RESOURCE EFFICIENT SCOTLAND

Growth that doesn't cost the earth

Maximising re-use

of materials on-site

A programme from ZERO WASTE SCOTLAND

European Union gov.scot

EUROPE & SCOTLAND
European Regional Development Fund
Investing in a Smart, Sustainable and Inclusive Future

About this guide

This guide is part of the Training Pack for waste prevention on construction projects. It provides specific advice on maximising the re-use of materials on construction sites.

Throughout this guide, the term site won materials is used to describe wasted materials generated as a direct consequence of the works being undertaken on-site and which have the potential to be re-used.

Resource Efficient Scotland is the Scottish Government programme delivered by Zero Waste Scotland. It helps organisations in the private, third and public sectors to reduce costs by reducing energy, water and raw materials use and managing waste efficiently.

The Resource Efficient Scotland programme offers free advice and technical support and shares best practices and new technologies. Embedding resource efficiency within Scottish organisations makes a significant contribution to the achievement of the Scottish Government's strategic economic objectives, climate change, energy efficiency and zero waste targets.

This free on-site support , delivered by our team of implementation advisors and technical specialists, will help you to identify cost saving opportunities for your business.

For more details call Resource Efficient Scotland today on 0808 808 2268, email enquiries@resourceefficientscotland.com or visit the website at resourceefficientscotland.com to start saving.

Contents

Benefits of Re-use

Re-using site won materials can play a key role in saving costs on a project by avoiding use of building materials and reducing waste disposal costs.

Seizing opportunities to re-use materials on-site can lead to a more cost efficient project outcome with improved performance for contractors and clients. Key benefits that adopting re-use on-site can deliver, include:

- Reduced waste disposal costs covering both transportation and disposal;
- Avoidance of primary material use reducing cost of build;
- Evidence to support external and internal environmental management systems e.g. BREEAM or ISO14001;
- Raised staff awareness of re-use opportunities for future projects; and
- Good publicity and industry recognition for achievements and potential to differentiate your business from the competition.

This guide highlights key materials and practices that can support a business plan and implement re-use of materials arising on construction sites.

Cost savings associated with re-use of site won materials can include:

- Reduced need to purchase new materials: cost savings associated with recovery and re-use of items from demolition, e.g. bricks, ornamental objects, high value materials;
- Savings from reduced waste management costs; and
- Positive publicity, e.g. contribution to local community projects or wider national community / sustainability initiatives.

Target audience

Although this guide has been specifically written for small and medium-sized enterprises (SMEs) who work independently on projects or who provide supply chain services to large contractors, it may also be applicable to larger organisations.

It is recognised that SMEs will be part of the wider project supply chain and this guide is aimed at all parties that might influence non-SMEs and others to re-use materials. Figure 1 gives an indication of the relationships and opportunities within a construction project.

Client

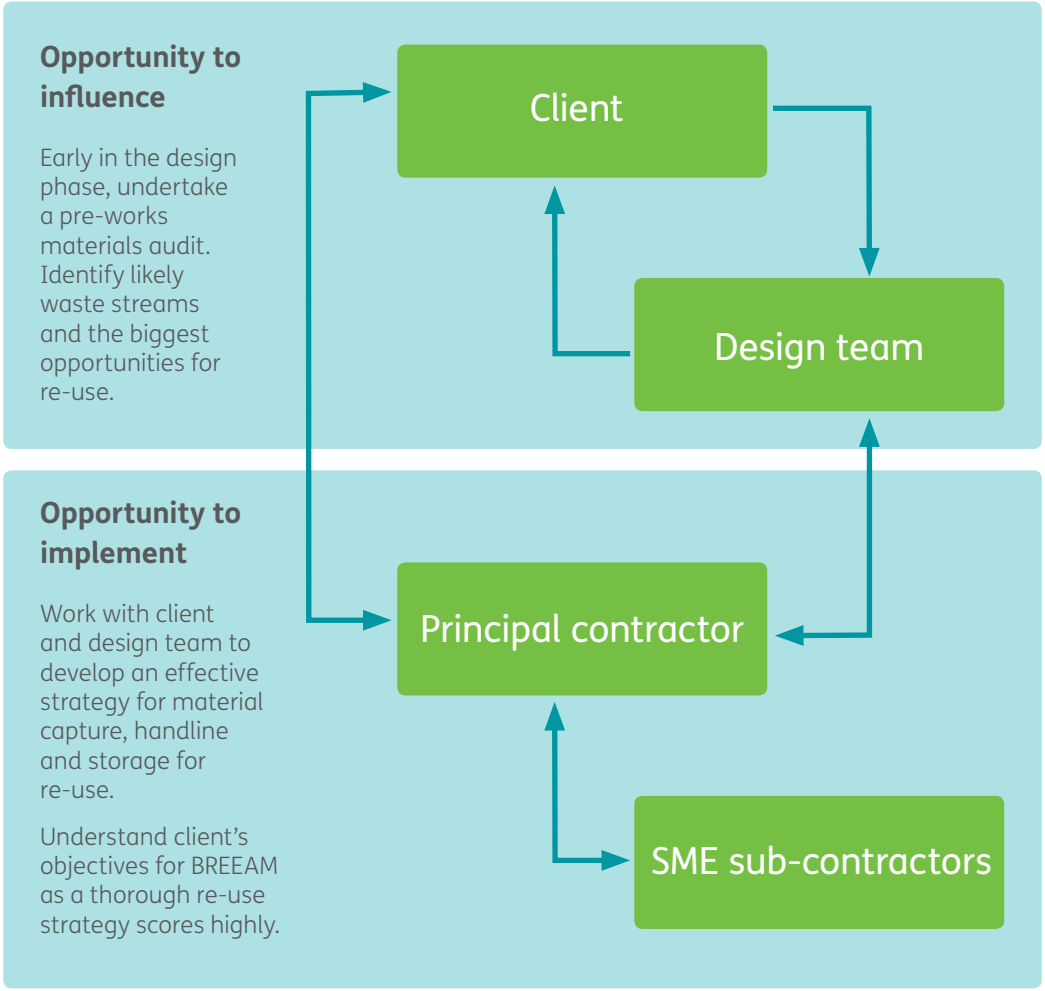
The client has an important role in driving material re-use and should understand the environmental benefits and financial savings that can be achieved through maximising re-use of site won materials. This guide will support the SME to help influence the client to identify the possibilities of re-use, and the true value of existing infrastructure and materials on-site.

Typically, taking action on reducing waste in projects can result in savings of up to 2% of the total construction project value. Addressing re-use opportunities is one of the key actions in achieving these savings and as such clients can help by introducing re-use targets on projects and using model procurement wording.

Design team

This guide contains examples of materials that frequently arise on construction sites during works, provides high level data to raise awareness of practical approaches to maximise material re-use and offers guidance for

Figure 1: Project relationships and opportunities



design teams to help achieve client objectives for material re-use throughout the design and construction phases.

The project design team should refer to Zero Waste Scotland's Designing out Construction Waste - A Guide for Project Design Teams, to understand the role they can play in minimising waste on construction sites.

It is important to differentiate between re-use opportunities that are achievable throughout construction, and those which become possible at end-of-life (i.e. demolition); the design team has the opportunity to maximise end-of-life re-use by specifying certain criteria during initial design. This approach adopts the principles for designing out waste and to demonstrate this, the design team could specify structural steel connections are bolted in preference to welded; this will allow the structure to be dismantled during demolition resulting in easily recoverable steel for new projects.

Principal contractor

The principal contractor on a construction project is key to maximising re-use of site won materials; they can assist the client in achieving their sustainability targets such as material re-use.

In the UK, construction projects are not legally required to have a Site Waste Management Plan (SWMP), however they do represent industry best practice in waste and resources management. The data in this guide can be used to help the principal contractor populate a SWMP to manage materials more effectively, help to reduce waste and save on disposal costs. A SWMP may however be required for BREEAM assessments or by local planning authorities who consider them as an environmentally responsible initiative.

This guide will benefit principal contractors by helping to inform what materials commonly exist on construction and demolition sites and describes how these may be recovered and re-used on-site.

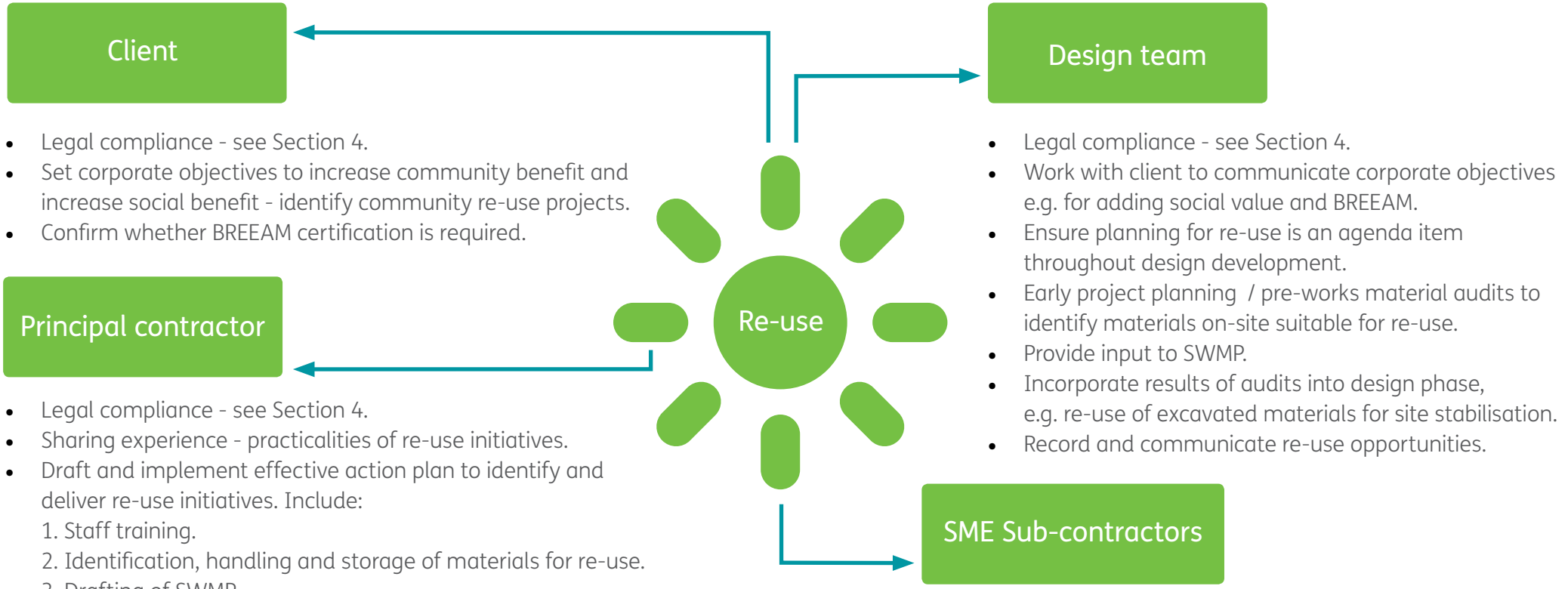
The principal contractor can help maximise the re-use of site won materials by ensuring that the client's re-use objectives are carried through the project supply chain. The principal contractor can also drive the successful implementation of re-use strategies by including training as part of site inductions and SMEs can assist them in meeting the client's overall targets.

SME sub-contractors

All sub-contractors in the supply chain of a construction project consume materials and generate waste and therefore can benefit the overall re-use performance of the project by seeking ways to maximise their re-use of materials and waste.

This guide will benefit all contractors in the construction programme supply chain by helping to inform them of the types of re-use opportunities and where there are services that can help implement them.

Figure 2: Typical activities to promote re-use of site won materials



- Legal compliance - see Section 4.
- Set corporate objectives to increase community benefit and increase social benefit - identify community re-use projects.
- Confirm whether BREEAM certification is required.

- Legal compliance - see Section 4.
- Work with client to communicate corporate objectives e.g. for adding social value and BREEAM.
- Ensure planning for re-use is an agenda item throughout design development.
- Early project planning / pre-works material audits to identify materials on-site suitable for re-use.
- Provide input to SWMP.
- Incorporate results of audits into design phase, e.g. re-use of excavated materials for site stabilisation.
- Record and communicate re-use opportunities.

- Legal compliance - see Section 4.
- Sharing experience - practicalities of re-use initiatives.
- Draft and implement effective action plan to identify and deliver re-use initiatives. Include:
  1. Staff training.
  2. Identification, handling and storage of materials for re-use.
  3. Drafting of SWMP.
  4. Appropriate reprocessing of site won materials - where applicable.
  5. Identification and specification of off-site recovered materials as these can be cheaper than equivalent new materials.

- Embrace objectives to maximise re-use of site won materials.
- Participate in 'toolbox talks' and site initiatives to become familiar with re-use initiatives.
- Segregate materials for re-use by using correct waste storage containers, ensuring contamination is minimised.

How to use the guide

The following four simple steps explain how to use this guide to identify opportunities for re-use of site won materials.

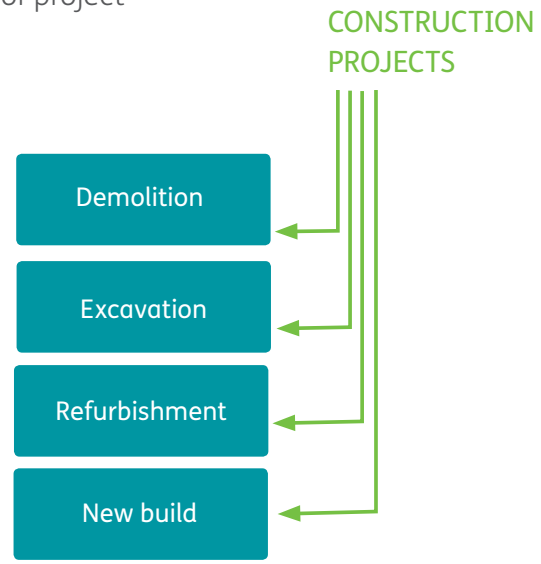
Step 1: What is your role in this project?
Depending on your role, there are different types of activities that can be undertaken to help re-use materials appropriately. In some instances, roles in the project will be combined, in which case consider those roles that are appropriate to your involvement.

Step 2: Review what you can do to maximise the re-use of site won materials.
See figure 2 on page 6 for typical activities to promote re-use of site-won materials. Choose the most appropriate for your role in the project.

Step 3: What type of project are you working on?
With the activities established, consider what type of project you are involved in. For this guide, project types are broken down into four main groups: demolition, excavation, refurbishment or new build.

Step 4: Consider the materials that may arise based on the type of construction project you are working on.
Based on the type of project, Section 3 of this guide helps to identify the activities and associated materials that are commonly associated with the project. This can help to consider the materials you may be dealing with. Section 4 then provides guidance on important legal requirements that you must consider in order to comply with all relevant waste guidance and legislation.

Figure 3: Step 3 - Type of project



Users of this guide should refer to the latest health and safety guidance for handling of materials at: hse.gov.uk/msd/manualhandling
and to the SEPA guidance on waste duty of care responsibilities at: sepa.org.uk/media/162520/duty_of_care_recycling

Step 5: Identify possible re-use opportunities for waste materials.
Finally with potential materials identified, Section 5 includes a table of materials and offers suggestions for re-use. Section 6 concludes with some common challenges that may restrict opportunities to re-use material and provides some practical suggestions on how to overcome these and where to go for further guidance and support.

Project types covered

The table on the following pages includes types of projects and activities covered in this guide.

For examples of the materials that may arise from these projects, and which are potentially suitable for re-use, please see pages 16 - 20.

Demolition and excavation	Activity
This could include the entire building structure including substructure, superstructure and external landscape that could be salvaged as a resalable asset or classified as demolition waste. It has been defined as the removal of old or unwanted buildings[1]. Demolition usually begins internally and moves to the exterior, the following activities are usually associated with a building demolition project.	• Removal of fixed and non-fixed soft furnishings and non-structural elements of the building. • Removal of any hazardous materials. • Removal of the building's main frame. • Excavation and removal of foundations and surrounding grounds.

Refurbishment	Activity
There are many opportunities for re-use of material particularly from strip out during a refurbishment project which with careful planning can provide opportunity for re-use.	• Removal of fixed and non-fixed soft furnishings and non-structural elements of the building. • Removal of any hazardous materials. • Removal of internal walls, partitions, ceilings, staircases. Could include services such as electricals and pipework. • Installation of new partitions, floors, ceilings, stairways and other joinery finishings. • Fitting out building: painting, electricals, furniture, IT and telecoms equipment. • Grounds maintenance: new landscaping, drainage and car park works.

[1] Code of Practice for Demolition BS 6187:2011

New build	Activity
This could include the entire build structure from groundworks where no demolition takes place. There may be opportunity to re-use surplus materials or off-cuts where these arise during a build and are considered as ‘site won’.	• Groundworks - building of foundations. • Construction of new building. • Fitting with mechanical and engineering services. • Installation of new partitions, floors, ceilings and stairways. • Fitting out building: painting, electricals, furniture, IT and telecoms equipment. • Grounds maintenance: new landscaping, drainage and car park works.

Legal Requirements

Management of materials on a construction site will always include identification of materials that are considered to be legally defined as waste and thereby subject to waste legislation and materials that are potentially hazardous and must be handled in compliance with health and safety and environmental protection legislation and best practice guidance[2].

There are also a number of opportunities for site won construction materials to be re-used without entering the waste regulation domain. This guide aims to provide SMEs involved in the construction sector with clarity on what, when and how waste legislation applies.

Definitions

In order to understand whether waste legislation applies to each material stream it is important to first note if its re-use is as a waste or a non-waste. Key definitions are listed below:

Re-use – any operation by which products or components that are not waste are used again for the purpose for which they were conceived.

Preparation for re-use – checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing.

Recycling – any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.

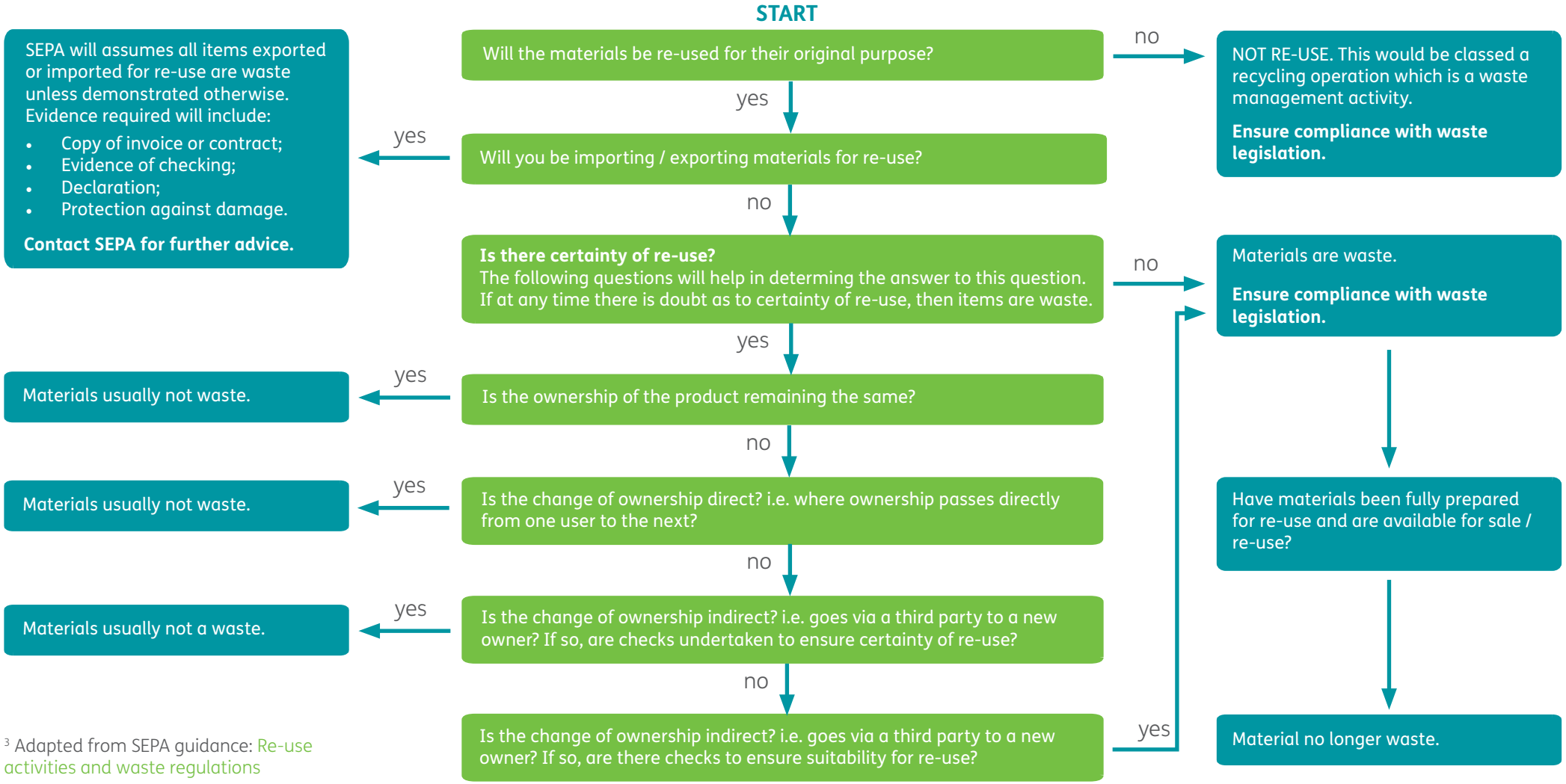
Waste – means any substance or object which the holder discards or intends or is required to discard.

Users of this guide should refer to; SEPA Guidance 'Re-use Activities and Waste Regulation' (WST-G-051), which provides clarity on when waste legislation applies to re-use activities and what you have to do to comply; and to Scottish Government guidance Duty of Care – A Code of Practice (2012), which lays out duties with respect to the management of waste.

The SEPA Guidance provides a flow chart to help determine when waste controls apply to re-use and this has been reproduced on page 11.

[2] http://www.netregs.org.uk/ Netregs provides a useful portal for environmental guidance to businesses in Scotland and Northern Ireland

Figure 4: Determining when waste controls apply to re-use of site won materials[3]



[3] Adapted from SEPA guidance: Re-use activities and waste regulations

Waste Regulation

Figure 4 on page 11, shows that where there is uncertainty whether materials will be re-used for their original purpose, those materials will be classified as a waste and waste controls will apply. In most circumstances you will not need a waste management licence to manage the waste, but would be able to carry out these activities as an exempt activity. Figure 5 on page 13, lists relevant exemptions and whether a charge is applicable.

All relevant exemptions are registrable with SEPA. Where the exemption duration is unlimited, these may be subject to revocation by SEPA if the requirements are not met.

Additional information on the scope of individual exemptions and downloaded applications forms and guidance can be found at: sepa.org.uk/regulations/waste/activities-exempt-from-waste-management-licensing

Applications for free exemptions can be made electronically at: sepa.org.uk/Wmx/pages/welcome

Electronic applications are generally approved within a working day. Paragraph 9 and 19 exemptions need to be registered 21 working days prior to commencing work.

If your waste activities are out of the scope of the exempt activities then your operations will require a waste management licence. In this instance it is recommended that you consult with SEPA as a matter of priority.

It is important to note that it is an offence to carry out an exempt activity without it being registered prior to commencement or to carry out an activity in breach of registration obligations. It is also an offence to operate a waste management activity without first acquiring the relevant licence.

Further reading and guidance

Further end-of-waste, special waste and regulatory guidance can be found on SEPA's website at sepa.org.uk/regulations/waste/guidance/

Where special waste will be present, due consideration should also be given to SEPA 2006 guidance: A Guide to Consigning Special Waste.

Figure 5: Relevant exemptions and charges

Exemption	Description	Fee payable?	Registration duration
9	The reclamation or improvement of land	Yes	12 months (but may be renewed)
15	Beneficial use of waste without further treatment	No	Unlimited
16	The screening of specified wastes	No	Unlimited
17	Storage of specified wastes in a secure place	No	Unlimited
18	Secure storage of specified wastes on any premises	No	Unlimited
19	Waste for construction and other "relevant work"	Yes	12 months (but may be renewed)
21	Chipping etc waste plant matter	No	Unlimited
24	Size reduction of bricks, tiles or concrete	No	Unlimited
25	The deposit of dredging wastes	No	Unlimited
33	Keeping or deposit of peat excavation waste	No	Unlimited

Handy hints and tips

1 Storage
Storage of waste and materials on-site must be carried out in a way that ensures both environmental protection from spilled or escaped material, and is secure to prevent escape of material such as windblown litter.

2 Plan ahead
The earlier you think about re-use, the easier it is to make sure you comply with your legal requirements.

3 Complying with duty of care
Where materials leave site, ensure you comply with your duty of care. Ask:

- Who is moving it?
- Where is it going to?
- Is it waste?
- Is the carrier a licensed waste carrier?
- Is it going to an appropriately licensed or exempt site? Don't accept a verbal confirmation, check.
- Have you got a waste transfer note?
- Does the note correctly describe the waste?
- Remember to take care; you are responsible and if it sounds too good to be true, it probably is.

Follow these steps even if you don't initially think something is waste. You have the legal responsibility for your materials.

4 Timing
If the material in question is to be re-used on-site in its original form, it is unlikely to be waste and will fall outside waste legislation. Where materials are to be re-used in their original form on another site, consider the time period before they will be re-used. If in doubt, register an appropriate exemption for their re-use at the other site.

5 Check relevant guidance
If you intend to re-use a material on-site for another purpose it may be waste. Check the relevant guidance and exemptions. If necessary speak to SEPA on 03000 996699.

6 Exemptions
If you intend to physically treat materials on-site, you will need a relevant exemption.

7 Nuisance issues
When carrying out shredding, grinding or grading activities, think about nuisance issues. Can you control or mitigate noise and dust issues? Think not only about when you are doing the work, but how the outputs will be stored. Check you've registered an exemption.

8 Registering for an exemption
If in doubt, before starting, register the site for an appropriate exemption. Exemptions are generally free to register and it can be done online. (Please refer to pages 13 and 14 for guidance.)

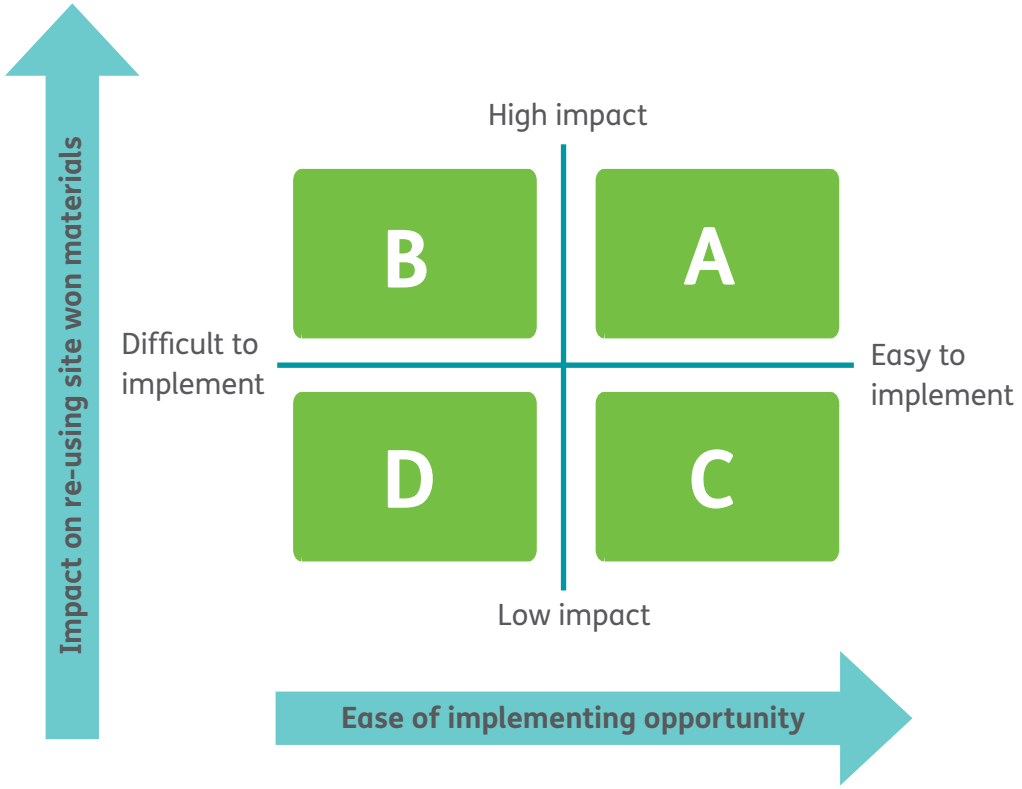
Evaluating re-use opportunities

The primary benefit of re-using site won materials is the reduction of costs associated with disposal and purchase of new materials. This section presents potential applications of commonly produced construction, demolition and excavation wastes and offers possible applications for re-use. The materials have been qualitatively ranked based on the effort to implement and potential costs saved.

The vertical axis in figure 6 describes the level of impact a re-use opportunity presents, in this context a high or low yielding opportunity refers to value saving associated with costs described above. Likewise the horizontal axis describes the ease of implementation of a particular re-use opportunity, in reality every SME construction project manager could identify their own re-use opportunities and rank them based on this simple qualitative approach.

When considering the re-use opportunities for a material it is important to remember that a more circular economy aims to protect the value of the material by keeping products and materials circulating at the highest value for the longest time. Consider how materials are to be re-used first before considering opportunities to re-purpose or downcycle. For example, reusing a steel beam in its existing form is better than remelting it and rolling a new steel beam, i.e. the energy used to remelt the beam is saved.

Figure 6: Matrix to evaluate site won opportunities



Materials re-use opportunities

Some of the biggest opportunities by weight for re-use of site won materials include:

- On-site / off-site re-use of excavated materials e.g. stabilising soils using hydraulic binders or manufacturing quality soils by mixing with compost like outputs both reduce costs and emissions from off-site transport.
- Re-using demolition materials on-site e.g. utilising mobile crushing plant to provide recycled aggregates for fill, capping and sub-base layers to reduce costs and emissions from off-site transport.

The following tables (pages 16-20) provide details of typical materials matched against the matrix in figure 6. This should be treated as guidance as individual project aspects will influence how easy or how much material may be re-used.

The case studies section starting on page 26 gives examples of how site won materials have been re-used.

Rank	Material	Examples of products	Re-use opportunity
A	Excavated material	Top soil, concrete, rubble, clay.	Can be re-used on-site as fill, stabilising soils using hydraulic binders, manufacturing quality soils by adding 'green' compost, and re-mediating brownfield land in-situ.
A	Iron and steel	Rolled steel joint (RSJ), structural steel, water tanks, steel buildings, stainless steel sinks and kitchens, modern pressed steel baths, fire escapes.	Steel containers, such as water tanks and baths, used as planters. RSJ's, structural steel, water tanks and kitchens re-used on other construction projects. Advertise materials for re-use using online scrap groups.
A	Wood off-cuts	Softwood studding, modern staircases, modern mouldings, scrap timber, cheap wood and panel furniture.	Can be stored separately and used for stud walls, lintels, and blocking to eliminate the need to cut into full length sheets.

Rank	Material	Examples of products	Re-use opportunity
B	Beams	Beams, joists, trusses, rough sawn planks, railway sleepers, baulks, good pine or oak ceiling joists.	Beams and joists in good condition to be re-used in other construction projects. Railway sleepers used to construct planters or as edging for gardens. There may be local gardening schemes / charities that may require such materials. Advertise materials for re-use using online scrap groups.
B	Brick, concrete and masonry	Common / building bricks, fire or refractory bricks, ceramic glazed, engineering bricks, paving. Masonry: Marble, granite travertine, limestone, cast stone, concrete block, glass block and cob.	Material arising from demolition can be processed on-site and used as fill, sub-base material or driveway / car parking substructure.
B	Carpet tiles	Various fibres and yarns: Wool and wool blends nylon, polypropylene, polyester, acrylic.	Often found in commercial and industrial buildings, carpet tiles can be removed without causing damage. They may then be suitable for re-use in new build or extensions to existing buildings which are not frequently occurred such as utility/server rooms or hallways.
B	Ironwork	Wrought iron, cast iron and early steel columns, conservatories, windows, doors trusses, frames, features and staircases.	Advertise materials for re-use using online scrap groups. Ironwork could be used on other construction projects.
B	Ironwork and brassware	Cast iron radiators, fire surrounds, kitchenware, door fittings, window fittings, church fittings, statues, urns, stoves, fire grates, grilles, gates, railings, cast and wrought iron furniture and fountains, made from iron, lead, brass, bronze, copper, spelter and aluminium.	Advertise materials for re-use using online scrap groups. Decorative ironwork and brassware could be sold on to garden centres e.g. fountains, gates, statues.

Rank	Material	Examples of products	Re-use opportunity
B	Paving	Concrete products, flagstones, clay floor tiles and brick pavers.	Concrete be crushed using a mini crusher to form an aggregate for re-use. Flagstones, tiles and pavers could be advertised for re-use using online groups.
B	Roofing	Reclaimed clay plain tiles, clay pantiles, clay interlockers, Bridgwater double triple and single romans and others, concrete tiles, stone tiles and slates, reclaimed natural roof slates, ridge and hips.	Advertise materials for re-use using online scrap groups. Scrap tiles could be crushed using a mini crusher to form an aggregate. Could send to reclamation yards if unbroken.
B	Scrap wood	Chipboard, plywood, MDF offcuts.	Low grade wood, small off-cuts, wood derived from the clearance of vegetation could be chipped on-site and used as a landscaping material.
B	Trees and shrubs	Evergreen or deciduous trees / shrubs varying in size.	Can be chipped on-site and used as a landscaping material.
B	Wood flooring	Wood floorboards, roof boards, woodblock, wood strip, parquet, re-sawn beams.	Advertise materials for re-use using online scrap groups. Reclaimed furniture makers may require wood floorboards for their projects.
B	Woodwork	Doors, door surrounds, window frames, window surrounds, shutters, staircases, facades, mouldings, skirting, dado, cornice, porches and cladding.	Doors, mouldings, dado, cornicing and porches in good condition could be sold on or re-used in other construction projects. Reclaimed furniture makers may require woodwork for their projects e.g. coffee tables can be constructed using reclaimed doors.
B	Decorative woodwork	Carved work, fire surrounds, church or pub interiors, shop fittings, institutional woodwork, carved relief panels, statues, bygones, carved ships figureheads, fire surrounds, panelling and panelled rooms.	Desirable decorative work could be sold on or re-used in other construction projects.

Rank	Material	Examples of products	Re-use opportunity
C	Bricks	Handmade bricks, wire cut bricks, machine made bricks and pressed bricks.	Bricks could be sold on or used in other construction projects. Advertise materials for re-use using online scrap groups. Use a mini crusher for bricks and hardcore to produce aggregate for re-use.
C	Electrical equipment	Cables, light fittings, consumer unit, alarm systems. Free standing equipment: kitchen appliances, visual and audio equipment.	Electrical equipment could be donated to charities. Cable off-cuts could be re-used. Unused fixtures and fittings could be returned to the supplier for exchange or refund.
C	Excess insulation from exterior cavities	Foam board or rigid foam (polystyrene, poly-isocyanurate, polyurethane), loose-fill and blown-in (cellulose, fiberglass, mineral wool), reflective system (foil-faced kraft paper, plastic film, polythene bubbles or cardboard), structural insulated panels, rigid fibrous or fibre insulation, sprayed foam, blanket insulation (fiberglass, mineral wool, plastic fibers, natural fibers).	Can be used as noise deadening material internally.
C	Pallets	Timber pallets from transportation of materials (blockwork, bricks, cement, grout, tiles, etc.).	Re-use pallet material as shuttering for concrete. Use pallet repair company to renovate and resupply pallets for transport of materials.
C	Stone	Walling stone, random, pitch-faced, dressed, ashlar, copings, dressings, calls, lintels and quoins.	Re-use stonework in other construction projects, or advertise materials for re-use using online scrap groups.

Rank	Material	Examples of products	Re-use opportunity
C	Stone	Door surrounds, window surrounds, steps and stairs, facades, stone features, cornice, mouldings, string course, portico, porches and cladding in natural stone, composition stone and concrete.	Advertise materials for re-use using online scrap groups or send to reclamation yards.
D	Bathroom sanitary ware	Baths, basins, toilets, cisterns, towel rails, bathroom cabinets, brass taps, shower heads, flush pipe, stoneware, earthenware, porcelain, vitrolite, brass, lead and copper bathroom fittings.	Salvage for resale or donation to community build projects.
D	Ceramic structures	Heavily moulded or bas-relief bricks, columns, cladding and balustrade.	Advertise materials for re-use using online scrap groups or send to reclamation yards.
D	Ceramic objects	Statues, vases, reliefs, moulded detail, fireplaces, garden ware, garden edging, flowerpots in fired clay, earthenware, stoneware, composition stone etc.	Advertise materials for re-use using online scrap groups or send to reclamation yards. Allotment groups may require items such as flowerpots, garden edging and garden ware.
D	Paint	Unused quantities of paint.	Can be remixed and used in storage or utility areas, local community paint re-use projects (Community RePaint, AkzoNobel, Paintcare).
D	Plasterboard	Used for walls, ceilings, partitions and encasements etc.	Product containing gypsum can be de-papered, crushed and small quantities used as a soil improver which promotes better drainage and soil structure.
D	Stonework	Carved stonework, statues, urns, troughs, pillars, cider presses, cider mills, fire surrounds and capitals.	Advertise materials for re-use using online scrap groups or send to reclamation yards.

Challenges and solutions

This section highlights some of the challenges to maximising re-use of site won materials and presents measures that could be implemented to help maximise re-use on-site.

The tables on pages 21 -24 give a summary of common barriers and mitigating actions to the re-use of site won materials.

Potential barriers	Mitigating actions	Further guidance and support
Lack of engagement with the regulator leading to objection when business attempts to implement a re-use opportunity.	Early engagement with regulator to highlight plans for re-use and ongoing liaison with regulator to ensure that all regulatory requirements are addressed.	Netregs provides environmental guidance for businesses in Northern Ireland and Scotland. The service provides specific information and guidance on construction resources as well as free e-learning modules. Netregs: **netregs.org.uk**
Lack of suitable on-site storage.	Consider use of material containers to provide weather-proof, damage protection and security to prevent materials being stolen. Request just-in-time deliveries where possible, this helps prevent stock piling, weather damage and maximises re-use potential of over ordered materials. Consider centralised storage for a number of projects. Consider planning for material sharing.	There are material exchange tools available for offering surplus materials or sourcing materials for projects. For example: Construction Material Exchange: **resourceefficientscotland.com/tools/construction_material_exchange** Recipro: **recipro-uk.com** Enviromate: **enviromate.co.uk**

Potential barriers	Mitigating actions	Further guidance and support
Amount of available re-use material is unknown.	Produce a SWMP at an early stage and update throughout the process. Undertake a pre-demolition and pre-refurbishment audit to identify the products and materials that can be re-used or recycled, prior to demolition or major refurbishment.	Resource Efficient Scotland provides guidance on developing SWMPs. Using the tool can help to track the availability of materials. See details at:**resourceefficientscotland.com/content/site-waste-management-plans-swmp-free-tool** Also see the Institute of Civil Engineering (ICE) Demolition Protocol.
Contaminated material such as special waste or bonded tiles.	Provide material containment options to encourage segregation of site won materials. Ensure special waste is kept separate from potential re-use materials.	Netregs provides environmental guidance for businesses in Northern Ireland and Scotland. The service provides specific information and guidance on construction resources as well as free e-learning modules. Netregs: **netregs.org.uk**
Availability of space for material processing.	Mobile crushing plant to process demolition aggregates for various granular applications.	Mobile crushing may be beneficial across a number of projects. Consider the whole life costing takes into consideration initial capital costs, finance costs as well as future costs including all operational costs, such as rent, rates, cleaning, inspection, maintenance, repair, replacements, renewals, energy and utilities, carbon, dismantling, disposal, security and management over the life of the built asset. The operation, maintenance and end of life costs will often exceed the initial capital costs by a factor of five. Resource Efficient Scotland offers a whole life costing tool. See details of the tool at: **resourceefficientscotland.com/resource/whole-life-costing-tool**

Potential barriers	Mitigating actions	Further guidance and support
Staff and sub–contractors don't use the re-use systems.	Raise staff awareness and include re-use as part of site inductions and tool box talks around topics such as: • Re-use facilities on-site. • The need for careful handling to minimise damage. • Awareness of potential local community benefits from its re-use. Consider introducing incentives to drive re-use.	For sub-contractors, consider the opportunity to build requirements to support re-use activities into contracts. Resource Efficient Scotland provides guidance on embedding sustainable procurement into construction contracts. See details at: **resourceefficientscotland.com/content/sustainable-procurement-construction** Further information and support is available from a number of organisations in Scotland that relate to the construction sector. See details at: **resourceefficientscotland.com/resource/further-sources-information-and-support** Alternatively contact Resource Efficient Scotland about further opportunities for training.
Lack of time to segregate material.	Review schedule with project manager to identify any float that can allow time for material segregation. On projects involving demolition, ensure programme has sufficient time allocated for 'soft strip' which maximises re-use potential.	Plan for re-use of materials at early stages of project development. Resource Efficient Scotland offers guidance on designing out wastes including scheduling of deconstruction activities and planning for re-use of materials. See details at: **resourceefficientscotland.com/resource/designing-out-construction-waste-guide**

Potential barriers	Mitigating actions	Further guidance and support
Complications of re-using building components in 'as is' condition.	Make sure that the materials to be re-used are in a suitable condition.	Reducing cost of waste, trade specific guides contain practical suggestions of re-use of particular building materials are available at: **resourceefficientscotland.com/resource/trade-specific-guidance**
Cost of hiring multiple containers.	Hiring multiple containers may require a bigger initial outlay before cost savings can be realised, but over the project lifetime this will result in savings.	See Whole Life Costing Tool for opportunities or consider planning of containers during project development – see Designing Out Waste for details: **resourceefficientscotland.com/construction**
Materials are not separated resulting in materials becoming contaminated.	Clearly marking up storage areas helps to reduce materials getting mixed with incorrect materials.	Resource Efficient Scotland provides guidance on developing SWMPs. Using the tool can help to track the availability of materials. See: **resourceefficientscotland.com/content/site-waste-management-plans-swmp-free-tool**

Recording and reporting re-use

Documenting re-use is as important as documenting waste movements as there are material and cost savings to be achieved. A key step in maximising re-use is to record and report all re-use opportunities, considering what can be re-used on-site now, and also what might be re-usable on other sites in the future.

To facilitate this process, the SWMP which has been developed should be used as the central 'go-to' document for recording materials for re-use. Starting from initial site waste audits undertaken at the design stage, data should be recorded on the types and expected quantities of materials. Recording of materials suitable for re-use should continue throughout demolition and / or construction phases and the SWMP should be updated accordingly when new re-use opportunities present themselves, the SWMP should be treated as a live document and kept up to date at all times.

The SWMP will become a valuable document which contains a log of materials potentially suitable for re-use; it should include materials captured through site demolition or through materials generated during construction. The designated owner of the SWMP should regularly communicate additions made to it's re-use section, highlighting the types and quantities of materials to site managers.

Following conclusion of the project, a review of the SWMP to assess remaining stock suitable for re-use should be undertaken. Disposal of materials segregated for re-use should be avoided and instead identify outlets for off-site re-use. This might include retaining the materials for re-use on other construction sites or advertising on construction material exchange schemes.

Case studies

Case study: Using demolition material as drainage fill and reusing existing fencing

Contractor: Archial Group

Project: Birmingham Schools for the Future Programme

Part of Birmingham's Building Schools for the Future (BSF) programme, the Archial Group designed a new school for approximately 1,500 pupils in the Aston area of Birmingham to combine the existing Holte Secondary School, Mayfield Special School and Lozells Primary School on one site.

The project team and client facilitated a workshop where possible design changes to reduce waste were explored and prioritised in order of their impact on waste reduction and ease of implementation. Short-listed design change options were analysed comparing them against the existing design to quantify savings in construction costs, quantity of site waste and costs of disposal, value of materials wasted and embodied carbon.

Source: Wrap case study - Designing out waste on a major schools project: Birmingham Schools.

The three recommended design changes were:

- **Recycling demolition material under sports pitches as fill:** This option would eliminate the need to transport material off-site and import new material. It would reduce total project costs by over £167,000, reduce waste by 7,200 tonnes and reduce embodied carbon by almost 980 tonnes.
- **Use of existing fence, not new hoarding:** In some areas the existing fence could be retained to keep the site secure without the need for temporary plywood hoarding. This would save over £37,000 in total project costs. Waste would be reduced by 60 tonnes and embodied carbon by 11 tonnes.
- **Pre-engineering of caretakers' houses:** Off-site construction of two semi-detached houses for caretakers instead of conventional on-site construction would result in a saving in the total project costs of £2,000; both waste and embodied carbon would be reduced by 11 tonnes. The key benefit of this option would be the positive impact on project programme; pre-engineering off-site greatly reduces the construction period for this element.

Case study: Re-using excavated aggregates on-site

Contractor: Foundations contractor, Farrans

Project: Scotland's National Arena, Glasgow

Farrans were successful in securing the contract to install the foundations and floor slab for Scotland's new National Arena on behalf of the Scottish Exhibition and Conference Centre (SECC).

This is a £125million state of the art, multi-purpose arena which includes a range of cafés, bars and restaurants. The foundations and floor slab contract was worth £7.4million. The building would be used for concerts and other entertainment events with an arena to seat 12,500 people, making it the largest purpose built indoor arena in Scotland.

Source: Wrap case study - Construction logistics: Local procurement of construction materials, construction waste and recycling.

Re-use and recycling activities undertaken:

- **Recycling of aggregates on-site:** Following ground investigations, two former dock walls were discovered directly below the arena's footprint. During site demolition and excavation, large amounts of concrete and sandstone materials were produced. Farrans recycled these aggregates on-site and they were used to construct a piling platform for the piling sub-contractors.
- **Systematic programme management:** There was risk of programme delay caused by the large amount of aggregates that needed processing on-site. Farrans managed this risk by carrying out all processing works at the beginning of the contract prior to the piling sub-contractors arriving. This ensured there was no programme clash in between the two operations.
- **Crushing and re-use of waste materials:** Approximately 4660m^3 of waste material, along with 1,500m^3 of roadway cold-milled material was crushed and re-used on-site. This saved around 560 vehicle movements to and from the development and reduced CO_2 emissions by approximately 2,500kg. As a result, the contractor saved approximately £139,000 and saw a reduction in environmental impact.

Case study: On-site segregation key to reusing materials through reducing contamination

Contractor: MSK Waste Management and Recycling

Project: Office fit-out of KPMG's new headquarters at 15 Canada Square, Canary Wharf

The building at 15 Canada Square is a 15-storey steel framed structure clad in high-efficiency, solar-control glass and features a full-height atrium space. MSK is a specialist construction waste management company which was commissioned to maximise re-use and recovery to divert a minimum of 90% construction waste from landfill during office fit-out phase.

The specialist services provided by MSK on the project involved comprehensive waste management and logistics packages starting with waste generation through to collection and reprocessing. The provision of a dedicated logistics manager provided a single point of contact for the client and fostered a partnership approach.

A demanding target of 90% diversion of waste from landfill was agreed with the client. Following completion of the office fit-out, it was confirmed that the target had been exceeded with a final diversion rate of over 95%: approximately 500 tonnes of materials collected and processed by MSK were re-used or recycled.

Source: MSK Waste Management & Recycling Case Study: Best Practice Construction Waste Collections Office Fit-Out of 15 Canada Square, Canary Wharf.

Material segregation and overcoming contamination:

- **Demonstration of re-use and recycling at tender stage:** During the tendering process, contractors had to demonstrate how materials would be re-used and recycled. This early engagement throughout procurement contributed to improved waste management performance. The selected contractors participated in a series of waste workshops to reaffirm the project's waste management objectives.
- **Use of containers for material segregation on-site:** This was key to maximising the re-use of construction waste materials. All containers (mostly 660L wheeled) were clearly labelled. The containers were easily manoeuvrable so they could be placed at the point of waste generation and wheeled to the storage / bulking area when full. MSK Logistics staff continuously monitored waste levels and segregation; they reported any infringements to the Principal Contractor.
- **Regular inspections to identify materials for re-use:** Once MSK staff had transferred waste containers to the bulking area, inspections were carried out to identify materials suitable for re-use. For example: reusable pallets were sold on, reusable timber was either used on-site or donated to organisations. Builders' rubble was screened and crushed for re-use. Carpet tile offcuts were retained for re-use on-site.

Case study: On-site material segregation, pallet repair and reusing insulation offcuts

Contractor: Risby Homes

Project: Housing development, Beverley, East Yorkshire

Risby Homes managed a £4 million, two-year development project of 25 homes in Beverley, East Yorkshire. The developer saw an opportunity to improve resource efficiency across the site which at the same time led to significant cost savings being achieved. These simple changes were extremely successful, to the extent that the site manager received recognition from the National House Building Council (NHBC), winning a Pride in the Job Award.

Led by the site manager, Risby Homes implemented a number of systems to maximise the re-use of materials generated on-site, increase on-site recycling and reduce overall site waste generation.

The housing developer estimated they achieved a cost saving of £13,000 (62%) on this project alone and intend to implement similar approaches to construction waste minimisation across their other sites.

Source: Wrap Guidance for small and medium sized contractors - Reducing your construction waste.

Systems implemented to maximise re-use and recycling:

- **Use of dedicated and clearly marked containers for materials:** This increased material re-use and recycling of timber, cardboard and rubble.
- **Re-use of delivery pallets:** Pallets acquired with deliveries of materials were repaired and re-used to help move materials around site and to aid with more efficient storage.
- **Re-use of insulation off-cuts:** Insulation off-cuts were collected and stored in a dedicated container and later re-used in the roof spaces as extra roof insulation, providing increased energy efficiency for the homes.
- **Recycling of plastic film packaging:** All plastic film was collected and stored separately in a dry container for recycling. This diverted large quantities from the residual waste containers.

Get in touch

For more details about construction support through Resource Efficient Scotland, contact the help desk on 0808 808 2268 to start saving.

For our range of tools and guides for the Scottish construction sector visit:
resourceefficientscotland.com/construction

For upcoming events visit:
resourceefficientscotland.com/events-list