumescent Paint:</b></p> <ul style="list-style-type: none"> <li>• Minutes</li> </ul>	<p><b>2 materials:</b></p> <ul style="list-style-type: none"> <li>• Structural Steel</li> <li>• Intumescent Paint</li> </ul>
<b>Raised Access Floor</b>	<ul style="list-style-type: none"> <li>• <b>Floor Overall Area:</b> m<sup>2</sup></li> <li>• <b>Floor tiles:</b> width, length</li> <li>• <b>Pedestals:</b> diameter, height</li> </ul>	<p><b>Finish</b></p> <ul style="list-style-type: none"> <li>• Colour</li> </ul>	<p><b>2 materials:</b></p> <ul style="list-style-type: none"> <li>• Finish</li> <li>• Pedestals</li> </ul>

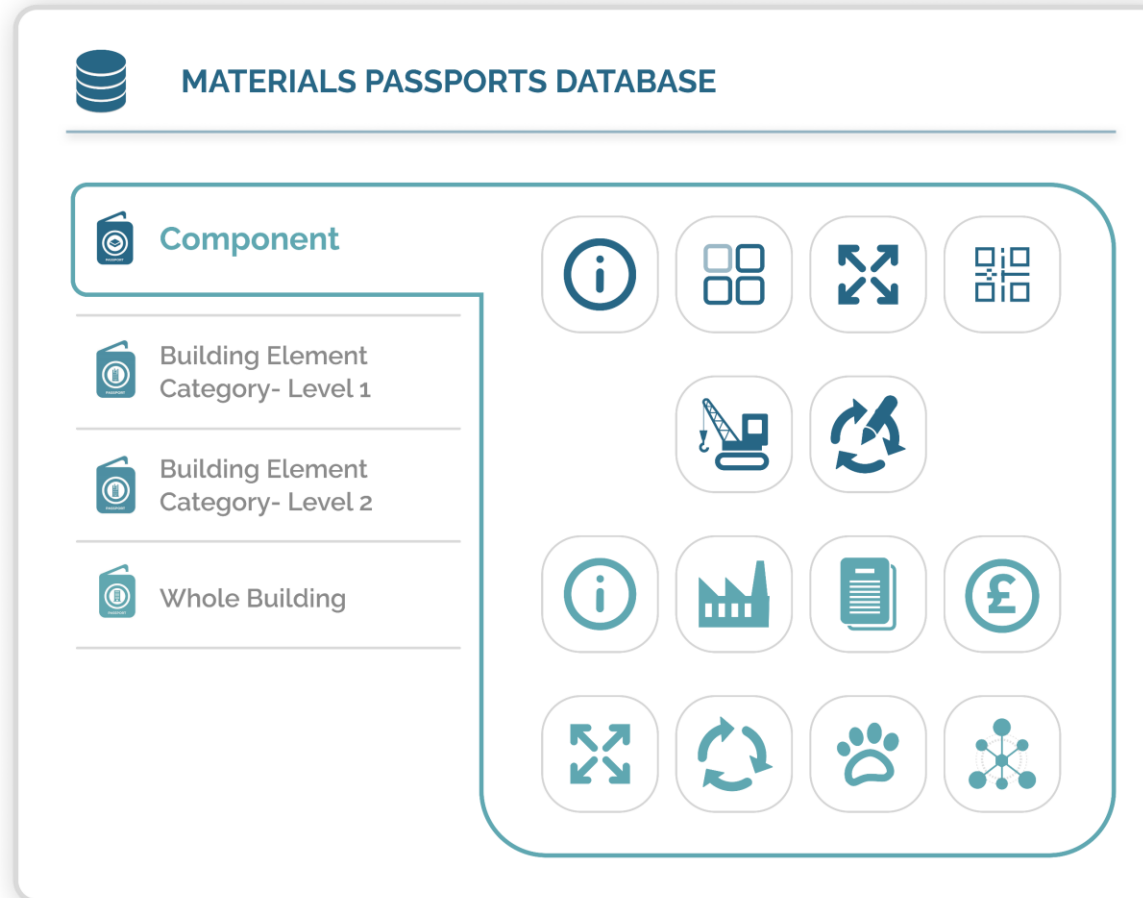




# Materials Passports Data Recording



# Materials Passports Database



# Ongoing Process



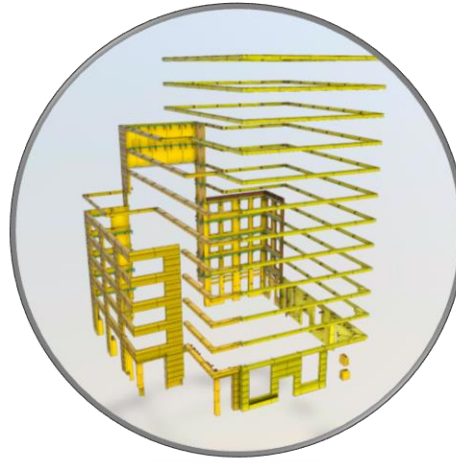
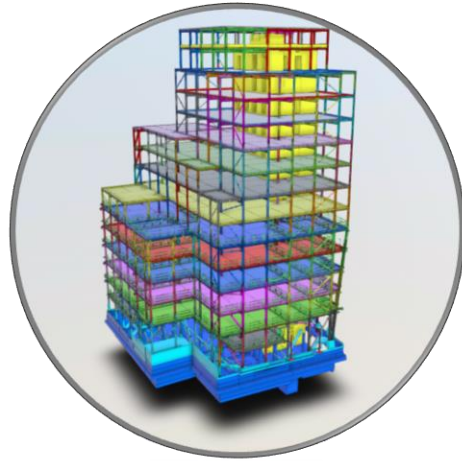
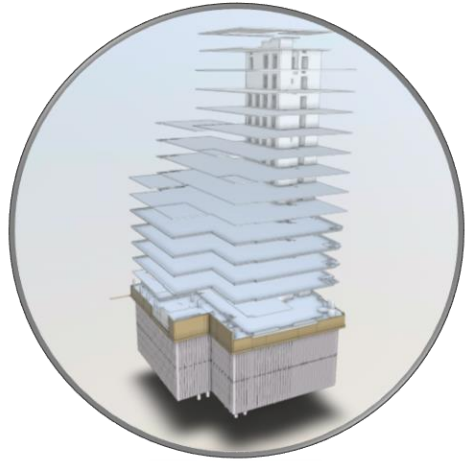
Storing all the information into the Circuland Platform:

- Passport for the whole Building
- Passport for each Building Element Category
- Passport for each Element
- Passport for each documented material

**Automated Calculations  
& Life Cycle Tracking**



# Ongoing Process



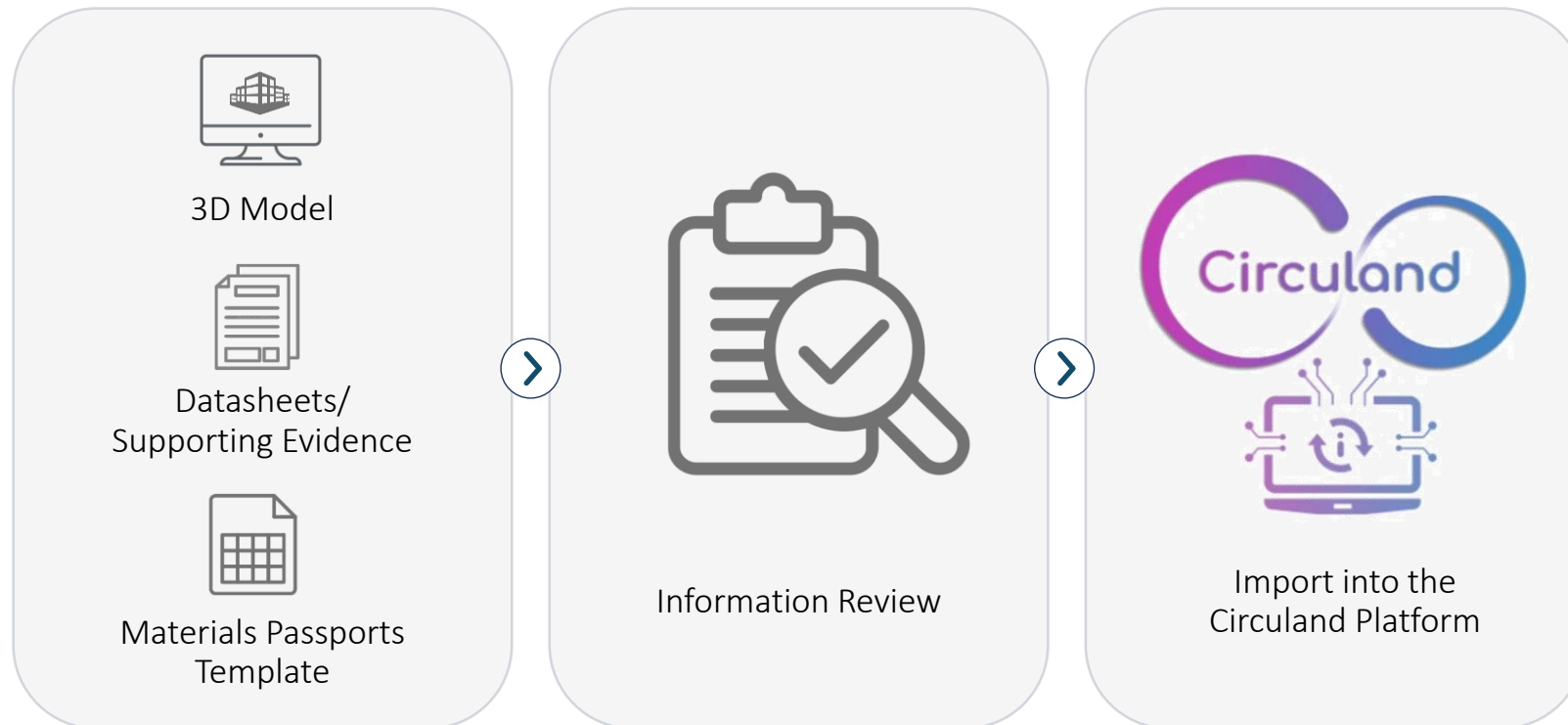
Edenica



[www.edenica.london](http://www.edenica.london)



# Ongoing Process



Thank you 😊



**Anastasia Stella**

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