



Deconstruction, Demolition and Recycling Potential

Demolition

- Demolition should only be considered as a last resort, once all other options have been exhausted.
- In cases where demolition is unavoidable, deconstruction and material recycling can minimise waste and reduce environmental impact.

Demolition

Demolition is carried out for various reasons, including:





Demolition

Demolition is carried out for various reasons, including:

**STRUCTURAL
INSTABILITY**

Demolition

Demolition is carried out for various reasons, including:

**URBAN
REDEVELOPMENT**



A photograph of a demolition site. In the foreground, a large pile of rubble, including broken concrete slabs and wooden beams, covers the ground. To the left, an orange hydraulic excavator arm is visible, reaching towards the debris. In the background, a white building with several windows is partially visible, and further back, a multi-story building is under construction or renovation, surrounded by scaffolding. The right side of the image is faded into a white background where the text is located.

Demolition

Demolition is carried out for various reasons, including:

**ENVIRONMENTAL
HAZARDS**

An aerial view of a demolition site. A yellow excavator with a hydraulic breaker attachment is positioned on the left, working on a concrete foundation. A large pile of debris, including bricks, wood, and metal, is in the center. A house with a brown tiled roof is in the background, partially obscured by a white smoke or dust cloud. A wooden fence is visible in the upper left.

Demolition

Demolition is carried out for various reasons, including:

**BUILDING &
PLANNING
REGULATION
VIOLATIONS**



Demolition

Demolition is carried out for various reasons, including:

DISASTER DAMAGE

Demolition

Demolition is carried out for various reasons, including:

ECONOMIC REASONS



A large yellow excavator with a red hydraulic breaker attachment is demolishing a concrete wall at a construction site. The ground is covered in rubble and debris. In the background, a city skyline is visible under a cloudy sky, including a tall tower with a purple top. The excavator has "John F. Hunt" written on its arm.

Demolition

Demolition is carried out for various reasons, including:

**INFRASTRUCTURE
EXPANSION**

Demolition

The current British Standard for demolition is **BS 6187:2011**, titled *Code of Practice for Full and Partial Demolition*.

This standard provides guidelines on safety, environmental management, risk assessment, and planning for demolition projects.

It covers the structural stability of buildings, occupational hazards, and best practices for minimising risks during demolition.

The standard ensures that demolition is conducted safely and efficiently while considering environmental impact.



Demolition

The type and method of demolition employed is dependent on:





Demolition



The type and method of demolition employed is dependent on:

- the location of the building
- the type of structure and construction
- the types of materials involved
- the space available on the site for segregation and storage
- how materials are to be disposed of
- health and safety of operatives undertaking demolition work
- the time and money available.



Demolition

The sequence of building demolition, and the detailed execution of the various stages depends on the size and type of the building, but typically is as follows:

- stripping out (“soft strip”)





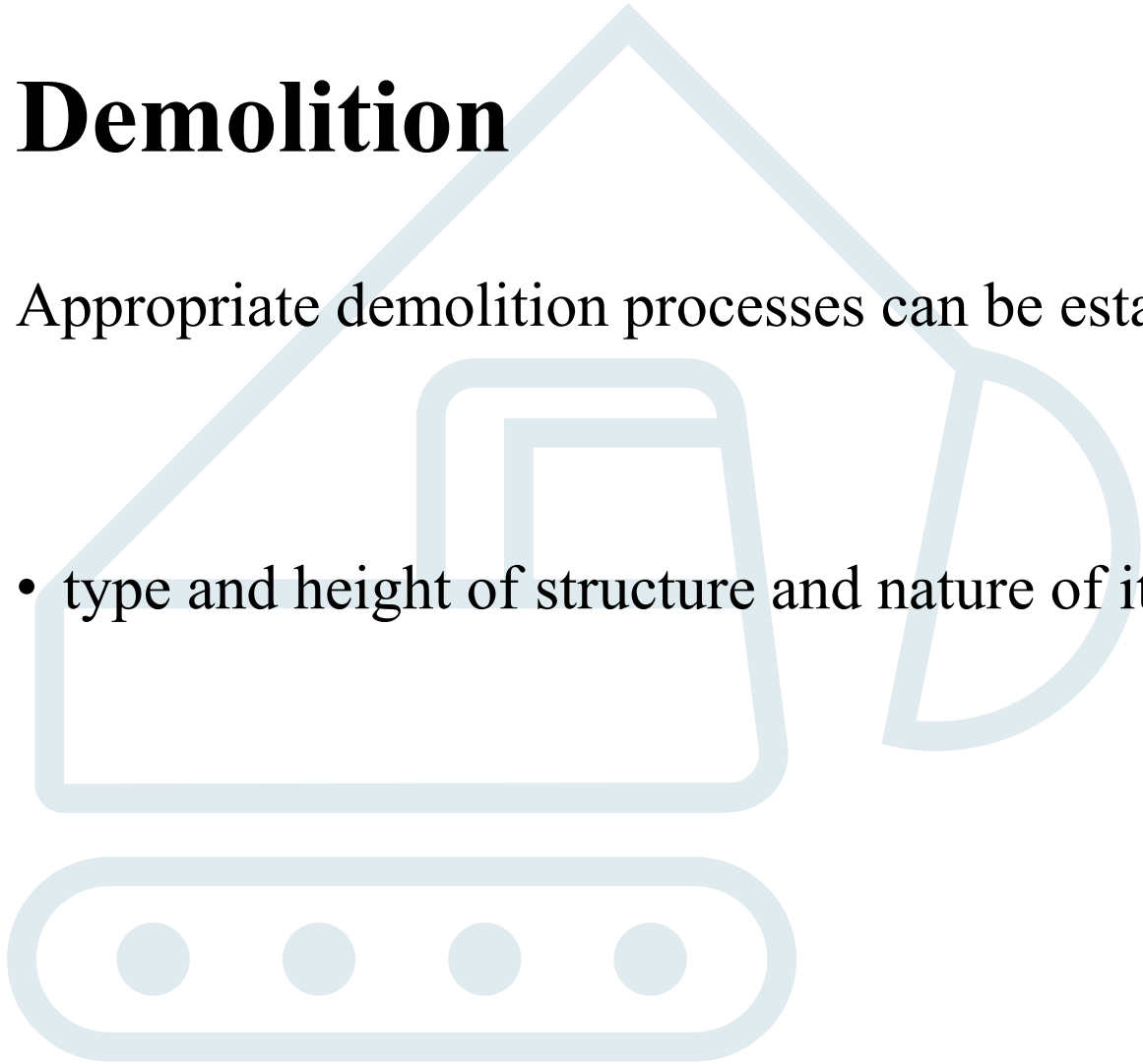
Demolition

The sequence of building demolition, and the detailed execution of the various stages depends on the size and type of the building, but typically is as follows:

- stripping out (“soft strip”)
- roofing tiles
- roof beams
- timber
- internal plasterboard
- exterior cladding
- floors
- major structural elements, and
- footings and foundations.



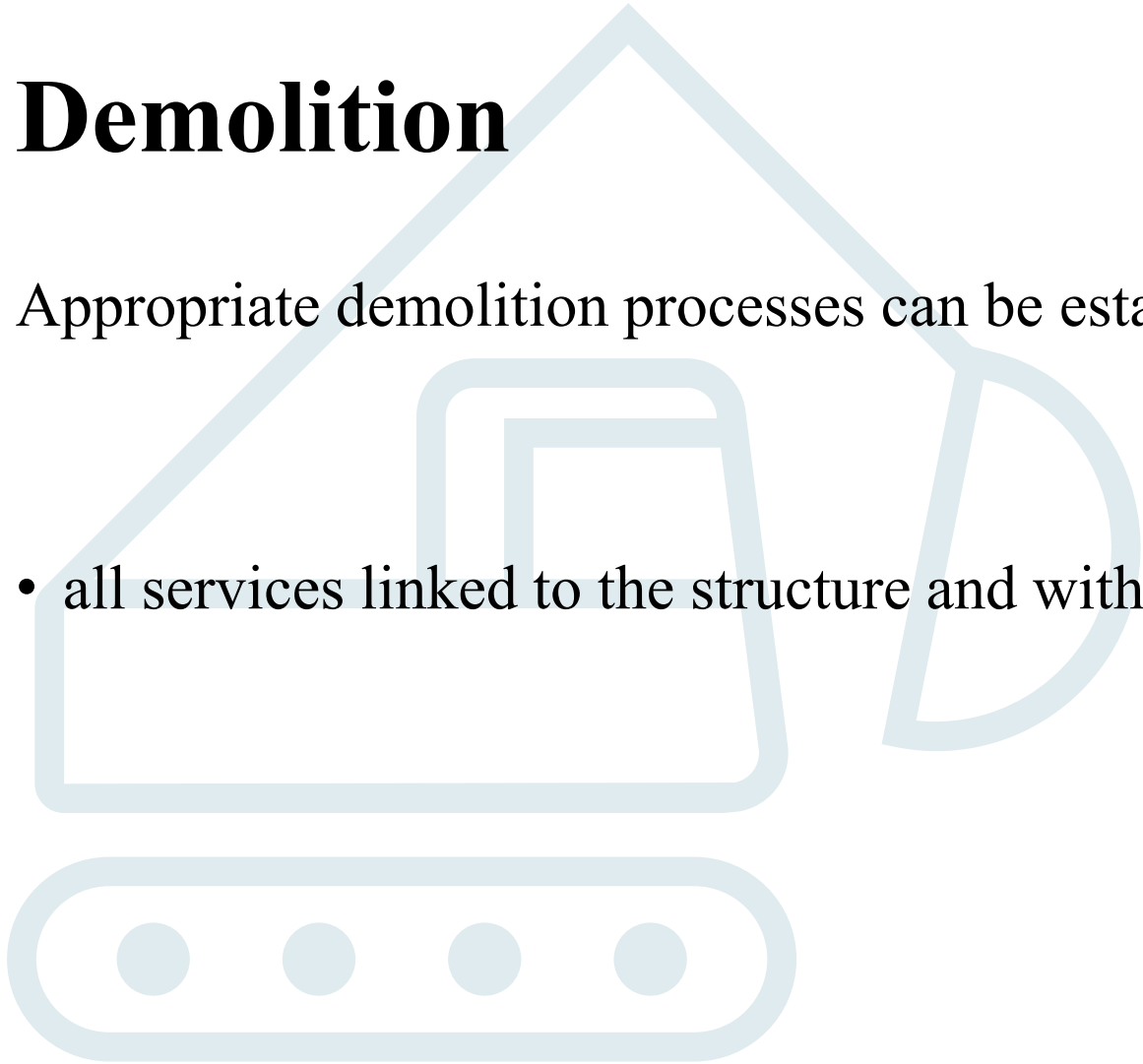
Demolition



Appropriate demolition processes can be established after consideration of the following:

- type and height of structure and nature of its construction (eg post-tensioned concrete)

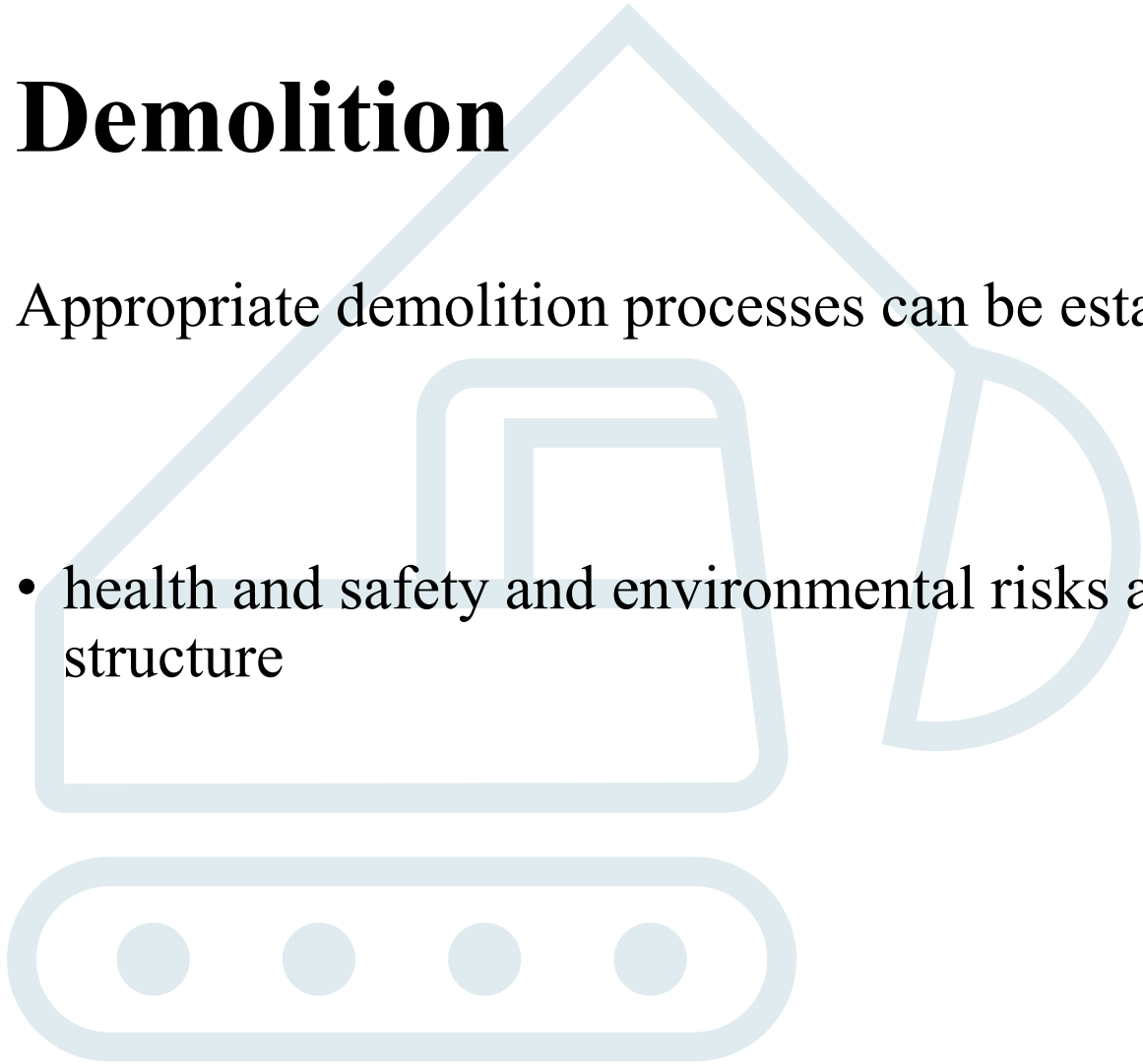
Demolition



Appropriate demolition processes can be established after consideration of the following:

- all services linked to the structure and within the structure's immediate location

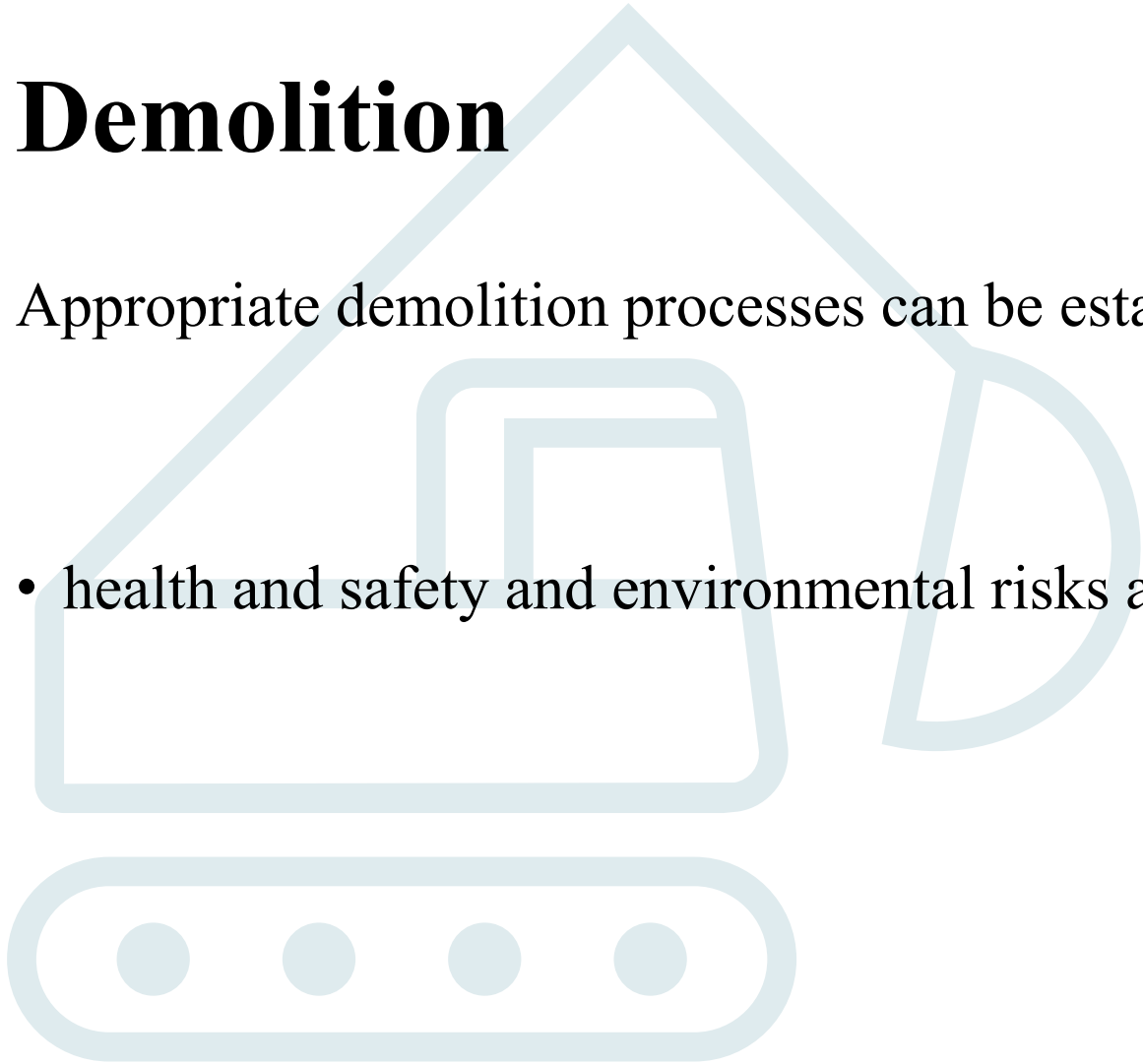
Demolition



Appropriate demolition processes can be established after consideration of the following:

- health and safety and environmental risks associated with materials present in the structure

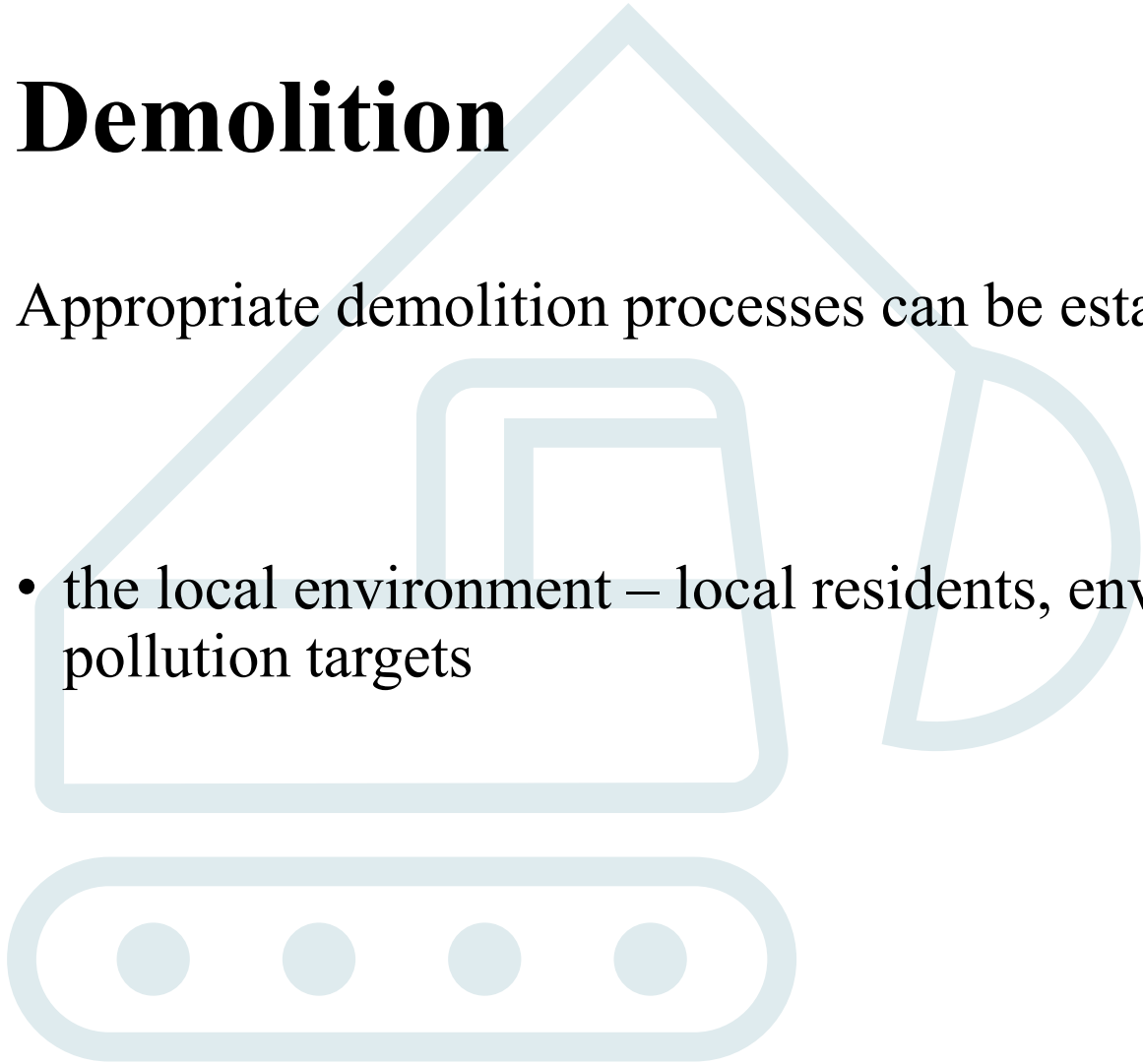
Demolition



Appropriate demolition processes can be established after consideration of the following:

- health and safety and environmental risks associated with demolition techniques

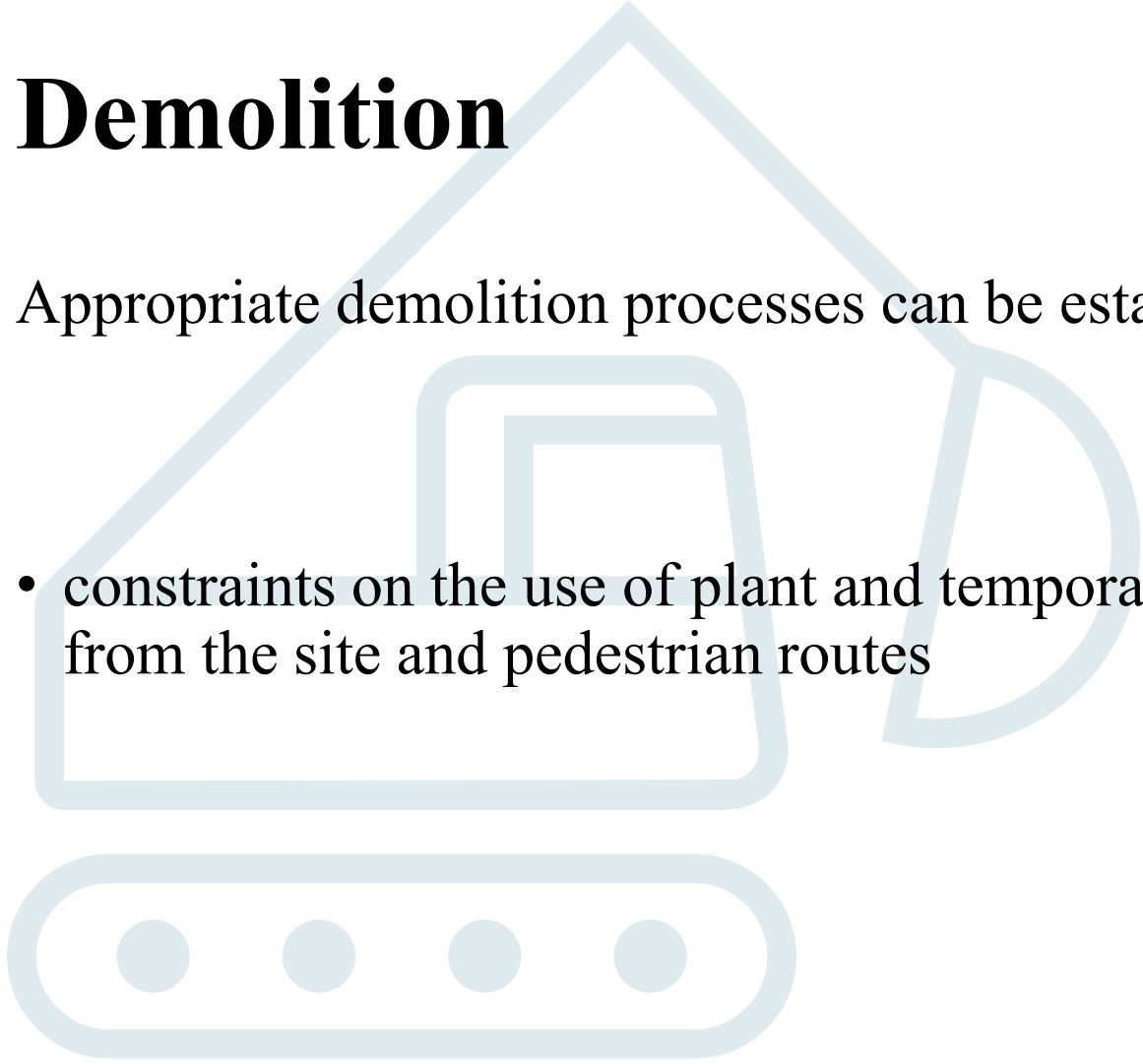
Demolition



Appropriate demolition processes can be established after consideration of the following:

- the local environment – local residents, environmentally sensitive areas, possible pollution targets

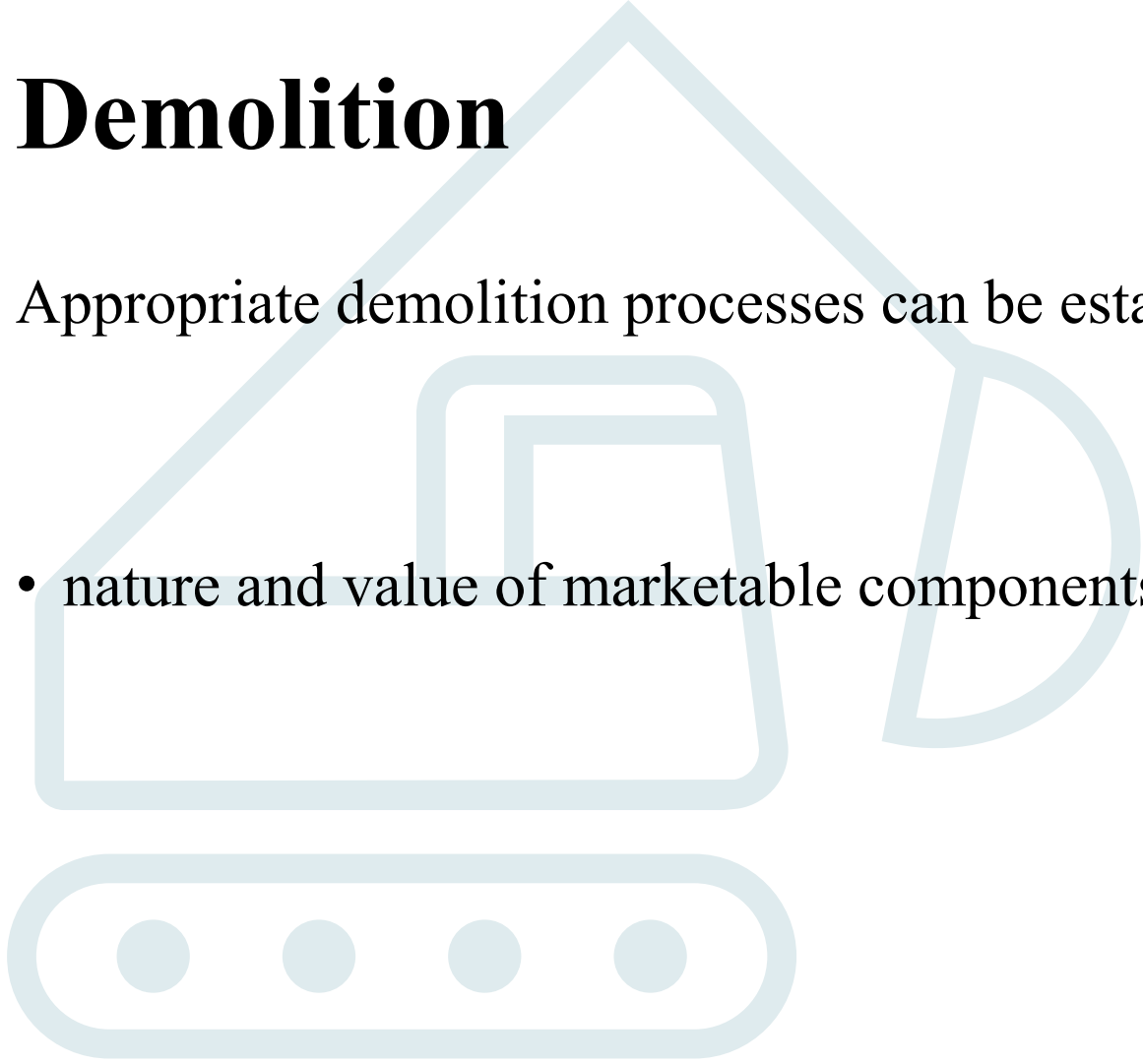
Demolition



Appropriate demolition processes can be established after consideration of the following:

- constraints on the use of plant and temporary works, including access to and egress from the site and pedestrian routes

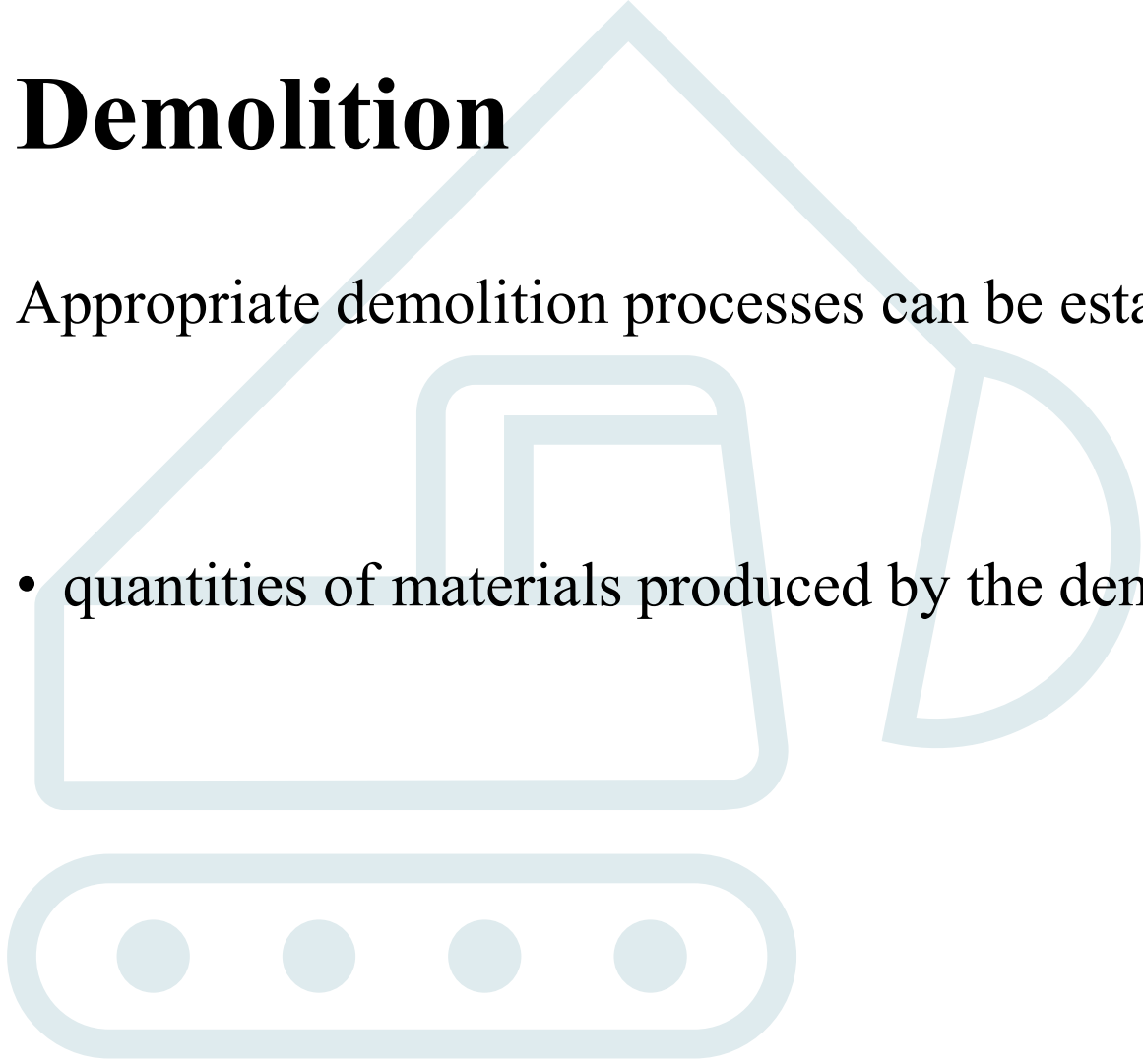
Demolition



Appropriate demolition processes can be established after consideration of the following:

- nature and value of marketable components and materials

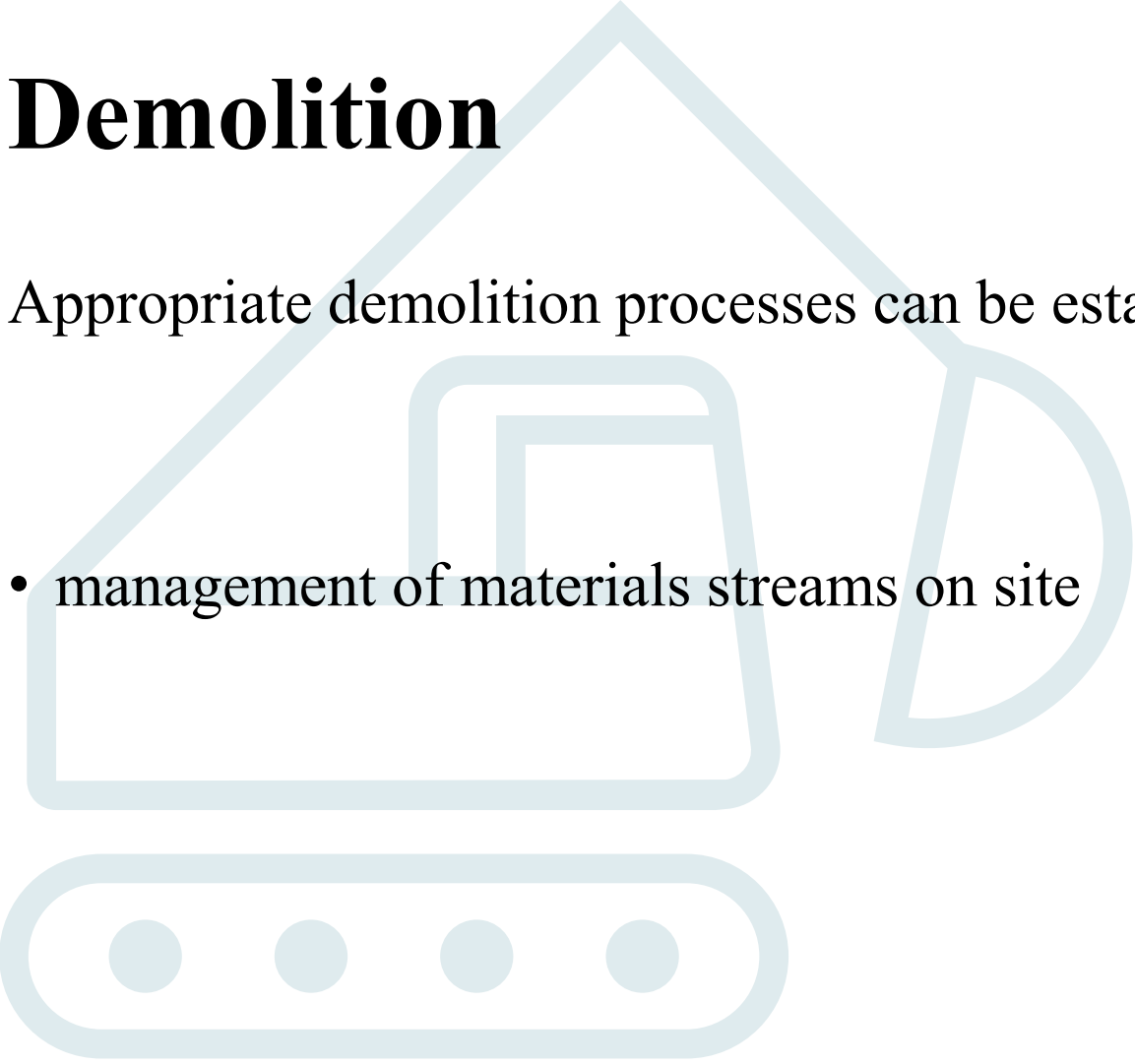
Demolition



Appropriate demolition processes can be established after consideration of the following:

- quantities of materials produced by the demolition process

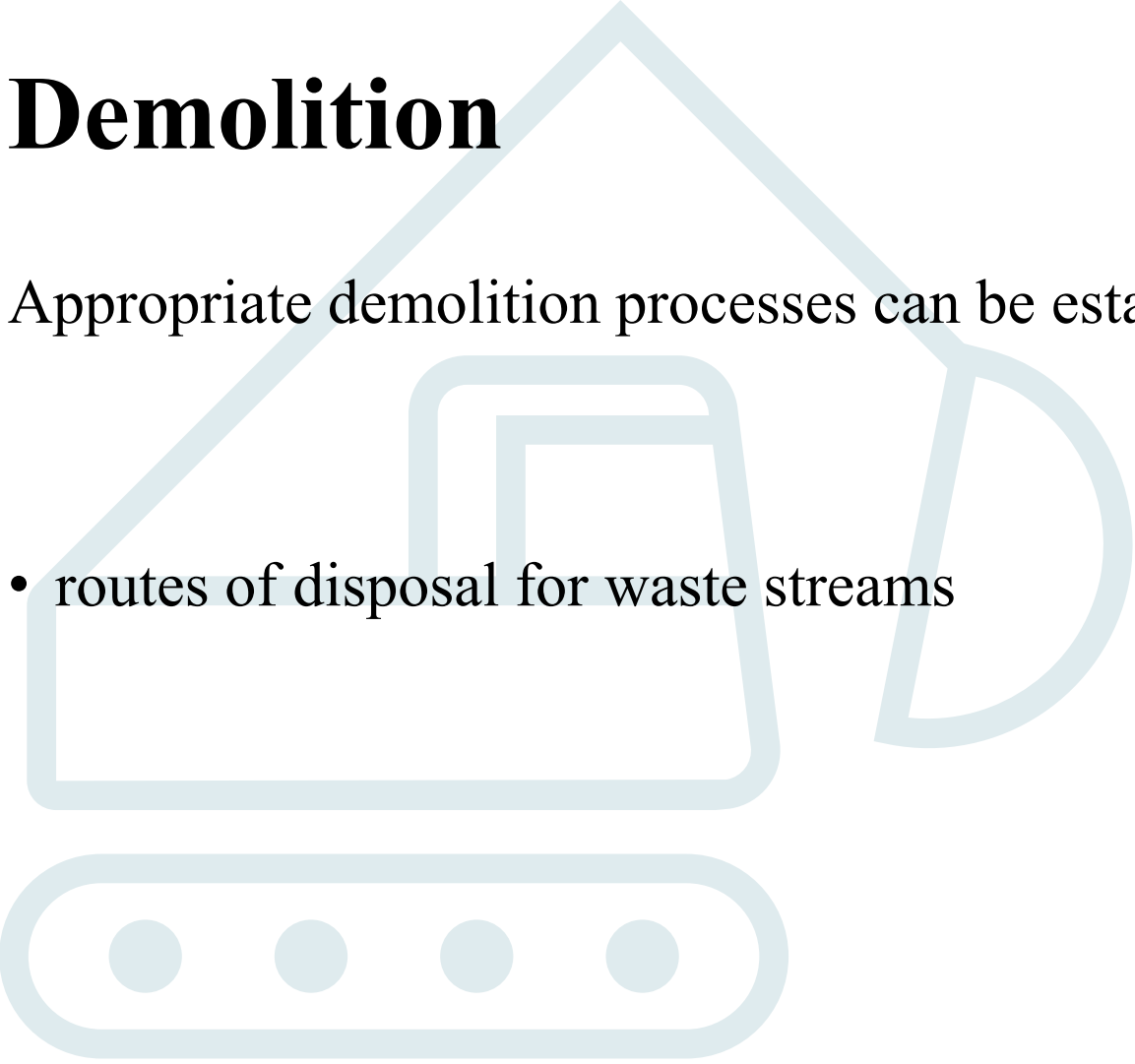
Demolition



Appropriate demolition processes can be established after consideration of the following:

- management of materials streams on site

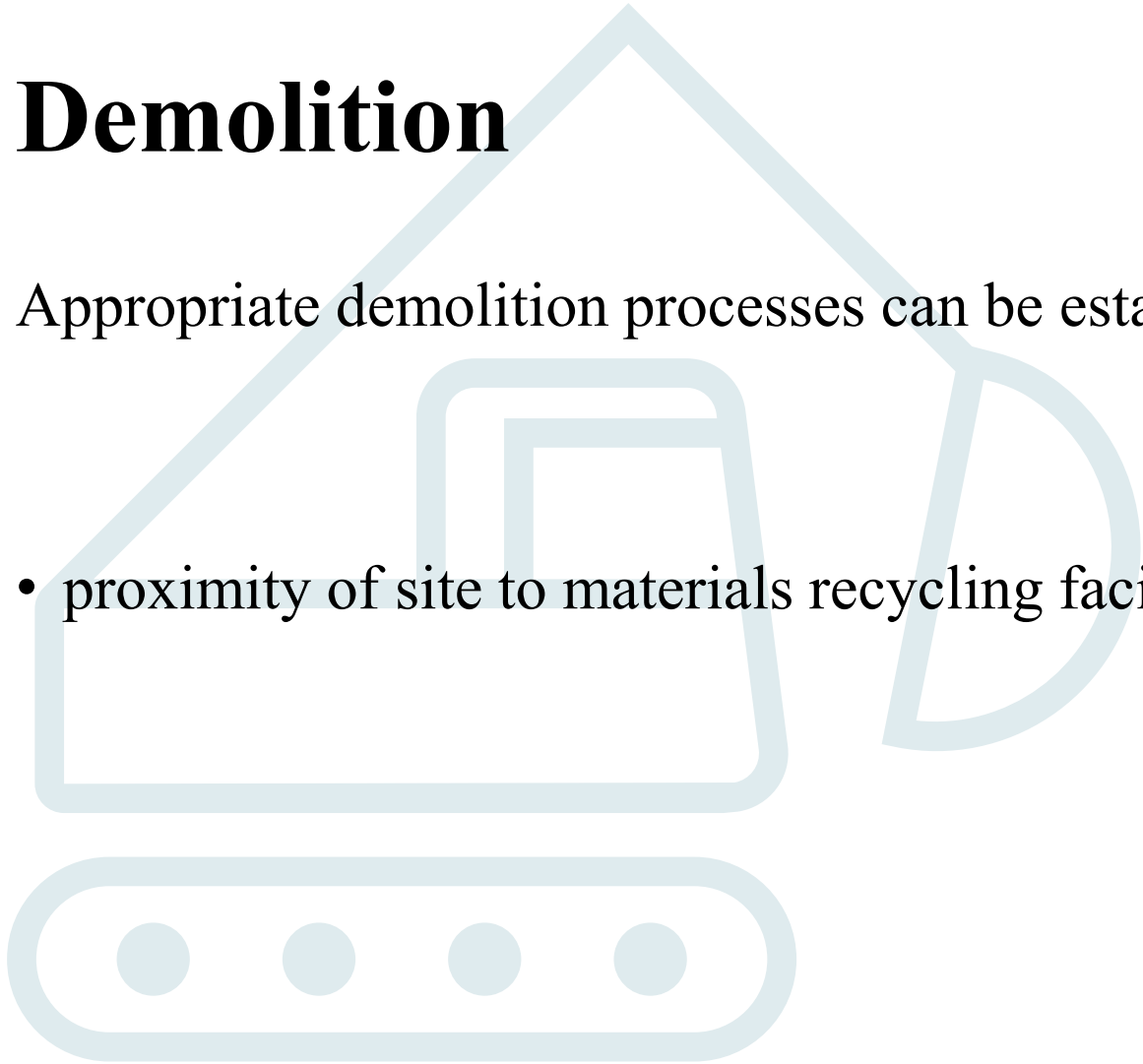
Demolition



Appropriate demolition processes can be established after consideration of the following:

- routes of disposal for waste streams

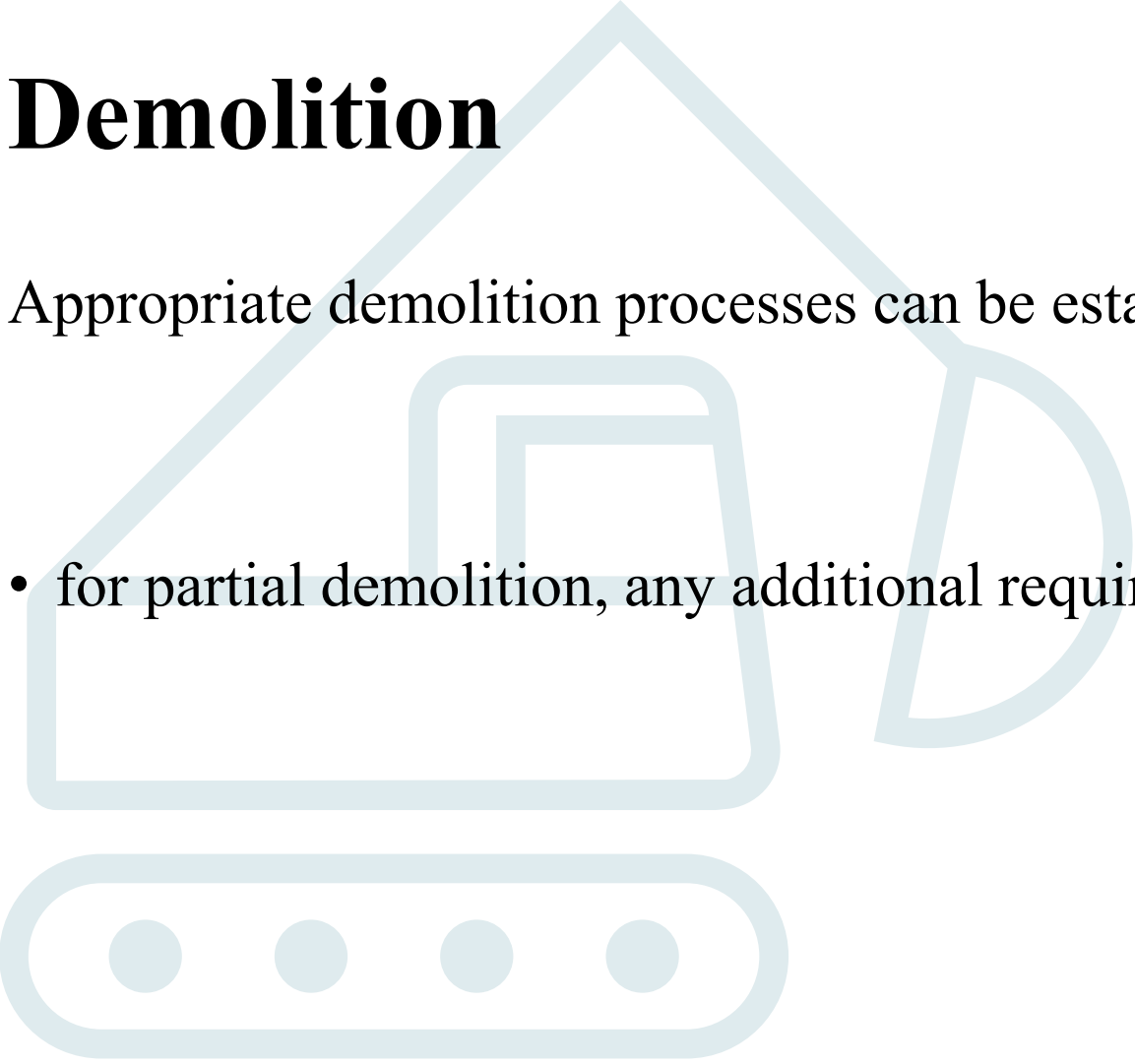
Demolition



Appropriate demolition processes can be established after consideration of the following:

- proximity of site to materials recycling facilities and waste transfer stations

Demolition

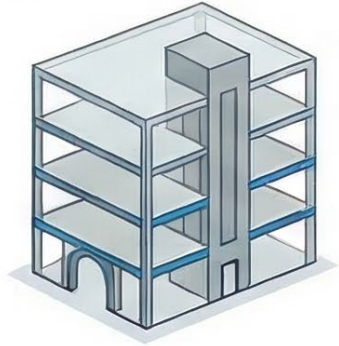


Appropriate demolition processes can be established after consideration of the following:

- for partial demolition, any additional requirements with respect to other site occupants.

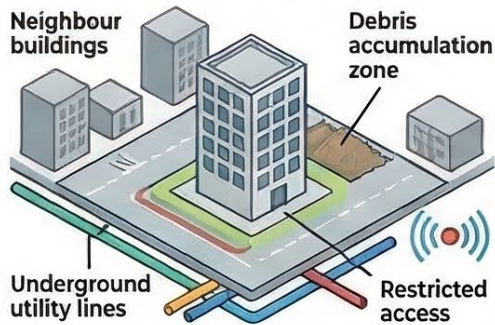
The Blueprint for Controlled Demolition: Strategy & Stability

Phase 1: Structural & Site Assessment



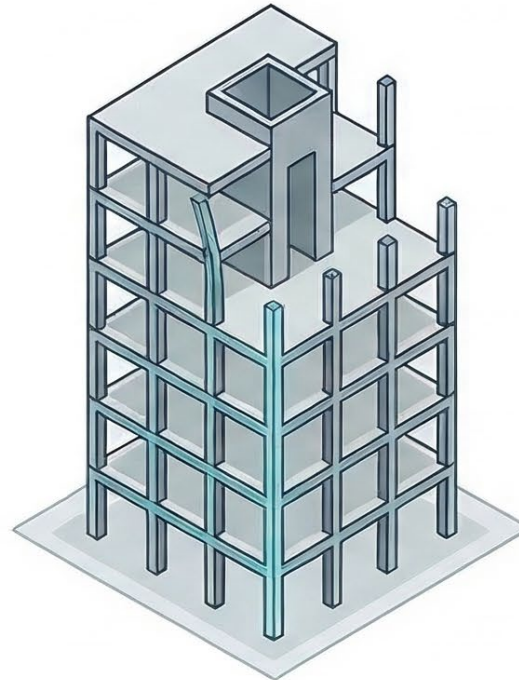
Analyze Structural Form

Evaluate load paths, floor loadings, and stability-sensitive elements like arches and lift shafts.



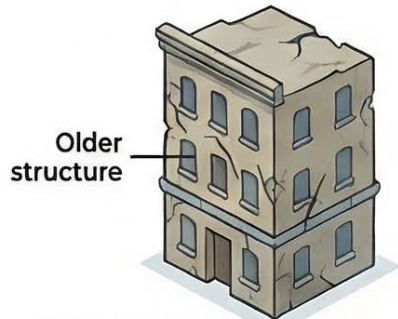
Assess External Constraints

Consider proximity to other services, available space, and the impact of debris build-up.



Identify Stability Risks

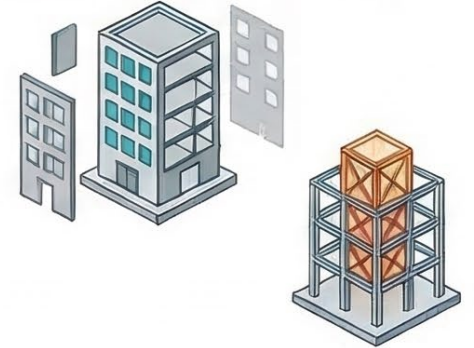
Screen for historic alterations or unknown factors that could trigger an uncontrolled collapse.



Phase 2: Methodical Execution

Establish Sequential Priority

Remove non-critical elements first, then proceed toward stiff elements like braced cores.



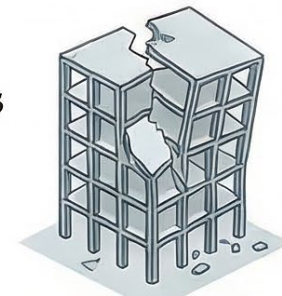
Document and Communicate

The demolition method must be fully documented and shared with the entire contract team.



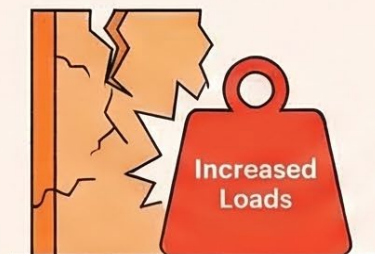
Adapt to Structural Changes

Update the demolition method immediately if the structural fabric changes during the process.



Preventing Structural Collapse: Standards for Temporary Support

When Temporary Support is Required

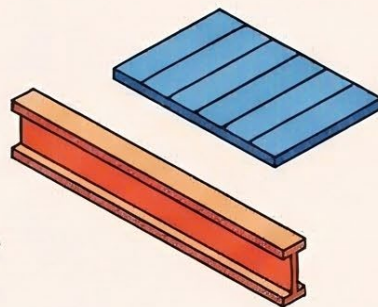


Structural Weakness or Load Changes

Use support if the structure is known to be weak or faces increased loads from machinery.

Altered Load Paths & Geometry

Required when removing permanent bracing, reducing the footprint, or working with cantilevers and hanging floors.



Protection of Critical Stability

Necessary when parts essential for stability are at risk of damage from falling debris.

Standards for Safe Execution



Qualified Design and Oversight

A qualified engineer must decide on necessity, while experienced designers must create the support specs.

Rigorous Lifecycle Maintenance



INSPECT



MAINTAIN



DISMANTLE

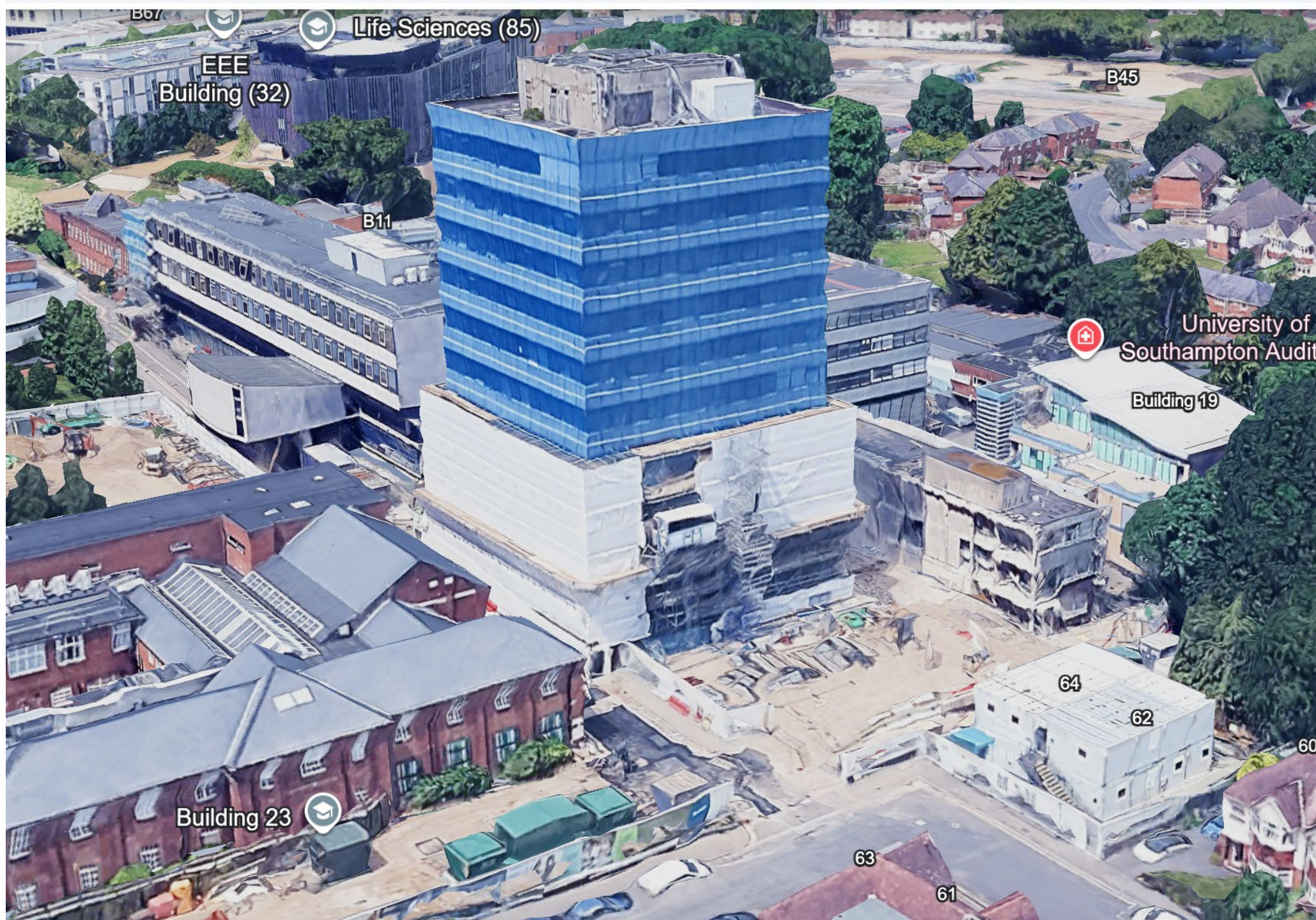
Supports must be inspected, maintained, and dismantled strictly according to the designer's original specification.

Written Safe Systems of Work

Use written method statements to establish exclusion zones, reinforce machinery, and train workers.







B67



Life Sciences (85)

EEE

Building (32)

B45

B11



University of
Southampton Audit

Building 19

64

62

60

Building 23



63

61



Material Streams

What are the materials streams arising from a typical structure?

Material Streams

What are the materials streams arising from a typical structure?

Iron and Steel

Roof Coverings

Non-Ferrous Metals

Glass

M&E Services

Pavement

Bricks

Concrete

Timber

Transformation Meter

- The Transformation Meter is a decision-making tool used to assess the adaptation potential of buildings.



Transformation Meter

- The Transformation Meter is a decision-making tool used to assess the adaptation potential of buildings.

1.Evaluation Criteria: It considers various factors such as the building's structural condition, architectural quality, and potential for reuse.



Evaluation Criteria

1. Structural Condition

This factor assesses the building's physical integrity, including:

- Foundation stability and load-bearing capacity
- The condition of walls, roofs and floors
- Signs of deterioration such as cracks, water damage or corrosion
- Compliance with modern safety standards

Evaluation Criteria

2. Architectural Quality

This factor measures the design value, historical significance and aesthetic appeal of a building:

- Unique or culturally significant architectural styles
- The quality of materials and craftsmanship
- The ability to integrate modern design elements without losing character

Evaluation Criteria

3. Reuse Potential

This factor determines how easily a building can be converted for new functions:

- Flexibility of the layout for different
- Availability of space for modern infrastructure upgrades
- Regulations that may allow or restrict repurposing

Evaluation Criteria

4. Environmental Impact

This factor examines the sustainability of adapting versus demolishing a building:

- The carbon footprint of demolition versus renovation
- Potential for energy-efficient upgrades (e.g., insulation, solar panels, water recycling systems)
- Waste reduction through material reuse and recycling

Evaluation Criteria

5. Economic Viability

This factor compares the cost-effectiveness of adaptation versus demolition and new construction:

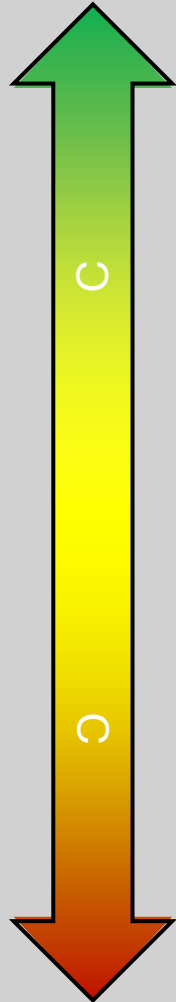
- Estimated cost of repairs, renovations, and regulation compliance
- Long-term financial benefits of adaptation, including energy savings and increased property value
- Availability of government incentives or grants

Transformation Meter

- The Transformation Meter is a decision-making tool used to assess the adaptation potential of buildings.
1. Evaluation Criteria: It considers various factors such as the building's structural condition, architectural quality, and potential for reuse.
 2. Scoring System: Each criterion is scored to determine the overall adaptability of the building.



Transformation Meter



Excellent Transformability

Transformable

Limited Transformability

Very Poor Transformability

Not Transformable

Transformation Meter

- The Transformation Meter is a decision-making tool used to assess the adaptation potential of buildings.

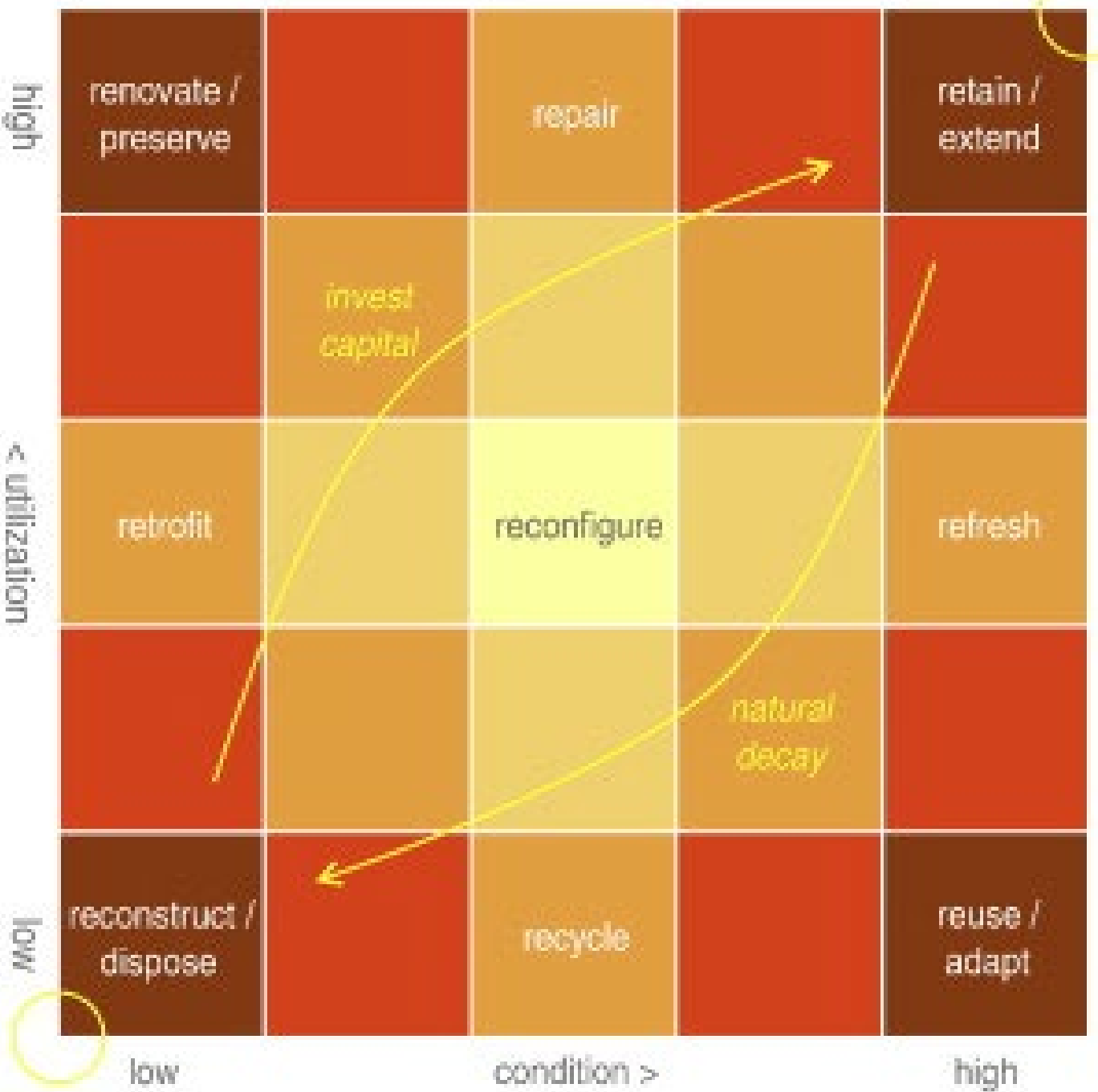


1. Evaluation Criteria: It considers various factors such as the building's structural condition, architectural quality, and potential for reuse.
2. Scoring System: Each criterion is scored to determine the overall adaptability of the building.
3. Decision Support: The scores help stakeholders decide whether to adapt or demolish the building based on its potential for successful transformation.

iconCUR

property management matrix

condition: utilization: reward



iconCUR ASSESSMENT WORKSHEET

88 George Street, Sydney (Australia)

Original construction: 1888

124 years old

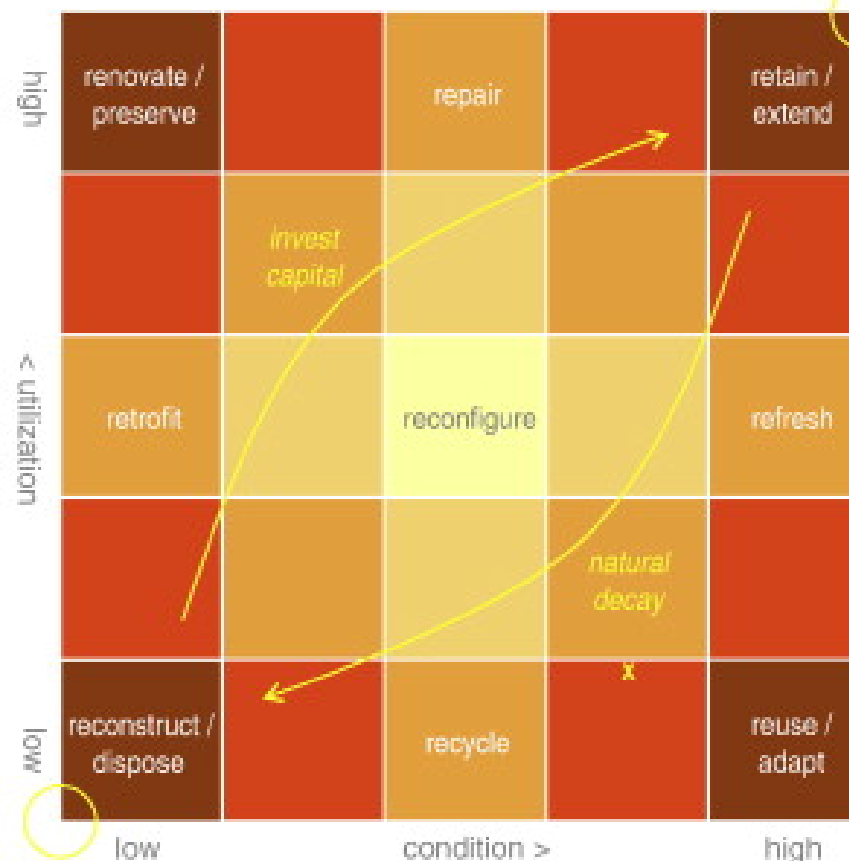
(before proposed intervention)

CONDITION		3.55				(high)
	weighting	design standard 50%	maintained service level 25%	regulatory compliance 25%		100%
structure	20%	4	4	4		4.00
exterior envelope	30%	4	4	4		4.00
interior finishes/fitout	20%	3	3	4		3.25
engineering services	20%	2	3	3		2.50
external works	10%	4	3	5		4.00
	100%	3.40	3.50	3.90		

UTILIZATION		0.96				(very low)
	weighting	demand or relevance 40%	fitness for purpose 40%	user satisfaction 20%		100%
internal space (foca)	30%	1	2	2		1.60
external space (uca)	10%	0	2	0		0.80
outdoor site area	10%	0	0	0		0.00
equipment and fitout	30%	1	1	0		0.80
engineering systems	20%	1	1	0		0.80
	100%	0.80	1.30	0.80		

COLLECTIVE UTILITY		3.00				(high)
	weighting	economic performance 20%	culture and heritage 40%	environmental values 40%		100%
operational viability	30%	2	2	3		2.40
locational context	20%	5	5	1		3.40
risk and opportunity	20%	2	4	3		3.20
asset valuation	20%	3	5	1		3.00
profile/mission	10%	4	5	2		3.60
	100%	3.00	3.90	2.10		

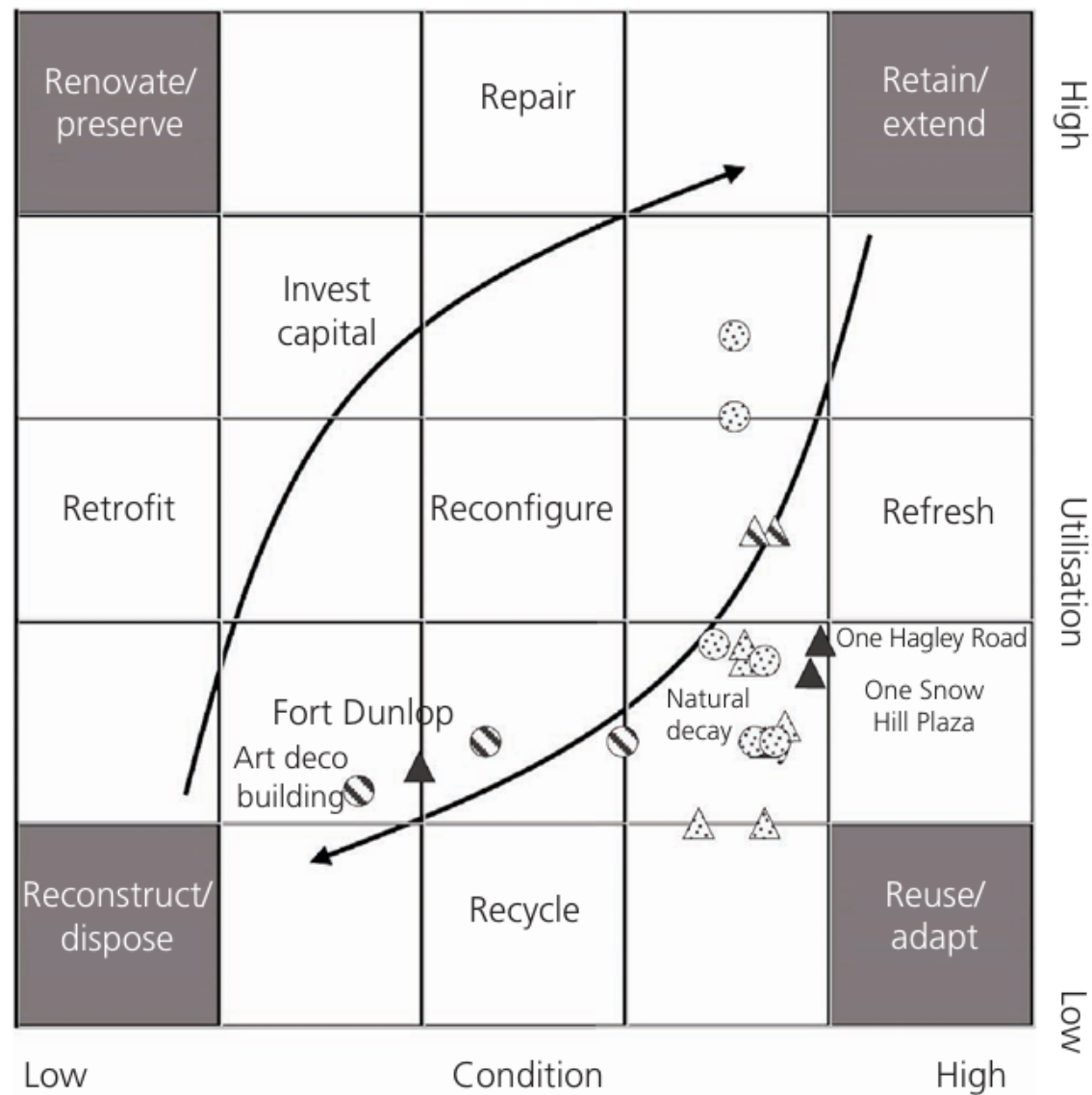
STAKEHOLDER INTEREST		3.80				(high)
	weighting	short-term perspective 50%	medium-term perspective 25%	long-term perspective 25%		100%
building owner	40%	3	4	5		4.20
building user	20%	3	2	1		1.80
facility manager	10%	5	5	5		5.00
sponsor/financier	10%	5	3	1		2.60
community	20%	5	5	5		5.00
	100%	3.80	3.80	3.80		



iconCUR
property management matrix
condition: utilization: reward

REWARD		2.28				(moderate)
		collective utility 3.00	X	stakeholder interest 3.80		
ASSET PERFORMANCE		2.26	condition (x axis)	utilization (y axis)	reward (z axis)	(average)
property status			3.55	0.96	2.28	recycle
trending decision			5.00	0.00	0.00	reuse/adapt
decision exposure						moderate risk
proximity to corner				75%	67%	far
extra reward likelihood						moderate

iconCUR that change is recommended and worthy of further investigation



Fill

- Larger individual buildings
- Selly Oak Hospital buildings
- Icknield Port Loop buildings

Shape

- ▲ Real life decision: adaptation
- Real life decision: demolition

Reuse and Recycle

- The construction and building industries consume huge quantities of materials.
- The environmental impact of the extraction, gathering and production of these materials is large and growing.
- Moreover, when buildings are constructed large quantities of materials are wasted and most of these are sent to landfill

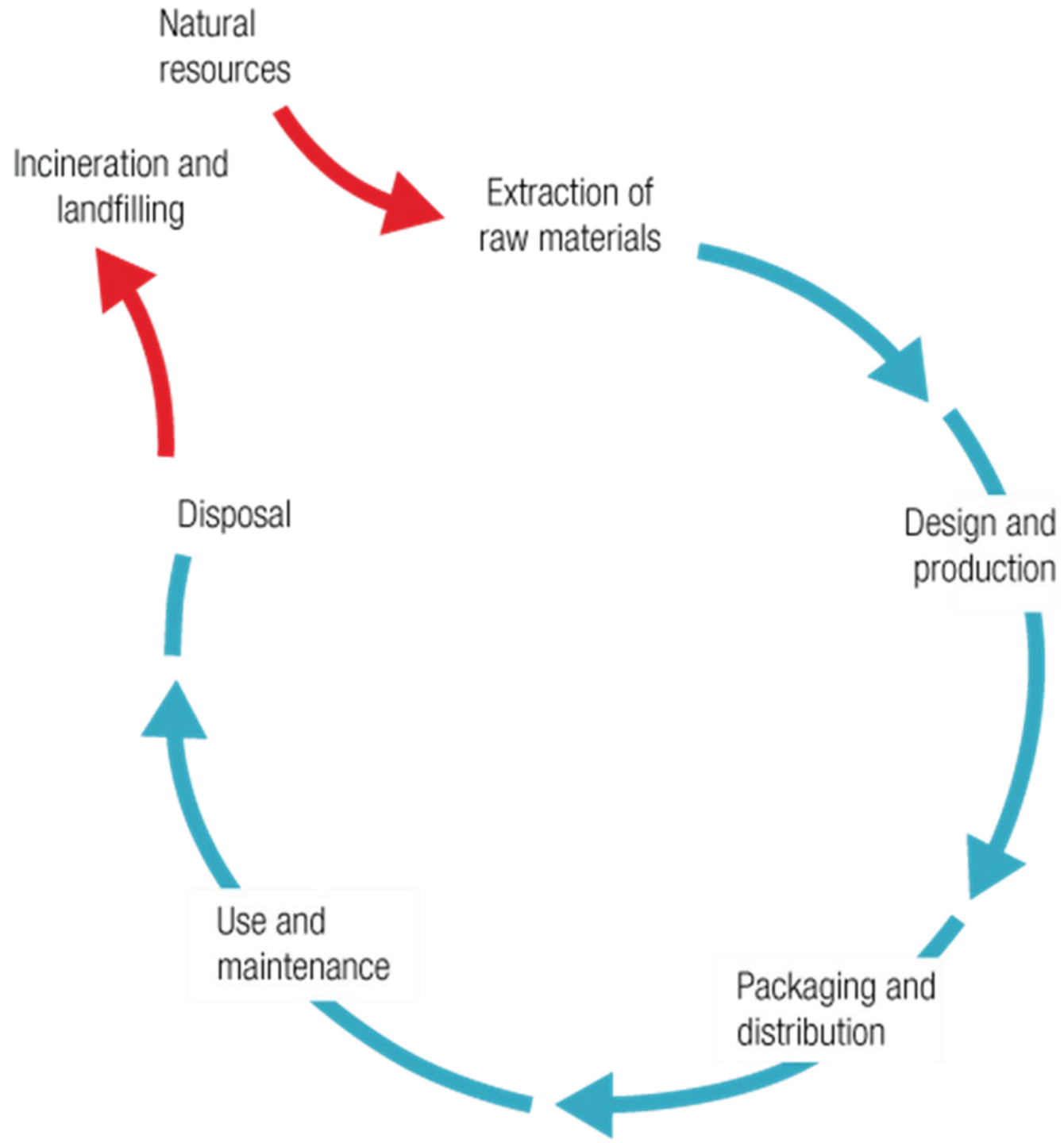
Material Type	Annual Consumption
Minerals (Crushed Rock & Gravel)	254 Million Tonnes
Metals (Steel, Copper, Brass, Aluminium and Alloys)	3.35 Million Tonnes
Timber	3.85 Million Cubic Metres
Polymers (PVC, polyurethane, polystyrene etc)	0.5 Million Tonnes
Paints	0.4 Million Tonnes

Reuse and Recycle

- Four approaches that can each influence the design and specification of materials and building components to facilitate reuse and recycling after deconstruction:
- **Consider the whole life of a product or material**
- Consider the potential of components for reuse
- Consider the processes of deconstruction when designing components and buildings
- Consider the ownership of buildings and their components

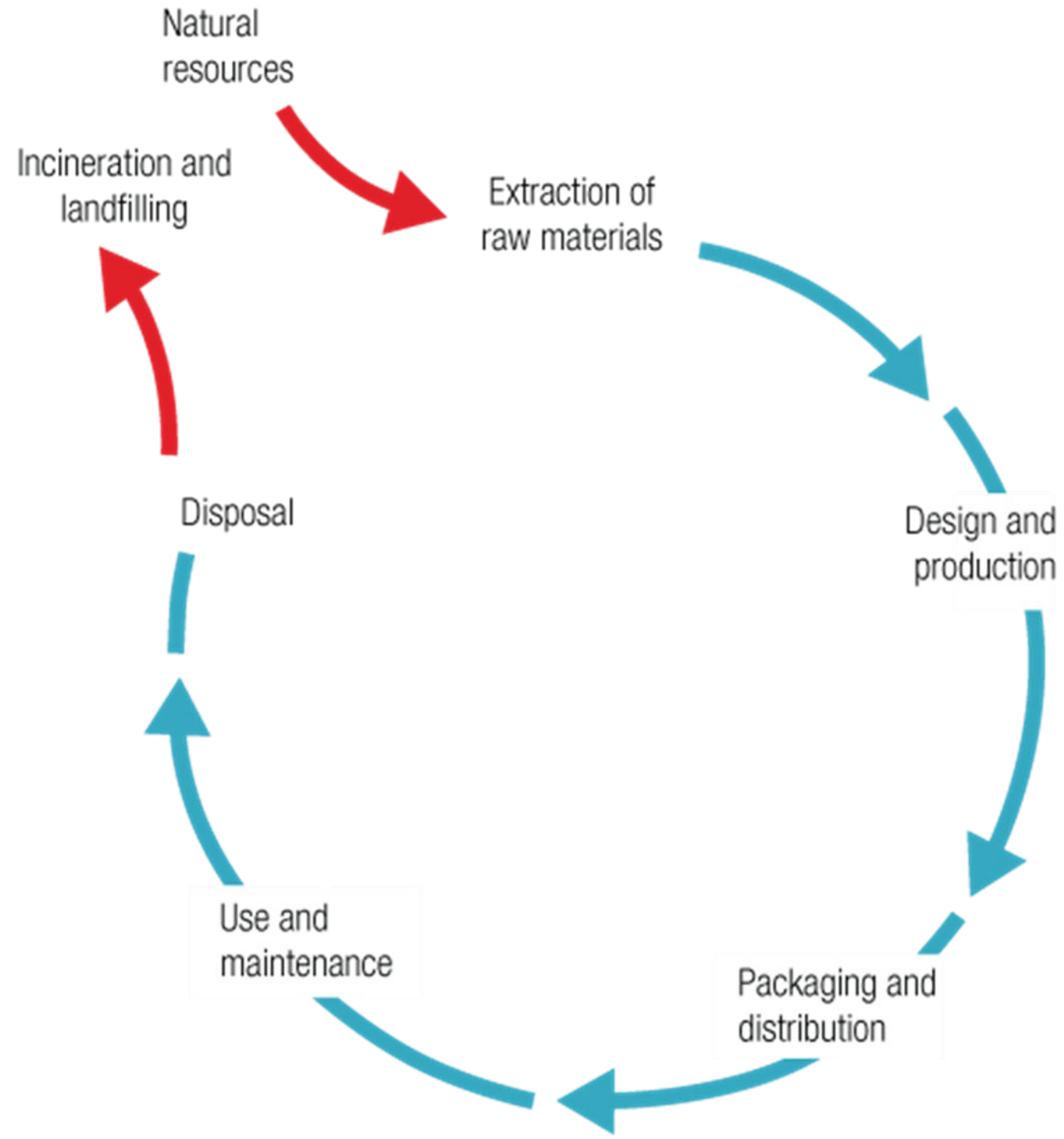
Product Life Cycle

- The lifecycle of a product refers to the stages it undergoes from conception to disposal, encompassing its environmental, economic, and social impacts at each phase.



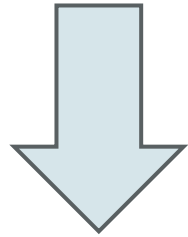
Product Life Cycle

Linear Economy

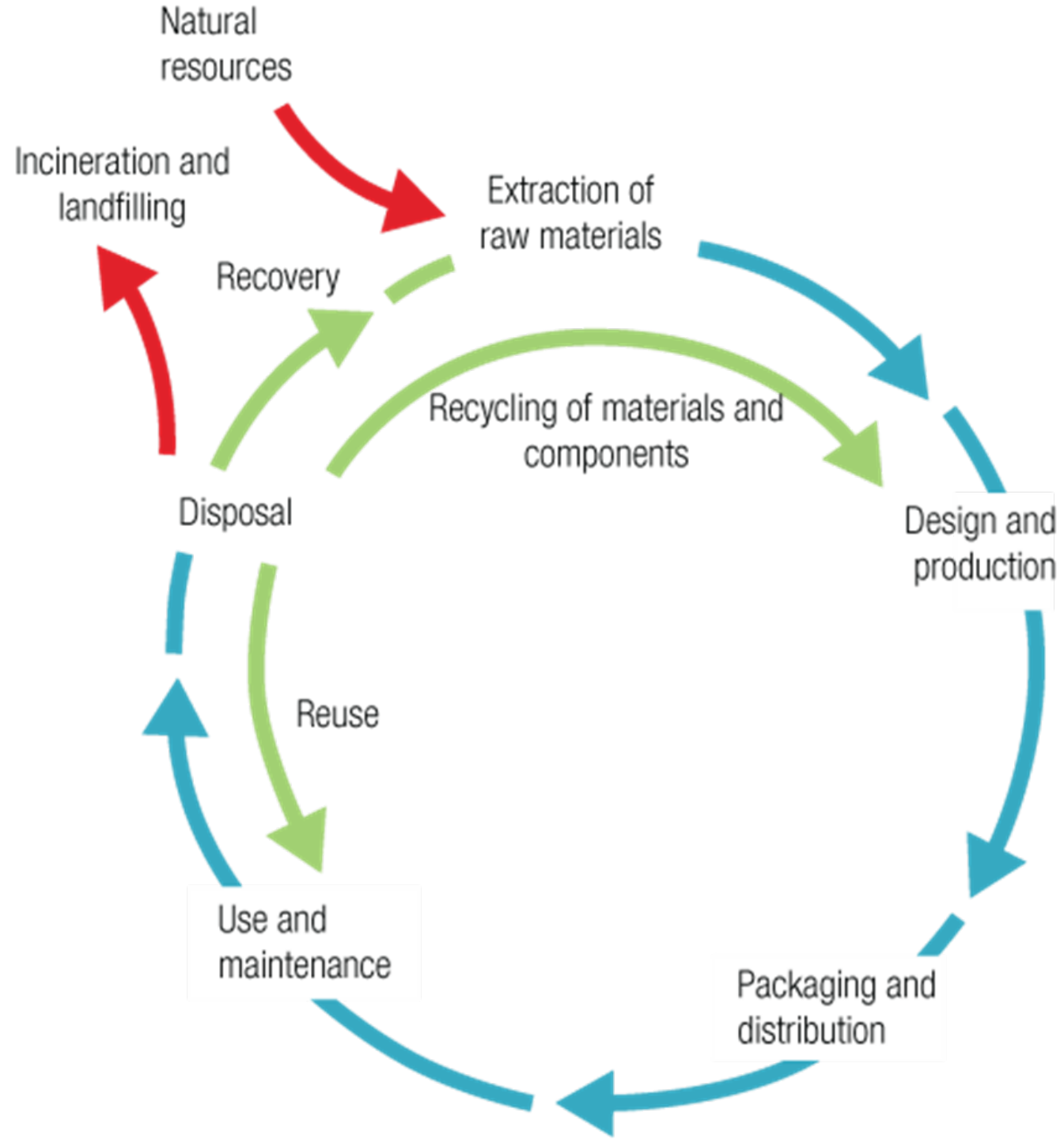


Product Life Cycle

Linear Economy

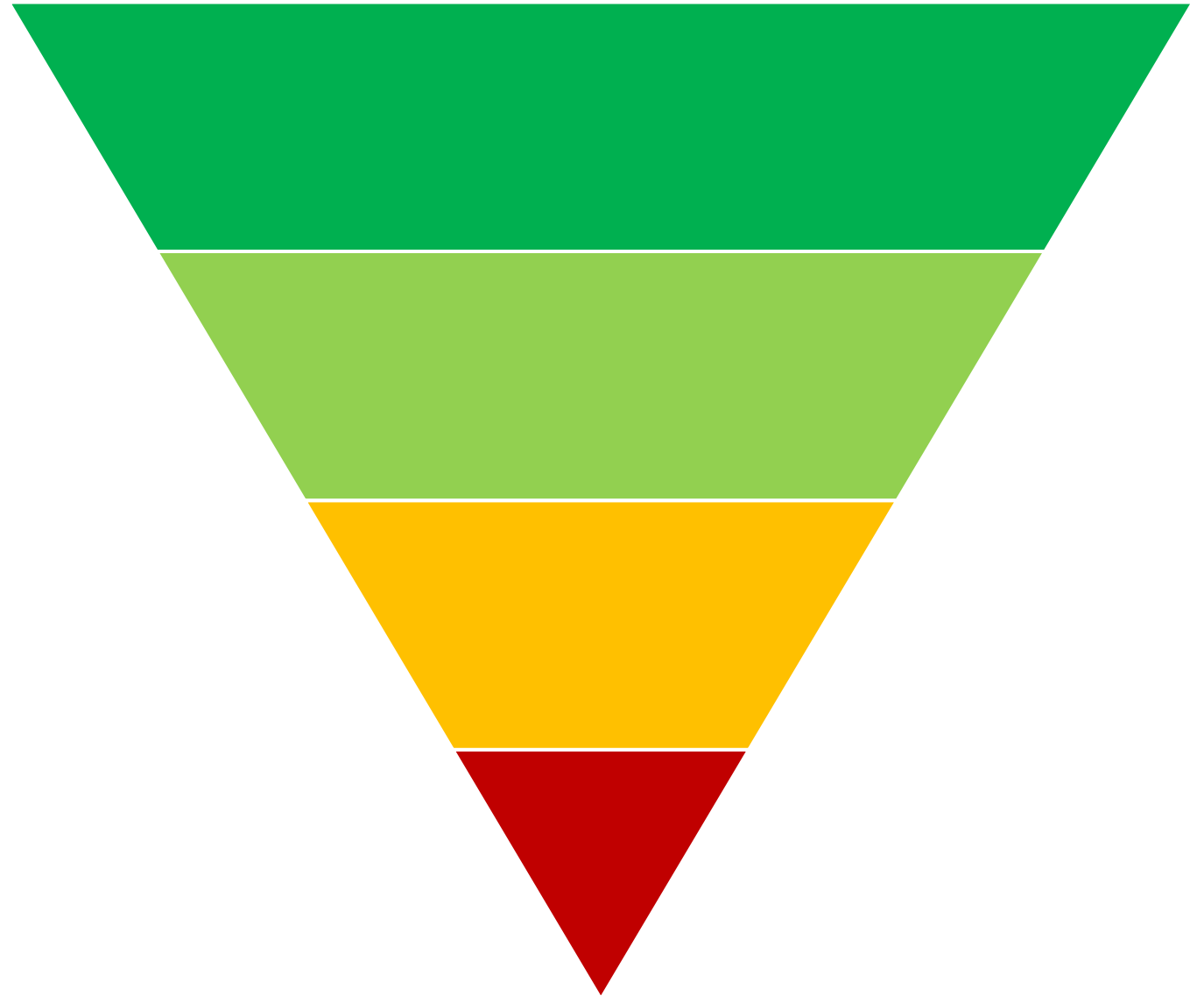


Circular Economy



Waste Hierarchy

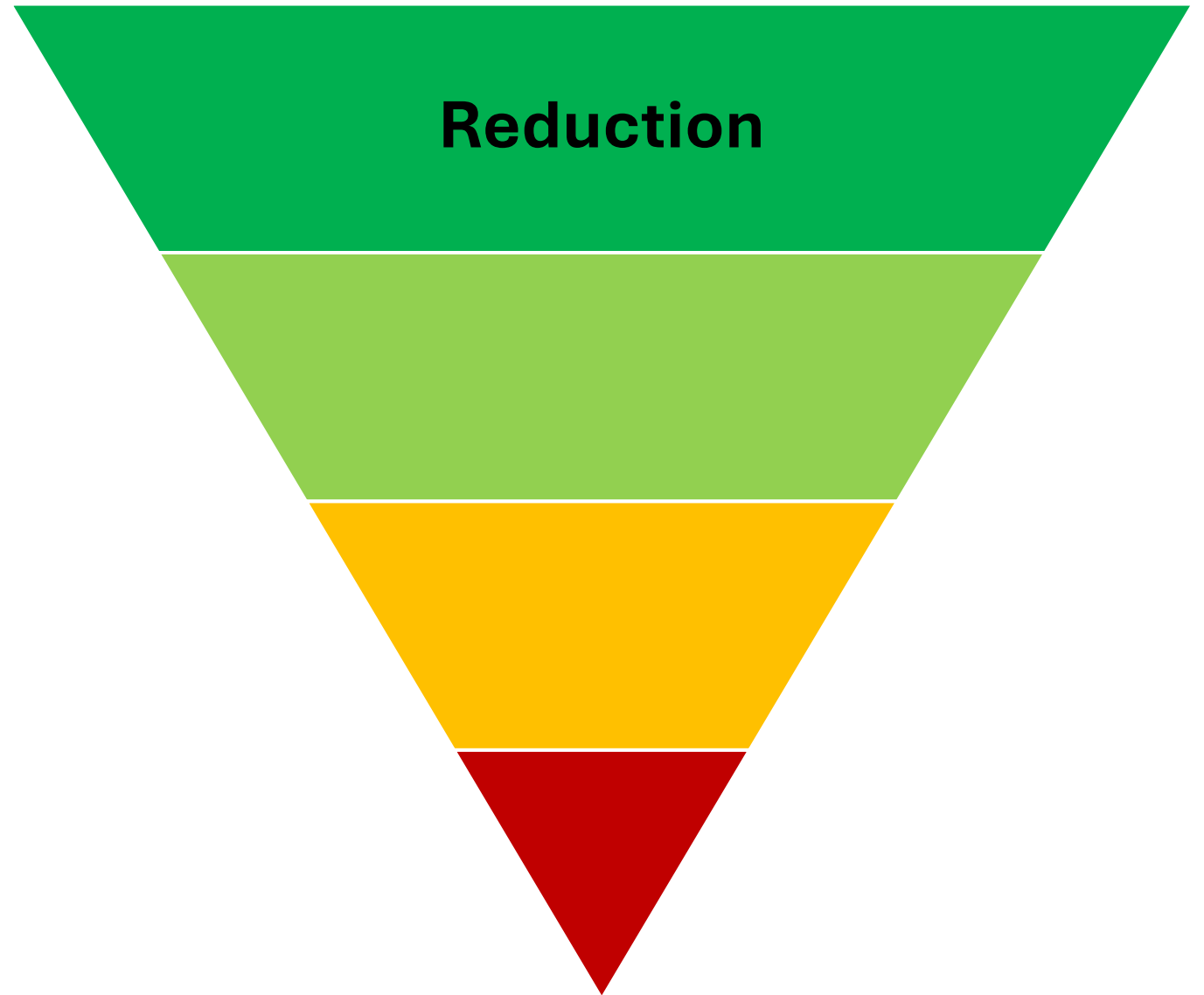
- The idea of the waste hierarchy was developed to aid thinking about the management of waste.
- To make both waste production and waste management practices more sustainable, the different waste management options are ranked into a hierarchy



Waste Hierarchy

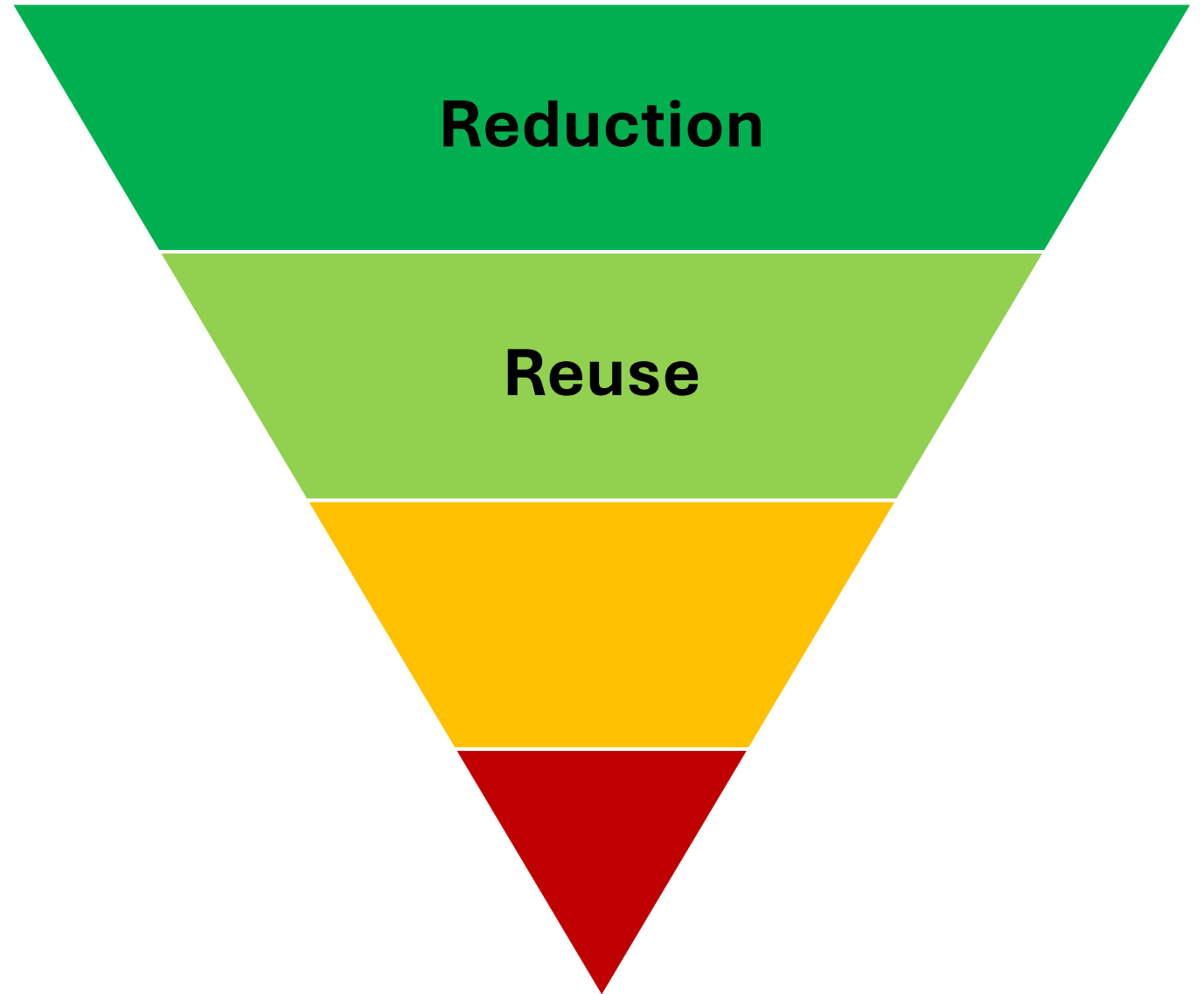
Waste reduction has two components:

- Reducing the amount of waste produced
- Reducing the hazard of the waste produced.



Waste Hierarchy

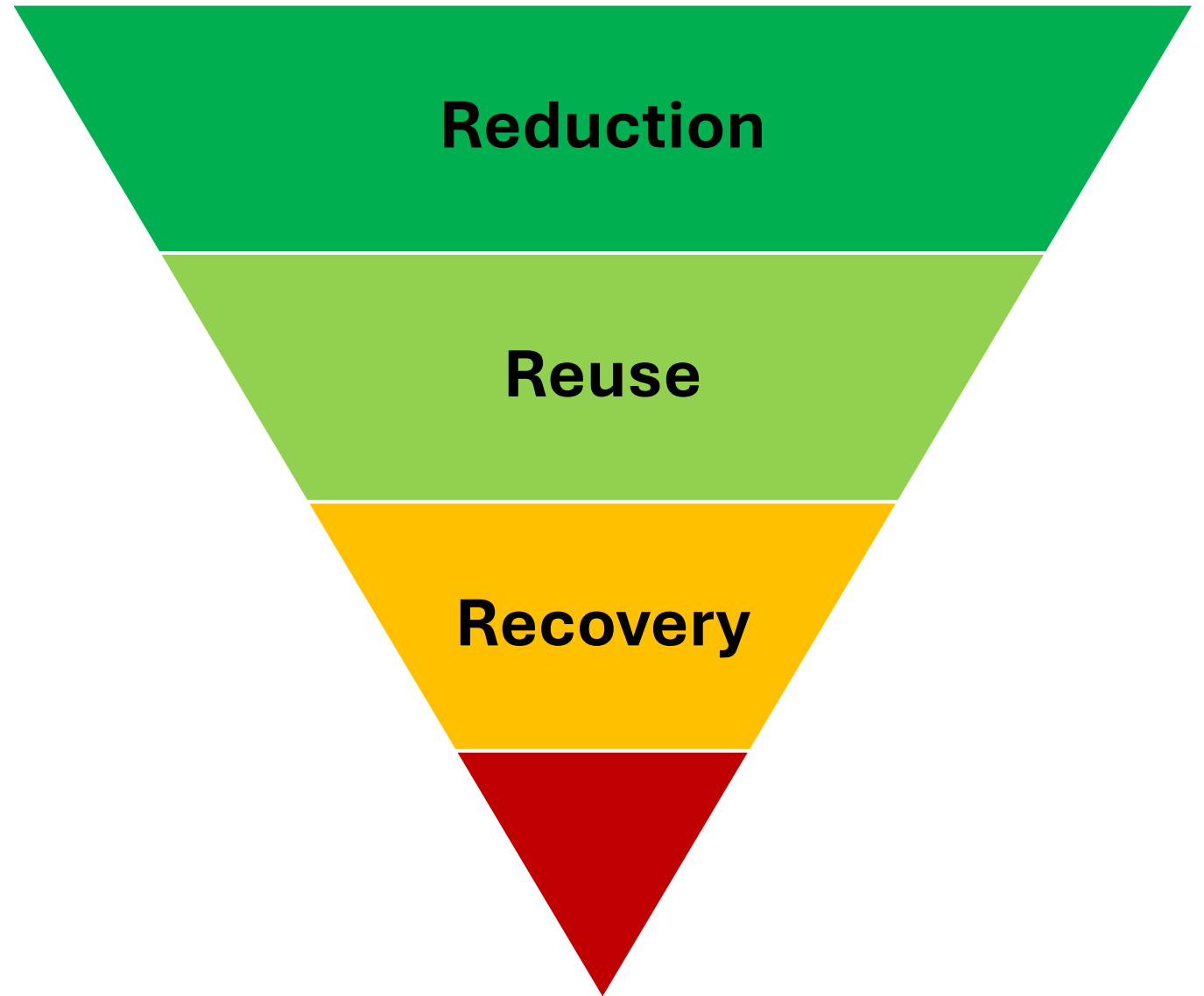
- Putting objects back into use so they do not enter the waste stream.



Waste Hierarchy

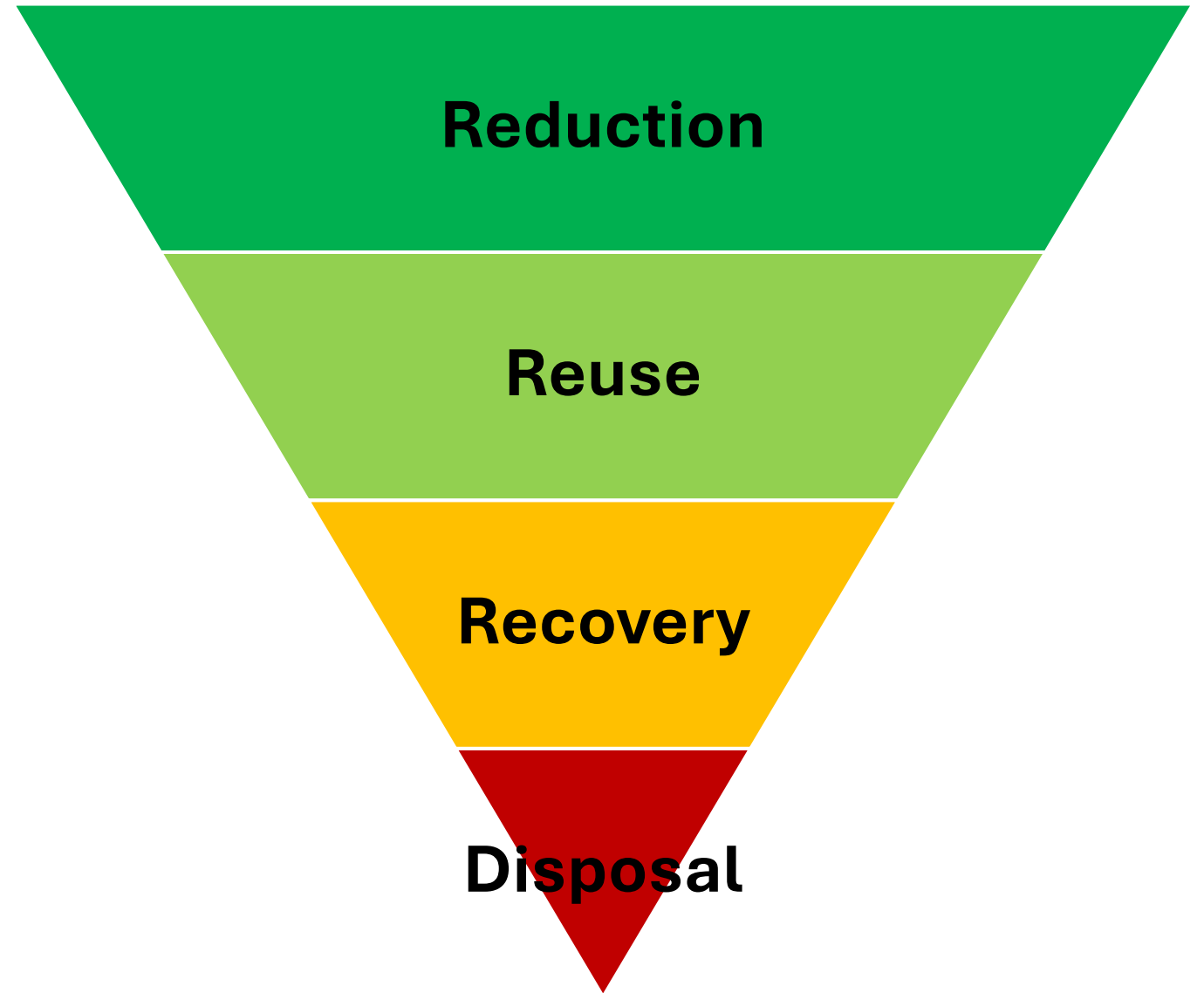
Waste recovery has three components:

- Recycling – collecting and separating materials from waste and reprocessing them to produce marketable products
- Composting – processing biologically degradable organic waste aerobically to produce a reasonably stable, granular material
- Energy – incinerating waste to generate energy.



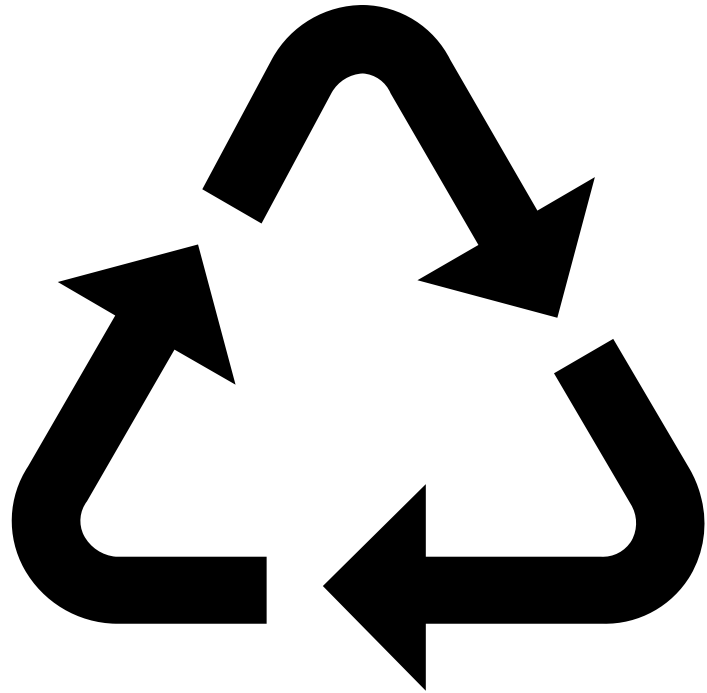
Waste Hierarchy

Disposal of waste to a landfill site.



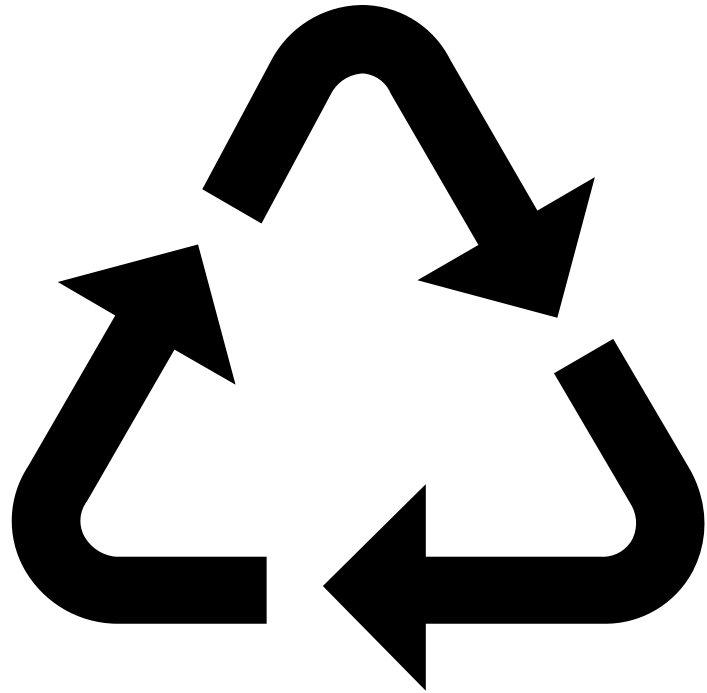
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- Consider the processes of deconstruction when designing components and buildings
- Consider the ownership of buildings and their components



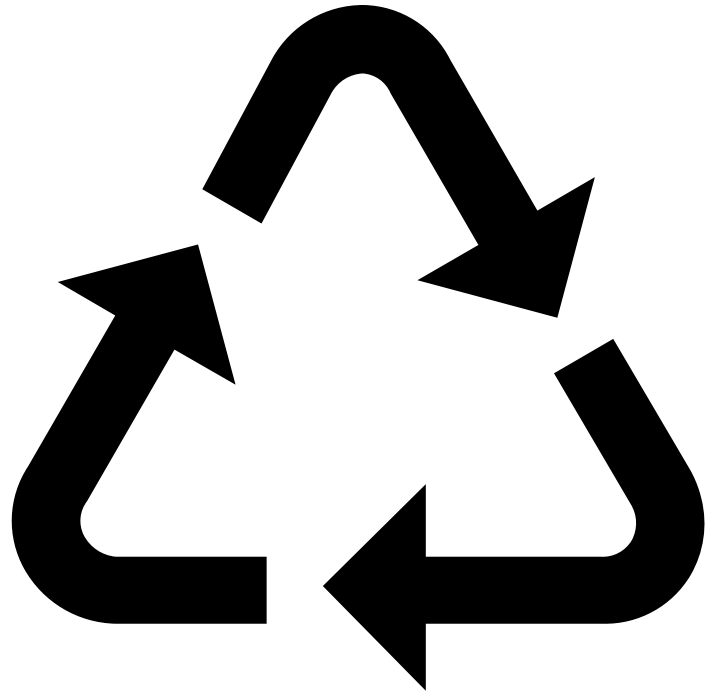
Assessing the potential for Reuse and Recycling

- Decisions about how and why to choose reuse or recycling, and how best to minimise the quantities of materials sent to landfill, will be influenced by the criteria used to evaluate the environmental impact of the alternatives.
- It will be important to ensure that the criteria for assessment and evaluation are agreed among the members of the project team, and with the client, early in the project



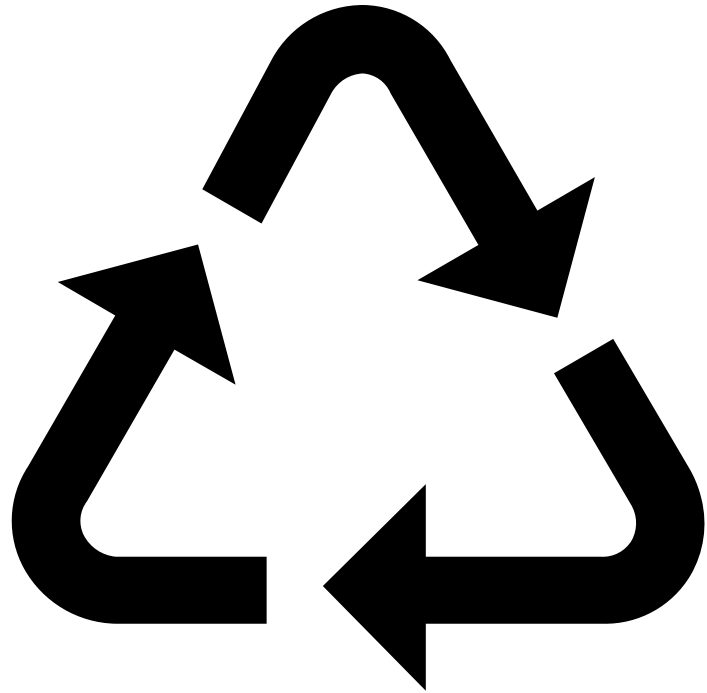
Assessing the potential for Reuse and Recycling

- Mass of Materials



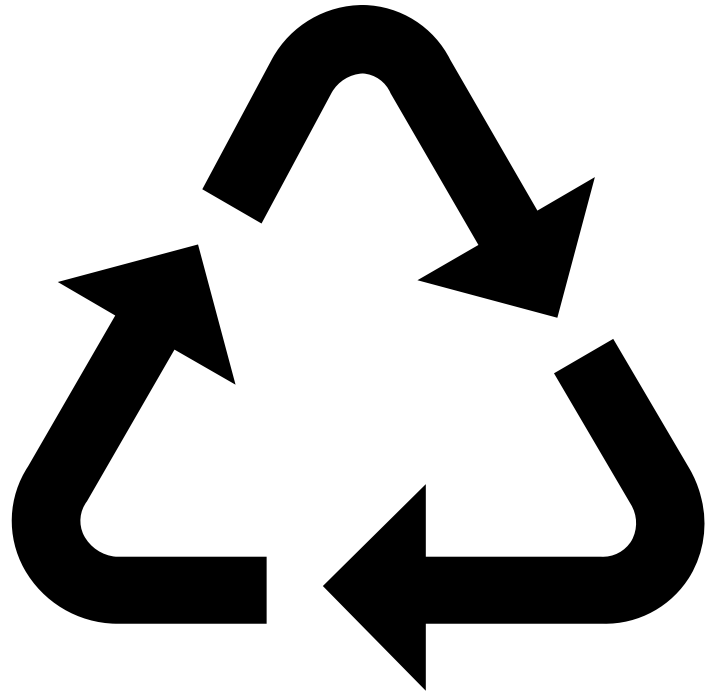
Assessing the potential for Reuse and Recycling

- Mass of Materials
- Volume of Materials



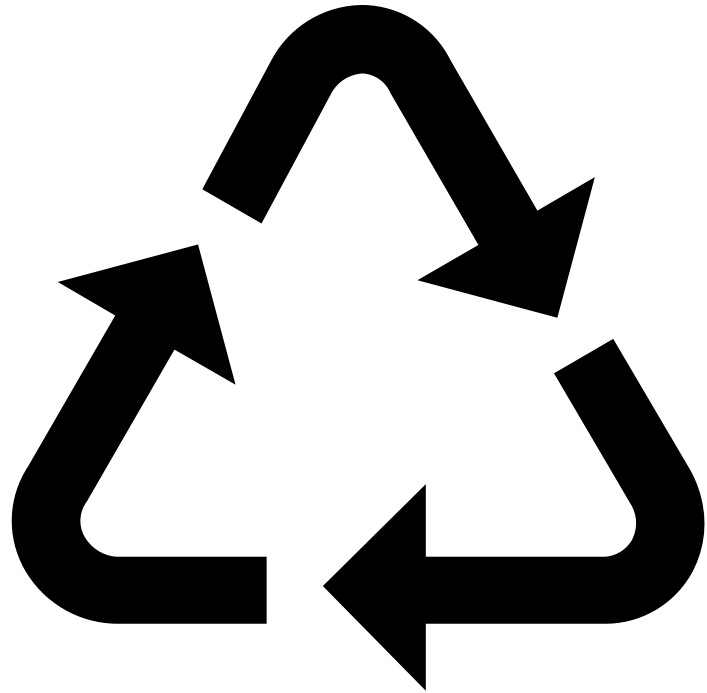
Assessing the potential for Reuse and Recycling

- Mass of Materials
- Volume of Materials
- Embodied Energy



Assessing the potential for Reuse and Recycling

- Mass of Materials
- Volume of Materials
- Embodied Energy
- Market Value



Assessing the potential for Reuse and Recycling

- Mass of Materials
- Volume of Materials
- Embodied Energy
- Market Value
- Ability to biodegrade

Materials



- Materials vary in the ease with which they can be separated from the general mass of a dismantled or demolished building
- Understanding the processes of deconstructing and demolishing buildings is vitally important to assessing the opportunities for reusing components and recycling materials.

Materials

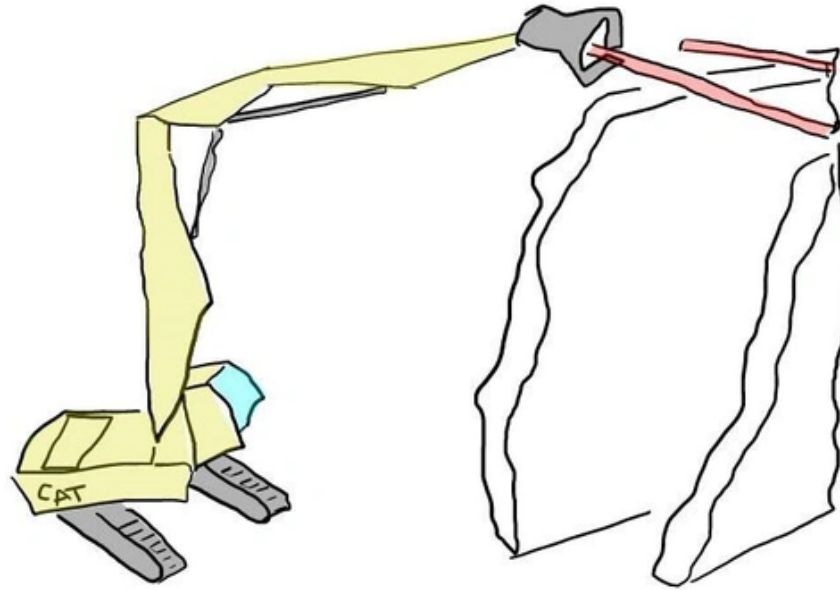


- It is always important to ensure that all materials streams are carefully managed.
- To increase their potential for reuse or recycling, materials and components need to be segregated and stored, either on site or in a nearby temporary location, before subsequent handling.
- During this stage it is also important that contamination or other damage is prevented, to preserve the potential for reuse or recycling

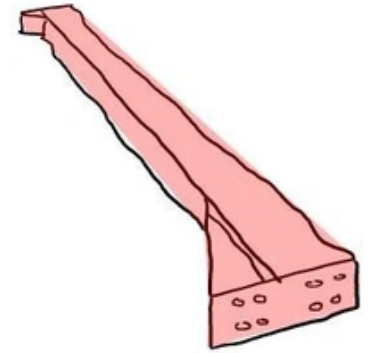
PRE-DEMOLITION SURVEY TO
IDENTIFY POSSIBLE STRUCTURAL
ASSETS FOR REUSE



→ CAREFUL SECTION
RECLAMATION DURING
DEMOLITION →



SECTION CLEANED, CUT TO
LENGTH, PREPARED FOR
NEW END CONNECTIONS AND
CORROSION PROTECTED



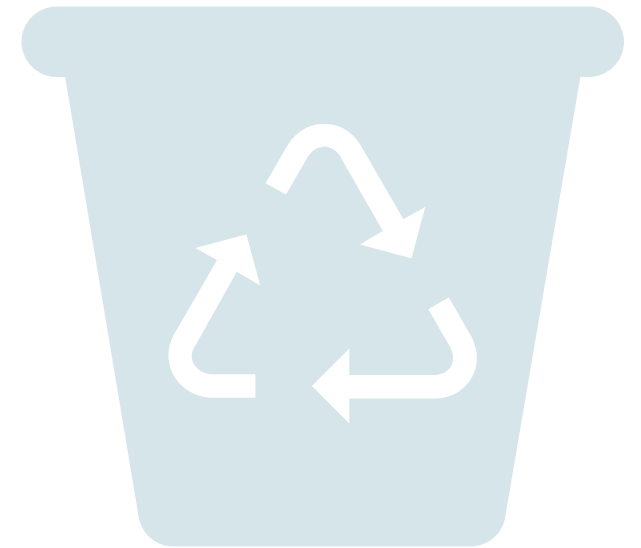
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- Consider the whole life of a product or material
- Consider the potential of components for reuse
- **Consider the processes of deconstruction when designing components and buildings**
- Consider the ownership of buildings and their components

What information needs to be provided to facilitate reuse and recycling?

Careful deconstruction of a building to facilitate reuse and recycling will be easier, cheaper and more likely to be undertaken if the following information is available to those assessing whether deconstruction is feasible:

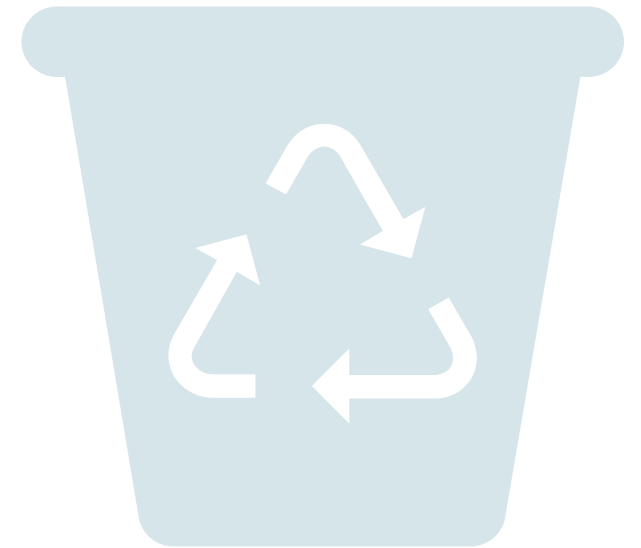
- A full set of as-built drawings



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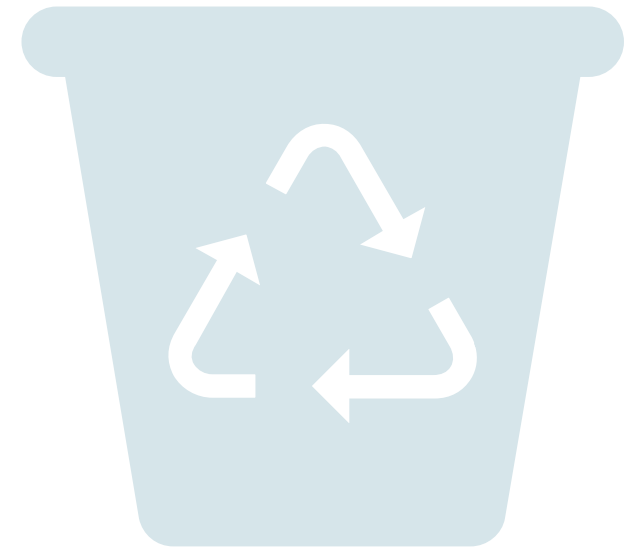
- A full set of specifications for components and the materials of which they are made, including details of manufacturers or suppliers



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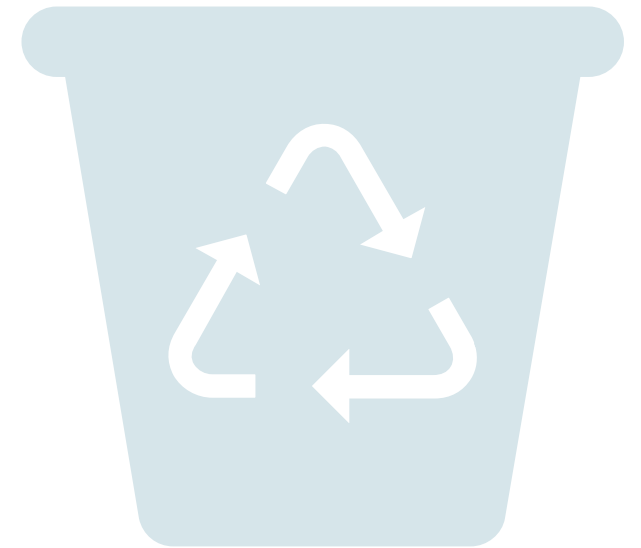
- Details of the design life or service life of components, plant and equipment



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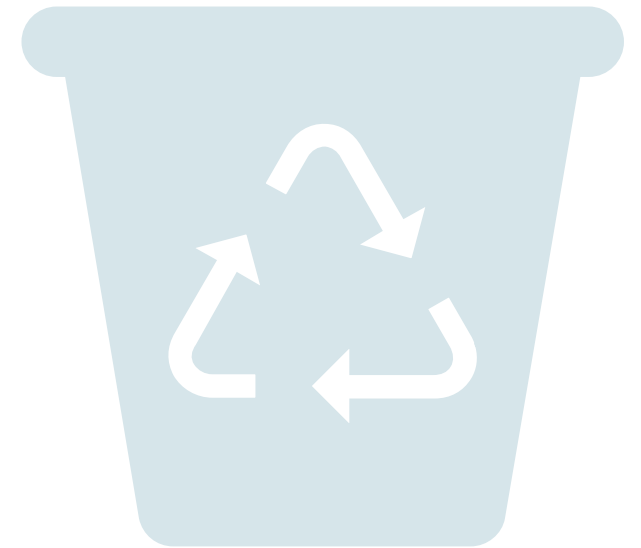
- Details of warranties covering components, plant and equipment



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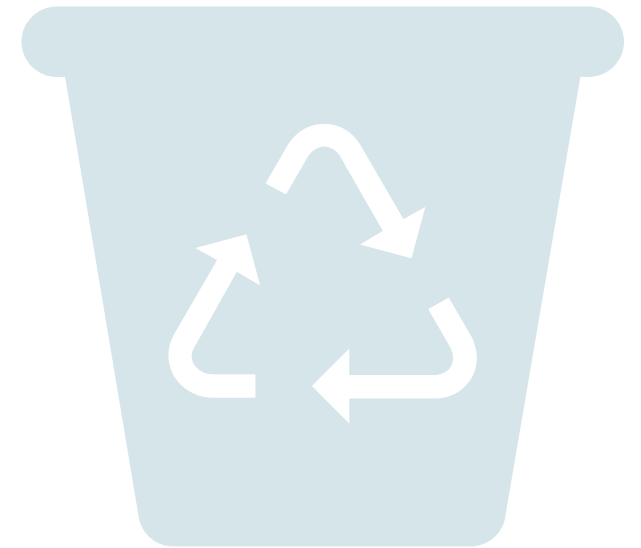
- Methods for establishing the remaining functional performance or life of a product or component



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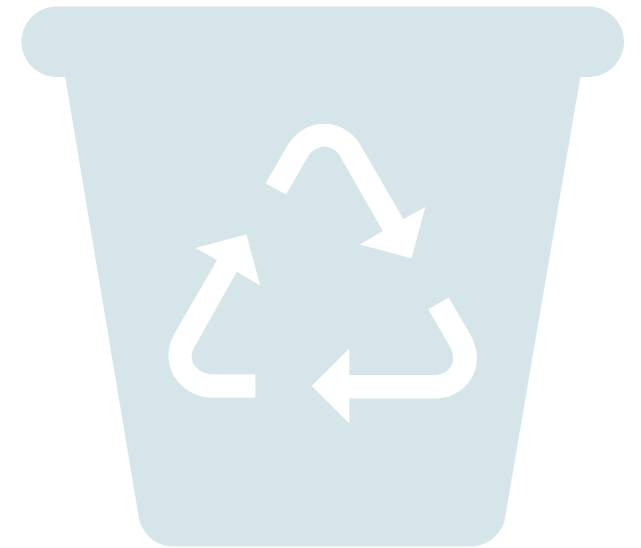
- A description of the how the structure of the building works, and how it has been constructed



What information needs to be provided to facilitate reuse and recycling?

Careful deconstruction of a building to facilitate reuse and recycling will be easier, cheaper and more likely to be undertaken if the following information is available to those assessing whether deconstruction is feasible:

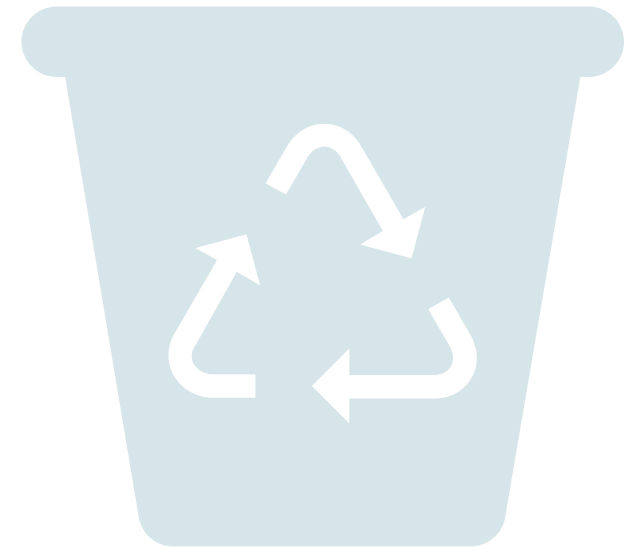
- A method statement indicating the nature of all the key construction activities and their sequence



What information needs to be provided to facilitate reuse and recycling?

Careful deconstruction of a building to facilitate reuse and recycling will be easier, cheaper and more likely to be undertaken if the following information is available to those assessing whether deconstruction is feasible:

- A method statement for deconstruction indicating all the key deconstruction activities and their sequence



What information needs to be provided to facilitate reuse and recycling?

- The owner of a building without good information who wants to recycle components and materials when it is taken down will probably need to first:
 - commission a structural survey to establish how the building is constructed and may be safely deconstructed or taken down, and then commission a full audit of the materials content.

What information needs to be provided to facilitate reuse and recycling?

- This expense and inconvenience could be avoided if the design and construction team provide the building owner with the above information.
- The information compiled and provided to the owner at handover will need to be updated each time equipment is replaced and alterations to the fabric of the building are made.

Description of element/item	Steps to maximise value at deconstruction	Design for reuse after deconstruction	Design for recycling after deconstruction
	The value of a building element at deconstruction will reflect its condition at that time, the work needed to refurbish it for later reuse and the level of performance that it might be able to achieve. Ensuring that components or elements can be easily cleaned, maintained and serviced will help to: ■ maximise the life remaining in a component when it is removed by deconstruction ■ minimise the degree of reconditioning required to prepare it for re-certification of a certain level of technical performance. Maintenance and careful protection of components during their life (eg corrosion protection) can also make material recycling easier and improve end-of-life value.	Designing for reuse after deconstruction will require that the element can be removed from the building with as little damage as possible. A suitable deconstruction sequence must be planned that is appropriate to the time when the component is likely to be removed.	Recycling after deconstruction will differ little from recycling after demolition. Material recycling after deconstruction (rather than demolition) may occur when certain components have been removed by deconstruction for reuse, leaving others that cannot be reused. Alternatively, the careful process of deconstruction may increase the likelihood of materials being clean and separable and better suited to recycling than following demolition.

Reuse and Recycle

- Four approaches that can each influence the design and specification of materials and building components to facilitate reuse and recycling after deconstruction:
- Consider the whole life of a product or material
- Consider the potential of components for reuse
- Consider the processes of deconstruction when designing components and buildings
- **Consider the ownership of buildings and their components**

Managing the Delivery

- It is one thing to design a building for deconstruction to facilitate reuse or recycling; it is quite another to ensure that it is actually constructed that way.
- Designers' proposals and intentions are often changed between detail design and the completion of a building.
- Those who control the final specification of materials and equipment will have the final say, and they are likely to be driven by other goals such as capital cost and the construction programme.

Managing the Delivery

Different members of the team will have different inputs to offer:

Managing the Delivery

Different members of the team will have different inputs to offer:

- **Client**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- **Planning Consultants**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- Planning Consultants
- **Quantity Surveyors**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- Planning Consultants
- Quantity Surveyors
- **Environmental Consultant**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- Planning Consultants
- Quantity Surveyors
- Environmental Consultant
- **Design Team**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- Planning Consultants
- Quantity Surveyors
- Environmental Consultant
- Design Team
- **Construction Team**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- Planning Consultants
- Quantity Surveyors
- Environmental Consultant
- Design Team
- Construction Team
- **H&S**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- Planning Consultants
- Quantity Surveyors
- Environmental Consultant
- Design Team
- Construction Team
- H&S
- **Facilities Management**

Managing the Delivery

Different members of the team will have different inputs to offer:

- Client
- Planning Consultants
- Quantity Surveyors
- Environmental Consultant
- Design Team
- Construction Team
- H&S
- Facilities Management
- **Demolition Contractor**