

# Reduction of Site Construction Waste, Recycling and Re-use of Materials: A Site Guide

## Ten actions for site managers

- 1 **Ensure** sub-contractors are briefed on project aims for waste reduction and segregation.
- 2 **Establish** a company or site benchmark (or use ours) against which to measure results.
- 3 **Allocate** clear and accessible space for segregated waste skips.
- 4 **Use** mini-skips where work is remote from main skip area and transfer by forklift.
- 5 **Engage** all site workers with toolbox talks, briefings and canteen poster campaigns.
- 6 **Publish** waste performance figures on site and elsewhere.
- 7 **Compare** performance with other sites in your company/ area/industry sector.
- 8 **Use** existing staff, such as forklift drivers, to monitor operation of waste segregation.
- 9 **Re-use** as much of the waste as possible on site, e.g. brick/concrete.
- 10 **Identify** new outlets for and ways to use waste products.

## Main lessons learnt at Greenwich

Good 'housekeeping' of waste is important and improves site safety. So:

- Make waste a key site improvement target from the start of the project.
- Set realistic targets.
- Make sure that responsibility for individual wastes is clearly defined.
- Use toolbox talks and posters to keep waste 'on the agenda' for all.
- Be aware that waste volumes increase as completion is approached.
- Packaging is a major contributor to waste.
- Ensure that materials are stored in appropriate conditions.

## Engage the whole supply chain

- Engage the help of your waste removal contractor in the process.
- Use supplier take-back schemes wherever possible.
- Seek outlets for materials for recycling – paper, timber etc.
- Re-use as much waste material on site as possible.
- Return over-ordered materials wherever possible.

## Separation of specific waste streams is crucial

- Clearly mark segregated waste skips in an accessible area.
- Use forklift drivers to monitor segregation.
- Use tools such as SMARTStart to assist in managing waste.
- Compact waste in skips to reduce volumes.

**Attention to these themes should lead to dramatic improvement in your site's performance in reducing and dealing with waste.**



## Introduction

The total annual material resource requirement for UK construction is estimated to be 424 million tonnes. Around 94 million tonnes of waste is produced annually by construction and demolition.

The costs of these materials and of waste disposal have increased dramatically over the last decade and are set to continue to rise due to the following reasons:

- Tighter regulation of waste management throughout the EU.
- Landfill taxes increasing from £14 to £35 per tonne by 2013.
- Taxes on primary materials such as the Aggregates and Climate Change Levy.
- Obligations to recycle packaging waste.

These factors make a strong commercial case for reducing waste and for the re-use or recycling of unavoidable waste. But attention to site waste also plays an essential part in improving environmental performance, staying competitive and in improving profits.

The whole project team, from labourer to client, can have a positive impact on waste reduction, re-use and recycling, often through very simple changes.



*Greenwich Peninsula land-use plan*

## Greenwich Millennium Village

The Greenwich Millennium Village (GMV) construction waste benchmarking and minimisation research took place over a period of three years, from May 2000 to April 2003. It was made possible through Landfill Tax funding from the Hanson Environment Fund and matching funding from Greenwich Millennium Village Limited. Greenwich Millennium Village is a joint venture development by Countryside Properties and Taylor Woodrow in association with English Partnerships.

The key theme of the development is the promotion of sustainable urban development embracing latest design, innovation and technology. Greenwich Millennium Village forms part of the redevelopment of Greenwich Peninsula.

Phase 1a of GMV provides 100 apartments at the northernmost part of the site beside the River Thames and adjacent to the man-made lake and Ecology Park. The 100 units have a concrete structural frame with lightweight dry lined timber studding and wet applied render cladding. The two buildings have an overall area of 10,226m<sup>2</sup> and were completed in September 2001.

Phase 2a is a mixture of low and high rise building forms. The high-rise (88) units are in situ concrete frame with rainscreen cladding. The low-rise units (98) are two to four storey timber frame buildings with rainscreen cladding and timber windows. Total floor area is 15,256m<sup>2</sup> and the units were completed between December 2000 and January 2003.

### Client commitment to sustainability

From the outset English Partnerships and Greenwich Millennium Village Limited required that the key sustainability targets be met over the duration of the development, with interim milestones for review.

The targets included:

- Reducing primary energy.
- Reducing embodied energy.
- Reducing water consumption.
- Reducing construction cost.
- Reducing project duration.
- Zero defects.
- Reducing construction waste.
- Integration of tenures.
- Promotion of a mixed use development.
- Positive encouragement of a sustainable development.

Reducing construction waste also contributes to reducing construction cost and embodied energy.

### Waste reduction target

A 50m<sup>3</sup> waste per dwelling benchmark was calculated from skip returns from previous residential developments. The target for the reduction of waste at GMV was set at 50% by the end of the project, requiring the volume of site generated waste to fall from 50m<sup>3</sup> per dwelling to 25m<sup>3</sup>.

This was to be achieved through improved site practices and partnering with suppliers and sub-contractors. This level of improvement has been achieved at the first interim milestone in 2003.

The BRE SMARTWaste system was used to measure the underlying causes of construction waste and to monitor subsequent actions.

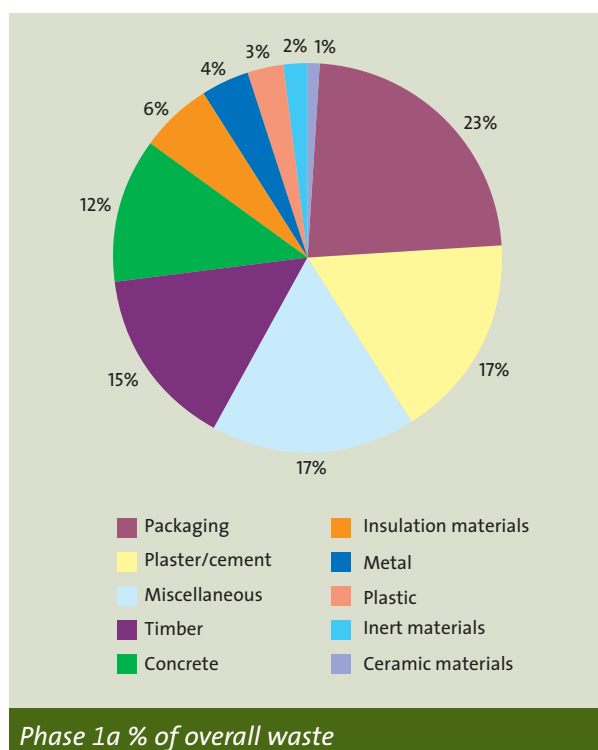
Throughout the construction of the 300 homes in Phases 1a and 2a waste data was collected on:

- Types of waste.
- Quantity.
- Location.
- Disposal.
- Cause of waste as it was being produced.

At the end of this time (2003), the overall amounts of waste and savings for Phases 1a and 2a were collated. Thanks to the efforts of the whole project team the target to reduce waste sent to landfill was exceeded.

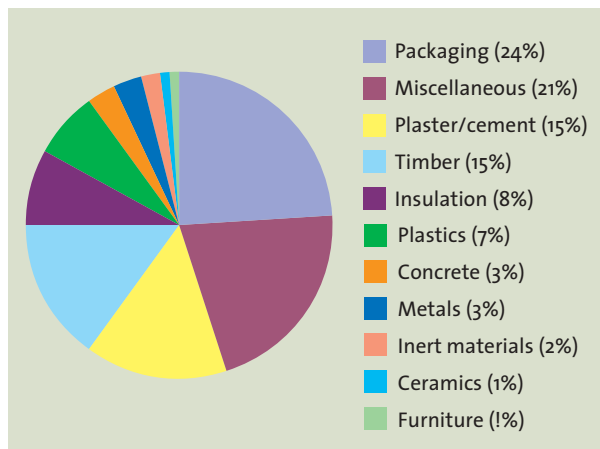
### Phase 1a results

- The construction produced 23.4m<sup>3</sup> of material waste per apartment, excluding segregated waste.
- Total number of skips - 614 (4.5m<sup>3</sup>) representing six skips per dwelling.
- General void space contained in skips was calculated at 52%. (Little compacting was done).
- Plasterboard was taken back by the supplier.



## Phase 2a results

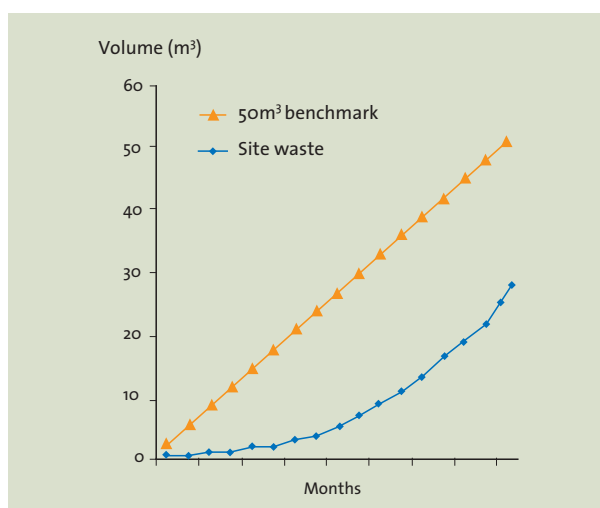
- The overall volume of waste produced during the construction of apartments was 20.5m<sup>3</sup> per unit, excluding segregated waste.
- Total number of skips – 855 (4.5m<sup>3</sup>) – approximately five skips per dwelling.
- The general void space in skips was calculated as 32%. (Compaction and careful skip loading significantly reduced waste volume).
- There was no plasterboard take-back on this phase.



Phase 2a % of overall waste

## Waste profile

The volume of waste increased sharply towards the end of the construction phase. This is mainly due to packaging and site clearance.



Waste profile per dwelling against benchmark

## Costs and benefits

At the benchmark 50m<sup>3</sup> per dwelling 3,178 skips would have been needed. The actual number of skips used was 1,469, a saving of 1,709 skips. This reduction in skips leaving the site represents a cost saving of around £150,000 over Phases 1a and 2a.

When adding the savings for segregated skips (charged at only £60 per skip), there is a further saving of around £4,000. These cost savings will increase as the price of waste disposal rises, as it inevitably will, over the coming years.

There were also unquantified savings in the reduced volume of construction products required where waste was minimised and/or materials were re-used or recycled.

Further benefits were derived from cleaner, tidier and safer site conditions.

## Waste reduction, re-use and recycling

- **Reduction** – waste is not produced, e.g. length of timber is right size and doesn't need cutting.
- **Re-use** – waste finds another use on site, e.g. timber offcuts used as noggins, pallets for storage.
- **Recycling** – waste is processed to make something else, e.g. bricks crushed for use as hardcore, paper sent for reprocessing.

At GMV targets were met and bettered through a series of waste reduction, re-use and recycling activities. The measures put in place at GMV may not all be possible on every site. Local conditions, such as distance to reprocessing facilities and space on site often dictate the viability of any waste minimisation and management strategies.

*However, one key arrangement MUST be used on every site – separation of individual waste streams allowing segregation of the waste and reduction in costs for disposal.*

## Other 'things to do' on your site include:

### Address waste issues early

- Plan waste management into your site, e.g. where to place skips, chutes and other waste management facilities.



Segregated skips

- Target waste management activities relative to work programme. Discuss timing and requirements for waste management.
- Plan for storage. Poor storage of materials is often a major cause of waste on site.



Good storage (left) and bad storage (right)

- A tidy site will produce less waste and be more efficient.
- Include waste management in subcontracts.
- Assess previous waste generation and set realistic targets from company records or from your personal knowledge of previous sites.
- Discuss take-back schemes early with suppliers.

### Keep at it!

- Appoint a site 'waste champion'.
- Collect and disseminate information about your ongoing waste generation.
- A simple tool for collecting waste information (SMARTStart) is detailed at the back of the guide.

- Hold short weekly meetings with the key site personnel to discuss problems and opportunities relating to waste on site or incorporate waste in the agenda of other meetings.
- Raise awareness using toolbox talks, posters etc, to make sure that everyone working on the site is aware of the importance of waste minimisation and management on site.



SMARTWaste poster

## Simple things

Simple measures that can be implemented to reduce the generation of waste and increase recycling:

- Segregate materials that can be recycled.
- Use Yellow Pages and other sources to locate recycling sites, waste operators etc. From July 2003, SMARTStart will incorporate details of such facilities.
- Re-use offcuts. Offcuts of timber, plasterboard, insulation and sheeting should be routinely used rather than be taken from fresh supplies.
- Minimise materials movement. Move materials around the site as little as possible – breakage is more likely to happen during movement.
- Avoid excess. Do not order significantly more concrete and mortar than can be realistically used before setting. Use mortar silos wherever possible.

### GMV's 10 steps to waste reduction:

#### Step 1

All the contractors on the GMV site are involved in the drive for waste minimisation early in the tendering process. Clauses in Employer Requirements and sub-contractor tender documents form part of a partnering arrangement.

#### Step 2

SMARTWaste was used to identify:

- Key waste products
- Causes of waste
- Current disposal method

#### Step 3

Site teams used weekly updates and monthly meetings to identify ways to reduce, re-use and recycle waste. At GMV the standard safety induction for everyone coming onto site includes basic information about waste minimisation and management, everyone is made aware of the segregation of materials on site.

#### Step 4

Reducing waste through site practices is often down to improved site materials storage, minimum movement of materials and avoidance of excess.

#### Step 5

Offcuts of timber, plasterboard, insulation and sheeting can be used to fill in rather than cut from fresh supplies as long as quality is not compromised.

#### Step 6

Formwork can be used at least three times prior to disposal. There may also be scope for recycling of formwork as mulch, as long as treatments are not a hazard.

#### Step 7

Pallets are re-used around the site for storage of materials or stored for periodic collection by suppliers or specialist pallet companies.



Formwork

#### Step 8

Waste that cannot be avoided or re-used on site is segregated for recycling wherever practical. This includes:

- Timber
- Cardboard
- Paper
- Concrete
- Site metals
- Drinks cans

#### Step 9

Plasterboard offcuts that cannot be used are placed into one cubic metre bags, provided by the supplier at nominal cost. Filled bags are taken away by the supplier's contract haulier. The returned plasterboard is processed and put back into the manufacturing process.



British Gypsum collection

**Step 10**

The whole site is kept up to date with achievements on the main site notice board. All the sub-contractors are invited to regular workshops where they provide vital feedback on further activities that can be pursued.

**Continuous improvement**

Although the waste reduction targets have been met it is clear that further phases of the development can and should build upon this success.

While continuing the current site methods, opportunities to develop further reduction, re-use and recycling activities will be explored.

These include:

- Take-back schemes for insulation and other materials. These need to be regularly reassessed in regard to volumes, site storage issues and costs.
- Use of permanent formwork would prevent re-used formwork coming to the end of its useful life and becoming waste. However, there are issues relating to the overall use of materials that need to be considered.
- Further use of timber, plasterboard and insulation offcuts on site wherever possible.
- Improved methods of storage to prevent any weather damage to materials awaiting installation/use.

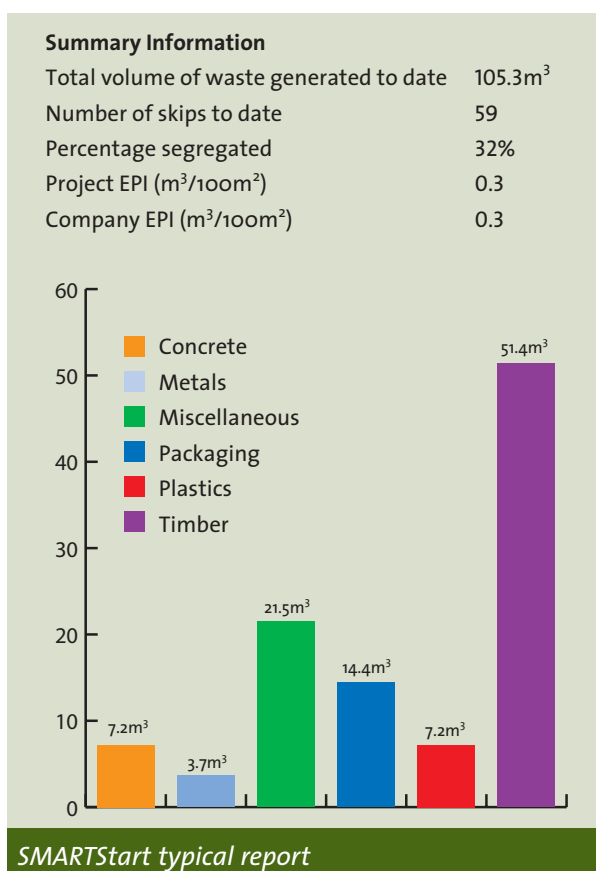
**SMARTStart**

The continuing, and hopefully improving, performance of waste reduction, re-use and recycling at GMV will be measured by the main contractors for the rest of the project using SMARTStart.

This quick and easy tool provides automatic updates of:

- Number of skips
- Number of segregated skips
- Estimate of key waste products
- Other recycling activities

Below is a typical report from SMARTStart



Data is collected by forklift drivers or whoever signs out skips from the site.

SMARTStart has been developed on the GMV site and is accessible to any organisation following a simple registration on [www.smartwaste.co.uk](http://www.smartwaste.co.uk)

### Further information

For further information see the companion guide: 'Reduction, Re-use and Recycling of Construction Waste – A Project Management Guide'. This sets out the main lessons learnt in the implementation of waste minimisation throughout the supply chain.

### Other sources of information

Rethinking Construction and Construction Best Practice Programme have now joined forces under the banner of 'Constructing Excellence'. Under this joint remit they provide information in:

- Best Practice Clubs, guidance, case studies and key performance indicators.

Construction Best Practice Programme:  
[www.cbpp.org.uk](http://www.cbpp.org.uk)

Rethinking Construction:  
[www.rethinkingconstruction.org](http://www.rethinkingconstruction.org)

Recycled and secondary aggregates  
case studies and technical advice:  
[www.aggregain.org.uk](http://www.aggregain.org.uk)  
Free helpline 0808 1002040



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BRE, Garston, Watford, Hertfordshire WD25 9XX  
[www.bre.co.uk](http://www.bre.co.uk)

Timber recycling  
[www.recyclewood.org.uk](http://www.recyclewood.org.uk)

General recycling and waste management  
news, jobs and prices  
[www.letsrecycle.co.uk](http://www.letsrecycle.co.uk)

Guidance and contacts  
[www.wrap.org.uk](http://www.wrap.org.uk)

Legislation  
[www.environment-agency.gov.uk/netregs/](http://www.environment-agency.gov.uk/netregs/)

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