

Practical solutions for sustainable construction

Achieving good practice Waste Minimisation and Management

Guidance for construction clients, design teams and contractors



WRAP works in partnership to encourage and enable businesses and consumers to be more efficient in their use of materials and recycle more things more often. This helps to minimise landfill, reduce carbon emissions and improve our environment.

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Executive summary

Waste Minimisation and Management (WMM) on construction projects will help reduce the significant quantities of construction waste sent to landfill

Implementing good practice waste minimisation and management (WMM) on construction projects will help reduce the significant quantities of construction waste sent to landfill and make a substantial contribution to sustainable development.

The purpose of this guidance is to assist construction clients, design teams and main contractors achieve good practice WMM on their construction projects. It sets out what is meant by good practice WMM, why it is important, who should implement it and how it can be made an explicit requirement of the procurement process. This guidance is part of a suite of three documents that focus specifically on good practice WMM. The other guidance documents provide a high-level business case for client decision makers and a technical summary for implementing good practice WMM by the contractor and their supply chain.

Key benefits

Increasing numbers of construction clients, developers, design teams and contractors are implementing good practice WMM to secure a range of key project benefits. These benefits include the ability to:

- reduce material and disposal costs through a reduction in the materials ordered and waste taken to landfill;
- increase competitive advantage through differentiation;
- improve performance against CSR objectives;
- lower CO₂ emissions;
- meet planning requirements;
- complement other aspects of sustainable design; and
- respond to and pre-empt changes in public policy, such as increases in Landfill Tax.

Good practice WMM

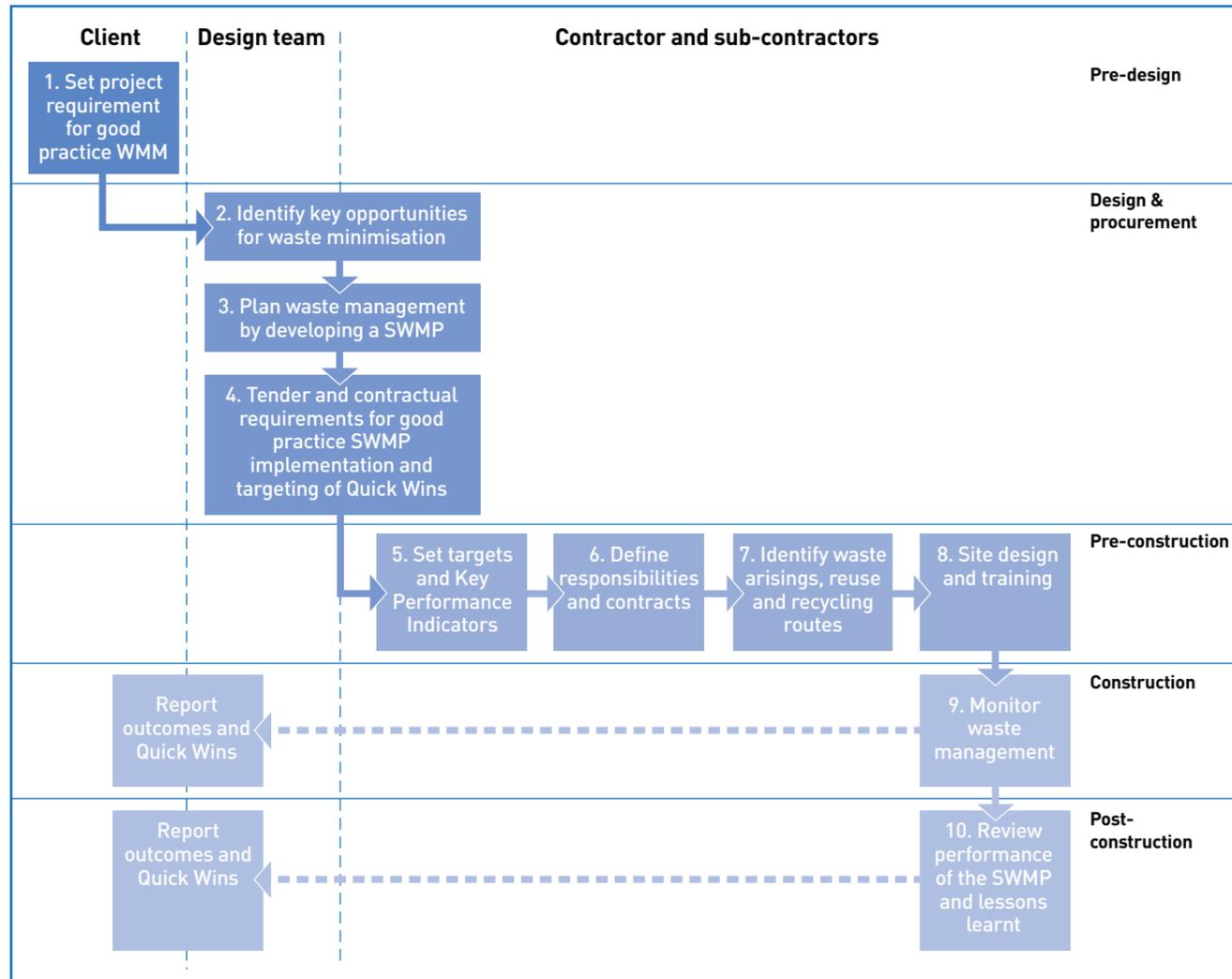
Good practice WMM should follow the principles of the waste hierarchy: reduce the quantity of waste generated, then maximise the amount that can be reused or recycled.

Waste minimisation includes a range of straightforward methods to 'design-out' waste from a project and limit waste arising during the construction phase. Waste management involves identifying potential waste streams, setting target recovery rates and managing the process to ensure that these targets are met. Good practice WMM is going beyond standard practice to realise benefits that can be achieved on many projects without a fundamental change in working practice and will in most cases generate cost savings.

Good practice WMM can be applied to all forms of construction project, including new build, refurbishment, fit-out and infrastructure, regardless of the procurement route adopted.

Fully benefiting from good practice WMM on a project will mean adopting its principles at the earliest possible stage, preferably mandated by the client through procurement requirements. The principles of good practice should then be communicated and implemented by the design team, contractor, sub-contractors and waste management contractors through all project phases – from outline design to project completion. This process is illustrated on the following page.

Achieving good practice Waste Minimisation and Management



Good practice WMM techniques and processes, for example, using Modern Methods of Construction and identifying a site waste champion, should be implemented through a Site Waste Management Plan (SWMP).

Using Site Waste Management Plans

A SWMP is not just a tool for managing waste on-site. It should be also used as a tool during earlier project phases to inform the development of the design by identifying potential waste streams to minimise and targeting appropriate rates of recovery.

Planning and developing the SWMP before construction begins will greatly help realise the benefits of good practice WMM.

It is expected that the use of SWMPs will become a mandatory requirement for many projects throughout the UK, the current position being summarised opposite.

England and Wales	SWMPs expected to become a mandatory requirement for projects with a value in excess of £250,000 from April 2008 following separate consultations in England and Wales.
Scotland	The 2006 public consultation on the proposed Scottish Planning Policy 10: Planning for Waste Management, included provision for SWMPs to form part of the planning conditions for new developments with a value in excess of £200,000.
Northern Ireland	The Waste Management Strategy 2006 – 2020 indicated that detailed proposals for a statutory requirement to prepare SWMPs will follow through a public consultation.

Aiming for Quick Wins

On any project there are certain key waste streams that can offer significant savings, otherwise known as 'Quick Wins'. By implementing three to four of these good practice 'Quick Wins', there is potential to increase overall recycling rates of construction waste from standard industry performance by more than 20%.

To assist the setting of target waste recovery rates, WRAP have identified good practice recovery rates for a comprehensive range of waste streams.

Setting a requirement

Clients can provide a mandate for action on all construction projects by setting a requirement for good practice WMM when procuring design teams and contractors. This simple action will be the crucial first step in realising the key benefits of adopting good practice WMM. The client's core requirement can be set as follows:

'...we require a Site Waste Management Plan (SWMP) to be developed from the pre-design stage to inform the adoption of good practice waste minimisation in design, and for the SWMP to be implemented in all construction site activities in line with good practice published by WRAP. The SWMP is required to set targets for waste reduction and recovery based on an assessment of the likely composition and quantity of waste arisings and identification of the most significant cost-effective options for improvement (Quick Wins). This should be supplemented by information on how the targets will be achieved during construction activities and how the actual levels of waste reduction and recovery will be monitored for comparison with the targets set.'

This requirement crystallises the client's project objective for good practice WMM and can be cascaded through the entire supply chain using a suite of procurement clauses to ensure that it is delivered.

Making it simple

To help clients, designers, contractors and sub-contractors, WRAP have produced a suite of guidance material of which this guidance document is part, to assist in achieving good practice WMM: a high level business case for client decision makers and a technical summary for implementation by the contractor and their supply chain.

In addition, WRAP's construction portal www.wrap.org.uk/construction contains extensive related information covering all aspects of materials use in construction, including case studies, reference guides and information on managing specific waste streams.

1.0 Introduction

The construction industry is the UK's largest consumer of natural resources, using over 400 million tonnes of material per annum. It generates more than one-third of the UK's waste arisings, of which only half is reused or recycled (primarily aggregates and metals). Over 60 million tonnes of construction sector waste is sent to landfill or similar disposal sites every year. More efficient use of materials would make a major contribution to reducing the environmental impacts of construction including reducing demand for landfill and the depletion of finite natural resources. This would also contribute to the economic efficiency of the sector and of the UK as a whole.

Major improvements in materials efficiency are possible, without increasing cost, by:

- minimising the overall creation of waste resulting from, for example, over-ordering or inefficient design;
- reducing the quantity of material sent to landfill during the construction process through effective waste management;
- recycling materials already on the construction site into the new construction project; and
- using more recycled materials and mainstream products with higher recycled content, including recycled content (such as glass and plastic) not necessarily sourced from construction and demolition waste.

Taking action in each of these areas would enable construction projects to achieve good or best practice in resource efficiency. These key actions fit into a sequence (see Figure 1.1) and should be prioritised in accordance with the waste hierarchy (see Figure 3.1 in Section 3).

As a result, construction clients and developers are increasingly looking to set targets and requirements for good practice waste minimisation and management (WMM) and the use of materials containing higher levels of recycled content. They see it as a relatively simple and measurable way of making a difference which can be easily incorporated within a wider sustainability action plan for a project.

Bearing in mind the high cost of disposing of waste, it is apparent that producing less waste will have the added benefit of minimising the cost of removing that waste. In light of recent and future increases in Landfill Tax, reducing the amount of waste produced and improving management and recovery options will produce ever increasing financial savings as well as the obvious environmental benefits.

Figure 1.1 Sequence of actions to deliver good practice in resource efficiency in construction



2.0 Why is good practice Waste Minimisation & Management important?

2.1 Key benefits

Adopting the principles of good practice WMM on a project can demonstrate a firm commitment to sustainable construction and environmental management. If implemented correctly, good practice WMM can be a straightforward process that can deliver a range of benefits in addition to improvements in materials resource efficiency.

Key benefits include:

- **reduced material and disposal costs** – less waste generated means that a reduced quantity of materials will be purchased, and less waste taken to landfill will reduce gate fees for disposal. Cost savings will stimulate the adoption of improved recovery practices and motivate a sustained change in waste management practice;
- **increased competitive differentiation** – benefits both developers and contractors, particularly where this will help to meet prospective client's sustainability objectives;
- **increased performance against CSR objectives** – real performance against corporate responsibility and sustainability policies can be quantified, thereby meeting the expectations of external stakeholders and employees;

- **lower CO₂ emissions** – as an example, implementing good practice plasterboard recovery compared with standard practice can save 4.2 tonnes of CO₂ for each tonne of additionally recovered plasterboard;

- **meeting planning requirements** – planning authorities are increasingly setting conditions for environmental performance as part of the development process;

- **complementing other aspects of sustainable design;** and

- **responding to and pre-empting public policy** – those organisations responding to the thrust in public policy making for the increased sustainability of construction and the built environment will be in an advantageous position in comparison with those that wait until they are compelled to act by legislation.

Good practice WMM is a particularly attractive option because it is relatively straightforward to develop and implement and need not impact the overall design and financial outcomes of the project. It is possible to be significantly more efficient in the use of natural resources without compromising cost, quality or construction programmes.

Waste Minimisation & Management can be a straightforward process that can deliver a range of benefits including reduced costs and improved CSR

2.2 True cost of waste

The true cost of waste disposal is not just the cost of paying a waste contractor to remove a skip from site, as illustrated in Figure 2.1.

There are also some additional costs not covered in the above, these are:

- the time taken by on-site sorting, handling and managing waste;
- poor packing or overfilling of skips leading to double handling (this cost is very difficult to quantify); and
- the cost of the materials that have been wasted.

As an example, the true cost of filling and disposing of one skip with mixed construction waste in one study¹ was found to be **£1,343**. Although the skip hire was only £85, the labour cost to fill it was £163 whilst the cost of unused material in the skip was the most significant at £1,095.

The true cost of construction waste will continue to rise substantially each year due to:

- Landfill Tax increasing each year (see Section 2.3 below);
- higher disposal costs; and
- taxes and levies on primary materials.

2.3 Key public policy drivers

There is an increasing thrust of public policy to achieve greater resource efficiency and reduce waste sent to landfill in the construction industry. While there is currently no regulatory obligation to reduce and manage waste to good practice standards,

Figure 2.1 The true cost of waste



the following initiatives provide a clear indication of the direction in which policy is moving.

Landfill Tax

The Landfill Tax was introduced in 1996 to encourage all organisations, including those in the construction industry, to reduce the amount of waste disposed to landfill. There are two rates of tax: a standard rate of £24 per tonne for active waste (substances that either decay or contaminate land); and a lower rate of £2 per tonne for inert materials (including rocks, soils, ceramics and concrete). The standard rate is due to increase by a rate of £8 per tonne, per annum, until 2010/11 and the lower rate will increase from £2 to £2.50 per tonne in 2008. The proposed increases therefore provide a strong financial incentive to reduce waste with immediate effect.

Mandatory requirement for Site Waste Management Plans on construction projects

An important part of a good practice WMM strategy for a project is the Site Waste Management Plan (SWMP) – see Section 3.2 of this guidance for further information. It is expected that the use of SWMPs will become a mandatory requirement for many projects throughout the UK in the near future, the current position being summarised below.

England and Wales	A requirement for regulatory measures was included in the Clean Neighbourhoods and Environment Act 2005. Following separate consultations in England and Wales, it is expected that a basic SWMP will be a mandatory requirement for projects with a value in excess of £250,000 and a detailed SWMP for projects in excess of £500,000 from April 2008.
Scotland	The 2006 public consultation on the proposed Scottish Planning Policy 10: Planning for Waste Management, included provision for SWMPs to form part of the planning conditions for new developments with a value in excess of £200,000.
Northern Ireland	The Waste Management Strategy 2006 – 2020 indicated that detailed proposals for a statutory requirement to prepare SWMPs will follow through a public consultation.

¹ AMEC – Darlington Survey (<http://envirowise.gov.uk/media/attachments/202895/BRE-Construction-resource-efficiency.pdf>)

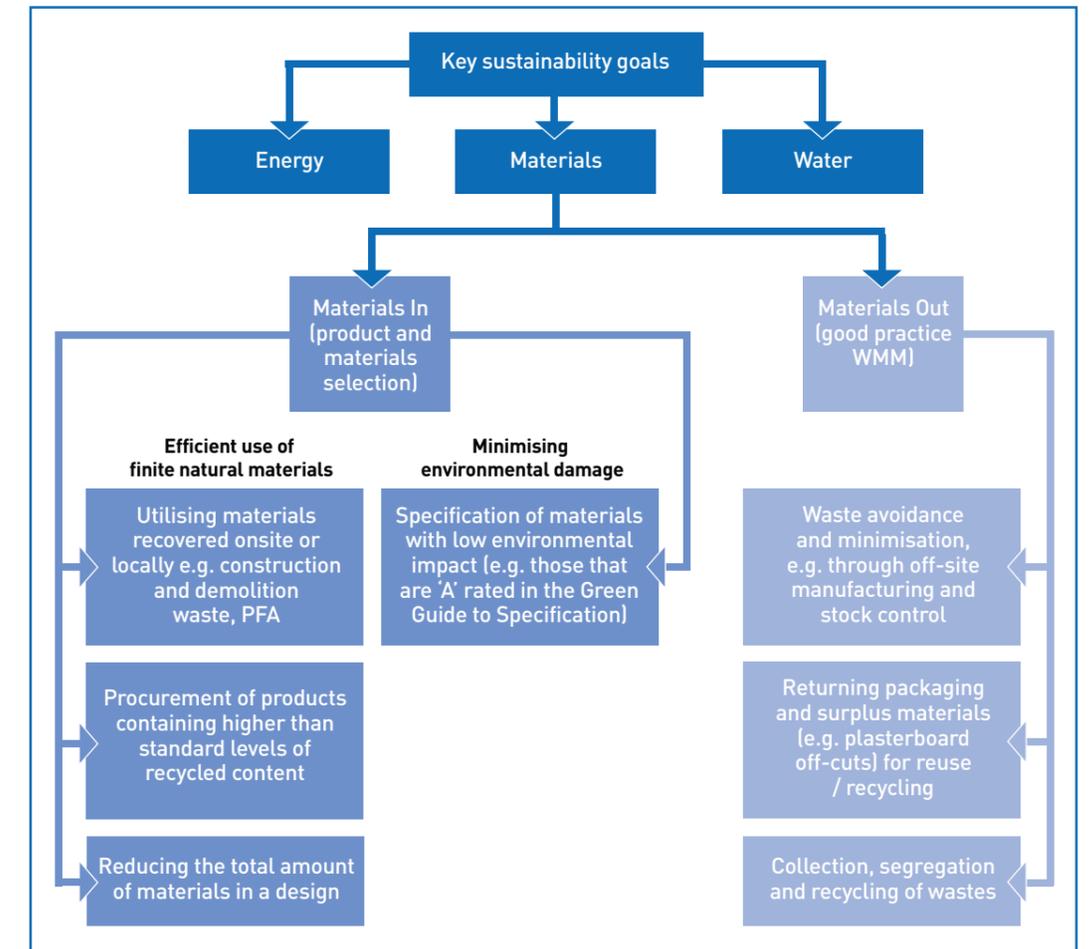
Code for Sustainable Homes

The Code for Sustainable Homes is a voluntary scheme that has been developed by Government and Industry. The Code focuses on new build housing with the expectation that it will be adapted to apply to all buildings in the longer term. The Code is currently a voluntary assessment standard but it may become mandatory in the future. A specific requirement of the Code is for a SWMP to be in operation in order to achieve the minimum assessment rating. Further points are awarded where the SWMP includes procedures and commitments that minimise waste in accordance with WRAP/Envirowise guidance.

2.4 Contribution to sustainable development

There are three key areas where the development and construction industry needs to increase its efficiency: energy, water and materials usage. Figure 2.2 highlights the various ways in which efficient use of materials directly contributes to greater sustainability in construction.

Figure 2.2 Good practice Waste Minimisation and Management is a key element of sustainable construction



The Figure shows that there are two important aspects of materials efficiency; product selection and waste management. Each of these can then be broken down into constituent parts which themselves have an impact on both:

1. Minimising environmental damage:

Reduced waste means less quantity of landfill space used and reduced environmental impacts (e.g. embodied CO₂, SO₂, NO₂, particulates and waste) associated with extracting, transporting, and manufacturing / processing the raw materials of construction products².

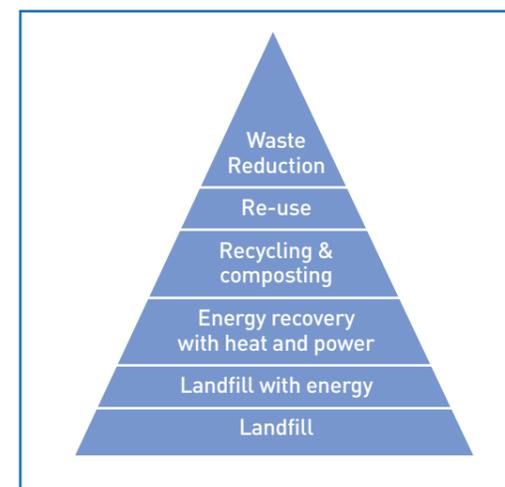
2. Conserving natural resources: Recycled packaging and waste results in a reduced demand for virgin materials thereby stimulating demand for recycled materials amongst product manufacturers and thereby encouraging higher levels of recycling throughout the economy.

By minimising the amount of waste generated during construction, maximising the proportion of unavoidable waste arisings that are recycled whilst simultaneously using recycled materials from other sectors (e.g. glass and plastic), the construction sector can make a major contribution to achieving this goal.

² *The Green Guide to Specification. Anderson, Shiers, and Sinclair, 2002. BRE Bookshops.*

3.0 What is good practice Waste Minimisation and Management?

Figure 3.1 Waste hierarchy

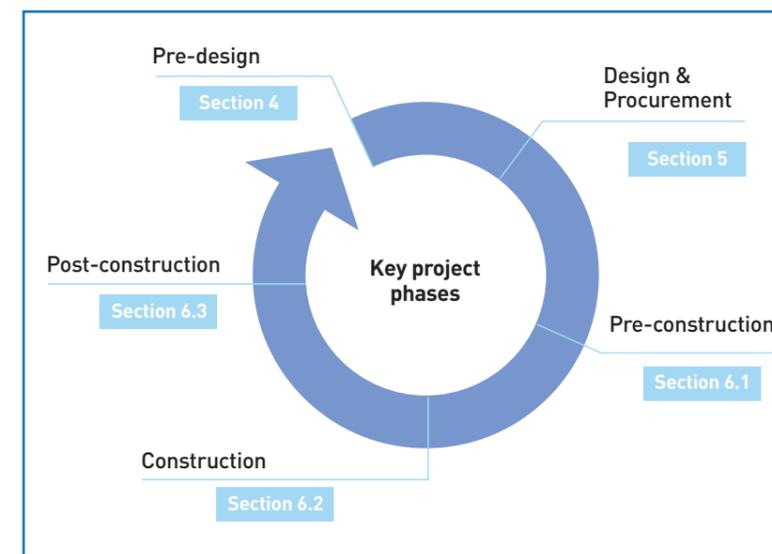


3.1 Introduction

The principal objective of good practice WMM is to use materials more efficiently and to reduce the amount of waste requiring final disposal. Adopting the waste hierarchy (see Figure 3.1) to reduce, reuse, recycle, recover and dispose, makes good business sense both for clients and the construction sector.

Good practice WMM should follow the waste hierarchy. The primary aim should therefore be to minimise the total quantity of waste produced through a project. After this, the waste that is produced should be managed effectively to limit the quantity sent to landfill. This will involve recovering the material in a number of waste streams for either re-use or recycling.

Figure 3.2 Key project phases for implementing good practice Waste Minimisation and Management and the relevant sections in this document



The potential for minimising and managing waste should be considered throughout the project. To achieve this, a requirement for good practice WMM needs to be introduced at the outset of a project when there is most scope to influence the project outcomes. The objective should be addressed in subsequent project phases (design and construction) by all parties, with the lessons learnt from the project implemented on future projects. The remaining sections of this guidance will follow the key stages of the project shown in Figure 3.2.

A critical component for delivering good practice WMM is the formulation and implementation of a Site Waste Management Plan (SWMP) at an early stage of a project. Section 3.2 gives a brief introduction to SWMPs and is detailed further in remaining sections of this guidance.

3.2 Site Waste Management Plans – an overview

The DTI originally published a voluntary Code of Practice for Site Waste Management Plans (SWMPs) in 2004³. As described in Section 2.3, it is expected that SWMPs will become a mandatory requirement across the UK.

The benefits of implementing a SWMP in accordance with DTI Guidance have been found to be⁴:

- 15% less waste on-site;
- 43% less waste to landfill;
- 50% savings in waste handling charges; and
- 40% saving on waste management costs compared to landfill disposal.

However, to realise the benefits of good practice WMM, a SWMP should be developed and implemented to good practice standards as identified by WRAP – beyond the regulatory minimum.

The SWMP, having been initially developed by the design team, should be fully developed and implemented by the principal contractor. As a minimum, the SWMP will contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, re-use and recovery of construction waste, with disposal to landfill as the least preferred option. The SWMP can also be used by the design team as a tool to inform waste minimisation during the design stage of the project to ensure that the desired benefits of implementing the SWMP during later project stages will be realised.

The DTI guidance identifies nine steps to effectively implementing a project SWMP. The majority of steps involve planning site waste management during pre-construction, illustrating the importance of this project phase to effective waste management. Key features of good practice in the nine steps include:

- The person responsible for producing and implementing SWMP is identified. This person may also be given responsibility for ensuring compliance with Duty of Care regulations. This can result in an

immediate noticeable improvement in waste segregation and record keeping for waste.

- A register is produced of the likely types and quantities of waste generated during construction.
- Training is formalised for personnel at each level of the waste supply chain so waste awareness improves. To improve overall awareness of the SWMP, all contractors must sign and formally agree to the document.
- Identifying target recovery rates for each waste type along with formal measurement of these targets to demonstrate compliance and implementation of the SWMP.

Formulating and implementing a SWMP on a project should be viewed as a process for delivering good practice WMM, with input from the design team, contractor and sub-contractors, rather than an end in itself.

3.3 Waste minimisation – an overview

Waste minimisation is one of the most effective approaches to responding to the waste problem in the construction industry. Waste minimisation should be considered not only for the construction phase of a building but through to eventual deconstruction. This requires a ‘cradle to cradle’ approach.

The key aspects of waste minimisation are briefly outlined below.

■ Design solutions

- Building form – design building size and space to eliminate unnecessary elements, and to reduce off-cuts resulting from the construction process, and ensure compatibility between market supply and specification.
- Design flexibility – ensure flexibility in design for future building expansion, adaptation and dismantling.
- Design complexity – reduce the complexity of the design to standardise the construction process and reduce the quantity of materials required.

³ DTI - Site Waste Management Plan (1021 kb)

⁴ Report C536 from CIRIA.

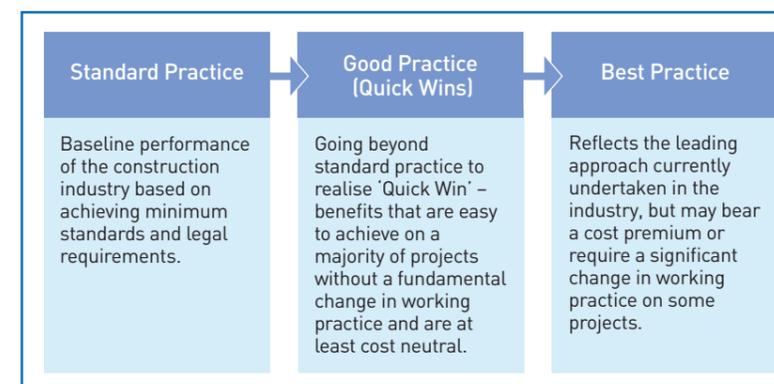
- Specifications – avoid over-specification and minimise variation in components and joints; evaluate the reuse and recycling opportunities for the specified materials before specification.
- **Demolition**
 - Avoid the disposal of reusable materials and building elements; maximise the use of reclaimed materials on site.
- **Logistics**
 - Logistic Plan – development of a logistic plan at the early stages of the project will ensure that due consideration is given to material requirements through the construction phase of the project, enabling efficient management of the delivery and storage of materials and that the most effective logistic methods are adopted.
 - ‘Just-in-time’ delivery – improving the movement of materials to the site and within the site to alleviate space constraints for storage and site congestion.
 - Construction Consolidation Centres – these provide effective supply chain management solutions enabling the safe and efficient flow of construction materials and equipment from supplier to site.
- **Modern Methods of Construction (MMC)**
 - Improvements in the products or processes employed in the construction industry, ranging from innovative components to be used on site through to whole building systems manufactured off-site.
- Off-Site Manufacturing – utilise prefabrication, factory assembly, pre-assembly, off-site assembly/manufacture, panelised or modular volumetric construction where possible, for example, staircases, lift assemblies, architectural steelwork and toilet blocks for hotels, prisons and student accommodation. Waste Minimisation is realised due to the controlled environment and the “production line” type process where there is repeatability in construction.
- **Materials procurement**
 - Materials ordering – reduce the amount of surplus materials by ordering the correct amount of materials at the right time.
 - Material storage – material storage areas should be safe, secure and weatherproof to prevent damage and theft.
 - Supply chain manager – will develop relationships and partnerships with suppliers during construction who can implement waste minimisation at source.
 - ‘Take-back’ schemes – setting up schemes with suppliers to take back surplus materials.
- **Packaging**
 - Reduce and reuse – engage with the supply chain to supply products and materials that use minimal packaging, and segregate packaging for reuse.

3.4 Good practice WMM

The extent to which the construction industry is implementing methods of WMM can be described using the concepts of standard, good and best practice. These three concepts are illustrated in Figure 3.3.

It should be the aim of all clients, designers and contractors to achieve good practice WMM. With only a small change in current working practices, the key benefits can be realised: cost savings, more efficient operations and lower environmental impact. Ultimately, the long-term aim is to meet best practice to maximise the benefits offered by good practice WMM, and to eliminate any cost premium of best practice through economies of scale and learning.

Figure 3.3 Standard, good and best practice Waste Minimisation and Management



It is recognised that it will not be practical to implement all the measures for good and best practice at once, and on some projects restrictions on space, time and resources may make it hard to implement some of them. However, considerable improvements can be made on most sites through implementing several Quick Wins - therefore the potential benefits are available for all parties, regardless of the project type.

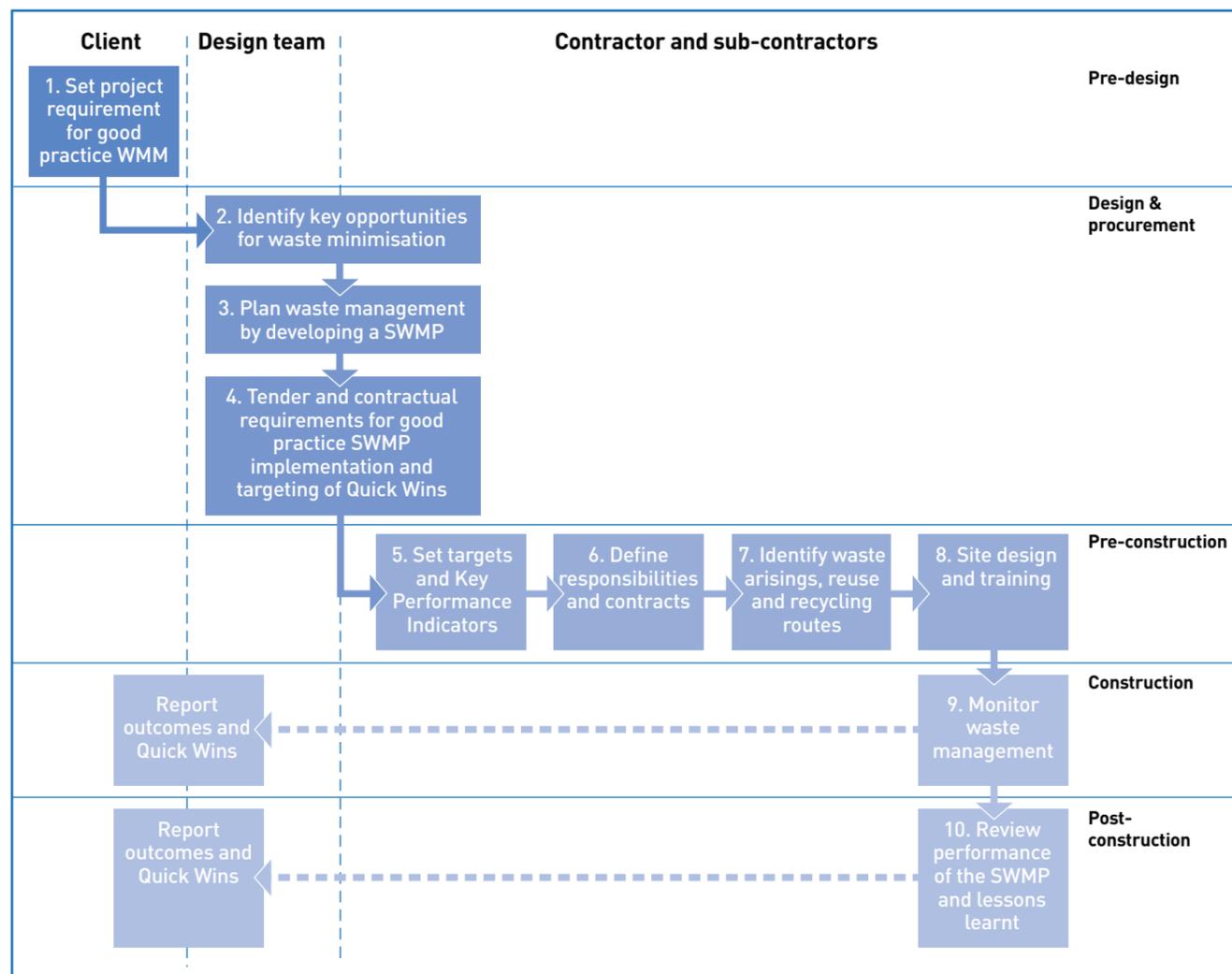
All three concepts are developed further in subsequent sections of this guidance to show how to meet good and best practice at each different project phase by clients, the design team and contractors.

3.5 Achieving good practice WMM

The effective delivery of good practice WMM on a project will require its adoption by clients, designers and contractors from the project outset. The following sections address the roles and responsibilities of various parties to achieve good practice throughout the project.

Figure 3.4 summarises the key steps and responsibilities for achieving good practice WMM from setting a project requirement by the client from the outset through to its implementation and feedback of outcomes by the contractor.

Figure 3.4 Achieving good practice Waste Minimisation and Management



4.0 Pre-design and client requirement stage



Step 1 Set project requirement for good practice Waste Minimisation & Management

Clients can encourage good practice WMM from the project outset on all projects. By setting requirements for good practice upfront in the procurement process, they provide a mandate for action. This will maximise the potential for realising the key benefits of adopting good practice WMM.

The **client's core requirement** can be framed as follows:

'...we require a Site Waste Management Plan (SWMP) to be developed from the pre-design stage to inform the adoption of good practice waste minimisation in design, and for the SWMP to be implemented in all construction site activities in line with good practice published by WRAP. The SWMP is required to set targets for waste reduction and recovery based on an assessment of the likely composition and quantity of waste arisings and identification of the most significant cost-effective options for improvement (Quick Wins). This should be supplemented by information on how the targets will be achieved during construction activities and how the actual levels of waste reduction and recovery will be monitored for comparison with the targets set.'

Specific client responsibilities include:

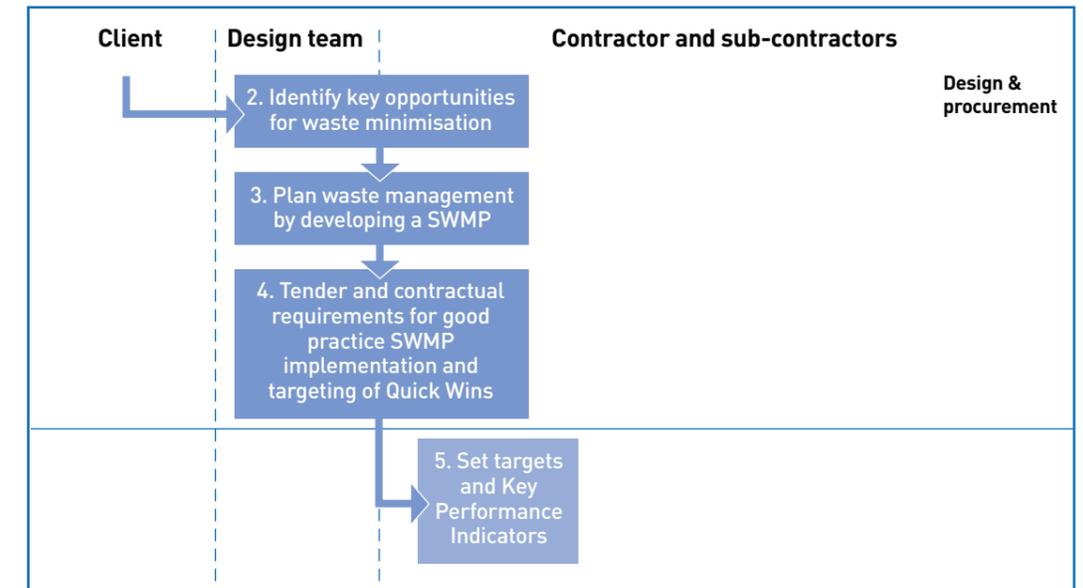
- include a **corporate objective for good practice WMM** in the organisation's environmental or procurement policies to provide a mandate for action on all projects;
- prior to appointment, determine the **design team's/contractor's awareness** of applying waste minimisation methods and reusing, recycling and reclaiming materials;
- set a **project requirement** in the design brief for the design team or contractor to consider design options to minimise waste, set good practice targets (through Key Performance Indicators (KPIs)) for material recovery and to monitor these targets through developing and implementing a SWMP;
- allocate **project time and resources** for planning and implementing a SWMP;
- establish the **appropriate construction approach**, whether refurbishment or demolition;
- set a **clear and detailed design brief** aimed at avoiding waste production during construction where possible;
- develop a **'partnership'** way of working among the project team; and
- introduce WRAP's **Efficient Use of Materials in Regeneration** guide incorporating the **ICE Demolition Protocol** to the design team and encourage a link with the SWMP to maximise waste reduction.

Rather than the client setting specific targets for material recovery rates, the onus should be on the contractor to develop these targets, in conjunction with the design team, after identifying how to reduce waste and appropriate recovery methods. This is because the contractor is best placed to identify opportunities to reduce waste given their position as the interface between the design and construction phases of the project taking into account the supply chain to be employed.

The successful attainment of good practice WMM during on-site activities will lead directly from the specific project objectives set by the client. The client's requirements will filter through the supply chain to specifically target the contractor, sub-contractors and waste management contractors. Suggested wording for each contractual point in the procurement process is provided in Section 8.

The contractor is best placed to identify opportunities to reduce waste

5.0 Design & works procurement stage



The design and works procurement stage responsibilities depend on the procurement route adopted. Table 5.1 identifies who should be responsible for good practice WMM depending on the procurement route.

The key actions in the design and works procurement stage for consideration by either the contractor or design consultants are detailed below.

Step 2 Identify key opportunities for waste minimisation

The design and works procurement stage represents the key opportunity in a project to consider and implement waste minimisation practices, as identified in Section 3.3. It is therefore imperative that due consideration is given to designing out waste from the start of this phase. Waste minimisation should also be an integral item for discussion within the building project team.

Table 5.1 Responsibilities depending on procurement route

Procurement type	Procurement route	Role and key responsibility
Early contractor involvement	Design & build Management contracting Construction management Private Public Partnerships	Contractor to develop the SWMP, identify likely quantity of waste streams and develop target recovery rates. Contractor to identify most appropriate construction methods and techniques to minimise waste during construction for adoption by the design consultants.
No contractor design input	Traditional procurement methods	Design consultants (architect, engineers) responsible for adopting waste minimisation techniques and considering key elements of the SWMP – likely waste streams and recovery potential.

Step 3 Plan waste management by developing a SWMP

The SWMP should be developed during the design stage as it can act as a tool to inform the design process and address the waste problem at its source. The SWMP will provide information, such as potential waste streams and their likely quantity, to enable strategic decisions to be made regarding the design and supply chain. This will allow waste production during different stages of construction to be controlled.

The key elements of waste management for consideration at the design stage will be to:

- identify the waste streams (e.g. wood, brick/concrete, soils, plastics etc.) likely to be produced during construction and/or demolition to establish the potential for re-use (on or off-site) and recycling;
- identify the most significant opportunities to increase reuse and recycling rates (termed Waste Recovery Quick Wins, WRQWs) and the realistic recovery rates – see Section 7 for information on WRQWs;
- identify where waste materials can be re-used on-site (for preference) or, where this is not possible, see if they can be re-used off-site;
- consider appropriate site practices such as how waste materials will be segregated, and the measures that will be used for raising site operatives' awareness of waste reduction, reuse and recycling; and
- set out the method for measuring and auditing construction and demolition waste.

Box 1: Design & procurement stage information resources

There are a number of environmental and sustainability tools available which promote resource efficiency in construction during design processes. These include:

WRAP's Efficient Use of Materials in Regeneration – Guidance for delivering cost effective and sustainable design and construction practices through materials resource efficiency. www.wrap.org.uk/construction

Code for Sustainable Homes – A voluntary scheme for assessing new housing but likely to become mandatory in the future. Baseline requirement plus additional credits available for adopting site waste management plans in accordance with WRAP/Envirowise guidance. www.planningportal.gov.uk/uploads/code_for_sust_homes.pdf

BRE Environmental Assessment Method (BREEAM) – A method for assessing the environmental impacts of new buildings and refurbishment projects either at design stage or at maintenance and operation stage. Covers offices, retail, schools, industrial, prisons, courts and bespoke buildings. www.breeam.org

The Civil Engineering Environmental Quality and Assessment Scheme (CEEQUAL) – Assesses all the potential environmental impacts of a project. Appropriate for large projects or a portfolio of small projects, and used particularly for infrastructure projects. www.ceequal.com

NHS Environmental Assessment Tool (NEAT) – NEAT aims to identify the environmental impacts created during operational activities of NHS healthcare facilities. www.dh.gov.uk

The ICE Demolition Protocol – Describes how demolition and new build design processes are managed to ensure that resource efficiency is achieved. Assists the designer and client in maximising the use of existing building elements. www.aggregain.org.uk/demolition/index

SMARTWaste – A series of tools to help companies monitor and assess their waste. The information can be useful for designers and architects to review design strategies and minimise waste arisings. www.smartwaste.co.uk

Green Guide to Specification – Provides guidance on the relative environmental lifecycle impacts of different elemental specifications for roofs, walls, floors etc. www.bre.co.uk

Design for Deconstruction: Principles of Design to Facilitate Reuse and Recycling (CIRIA, 2004) – Aims to maximise reuse of components and recycling of materials when buildings are wholly or partially deconstructed or demolished. Provides information on the principles and strategies of design for new construction works, to facilitate their eventual efficient, safe and economic deconstruction so as to optimise reuse and recycling. www.ciria.org.uk

Step 4 Requirements for good practice SWMP implementation and targeting of Quick Wins

Pre-qualification requirements

Before issuing full tender documentation, it is cost-efficient to identify those potential contractors that will support the client's objectives for good practice WMM and help to develop them further. This is achieved as part of the overall prequalification exercise for the project, in which prospective bidders are asked to demonstrate credentials against certain headline criteria.

As part of this process, the tenderer's ability in the following areas should be evaluated:

- experience of designing and implementing good practice in site waste management; and
- ability to motivate and specify subcontractors and waste management contractors to deliver the required performance.
- **good practice site waste management plans** implemented in line with DTI and WRAP guidelines that also includes the measurement of waste generated and the percentage of waste disposed of at landfill;
- provide **waste quantities**, costs and destination in specified summary format;
- appointment of a **supply chain manager** during construction and operation;
- waste management contracts tendered on the basis of **optional prices for segregation** of waste streams and increased reuse and recycling;
- waste management contractors to report the **quantities of different waste streams** they manage, and the split of each waste stream between disposal routes (landfill, reuse, recycling, energy recovery); and
- **sub-contractors employed with the same liability as the main contractor** to ensure waste management requirements are fed down the supply chain.

Section 8 includes a suggested question for inclusion in a Pre-Qualification Questionnaire where applicable.

Tender documentation and contractual agreements

It is important to set clear minimum requirements for good practice WMM in the tender documentation, to which all tenders have to comply. The tender requirements that are appropriate for a project, regardless of the procurement route, where good practice WMM is an objective are:

- that the contractor sets quantitative **KPIs and targets** for waste recovery from the most significant waste streams (refer to Section 7 for further information);
- that the contractor commits to **continual improvement targets** for waste reduction;
- use of the **ICE Demolition Protocol** where demolition is taking place as part of the project;

It is recommended that the prospective contractors in their tenders indicate the likely waste recovery targets and KPIs that can be achieved on the project given the stage of the design. The reason for this is two-fold. Firstly, if the design incorporates good practice levels of waste minimisation, there will be less potential for waste generation on-site and therefore a lower target rate should be adopted accordingly. Secondly, the contractor is better suited than the client to propose recovery rates based on their working practices.

Waste recovery targets and KPIs will need to be developed further and agreed with the client in conjunction with the design team prior to appointment of the contractor. Section 6.1 provides further information on setting targets and KPIs by the contractor.

It is important to set clear minimum requirements for good practice Waste Minimisation and Management

6.0 Construction stage

During the construction phase of a project, good practice WMM implemented through a SWMP will have the most impact in terms of minimising the waste produced and the proportion sent to landfill. This section sets out the measures to achieve good practice on-site.

The development of a good practice SWMP and the implementation of it can be adopted

on all sites. However, there is no 'one size fits all' approach because there are certain constraints that will affect what can be achieved realistically. Table 6.1 identifies these key constraints and the measures to adopt in order to overcome them and achieve good practice.

Table 6.1 Key constraints to achieving good practice

Key constraint	Implication	Achieving Good Practice
Lack of a client requirement for good practice	The lack of a contractual obligation may not induce the contractor to implement good practice WMM.	Client and design team to make contractor aware that undertaking more than standard practice is likely to realise financial savings and more efficient site operations.
Site location	Difficult to find local recycling markets in rural locations.	Ensure the waste management contractor can provide a cost effective recycling service.
Project type	Fit out projects offer less opportunities for waste recovery than new build or refurbishment projects	Identify and focus on those material streams that offer Quick Wins – see Section 7.
Space on-site	Small sites and high density sites can limit space available for segregation of waste.	Target the key waste streams in each project phase. Place a requirement on the waste management contractor to segregate off-site. Adopt other segregation approaches such as smaller containers at each floor level for high-rise city centre projects (for example).
Project timescales	Projects with short lead-in periods, tight programmes and quick construction rates may overlook good practice.	Identify and plan the key material streams offering Quick Wins - see Section 7. Implement the areas of good practice that have been shown to be most effective on previous projects. Establish partnerships with waste management contractors to undertake greater role to remove effort from contractor and sub-contractors.
Contract variations	Procurement methods that do not significantly penalise clients for making design changes can increase levels of unplanned wastage.	Set up a dialogue with the client and designers at an early stage so that waste arisings from design changes can be adequately planned. Identify areas in the design that are not sufficiently developed and suggest possible waste implications.

Waste Minimisation and Management does not require a fundamental change in working practice

Depending on the procurement route adopted (see Table 5.1), these constraints should be considered during the design stage by the design team or contractor. The contractor should then plan in more detail for overcoming these constraints during the pre-construction phase of the project.

Figure 3.4 shows that most steps for delivering good practice WMM are undertaken before the project has commenced construction. This is essential to its delivery.

For each of the six remaining process steps, this Section describes the activities to be carried out to achieve good practice WMM and best practice WMM. The following key is used:

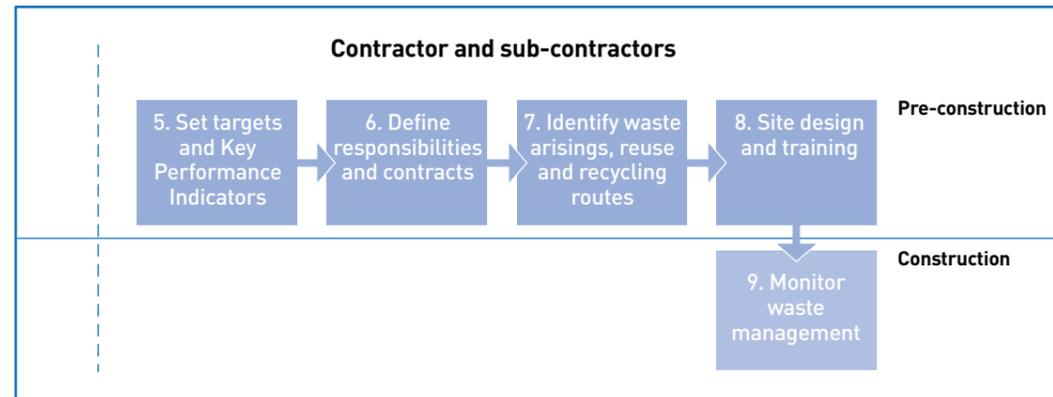
- Activity carried out thoroughly on all sites
- Activity carried out occasionally or at low levels
- Activity not carried out

Green indicates that the activity must be fully carried out to the same standard by the contractor on all their sites. Amber represents where an activity is carried out on some of the sites run by the contractor or where the activity is only partially carried out. This will be expanded where relevant for each process step. Red means that the activity is not carried out on any site by the contractor.

Standard, good and best practice is shown for each activity. The 'traffic light' key can be used by contractors in two ways: firstly to assess their current company practice and secondly, to identify the actions required for achieving good practice WMM and then best practice WMM as a long-term goal.

Standard practice represents the current activities amongst most construction companies. Therefore, it will be clear to identify which steps will be necessary to get to good practice WMM. It is worthwhile noting again that moving towards good practice WMM does not require a fundamental change in working practice and will in most cases result in a cost saving.

6.1 Pre-Construction



Step 5 Set targets and Key Performance Indicators

Setting targets	Standard	Good	Best
Targets based on standard industry KPIs	Red	Green	Red
Targets based on internally developed KPIs	Red	Red	Green

Good practice WMM requires the contractor to establish and agree targets using KPIs for the recovery of materials from the waste stream based on, for example, the Quick Win recovery rates identified by WRAP in Section 7. Meeting these targets and KPIs will become a contractual obligation for the main contractor and sub-contractor and will enable the performance of the project to be monitored during the construction phase.

To meet best practice WMM, targets can be based on specific KPIs developed by the contractor once the lessons learnt from previous project reviews have been embedded within the company. This allows the contractor to demonstrate continued performance in the area of waste management which has wider business benefits.

The following types of target and KPIs, expressed in percentage terms, can be established:

- **recovery of waste materials for reuse and recycling** - different target levels may be appropriate for different stages of construction, such as demolition, new build, fit-out and refurbishment;

- **reuse of materials on site** - particularly relevant where large-scale demolition is included; and
- **reduction in tonnage of waste per unit of construction activity** (evaluated as a continuous improvement target) - if the designer and contractor identify specific areas to be targeted for improvement, such as recycling of plasterboard and reduction in packaging waste, then specific targets can be agreed in these areas. It is also possible to compare total waste quantities against the waste benchmark maintained by Constructing Excellence (i.e. the amount of waste including extracted material, demolition waste etc) in m² removed from site during the construction process per £100,000 of project value.

The measurement of “percentage recovery” KPIs enables the broad performance of projects to be compared between projects by clients and contractors. Performance indicators and benchmarks being developed by BRE under the SMARTWaste scheme will allow projects to be compared with industry benchmarks in the future.

Step 6 Responsibilities and contracts

Duty of Care	Standard	Good	Best
Documentation showing compliance with legal requirements	Green	Green	Green
Responsibility for waste management			
One person designated as overall waste champion	Red	Yellow	Green
Responsibility for individual areas designated to individuals	Red	Red	Green
Waste management contractors			
Dialogue to establish opportunities for recycling	Red	Green	Green
Contractual agreements with high recycling levels; partnerships	Red	Red	Green
Sub-contractors			
Agreements with sub-contractors on how to manage waste	Red	Green	Green
Contractual agreements with set targets and regular reviews	Red	Yellow	Green

It should be standard practice for an individual to be designated with responsibility for the SWMP. For good practice WMM, the individual responsible for the SWMP will also be assigned some further responsibilities associated with waste, but this will stop short of having a waste champion. Under best practice WMM, there will be a clearly designated waste champion or environmental co-ordinator which will hold overall responsibility for waste management. The role includes co-ordinating all waste or environmental issues on-site from waste data to identifying training needs. Sites with a waste champion tend to perform better in managing waste.

As sub-contractors usually generate the waste during construction, good practice WMM requires them to engage with the SWMP process and to be contractually obliged to manage waste accordingly where possible. Incentives for waste segregation and penalties for waste contamination also motivate behaviour.

When appointing a waste management contractor, consideration should be given to their waste recovery performance, service delivery, provision of suitable equipment and advice given.

Step 7 Waste arisings, reuse and recycling

	Standard	Good	Best
Identification of waste arisings and disposal routes			
Listed in the SWMP before site work commences	Yellow	Green	Green
Opportunities for recycling/reuse identified prior to construction	Red	Green	Green
Waste minimisation included in the design; prefabrication etc	Red	Yellow	Green
Reuse of materials			
Inert materials	Yellow	Green	Green
Concrete, soils and inert materials on and off-site	Red	Green	Green
Reuse area on site for all materials	Red	Yellow	Green
Recycling of materials			
Metals and high value materials	Green	Green	Green
Timber, plasterboard, packaging and inert	Red	Green	Green
Take-back schemes with suppliers for materials, packaging etc	Red	Yellow	Green

The identification of waste arisings and their subsequent management is the core of the SWMP. It is important to establish which work package will generate the waste, an estimation of quantities, the waste owner, the waste management method and any control measures.

Section 7 provides further information on those materials that can potentially offer waste recovery Quick Wins for reuse and recycling on a range of projects. Planning for Quick Wins involves planning ahead in terms of how behaviour (segregation, bin size, collection frequency etc) should change for different project phases.

Step 8 Site design and training

	Standard	Good	Best
Site design, storage and logistics			
Layout and skip location considered at design / planning stage	Red	Yellow	Green
Separate containers for hazardous waste	Green	Green	Green
Containers optimised for segregation with clear labels and signs	Red	Green	Green
Segregated containers at workface; use of compacters, balers	Red	Yellow	Green
Clearly located and defined storage areas for materials	Red	Green	Green
Just in time delivery, secure storage areas, no double handling	Red	Red	Green
Training of workforce			
General information on waste in site induction and toolbox talks	Red	Green	Green
Specific training for on-site environmental issues for key staff	Red	Yellow	Green
Feedback welcomed with relevant incentives	Red	Yellow	Green

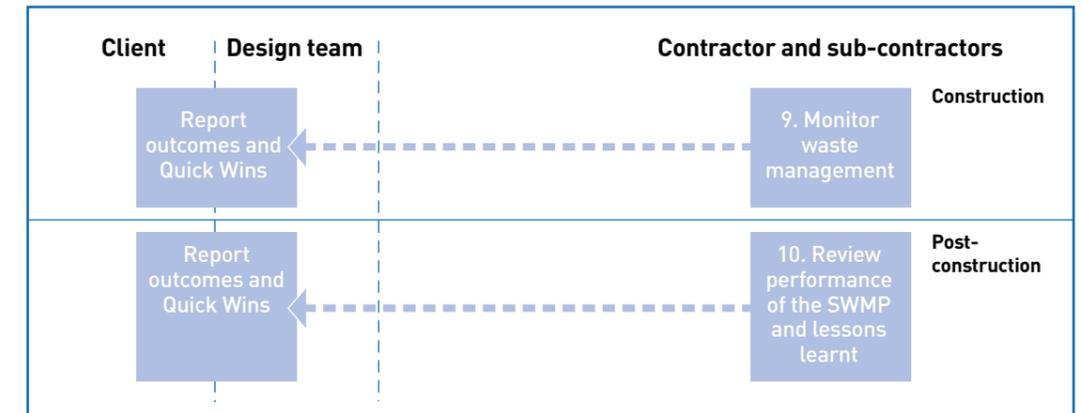
Space permitting, key waste streams should be segregated. Good practice WMM involves segregating timber, plasterboard and packaging in addition to general waste, inert waste, mixed metals and hazardous waste. The segregation scheme should include appropriate training, monitoring and enforcement with clear signage and using the National Colour Coding Scheme.

It is good practice WMM to present information on the SWMP during the induction process and toolbox talks. Toolbox talks are ideal to regularly communicate changes to waste management procedures throughout the project.

Materials should be stored in designated storage areas to protect from damage. Best practice WMM would be to adopt 'just-in-time' delivery to remove all risk of accidental or malicious damage.

Moving towards best practice WMM requires specific training for key internal staff to enable them to train others and gathering feedback from site personnel to better inform the SWMP.

6.2 Construction



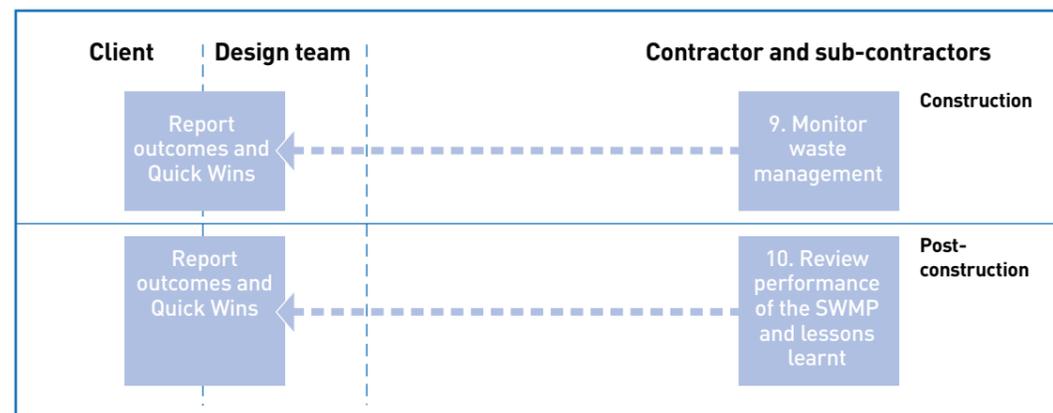
Step 9 Monitoring waste management

Monitoring	Standard	Good	Best
Skip costs monitored, action taken if too high	Yellow	Green	Green
Skip costs and volume data from waste management contractor	Red	Green	Green
Use of auditing tool such as SMARTWaste	Red	Yellow	Green
Regular monitoring of volume/tonnage with reviews for action	Red	Yellow	Green

Under good practice WMM, it should be the aim to obtain data for the amount and type of waste generated to compare against the estimated quantities identified during the development of the SWMP. Waste measurement can include cost, type of waste, amount by volume and tonnage, reason for generation and management route. The actual waste quantities obtained should be compared with the initial targets to identify if the site is under-performing and whether corrective action is required to get back on track. The SMARTWaste auditing tool may be used as a means of logging and generating data.

For good practice WMM, monitoring will occur throughout the project although not on a regular basis. Under best practice WMM, monitoring and measurement of waste will be ongoing with regular interpretation to identify trends and rectify wasteful practices. The results from monitoring waste arisings should be included in weekly or monthly site meetings.

6.3 Post Construction



Step 10 Review performance of the SWMP and lessons learnt

Performance review	Standard	Good	Best
Periodic review of performance, final review at project level			
Regular review during project, lessons embedded in company			

During the implementation of the SWMP on a project, its overall performance in managing waste should be reviewed at least periodically throughout the project to ensure that it is working effectively and so that any anomalies can be addressed.

- comparing performance and setting on-going benchmarks and targets for waste; and
- the gradual development of a bespoke SWMP format and procedures over the medium to long term.

A final review of implementing the SWMP once the project is completed is essential to ensure that any lessons learnt are identified and addressed in future projects. It is better practice however for the lessons learnt to be embedded within the company. Embedding project experience at the company level includes:

- producing generic company-wide SWMP templates;
- integration of SWMPs with existing plans and procedures;

By embedding the lessons learnt, the implementation of SWMPs will become more effective and efficient requiring lower resource requirements. This will translate into increased cost savings due to a reduction in labour costs associated with developing and implementing the SWMP. Incorporating SWMPs into the culture of a company can be used to illustrate a company-wide commitment to best practice WMM for an improved reputation with clients.

Box 2 Construction stage information resources

There are many resources available to assist with implementing SWMPs on-site and resource efficiency in construction.

Legislation

NetRegs – Free advice on environmental legislation relating to the construction sector with regular updates. www.netregs.gov.uk

Waste Management

WRAP How to Guides – For Site and Environment managers, with advice and guidance on how to segregate, reuse and recycle different materials. www.wrap.org.uk/construction/on_site/site_how_to.html

SALVO – Information on the reclamation sector, including materials and products arising from refurbishment/demolition and a materials information exchange. www.salvoweb.com

BREMAP – Provides lists and maps of waste management facilities based on location. www.bremap.co.uk

Construction Recycling Sites – Database of construction-related recycling sites that accept or sell materials. www.ciria.org.uk/recycling

National Colour Coding Scheme – Templates and further information for the colour coding scheme for skips on construction sites. www.wasteawareconstruction.org.uk

Trade Contractors

Envirowise – Environmental fact sheets for labourers, carpenters, bricklayers. www.envirowise.gov.uk

Measurement

SMARTWaste – Details of waste measurement tools and pre-demolition audits. www.smartwaste.co.uk

National Construction Waste Benchmarking – Free website to submit data and produce benchmarks for construction, refurbishment and demolition waste. www.smartwaste.co.uk/wastebenchmarking

Material Specific

AggRegain – Use to find suppliers of recycled aggregates, case studies on the use of recycled and secondary aggregates and specifications. www.aggregain.org.uk

Recycle Wood – Lists wood recyclers and suppliers of recycled wood products. www.recyclewood.org

Community Wood Recycling – Lists organisations that will accept wood waste using social enterprises. www.communitywoodrecycling.org.uk/index.htm

Community RePaint – Accept certain types of paint. www.communityrepaint.org.uk/index.php

Windows – Recycling your window waste – a good practice guide. www.wrap.org.uk

Recovynyl – Provides financial support for the collection of PVC waste. www.recovynyl.gov.uk

Packaging – Envirowise guidance 'Managing packaging waste on your construction site' (GG606). www.envirowise.gov.uk

Plasterboard – Case studies on the segregation, collection and recycling of waste plasterboard. www.wrap.org.uk/construction/plasterboard/case_studies/index.html

Hazred – Working with small companies including construction to reduce hazardous waste. www.hazred.org.uk

General

WRAP – Helps deliver Government targets for construction waste by developing standards and requirements, getting these adopted by construction clients, and supporting investment in waste recovery infrastructure. Free advice, guidance, tools and case studies for addressing resource efficiency at all stages of the construction cycle. www.wrap.org.uk/construction

Envirowise – Free advice, support, guidance and case studies for implementing SWMPs. www.envirowise.gov.uk

CoRE – Provides free access to waste measurement tools for construction projects in the East, South East and London regions. www.smartwaste.co.uk/core.jsp

BRE – Manage SMARTWaste and provide advice, tools, guidance on construction resource efficiency. www.smartwaste.co.uk

C4S – Provides research and consultancy on construction resource efficiency and sustainable construction. www.c4s.info

Construction Excellence – Information, case studies and tools for sustainable construction. www.constructingexcellence.org.uk/zones/sustainabilityzone/default.jsp

CIRIA – Information, guidance, research and case studies relating to waste management in construction. www.ciria.org

7.0 Waste Recovery Quick Wins

7.1 What are Quick Wins?

The previous sections have described how a key component of the SWMP is to identify which waste streams can be targeted to reduce waste. On any project, there are certain key waste streams that can offer significant savings if good practice levels of recovery are met.

By implementing good practice 'Quick Wins' on three to four of the key waste streams on any project (typically those which occur in the largest quantities), there is potential to increase overall recycling rates of construction waste from standard industry performance by more than 20%.

Definition of a Quick Win

A Waste Recovery Quick Win (WRQW) is an improvement in recovery (re-use or recycling) for a specific construction waste material, applicable on a range of construction projects, which will deliver a higher rate of recovery than standard practice without increasing costs and preferably with a cost saving.

Delivering Quick Wins

Particular materials will lend themselves to a range of alternative recovery practices (relative to current practice), dependant on whether they are:

- produced in **sufficient quantities** to make the operating costs of the recovery practice economically attractive;
- **easily segregated** on-site;
- significantly **higher in value** as a segregated waste compared to mixed waste; and
- produced in a locality where **reprocessing options** for those materials are readily available.

In practical terms, the WRQWs will be identified through discussion between clients

and their construction supply chain (including local waste management contractors) to determine the economics and performance levels of alternative recovery practices. This will depend on site-specific parameters such as availability of reprocessing facilities, transport distances, quantities of materials and capacity for on/off site waste segregation.

Cost-effective material recovery

The extent to which material can be recovered in a cost-effective way is determined by the amount of effort and nature of the technology utilised. In practice, the factors which influence these WRQWs will include:

- **waste recovery infrastructure** – the local availability of waste recovery infrastructure (e.g. the presence of a company able to receive plasterboard, for instance, from demolition and/or construction projects, for onward recycling)⁶;
- **gate fees** – the gate fee charged for material accepted at landfill sites, exempt sites and reprocessing facilities; and the value gained from the sale of segregated waste materials where applicable;
- **project baseline** – the baseline performance on waste recovery from which the project is starting from;
- **site type** – the location and space constraints of the site; and
- **time** – the programme and resource constraints of the project.

There is potential to increase overall recycling rates by more than 20%

⁶ Publicly available directories of construction-related recycling sites are available from WRAP (www.aggregain.org.uk/supplier_directory/index.html), BREMAP (www.bremap.co.uk) and the CIRIA database (www.ciria.org/recycling).

Project type and phase

WRQWs are achievable across a range of project types whether new build, refurbishment or fit-out. This covers all sectors including residential, offices, retail, industrial and infrastructure.

Similarly, WRQWs will be available across all phases of the construction process. The specific material WRQWs may change between the following main project phases:

- **Site clearance, preparations and underground services** (e.g. demolition, remediation, bulk earthworks, utilities and foundations).
- **Structural phase** (e.g. frame, walls, roofs, floors, cladding).
- **Internal phase** (e.g. internal walls, plastering and Mechanical & Electrical (M&E) plant).

- **Fit out** (e.g. doors, suspended ceilings, bathroom suites & tiling, carpets & flooring, electrics).

- **External works** (e.g. roads, pavements, hard & soft landscaping).

7.2 Standard, good & best practice performance benchmarks

Standard, Quick Win and Best Practice recovery rates have been established for a range of materials, as summarised in Table 7.1. The recovery rates shown in the table are for total waste recovery, both on-site and off-site.

Table 7.1 Standard, Good and Best Practice recovery rates by material

Material	Standard Recovery %	Good Practice Quick Win %	Best Practice Recovery %
Timber	57	90	95
Metals	95	100	100
Plasterboard	30	90	95
Packaging	60	85	95
Ceramics	75	85	100
Concrete	75	95	100
Inert	75	95	100
Plastics	60	80	95
Miscellaneous	12	50	75
Electrical equipment	Limited information	70*	95
Furniture	0-15	25	50
Insulation	12	50	75
Cement	Limited information	75	95
Liquids and oils	100	100	100
Hazardous	50	Limited information**	Limited information**

* This is a required recovery target for the type of WEEE likely to be produced from construction sites. e.g. lighting (the WEEE regulations, Jan 2007).

** This cannot be 100% as much hazardous waste (e.g. asbestos) must be land filled.

The typical WRQWs for a range of projects, given their quantities of waste and the increase in recovery rate from standard to good practice, are **timber, plasterboard and packaging**. These will mainly apply to the structural, internal and fit-out phases of a project.

Timber recovery – Identified as a key opportunity at the structural phase because of the quantity of form-work and shuttering produced. The nature of this material, in terms of its bulk, potential to recycle and the quantity of arising, makes it a WRQW and strategic opportunity to target and manage through adopting segregated waste management approaches.

Packaging and plasterboard – Through careful targeting and management, these materials represent major opportunities for improved levels of waste recovery – in the region of 90% recovery of plasterboard can be delivered (excluding demolition). Plasterboard is a key waste arising from the internal phase, and packaging likewise for both internal and fit-out phases.

It is worth noting however, that these WRQWs may not be the best opportunities on all projects. It is therefore important that on any project under consideration, all waste streams are considered for their WRQW potential.

7.3 Financial benefit of Quick Wins

WRQWs can potentially achieve significant cost savings in addition to environmental benefits. Identifying, targeting and delivering WRQWs, framed by an effective site waste management plan, can deliver real financial benefits.

To demonstrate this, Table 7.2 shows that savings could be achieved for a £150 million city centre development incorporating retail, commercial, leisure and residential by implementing WRQWs for a range of materials above current practice. The good and best practice recovery rates shown in the table are specific to the project used in this example. The reference recovery rates included in Table 7.1 should be used when setting targets and not those below.

Waste Recovery Quick Wins can potentially achieve significant cost savings

Table 7.2 Summary of WRQWs and their potential cost savings for a case study project

Material	Practice	Recycling Rate (with source segregation)	Project Savings	
			Tonnes Diverted from Landfill	Potential Cost Savings
Concrete	Current	0%	0	£0
	Good	70%	575	£27,200
	Best	100%	822	£38,800
Metal	Current	0%	0	£0
	Good	93%	176	£14,300
	Best	100%	189	£15,400
Timber	Current	0%	0	£0
	Good	70%	120	£15,100
	Best	90%	155	£19,400
Packaging	Current	0%	0	£0
	Good	60%	122	£33,800
	Best	95%	194	£53,600
Excavated soil	Current			Current Practice saving £168,200
	Good	95%	84,075	
	Best			
Canteen waste	Current	0%	0	£0
	Good	30%	44	£3,000
	Best	80%	118	£7,900
Plasterboard	Current	0%	n/a	n/a
	Good	80%		
	Best	100%		
SUMMARY TOTAL	Current Practice		84,075	£168,200
	Good Practice Saving (above current practice)		1,037	£93,400
	Best Practice Savings (above good practice)		441	£41,700

8.0 Model clauses for procurement

This section provides a 'family' of good practice WMM requirements that can be used in generic corporate policy statements, project briefs and prequalification processes, and subsequently in tender, appointment and contractual processes for traditional and design & build procurement processes. Figure 8.1 shows how this wording relates to different stages of both traditional and design and build procurement processes.

Organisations wishing to set a requirement for good practice WMM are encouraged to make use of this model wording and insert as appropriate in their documentation and processes. There is significant overlap between the wording proposed for the different forms of procurement, and comprehensive information is provided for each process resulting in some unavoidable repetition of information.

Use of the model wording

Users are referred to the Disclaimer at the back of this guidance document. The model clauses are not intended to replace standard Terms and Conditions of Contract. They are intended for use as part of the client's specification of the works that define the required output and performance, alongside other clauses on sustainability such as minimum performance on energy and water efficiency. Any organisation or other person should take their own legal, financial and other relevant professional advice when considering the use of the model clauses in any procurement process.

Figure 8.1 Procurement steps at which model wording can be applied

Project stage	Available wording	
Pre-project	Policy statements	
Briefing / pre-qualification	Project briefs	
	Design team pre-qualification	
	Contractor pre-qualification	
Design	Traditional procurement	Design and build
	Appointment of team	
Pre-construction	Tender specifications/briefs	Employer's requirements
	Contract clauses	
	Framework agreement	
Partnering frameworks	Framework agreement	

'In all of our development work, our aim is to minimise any adverse impacts that construction has on the environment'

8.1 Policy statement

Here is a sample of the kind of statement that can be used in environmental or procurement policies to signal intention and provide a mandate for action:

'As part of its commitment to sustainable construction, [Organisation name] aims to improve its efficiency in the use of material resources. One targeted outcome is to continuously reduce the quantity of waste arising and increase the recovery of materials for reuse and recycling on all construction projects. Therefore, in its procurement, [Organisation name] will set requirements for its projects to incorporate good practice waste minimisation techniques and to plan and implement good practice waste management and recovery in accordance with WRAP guidance.'

If there is also a project requirement for recycled content, the statement can be phrased as follows:

'As part of its commitment to sustainable construction, [Organisation name] aims to improve its efficiency in the use of material resources. Two targeted outcomes are to:

- exceed a threshold proportion of re-used and recycled inputs in the products and materials used on construction projects. Minimum requirements will therefore be set by [Organisation name] for re-used and recycled content as a percentage of the value of materials used on a project, and seek the adoption of cost-neutral improvements; and
- continuously reduce the quantity of waste arising and increase the recovery of materials for reuse and recycling on all construction projects. Minimum requirements will therefore be set by [Organisation name] for its projects to incorporate good practice waste minimisation techniques and to plan and implement good practice waste management and recovery in accordance with WRAP guidance.' Further guidance on recycled content can be found at www.wrap.org.uk/construction in particular, guidance entitled *Setting a Requirement for Recycled Content in the Procurement of Construction Projects*.

8.2 Project information / briefs

Where the client sets a high-level brief to the design team or contractor (in the case of design & build and PFI processes), the following wording can be included to define the overall objectives and requirements for environmental performance – thereby providing the mandate for appropriate technical solutions to be offered:

Under general design objectives, the following text is appropriate:

'In all of our development work, our aim is to minimise any adverse impacts that construction has on the environment. We seek this through the design process, materials selection, construction techniques and operational methods. All organisations appointed to work on our behalf are required to work in accordance with these principles. Specific information on our environmental policy is set out in [Insert reference to the relevant document on this topic], to which all consultants and contractors appointed on our projects are expected to conform.'

Alongside information on energy efficiency, water efficiency and other environmental performance criteria, the following text can be used to describe aims for materials resource efficiency:

- 'In respect of the efficient use of materials, our aim is to minimise the consumption of finite natural resources and to minimise the quantity of waste being sent to landfill sites. Therefore, as general design principles, we seek the following where commercially viable (in accordance with the waste hierarchy):
- efficient design and stock control to minimise the use and waste of materials;
 - re-use and refurbishment of existing infrastructure;
 - use of reclaimed products and materials;
 - Use of renewable materials from legal and sustainable sources (such as timber with appropriate certification);
 - waste minimisation on site;
 - recycling of construction, demolition and excavation waste; and

- Procurement of products and materials with good practice levels of recycled content (relative to other products meeting the same specification).

These objectives should be pursued while avoiding adverse impact on cost, quality or other requirements in this brief, and minimising transport (especially road transport of heavy materials) where feasible.⁷

Where there is a specific outcome for good practice waste minimisation and management, it can be phrased as follows⁷:

'As a minimum, we require a Site Waste Management Plan (SWMP) to be developed from the pre-design stage to inform the adoption of good practice waste minimisation in design, and for the SWMP to be implemented in all construction site activities in line with good practice published by WRAP. The Plan is required to set targets for waste reduction and recovery based on an assessment of the likely composition and quantity of waste arisings and identification of the most significant cost-effective options for improvement (Quick Wins). This should be supplemented by information on how the targets will be achieved during construction activities and how the actual levels of waste reduction and recovery will be monitored for comparison with the targets set.

The applicable Quick Wins will need to be determined following analysis of the specific project, but they are likely to include timber, plasterboard and packaging. Other recovery opportunities may exist for the following waste streams:

Metals	Insulation
Concrete	Ceramics
Plastics	Inert
Electrical equipment	Cement
	Furniture

Resources for identifying Quick Wins with minimum effort are available from www.wrap.org.uk/construction/

8.3 Pre-qualification

Assessment of capacity and competence to respond to a requirement for good practice WMM should be included in pre-qualification processes for all parties involved in delivering a project (e.g. designers, contractors, sub-contractors and consultants). Generally speaking, information on ability to reduce wastage and increase recovery of materials should be included alongside other information on environmental performance criteria for the project, such as recycled content in construction projects.

It is expected that pre-qualification processes will include a questionnaire (PQQ) and may be followed by an interview to explore issues in more depth. If the issue of waste management is to be raised during a supplier interview, it is good practice to flag up its importance by including it within the PQQ, thereby providing an opportunity for suppliers to prepare a response.

Following are some examples of PQQs which might be suitable for different members of an organisation or project-specific supply chain. They are followed by guidance on how to interpret different responses and pursue the matter further at interview.

8.3.1 Designers, contractors, sub-contractors and consultants

Prequalification question:

'Does your company have the skills and experience to implement good practice waste minimisation and management in accordance with WRAP guidance during the design and/or construction phase?' [see www.wrap.org.uk/construction/](http://www.wrap.org.uk/construction/)

Although it is clearly of benefit for the professional consultants to have a good understanding of good practice WMM, it is of most importance if the designers, contractors and sub-contractors are able to implement good practice WMM and identify waste recovery Quick Wins. Therefore, they should be able to demonstrate an appropriate awareness and working knowledge accordingly, such as the WRAP guidance.

Should any party fail to respond appropriately to the question, it may be appropriate to refer that party to WRAP's resources, making it clear that ability to address this issue would be a necessary component of successfully meeting the contract requirements.

If a specific design team member or contractor is identified to take overall responsibility for delivering good practice WMM, it is particularly important that this individual has a good grounding in the processes described in this guidance.

If an interview stage is included, questions could check the specific skills and knowledge levels required by each type of consultant. Whilst it is important that all consultants and contractors understand the issue of good practice WMM, specific skills are required by certain roles. For example, the designer should have a good working knowledge of waste minimisation methods in design and be able to begin the development of the SWMP. Similarly, the contractor should demonstrate experience of operating a SWMP in line with published good practice, and know how to manage subcontractors and waste service providers to deliver the required data and site practices.

Identified below are some model questions to be included in the interview guidance:

1. Which good practice WMM processes do you think are applicable to this project and why?
2. What knowledge and experience do you have in developing and/or implementing site waste management plans to good practice levels on construction projects?
3. What is your experience in setting waste recovery targets, measuring waste streams on-site and implementing review processes?

These questions encourage the respondent to expand upon and be specific about the skills and knowledge which they possess.

⁸ This will sit alongside requirements (where applicable) for the use of materials with recycled content – refer to the WRAP guidance on 'Setting a Requirement for Recycled Content in the Procurement of Construction Projects'.

8.3.2 Waste management contractors

The contractor or sub-contractors should obtain performance information from their waste management contractors being considered for a project prior to appointment. Examples of the prequalification questions that can be asked are:

1. Does your company audit and monitor its performance on reuse and recycling of individual waste streams?
2. How have you worked in partnership with contractors and/or sub-contractors to measure quantities of specific waste streams for individual projects to help achieve high levels of waste recovery?

If the waste management contractor cannot sufficiently answer the above two questions for example, it may then be appropriate to ask '**in what ways could you help achieve the client's objective for good practice waste recovery?**' This will identify whether the waste management contractor can potentially work in partnership with the contractor or sub-contractor on the project.

8.4 Tender specifications, contracts and appointments

The key requirement at this stage is to set out clearly what is expected of the design team and main contractor and how they will demonstrate that they have fulfilled their role in meeting the requirement for good practice WMM⁸. The requirements are formulated in different ways for traditional procurement versus design & build, in order to set out responsibilities clearly.

8.4.1 Traditional procurement

Under the traditional procurement process, the client is involved in separate tendering and appointment processes for the design team and for the contractor. As a result, there are two phases of appointment into which the requirement for good practice WMM should be incorporated – first the designer and then the contractor.

⁷ A specific outcome for the use of materials with recycled content should be set here also where applicable – refer to the WRAP guidance on 'Setting a Requirement for Recycled Content in the Procurement of Construction Projects'.

Appointment of designers

The design team has a key role in ensuring that good practice is adopted (if requested by the client). They are responsible for the following:

- implementing cost-efficient methods of waste minimisation for the project during the design stage;
- identifying possible Quick Wins for waste reduction and recovery, reviewing any additional Quick Win areas proposed by

the contractor, discussing which options the contractor will adopt, and estimating the potential outcome for the project; and

- developing targets for waste reduction and recovery in the project specification for agreement with the contractor.

After prequalification, the following wording may be incorporated in the designer's form of appointment:

'With respect to the project objective for good practice waste minimisation and management, the Designer shall take responsibility for:

- identifying appropriate methods of waste minimisation during the outline design stage and reporting to the Client the economic and practical implications of implementing these methods during the detailed design stage;
- agreeing with the Client which methods of waste minimisation to pursue and subsequently implementing the agreed methods at the appropriate design stage;
- identifying the most significant potential opportunities for achieving waste recovery Quick Wins as defined by WRAP and estimating likely recovery rates;
- ensuring that the Contractor is fully informed at tender/negotiation stage (or before) of the Client's requirements with respect to the implementation of good practice waste minimisation and management within the economic, physical and design constraints imposed by the project. As a minimum, the Design shall provide the Contractor with:
 - a brief description of the Client's policy context;
 - the requirement to adopt a good practice approach to implementing the site waste management plan and minimising waste during construction in accordance with WRAP guidance;

- a list of the most significant waste recovery Quick Win opportunities and likely recovery rates that could be achieved; and
- a statement outlining the Contractor's responsibilities for (a) selecting and agreeing the most significant Quick Win opportunities and target recovery rates with the Designer/Client, and (b) measuring and reporting actual performance against the agreed targets.
- agreeing with the Contractor which of the identified potential opportunities will be adopted and the waste recovery target to be achieved (to be known as 'selected Quick Wins'). Where one or more of the identified opportunities have not been adopted, justification of the commercial or technical reasons behind this decision should be provided;
- developing the SWMP in accordance with good practice during the design stage for handing over to the Contractor once appointed for completion prior to work commencing. The Designer is to liaise with the Contractor as necessary as the SWMP develops;
- reporting the Contractor's performance against the waste recovery targets to the Client;
- monitoring and reporting the Contractor's obligation to Duty of Care; and
- use of the ICE Demolition Protocol where relevant.⁹ (www.aggregain.org.uk/demolition/index.html).

The above statements apply to framework and traditional contracts. Where full design & build (single point responsibility) procurement is used, the contractor should take on the designer's responsibilities and any negotiations regarding the agreement of waste recovery targets should be carried out during the design stage and negotiated with the Employer's Agent on the client's behalf (see below). Similarly the Employer's Agent should be responsible for advising the client

on the validation evidence at contract completion.

Tender specifications / briefs

Here is some model wording that can be incorporated into the tender specification for the procurement of a construction project:

Under the preliminaries section or general conditions, introduce the following wording:

'As one of its objectives on sustainable development, [Organisation name] is seeking to maximise the cost-effective use of materials recovered from the waste stream – thereby diverting waste from landfill and reducing demand for finite natural resources. Therefore, [Organisation name] requires the project to achieve good practice waste minimisation and management in accordance with WRAP guidelines⁹.

This project is required to adopt the most significant cost-neutral opportunities to increase waste recovery. The list of anticipated waste streams that could deliver the most significant increases in waste recovery for the project and their respective good practice levels are included in this tender document.

The Contractor is therefore required to include in their tender the opportunities for waste recovery they will implement, identifying the minimum recovery rate that will be achieved in each. The Contractor will need to provide justification where there is any discrepancy with the recovery rates proposed in the tender documentation. Specifically, the Contractor shall (in association with his trade sub-contractors and waste management contractors where appropriate):

- assess the proposed waste streams and recovery rates given in the tender documents, identifying those that the Contractor considers to be realistic and the likely cost implication to the project;
- where possible, identify other waste streams that offer higher recovery rates and/or will be more cost-effective to achieve which the Contractor proposes to use as an alternative to those listed in the tender documents; and

- be prepared to negotiate a final List of Quick Win waste recovery rates to be included in the Contract documents (if awarded) for implementation in the project and appointing trade sub-contractors and waste management contractors with the same liability as under the main contract where applicable.

The Contractor will also be required to develop and implement a Site Waste Management Plan to achieve good practice waste management on the project. Therefore, the Contractor is required to include in their tender details of how the Site Waste Management Plan will be developed and implemented with specific reference to the constraints of the project, the management of these constraints, their supply chain, programme of key steps and reviewing performance. This should include a list of measures to minimise waste generated from on-site operations (for example, damage, theft etc).

Where relevant, the Contractor should employ a systematic approach to good practice in the recycling and re-use of locally available construction, demolition and excavation waste materials (on-site and from nearby sites) – for example, applying the methodology outlined in the Demolition Protocol (published by ICE, London Remade and Envirocentre).'

⁹ Where applicable, a target for the use of products and materials with recycled and re-used content should also be introduced under the general design objectives and architectural specification – refer to the WRAP guidance on 'Setting a Requirement for Recycled Content in the Procurement of Construction Projects'.

Contracts

With respect to the implementation of good practice WMM agreed with the contractor, the contract documentation may contain wording along the following lines:

'With regards to the Client's project objective for good practice waste minimisation and management, the Contractor's responsibilities under this Contract are to:

- meet the agreed minimum recovery rates for the specific waste streams included on the 'List of agreed Quick Win waste streams' unless otherwise agreed in writing by the Client;
- develop and implement the SWMP in accordance with the methodology included in the contract documents and undertake the measures to minimise waste contained therein;
- measure waste arising during the works and compare with the minimum recovery rates set under this Contract and then report these findings to the Contract Administrator [or other lead consultant] (in a form to be agreed) every [X] weeks at project meetings, including measures to be implemented to meet the minimum recovery rates if actual recovery is below target;
- appoint trade sub-contractors and waste management contractors with the same liability as under this Contract to meet minimum recovery rates (where applicable) and to support the Contractor to measure, monitor and report actual waste arising during the works; and
- ensure compliance of all appointed trade sub-contractors and waste management contractors with the legal requirements under the Duty of Care regulations and taking all reasonable actions as appropriate for non-compliance.'

Sub contracts and waste management contracts

Trade sub-contractors should be appointed with the same liability as under the main contract to ensure that the client's requirements and contractor's obligations are passed down through the supply chain. Therefore, any recovery targets on specific waste streams should be imposed on trade sub-contractors as well pursuing the minimisation of waste generated through on-site activities and compliance with the requirements of the SWMP.

The role of the waste management contractor is essential to good practice WMM because they are in an optimal position to measure actual waste arisings for comparison with the SWMP. The key responsibilities of the waste management contractor should therefore include:

- compliance with environmental legislation in relation to waste management, including compliance with the Duty of Care and the requirements of the Environmental Protection Act 1990 and related legislation;
- monitoring Trade Contractors compliance with the SWMP;
- management of all waste on site, in terms of segregation, storage, movement of waste around the site, collection and delivery of skips etc;
- arrangements for the transfer of waste for treatment, recycling or disposal;
- maintenance of accurate records (Waste Transfer Notes, Special Waste Consignment Notes, copies of Waste Carriers Licences, Waste Management Licences and Exemption details);
- monitoring and regular reporting to the Main Contractor accurate information on the quantity and cost of the waste recycled, reused and landfilled for each material type to assess performance against agreed waste recovery targets;
- compiling data relative to Key Performance Indicators;
- proposing improvements to increase recycling/reuse of waste or improve management of waste on site;

- attending regular meetings with the Main Contractor, agree agenda and make and distribute a record of each meetings and action points arising to an agreed template;
- providing suitable waste containers, plant, equipment and personnel as necessary; and
- providing appropriate waste management advice and training to key on-site personnel as necessary.

A key requirement of a waste management tender in order to facilitate segregation, should be for the waste management contractor to provide optional prices for segregation, or high levels of recovery at a transfer station (e.g. >90). The waste management contractors should also be asked to provide a price on the basis of the "traditional" approach – with weightings for method and cost – then allowing a decision to be made on the preferred contractor, if the segregated option proves to be uncompetitive.

Model contract clauses for trade sub-contractors and waste management

'[Organisation name] is committed to improving the environmental performance of their construction projects. Designs and specifications should consider the environmental impact of all elements of the design including choice of materials. One important contribution to sustainability goals is the efficient use of finite natural resources, diverting waste from landfill. This can be achieved by meeting good practice levels of waste minimisation and management throughout the project in accordance with WRAP guidelines and by adopting the most significant cost-neutral opportunities to increase waste recovery¹⁰.

The Contractor is required to implement where possible cost-effective methods of good practice waste minimisation during the design of the project and thereafter during construction. As a minimum, the Contractor should:

contractors have been developed and are contained in the technical document also produced by WRAP.

8.4.2 Design & build procurement

Design & build poses a different challenge to the setting of requirements for good practice WMM as the client (Employer) is responsible for the project brief and contractor appointment, and it is the contractor that subsequently owns the processes of design and construction.

The vehicle for setting minimum requirements is the Employer's Requirements. The Employer's Requirements contain a set of performance criteria which the contractor must meet. The contractor is responsible for developing these criteria into a suitable design and then for constructing the building.

Employer's Requirements

The tender documentation may include the following wording within the Employer's Requirements:

- Identify appropriate methods of waste minimisation in design before detailed design commences and report to the Employer's Agent on the economic and practical implications of adopting these methods during the development of the design.
- Agree with the Employer's Agent which methods of waste minimisation to implement at the appropriate design stage and demonstrate how the methods have been incorporated into the design.
- Include a list of measures within the Site Waste Management Plan (see requirements below) to minimise waste generated from on-site operations (for example, damage, theft etc) and demonstrate how these measures have been implemented.

¹⁰ Where applicable, it can also be stated that 'using materials that have above-average recycled content, employing both off-the-shelf mainstream products such as ..., and materials that have been recycled on-site such as ...' can achieve the efficient use of finite resources – refer to the WRAP guidance on 'Setting a Requirement for Recycled Content in the Procurement of Construction Projects'.

The Contractor is also required to meet specified minimum waste recovery rates for the waste streams with the largest cost-effective recovery potential (to be known as 'selected Quick Wins'). The Contractor is required to identify and agree with the Employer's Agent the key opportunities for Quick wins on the project and set minimum recovery rates to be achieved. Specifically, the Contractor's responsibilities (in association with his trade sub-contractors and waste management contractors where appropriate) shall be to:

- identify, and continually review as the pre-construction design develops, the waste streams with the largest cost-effective recovery potential and estimate likely recovery rates for each waste stream;
- agree with the Employer's Agent before the commencement of construction those waste streams that will provide the most significant opportunities for cost-effective recovery (to be known as 'selected Quick Wins') and the minimum recovery rates to be adopted for the project;
- meet the agreed minimum recovery rates for the selected Quick Wins unless otherwise agreed in writing by the Client;
- measure waste arising during the works and compare with the minimum recovery rates set for the project and then report these findings to the Employer's Agent (in a form to be agreed) every [X] weeks at project meetings including the measures to be implemented to meet the minimum recovery rates if actual recovery is below target; and
- appoint trade sub-contractors and waste management contractors with the same liability as under the Employer's Requirements to meet minimum recovery rates (where applicable) and to support the Contractor to measure, monitor and report actual waste arising during the works.

To assist the effective delivery of the above requirements, the Contractor should develop and implement a Site Waste Management Plan (SWMP) to achieve good practice waste management on the project. Specific Contractor responsibilities will be to:

- provide and agree a methodology with the Employer's Agent before detailed design commences regarding how the SWMP will be developed and implemented with specific reference to the constraints of the project, the management of these constraints, their supply chain, programme of key steps and reviewing performance. This should take into account good practice guidance published by WRAP and other organisations;
- develop the SWMP as the design progresses in accordance with the agreed methodology for completion prior to construction commencing. A copy of the completed SWMP should be provided to the Employer's Agent prior to construction commencing;
- implement the SWMP during construction in accordance with the agreed methodology; and
- ensure compliance of all appointed trade sub-contractors and waste management contractors with the legal requirements under the Duty of Care regulations and take all reasonable actions as appropriate for non-compliance.

Where relevant, the Contractor should employ a systematic approach to good practice in the recycling and re-use of locally available construction, demolition and excavation waste materials (on-site and from nearby sites) – for example, applying the methodology outlined in the Demolition Protocol (published by ICE, London Remade and Envirocentre).'

8.4.3 Partnering frameworks

Under a partnering process, the basic wording described previously can be applied (for either a traditional or design & build process depending on the nature of the framework). However, under a partnering framework a further document, the partnering agreement, will be produced clearly setting out the high-level objectives and performance measures of the framework and defining the roles and responsibilities of the different partners. There should also be

an expectation that the partners demonstrate continuous improvement in performance.

A typical partnering agreement will include information on the framework objectives, KPIs against which the team's performance can be monitored and roles and responsibilities. The following wording could be used as a basis (although on an actual project it is important that the detailed wording should be agreed by all partners):

'Objectives

[Insert under an objective relating to sustainable construction]
Good practice waste minimisation and management is an important element of sustainable construction, therefore the projects delivered under this agreement will seek to:

- adopt the principles of good practice waste minimisation and management in line with WRAP guidance from an early stage, preferably pre-design;
- demonstrate an increase in overall waste recovery for reuse and recycling achieved on all projects to at least good practice levels (as defined by WRAP) and continual improvement towards best practice; and
- implement a Site Waste Management Plan in line with good practice as published by WRAP to evaluate what level of waste recovery for reuse and recycling is possible, set targets for materials diverted from landfill and demonstrate that these targets have been met.

Performance indicators

[Insert under the section on KPIs to measure continuous improvement]
Waste recovery – Increase in percentage recovery rates for specific waste streams above those which would have been achieved if only 'standard' practices for WMM (as defined by WRAP) were employed.

Roles and responsibilities

[Insert with respect to resource efficiency]
Under this agreement, the project architect (or other appropriate consultant) shall identify potential Quick Win opportunities to increase the waste recovery rates on a project, implement methods of waste minimisation in the design and begin the development of the project Site Waste Management Plan. The contractor and their subcontractors are responsible for selecting the most significant Quick Wins to implement on a project, setting target recovery rates and taking responsibility to develop the Site Waste Management Plan and implement it during construction.'

8.4.4 Demolition

When the project includes significant demolition works on site, the following additional clauses may be used:

'The contractor shall adopt the methodologies established by the ICE Demolition Protocol to facilitate the recovery of materials (recycling/reuse) from the demolition work and to identify the potential for the incorporation of recovered material in the new-build/permanent works. This incorporated recovered material will contribute to the overall target of X% minimum reused and recycled content (plus evidence of good practice) set for the project [if applicable]. The contractor shall:

- undertake a pre-demolition audit and produce information on the quantities of material and the recovery targets in the format required by the ICE Demolition Protocol. This is referred to as the D-BOQ (Demolition Bill Of Quantities);
- consult with local material recovery organisations. The outcome of these consultations and the opportunities to maximise the reuse and recovery of material during the demolition process shall be reported to the client 4 weeks prior to the commencement of demolition works;
- produce a statement on the approach to site planning for the recovery of materials. This will include a drawing of the sites indicating the locations of material storage;

- set out in their tender response a mechanism by which the recovery of materials can be monitored against the targets. Examples for this are provided by the ICE Demolition Protocol; and
- determine the potential to specify recovered materials in the permanent works, using the materials recovered from this and other local projects. Quantify the contribution to the overall recycled content by value of the project resulting from these materials.

The ICE Demolition Protocol is an established mechanism which facilitates the cost-effective recovery of demolition materials and to identify the potential for the incorporation of recovered material in the new-build/permanent works. The client [replace with the name] is committed to sustainable development and therefore supports the incorporation of the ICE Demolition Protocol methodologies into demolition and construction projects.

WRAP (Waste & Resources Action Programme) has a freely accessible tool at www.wrap.org.uk/rctoolkit for assessing the overall reused and recycled content in a project. This tool would enable the contractor to demonstrate their compliance with the X% recycled content target and the contribution from materials recovered from the demolition works.'

9.0 Conclusion

This guidance provides a summary for construction clients, design teams and main contractors for achieving good practice WMM on their construction projects. This will help reduce the amount of construction waste sent to landfill, thus demonstrating a contribution to sustainable development and reducing project costs.

Good practice WMM can be achieved on all forms of project without a fundamental change in working practice. In summary, key aspects of achieving good practice WMM include:

- early project implementation by the client **to maximise potential benefits;**
- setting requirements for its delivery by the entire supply chain;
- adopting a SWMP in accordance with good practice to inform design and manage waste on site; and
- identifying Waste Recovery Quick Wins **on several waste streams.**

WRAP have produced two further guidance documents for achieving good practice WMM: a high-level business case for client decision makers and a technical summary for implementation by the contractor and their supply chain. In addition, WRAP's construction portal

www.wrap.org.uk/construction contains extensive related information covering all aspects of materials use in construction, including case studies, reference guides and managing specific waste streams.

Front cover photograph: Separate containers being used to segregate waste as it is produced at specific locations around the site.

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