Site Waste Management Plan

17 January 2017

TEMPLE

LEADERS IN ENVIRONMENT, PLANNING & SUSTAINABILITY.

Report for – UCLH Charity
Middlesex Hospital Annex
Site Waste Management Plan
Final

Document Version Control

Version	Date	Author	Reviewed by	Reviewed and Approved by
Draft	13/12/2016	Stephen Glenny	MarkFurlonger	Ben Harris
Final	16/12/2016	Stephen Glenny	MarkFurlonger	Ben Harris

Report for: **UCLH Charity**

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Contents

Appendices

1.0 Introduction

1.1 The Scheme

The site is located in the Bloomsbury Ward, of the London Borough of Camden. Situated at 44 Cleveland Street, it lies south of Howland Street, north of Tottenham Street and Tottenham Mews and west of Charlotte Street. The site is located close to the Camden-Westminster local authority boundary and is situated within the Charlotte Street Conservation Area (CSCA).

The scheme comprises the part-demolition of the existing annex buildings on site, with the listed part of the annex and adjacent North and South House buildings, all fronting onto Cleveland Street being retained and refurbished for residential use. To the rear of these buildings (North and Eastern parts of the site) a new building up to 8 storeys in height will be erected and will include commercial business space uses on the lower ground to second floors and residential uses above.

1.2 Principles of Waste Management

Waste is "*any substance or object which the holder discards or intends or is required to discard*", as defined in the Waste Framework Directive (2008/98/EC), which sets the basic concepts and definitions related to waste management.

The construction, demolition and excavation sector is the greatest contributor to total waste in the UK. It produced 77.4 million tonnes in 2010, of which 13 million tonnes went to landfill.

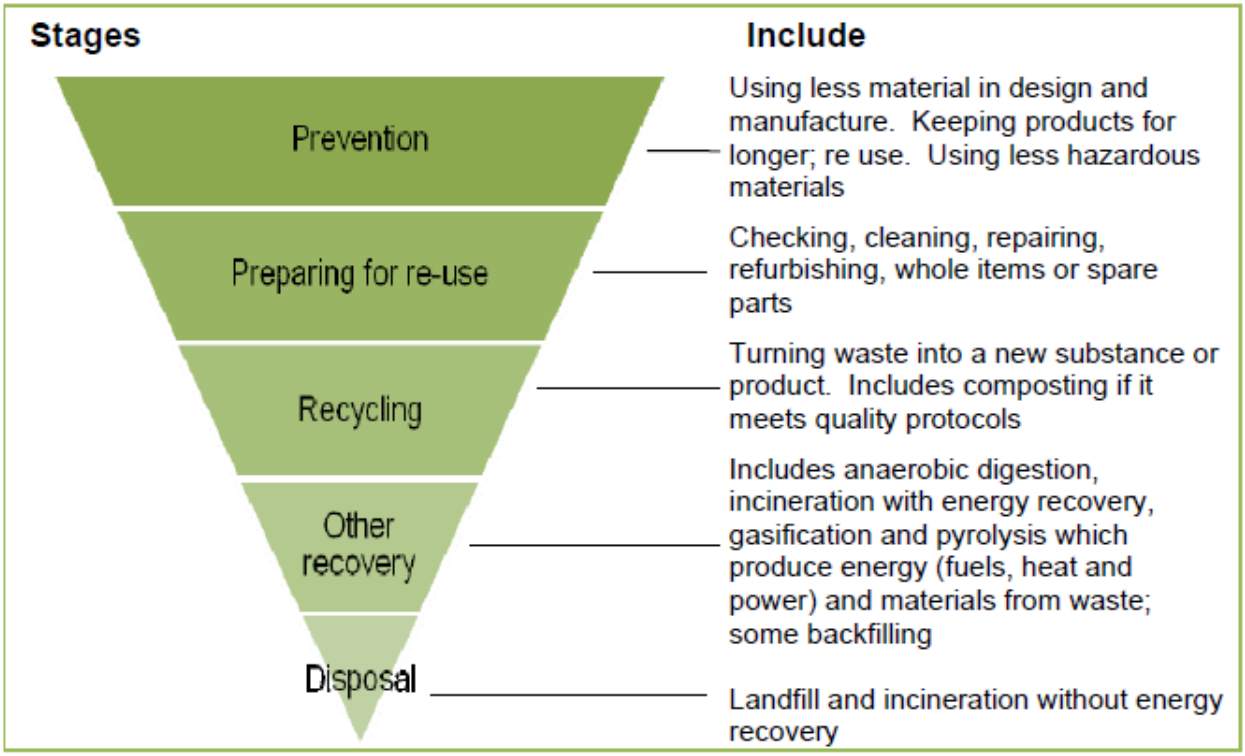
Implementing good practice waste minimisation and management (WMM) on construction projects will help reduce the amount of construction waste sent to landfill. Good practice WMM is increasingly being implemented in construction projects to realise key benefits. These include the ability to:

- 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 CO_2 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 should follow the principles of the waste hierarchy (Figure 1.1) as promoted in the Waste Strategy for England (2007). This includes principles to reduce the amount of waste generated and maximise the amount that can be reused or recycled. Following the waste hierarchy is a legal requirement through the Waste (England and Wales) Regulations 2011.

Waste minimisation includes designing out waste from a project and limiting waste arising in the construction phase. Waste management involves identifying potential waste streams, setting target recovery rates and managing the process to ensure these targets are met.

Figure 1.1 - The Waste Hierarchy (Source: DEFRA)



An important part of implementing good practice waste management is the Site Waste Management Plan (SWMP).

A SWMP is not just a tool for managing waste on-site, it should also be used as a tool during the early design phase of projects, identifying potential waste streams to minimise and targeting appropriate rates of recovery to inform the development of the design.

Planning and developing the SWMP before construction begins, greatly helps realise the benefits of good practice WMM, including cost savings.

1.3 Policy Context

The London Plan contains Policy 5.18 - Construction, Excavation and Demolition (C,E&D) Waste, for planning decisions, which states that:

- Local Development Framework's (LDFs) should require developers to produce site waste management plans to arrange for the efficient handling of C,E&D waste and materials.

Policy 5.16 of the London Plans sets a target for recycling 95% of C, E&D waste by 2020.

The London Borough of Camden forms part of the North London Waste Authority area along with the London Boroughs of Barnet, Enfield, Haringey, Hackney, Islington and Waltham Forest. The seven boroughs have joined forces to prepare the North London Waste Plan, which will set out the planning framework for waste management in the North London Boroughs for the next 15 years. The Plan is currently in development and scheduled to be adopted in 2018.

The London Borough of Camden's Core Strategy states that they will "*seek to secure the reuse of construction waste on development sites to reduce resource use and the need to transport materials.*"

CPG3: Sustainability gives the following key messages, which relate to Core Strategy CS13 – Tackling climate change through promoting higher environmental standards in design and construction and Development Policy DP22 – Promoting sustainable design and construction:

"*Reduce waste by firstly re-using your building, where this is not possible you should implement the waste hierarchy. The waste hierarchy prioritises the reduction, re-use and recycling of materials. Source your materials responsibly and ensure they are safe to health".*

CPG3 goes on to state that the council expect all developments to aim for at least 10% of the total value of materials used to be derived from recycled and reused sources. *Special consideration will be given to heritage buildings and features to ensure that their historic and architectural features are preserved* (our emphasis). Major developments are anticipated to be able to achieve 15-20% of the total value of materials used to be derived from recycled and reused sources.

CPG3 also states that building contractors are required to produce Site Waste Management Plans (SWMP) for all projects with an estimated construction cost of over £300,000; this is likely to be reference to the legislation that specified this requirement when the CPG was created but that is no longer in effect.

2.0 Site Waste Management Plan

2.1 Responsibilities and actions

Temple has been commissioned to produce the initial Site Waste Management Plan (SWMP) to accompany the planning application for Middlesex Hospital Annex. The planning section of the SWMP template is included in **Appendix 1** and the SWMP template itself is supplied with this report. Initial design decisions and good practice actions to reduce waste have been recorded and subsequent actions identified during detailed design will be recorded within the SWMP, which will act as a live document to be continuously updated as the project progresses.

Temple has ensured best practice in this SWMP by utilising the latest available version of the SWMP template from the Waste & Resource Action Programme (WRAP) website and the latest guidance on its implementation.

The SWMP will be passed on to the building contractor once appointed and it will be the responsibility of their Site/Environmental Manager or equivalent to review, update and report upon the SWMP during construction. They will also ensure that actions from the SWMP are followed through and that sub-contractors comply with the SWMP.

This SWMP provides a framework for the building contractor to manage waste in line with the waste hierarchy by identifying types and quantities of materials for re-use and recycling to reduce the amount of waste produced.

2.2 Types and quantities of waste

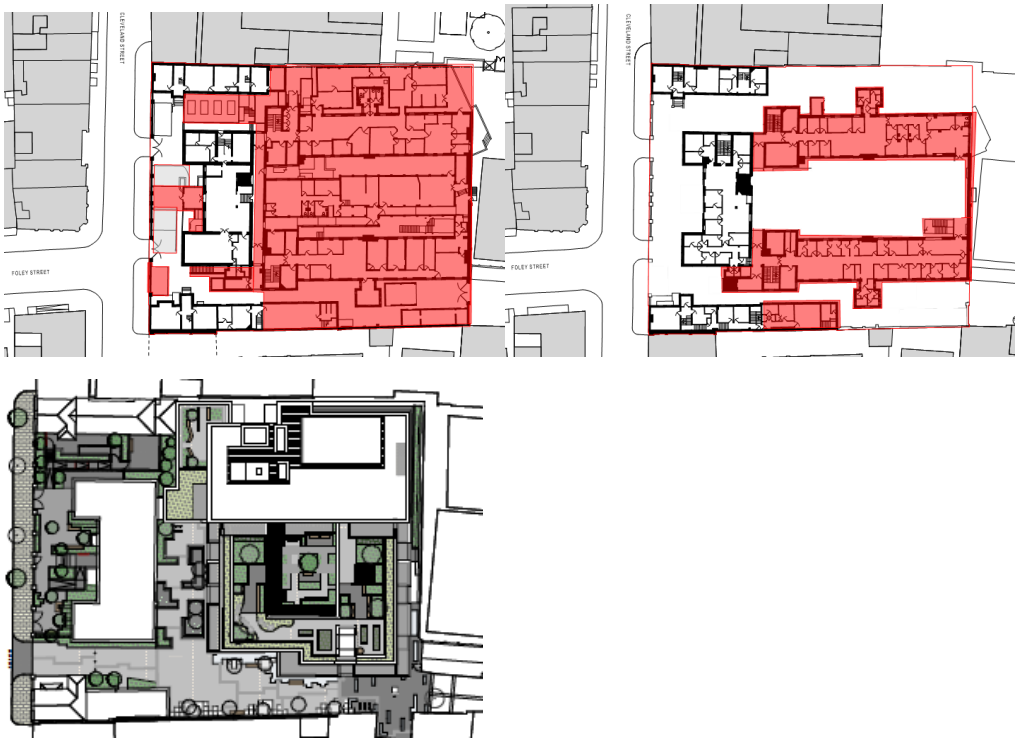
At this stage of design indicative figures have been calculated and added to the SWMP template for the types and quantities of waste generated from demolition and excavation. As the detailed design is developed the SWMP will be updated with more accurate figures, providing a forecast of construction waste and updated figures for excavation and demolition waste prior to the start of construction.

The indicative figures for demolition and excavation have been calculated using the demolition quantities estimator from WRAP's Designing out Waste (DoW) tool and are based on available information about the buildings scheduled for demolition and the size of the site..

Retention of existing buildings

In line with relevant policy, the project involves the retention and refurbishment of the listed Annex building and the North and South Houses fronting on to Cleveland Street, with the demolition of the rear (eastern) part of the site, shown in Figure 2.1, which is in poor condition.

Figure 2.1 Demolition plan for Middlesex Hospital Annex (red section shows area to be demolished)



Demolition

The project will involve the demolition of the rear part of the site. This primarily consists of Victorian brick buildings with some temporary structures. The demolition of these buildings will result in approximately 3,500 tonnes of material becoming available for reuse.

Indicative demolition figures have been obtained from the DoW tool demolition calculator and are shown in **Table 2.1**. A pre-demolition audit will be conducted to identify more accurate quantities of material with which to update the SWMP and to identify further opportunities for reuse and recycling.

Table 2.1 - Indicative demolition quantities

Material type	Quantity available for reuse (t)
Aggregates	120
Concrete	1,030
Ferrous	599
Glass	4
Masonry	1,436
Non-Ferrous	40
Plasterboard	80
Slates	16
Timber	144
Total	**3,469**

Excavation

The project involves excavation of a basement level, which will include plant areas, refuse storage, bicycle stores, office and ancillary space. This will result in an estimated 4,800 tonnes of excavated material that will require disposal.

Any hazardous waste discovered on site during the demolition, excavation and construction programme will be handled and disposed of in accordance with relevant legislation and will be the responsibility of the main contractor. There will be control measures in place for such eventualities within the Construction Management Plan. These works will be undertaken by a licensed and registered specialist subcontractor, including all associated background air monitoring and tests. Full copies of all reports including waste transfer notices will be recorded and kept by the Site Manager and will be available for inspection at all times.

Construction

Construction waste efficiency is one of the scoring criteria (Wst 01) for the BREEAM UK New Construction sustainability assessment methodology, last updated in 2014, where three credits are available: 1 credit for less than 11.1 tonnes of construction waste per 100m^2 of gross internal area (GIA), 2 credits for less than 6.5 t/100m^2 and 3 credits for less than 3.2 t/100m^2. The BREEAM exemplary level for this criterion is less than 1.9 /100m^2. These figures are based on completed construction projects and research conducted by BRE and WRAP for their resource planning tool.

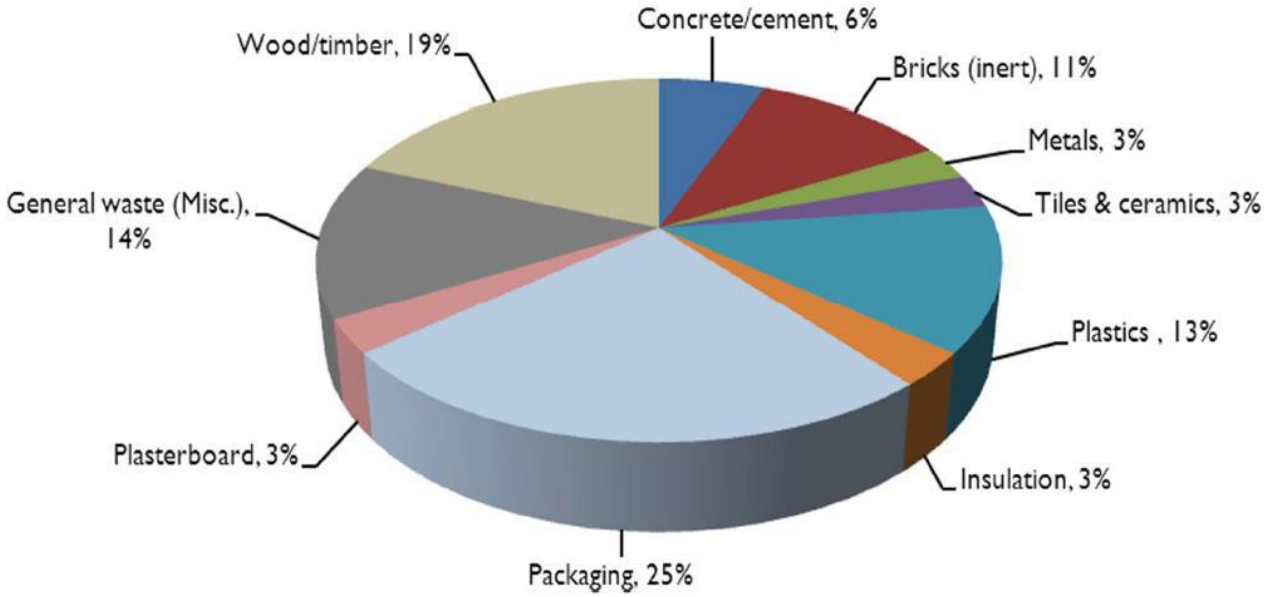
The project has a GIA of approximately 10,000m^2; therefore the total amount of construction waste likely to be generated is between 1,110 tonnes for standard practice and 190 tonnes for an exemplary project.

The WRAP Designing out Waste (DoW) tool can be used when more detail is know on the design to forecast construction waste or estimates can be entered directly into the SWMP by the design team and building contractor during detailed design and pre-construction as recommended in the SWMP template. The DoW tool also identifies baseline and good practice levels of recycled content within each element and poses key questions on designing out waste. An example output from the DoW tool is included in **Appendix 2**.

As the project progresses through more detailed design and into construction, greater detail on types and quantities of waste will be added into the SWMP by the individual appointed to draft and manage the SWMP by the building contractor, they will update the figures as required and follow the process within the SWMP.

The estimated composition of waste arising from construction is shown in Figure 2.2. This is based on data collected by BRE from approximately 10,000 UK construction projects since 2008.

Figure 2.2 Construction Waste Composition



Source: BRE SmartWaste

The major expected waste streams from the Middlesex Hospital Annex Project, due to the currently proposed construction method are; concrete, bricks and tiles. There is also likely to be packaging, timber, plasterboard, plastics and metals. All of these waste streams will need to have materials specific management plans for how they will be dealt with in accordance with the waste hierarchy. These will be included within the SWMP once they have been developed before construction begins.

2.3 Target setting

The Material Recovery Target is to be set by the client and project team. The figures included above are not specific targets for Middlesex Hospital Annex. Indicative targets will be developed for each waste stream as well as an overall construction waste target and included on the datasheet. It is recommended that the project aims for 2 or 3 credits in the BREEAM assessment methodology for construction waste efficiency, meaning the target for total waste generated should either be less than 6.5 t/100m^2 or less than 3.2 t/100m^2.

Standard, Good and Best Practice level targets within the SWMP template will be updated at detailed design stage when more information is known.

2.4 Waste Management Options

The waste hierarchy identified within **Section 1** (**Figure 1.1**) will be followed throughout detailed design and construction with identified actions recorded within the SWMP. This will seek to minimise the production of waste through design in the first instance and then through construction practices such as the use of prefabricated and standardised modular components to minimise waste or, if this is not feasible, the use of low waste fabrication techniques.

Offsite disposal of waste will be minimised and managed. It is expected that there will be insufficient space for complete on-site segregation of waste but this will be addressed during the detailed design of the site compound, with on-site segregation included if possible and all site personnel (including sub-contractors) trained in segregation of waste. Training will be the responsibility of the main contractor.

Waste which cannot be reused or recycled onsite is expected to go to local waste management sites. Due to the central London location, these are expected to be on the outskirts of London; for example, in the Lee Valley approximately 10 km away or West London approximately 8 km away. It will be the responsibility of the main contractor to identify suitable waste carriers and destinations. It is assumed that most construction waste material will be segregated and that segregated material will be recycled at a level of at least 90% with mixed construction waste recycled at a rate of at least 75%.

It will also be a requirement of the main contractor to ensure that permits and contracts are in place and that these comply with relevant legal responsibilities, including Duty of Care.

2.5 Measurement, monitoring and review

The contractor will measure the actual types and quantities of waste produced from demolition, excavation and construction. These will be compared to the initial figures entered within the SWMP to ensure all wastes are managed properly. The actual figures will be recorded on the datasheet. The implementation of the SWMP will be monitored by the Site/Environmental Manager and Project Manager to ensure it is being followed and updated as required.

The use of the SWMP will be reviewed at the end of the project to identify and share lessons learnt and performance against targets.

Appendix I - Site Waste Management Plan Template

Site Waste Management Plan

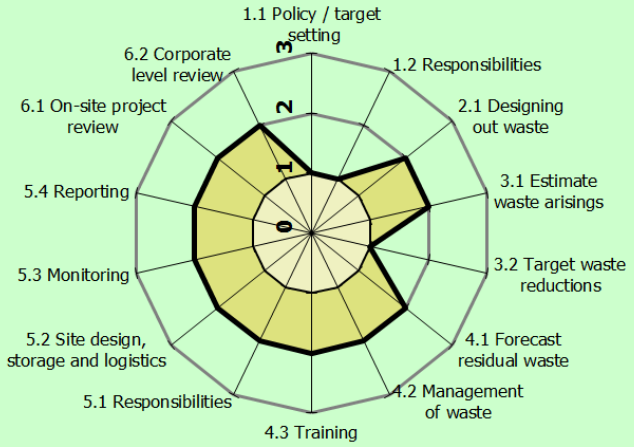
Version 3.2

Click here for help

Project title : Middlesex Hospital Annex

Project Stage	SWMP Section		Guidance
Policy and setup	1	Enter Basic Details	Section 1.0
Preparation and concept design	2	Record Waste Prevention Actions	Section 2.0
Detailed design	3	Forecast Waste Record Waste Reduction Actions	Section 3.0
Pre-construction	4	Specify Waste Carriers Plan Waste Destinations Record Waste Management and Recovery Actions	Section 4.0
Construction	5	Enter Actual Waste Movements	Section 5.0
Post completion and use	6	KPI's Reporting Sign Declaration	Section 6.0

Standard, Good and Best Practice Levels



Standard, Good and Best Practice Levels

Section 1.0 : Policy

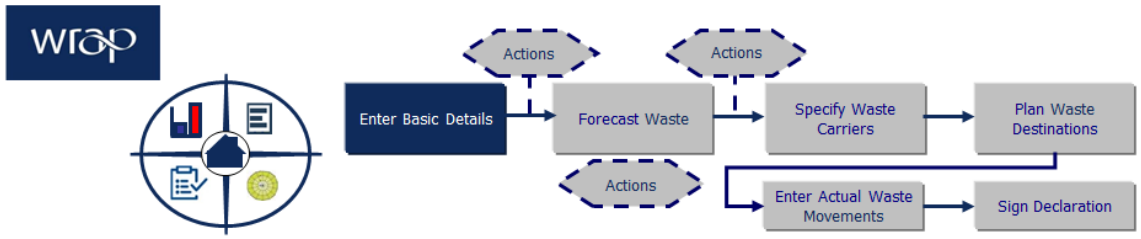
Section 2.0 : Preparation & Concept Design

Section 3.0 : Detailed Design

Section 4.0 : Pre-construction

Section 5.0 : Construction

Section 6.0 : Post Completion & Use



What to enter? Enter details of the project client, principal contractor, location and value . Select the metrics for the project (e.g. floor area) and record any project targets (e.g. waste to landfill, waste arisings, etc).

When? The basic details, metrics, project targets and the schedule sections of this sheet should be completed at the onset of a project. The sign off, explanation of deviation from the plan and lesson learnt sections should be completed at the end of the project.

Why? To provide project details and identify the person(s) responsible for the project SWMP.

Basic Details

Client name :	UCLH Charity
Principal contractor :	TBA
Owner of document :	Construction Project Manager
Project title :	Middlesex Hospital Annex
Project Reference :	
Project location :	44 Cleveland Street, Camden, London, UK
Project postcode :	W1T 4JT
Construction value :	
Type of construction :	Residential
Activity :	Both (new build and refurb)

Metrics

Please select metrics applicable to your project. These metrics are then used in the KPI sheet to track your progress.

Metric	Amount	Unit
Footprint (m2) of site	3,050	m2
Footprint (m2) of structure		m2
Gross Internal Floor Area m2		m2

Project targets

Please select project targets applicable to your project

KPI	Phase	Target	Unit
Waste to landfill	All		t
Material reused on site	All		t
Waste arisings	Construction		t
Material reused on site	Excavation		t

Schedule

Start date :		dd/mm/yy
Completion date :		dd/mm/yy

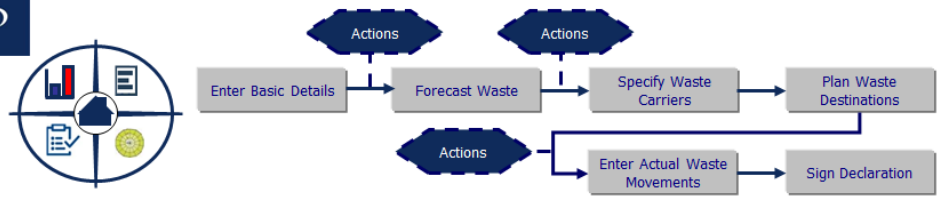
Site Waste Management Plan Sign Off		
Position	**Name**	**Contact Details**
Client	UCLH Charity	
Principal Contractor	TBA	
Site Waste Management Plan Drafter	Construction Project Manager	
Others (optional)		
Client WM Representative (if applicable)		
Project Manager		
Waste Management Coordinator/Champion		
Design Coordinator		
Document Controller / Secretary		

This is stage 6.3 of the template. Complete this declaration at the end of the construction project.

Confirmation that the plan has been monitored on a regular basis to ensure that work is progressing to plan and that the plan was updated.	
Signed by:	
Organisation:	
Position:	
Date:	
Signed by:	
Organisation:	
Position:	
Date:	

	Explanation of any deviation from the plan
1	
2	
3	
4	
5	
6	
7	

	Where relevant, drawing on any lessons learnt, an action plan to address these for the next project
1	
2	
3	
4	
5	



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Tell me about:

2 Waste Prevention Actions

3 Waste Reduction Actions

4 Waste Management and Recovery Actions

What to enter? Record relevant details including the action taken, action owner and waste impact for each of the following:

- the waste prevention actions taken before the development of the SWMP. This could include decisions taken at the **design stage** such as specifying modular units or standard sizes;
- any actions identified to reduce the forecast waste. The information is added to the waste prevention actions; and
- planned site practices, to record any actions that impact on project waste recovery. This could be actions such as on site practice or the segregation requirements of the waste contractor.

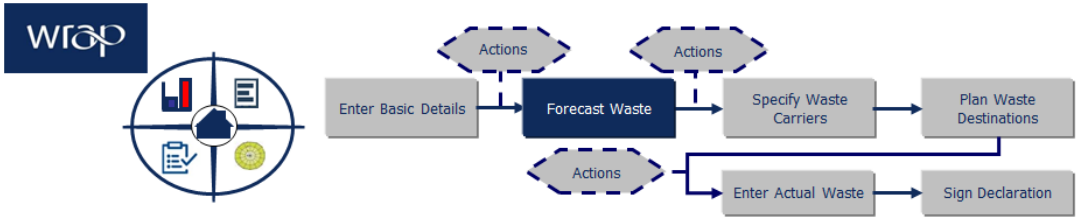
When? This worksheet should be populated during the **preparation and concept design** stage. Subsequently, actions identified to reduce the forecast waste during the **detailed design** stage should be added to the table. Finally, the actions for project waste recovery arising during **pre-construction** should be entered here too.

Why? This information forms an action log that is built up throughout the development of the SWMP / duration of the project and can be printed out for use on site.

Waste Actions

Enter actions in the next available row below

Number	Type of Waste Action	Action Taken	Action owner	Reference to project document /	Waste stream	Material type	Estimated Cost Saving	Waste reduced		Date for completion (dd/mm/yyyy	Status
								(m^3)	(tonnes		
1	Waste Prevention Action	Re Use of demolition material on site where possible within hard landscaping	Contractor		Inert - Soil & stones	soil and stones (inert) other than those mentioned in 17 05 03					
2	Waste Reduction Action	On site segragation of waste if possible within site constraints	Contractor		Mixed C&D waste (17 09 04)	mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03					
3	Waste Prevention Action	Pre Demolition Audit	Client								
4	Waste Prevention Action	Packaging returned to supplier	Contractor								
5	Waste Management and Recovery Action	Resource use and Waste minimisation/management will be covered as part of a Construction Management Plan	Client								
6											
7											
8											
9											
10											



Tell me about this sheet

UCLH Charity
TBA
Construction Project Manage

Middlesex Hospital Annex

What to enter? Enter your forecast for each waste material using the included pre-determined list of wastes. The template will automatically convert your estimate from tonnes to m^3, or m^3 to tonnes.

When? This worksheet should be completed by the project team during the **detailed design** stage.

Why? This worksheet is key to planning how to reduce, reuse and recover waste. Data entered here is used within the reporting sheet to measure forecast vs. actual performance.

Forecast Waste

						Forecast Quantities		Calculated Quantities (Converting between m^3 and t)		
C, D or E Activity	**Waste Stream**	**Material Type**	**Further description of waste - optional**	**Suggested LOW Code**	**Waste or Re-Use**	**(m^3)**	**(tonnes)**	**(m^3)**	**(tonnes)**	**Forecast provided by**
Excavation	*Packaging*	*plastic packaging*	*plastic packaging*	*15 02 02*	*Off-site destination*	*###*	*###*	*###*	*###*	*A.N Other*
Excavation	Inert - Soil & stones	soil and stones (inert) other than those mentioned in 17 05 03	hardstanding	17 05 04	Off-site segregated		4800	3840.00	4800.00	S Glenny
Demolition	Inert - mixture of concrete, bricks, tiles etc.	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	Aggregates from WRAP DoW tool - demolitions calculator	17 01 07	Off-site mixed		120	96.77	120.00	S Glenny
Demolition	Inert - mixture of concrete, bricks, tiles etc.	concrete	Concrete from WRAP DoW tool demolitions calculator	17 01 01	Off-site mixed		1030	811.02	1030.00	S Glenny
Demolition	Metals	iron and steel	Ferrous from WRAP DoW tool demolitions calculator	17 04 05	Off-site segregated		599	1460.98	599.00	S Glenny
Demolition	Inert - Glass	glass	Glass from WRAP DoW tool demolitions calculator	17 02 02	Off-site segregated		4	6.56	4.00	S Glenny
Demolition	Inert - mixture of concrete, bricks, tiles etc.	bricks	Masonry from WRAP DoW tool demolitions calculator	17 01 02	Off-site segregated		1436	1196.67	1436.00	S Glenny
Demolition	Metals	mixed metals	Non-ferrous from WRAP DoW tool demolitions calculator	17 04 07	Off-site segregated		40	95.24	40.00	S Glenny
Demolition	Gypsum (17 08 02)	gypsum-based construction materials other than those mentioned in 17 08 01	Plasterboard from WRAP DoW tool demolitions calculator	17 08 02	Off-site segregated		80	242.42	80.00	S Glenny
Demolition	Inert - mixture of concrete, bricks, tiles etc.	tiles and ceramics	Slates from WRAP DoW tool demolitions calculator	17 01 03	Off-site segregated		16	27.12	16.00	S Glenny
Demolition	Wood	wood	Timber from WRAP DoW tool demolitions calculator	17 02 01	Off-site segregated		144	423.53	144.00	S Glenny
								0.00	0.00	

?
Tell me about this sheet

UCLH Charity
TBA
Construction Project Manager
Middlesex Hospital Annex

What to enter? Enter the details of each waste carrier and each waste management facility you intend to use.

When? This sheet should be completed by the person responsible for the SWMP during the **pre construction** phase.

Why? The template uses this information in subsequent sheets to enable you to match waste streams with waste facilities and actual waste movements. Entering the data on this sheet avoids repetitive data entry on subsequent sheets within the tool. It also helps to:
- identify all persons removing the waste; and
- identify all waste carriers and registration numbers.

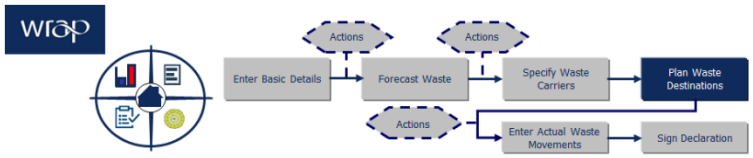
The Client and the Principal Contractor must take all reasonable steps to ensure that:
- they have a copy of, or reference to, the written description of the waste required by section 34 of the Environmental Protection Act 1990;
- all waste from the site is dealt with in accordance with the waste duty of care in section 34 of the Environmental Protection Act 1990(3) and the Environmental Protection (Duty of Care) Regulations 1991(4); and
- materials will be handled efficiently and waste managed appropriately.

Specify Waste Carriers

Name	Contact Details	Date checked with Environment Agency (dd/mm/yyyy)	Registration Number	Expiry Date (dd/mm/yyyy)

Specify Waste Management Facilities

Name	Type of facility	% reused if known	% recycled if known	% energy recovery if known	% total all forms of recovery	Overall diverted from landfill /	Date checked with Environment Agency (dd/mm/yyyy)	Licence / Exemption Number	Location of relevant documentation, e.g. WTN	C, D or E Activity (Leave blank if same facilty & recovery rate are used for different waste streams)	Waste Stream
						0%					
						0%					
						0%					
						0%					
						0%					
						0%					
						0%					
						0%					
						0%					
						0%					



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Tell me about this sheet

UCLH Charity
TBA
Construction Proj
Middlesex Hospita

What to enter? Enter a waste management action for each different waste type. The template consolidates the material types into a pre-determined list of waste streams and allows you to select a waste management facility and disposal cost for each waste stream.

When? This sheet should be completed during the pre-construction phase.

Why? Plan Waste Destinations' performs one simple task – it allows you to match up your forecast waste streams with expected waste management facilities (entered in 'Specify Waste Carriers').

The Client and the Principal Contractor must take all reasonable steps to ensure that:
- they have a copy of, or reference to, the written description of the waste required by section 34 of the Environmental Protection Act 1990;
- all waste from the site is dealt with in accordance with the waste duty of care in section 34 of the Environmental Protection Act 1990(3) and the Environmental Protection (Duty of Care) Regulations 1991(4); and
- materials will be handled efficiently and waste managed appropriately.

Total estimated forecast waste	Total (m^3)	Total (t)
Total from Waste Streams	8200.31	8269.00
Total Reused on site	0.00	0.00

Plan Waste Destinations

Construction
Demolition
Excavation

Construction

Waste sent offsite	Forecast: Estimated Volume (m^3)	Forecast: Estimated Weight (t)	Proposed Destination	% Diverted from landfill	Cost of waste disposal: £/m^3	Cost of waste disposal: £/t	Cost of waste disposal: Cost Forecast	Comments
	0.00	0.00					£0.00	

Retained on site	Forecast: Estimated Volume (m^3)	Forecast: Estimated Weight (t)
	0.00	0.00

Demolition

Waste sent offsite	Forecast: Estimated Volume (m^3)	Forecast: Estimated Weight (t)	Proposed Destination	% Diverted from landfill	Cost of waste disposal: £/m^3	Cost of waste disposal: £/t	Cost Forecast	Comments
Gypsum	242.42	80.00		0%			FALSE	Costs and details on recovery rates to be added by main contractor when waste handler identified
Metals	1556.21	639.00		0%			FALSE	Costs and details on recovery rates to be added by main contractor when waste handler identified
Wood	423.53	144.00		0%			FALSE	Costs and details on recovery rates to be added by main contractor when waste handler identified
Inert - Building rubble	2131.58	2602.00		0%			FALSE	Costs and details on recovery rates to be added by main contractor when waste handler identified
Inert - Glass	6.56	4.00		0%			FALSE	Costs and details on recovery rates to be added by main contractor when waste handler identified
	4360.31	**3469.00**					**£0.00**	

Retained on site	Forecast: Estimated Volume (m^3)	Forecast: Estimated Weight (t)
	0.00	**0.00**

Excavation

Waste sent offsite	Forecast: Estimated Volume (m^3)	Forecast: Estimated Weight (t)	Proposed Destination	% Diverted from landfill	Cost of waste disposal: £/m^3	Cost of waste disposal: £/t	Cost Forecast	Comments
Inert - Soil & stones	3840.00	4800.00		0%			FALSE	Costs and details on recovery rates to be added by main contractor when waste handler identified
	3840.00	**4800.00**					**£0.00**	

Retained on site	Forecast: Estimated Volume (m^3)	Forecast: Estimated Weight (t)
	0.00	**0.00**

Appendix II – WRAP Designing out Waste tool output

wrap Material change for a better environment

Project details

Project name Middlesex Hospital Annex (ID 17360)

Project description Refurbishment of heritage building, demolition of rear buildings and construction of new build residential

Building type Mixed use

Project type New Build

Mixed use? Residential, Office

Site Area 3,050 m2

Project assumptions

Building element	Type of use	Component selected	Quantity	Unit
Substructure	Mixed use	1500 x 1500 x 1000dp, strength C30 or higher	76	nr
Substructure	Mixed use	500x500 strength C30 or higher	274	m
Substructure	Mixed use	Expanded polystrene (EPS) zero ODP 75mm	1278	m2
Substructure	Mixed use	Reinforced in-situ concrete 250mm, C25 or lower	1214	m2
Substructure	Mixed use	Structural screed min 50mm thick to concrete	1155	m2
Frame	Mixed use	Reinforced in-situ concrete frame Generic, C25 or lower	10400	m2
Upper Floors	Mixed use	Reinforced concrete suspended slab - 175 thick - mesh reinforcment; permananent steel formwork (Holorib)	9209	m2
Roof Structure	Mixed use	Insitu concrete slab; 200mm thick; formwork; reinforcement not exceeding 5%; surface treatment	1155	m2
Roof Finishes	Mixed use	Natural Slate	1457	m2
Roof Finishes	Mixed use	Tiles - Concrete interlocking	1457	m2
Roof Finishes	Mixed use	Tiles - Plain Clay	1457	m2
Roof Insulation	Mixed use	100mm Polyurethane rigid board	1278	m2
External Doors	Mixed use	One hour f.r. steel fire door and frame, painted	2	nr
Internal Doors	Mixed use	Half hour fire res.; single to WC, Lobbies, Wet Areas and Stores etc inc frame & basic ironmongery	2	nr
Floor Finishes	Mixed use	500mm x 500mm carpet tiles	17640	m2
Floor Finishes	Mixed use	80/20 wool/nylon carpet, natural fibre underlay	20160	m2
Ceiling Finishes	Mixed use	600 x 600 x 19mm mineral fibre suspended ceiling tile, exposed metal grid	10300	m2
Ceiling Finishes	Mixed use	12.5mm plasterboard MF suspended ceilng systems; metal concealed grid and hangers	12250	m2
Mechanical Services	Mixed use	Air handling unit	2	nr
Mechanical Services	Mixed use	Controls equipment/devices	400	nr
Mechanical Services	Mixed use	Controls for AC systems	206	nr
Mechanical Services	Mixed use	Cooling source - Chiller	3	nr
Mechanical Services	Mixed use	Domestic cold water storage	2	nr
Mechanical Services	Mixed use	Fan coil units	200	nr
Mechanical Services	Mixed use	Heat source - Gas fired boiler	3	nr
Mechanical Services	Mixed use	Plastic foul drainage pipe	188	m
Mechanical Services	Mixed use	Pumps	200	nr
Mechanical Services	Mixed use	Domestic cold water storage	2	nr
Mechanical Services	Mixed use	Heat emitters - Radiators	200	nr
Mechanical Services	Mixed use	Heat source - Gas fired boiler	3	nr
Mechanical Services	Mixed use	MVHR unit	2	nr
Mechanical Services	Mixed use	Plastic foul drainage pipe	188	m
Mechanical Services	Mixed use	Toilet extract fan	2	nr
Electrical Services	Mixed use	fire alarm devices	18	nr
Electrical Services	Mixed use	Fire alarm panels	18	nr
Electrical Services	Mixed use	LV distribution boards	27	nr
Electrical Services	Mixed use	LV distribution switchgear	3	nr
Electrical Services	Mixed use	Outlets, connections	774	nr
Electrical Services	Mixed use	Switches, controls etc.	1032	nr
Electrical Services	Mixed use	fire alarm devices	18	nr
Electrical Services	Mixed use	Fire alarm panels	18	nr
Electrical Services	Mixed use	LV distribution boards	18	nr
Electrical Services	Mixed use	Outlets, connections	516	nr
Electrical Services	Mixed use	Switches, controls etc.	516	nr

Excavation waste 4,800 tonnes

Demolition waste 3,469 tonnes

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Project performance

Middlesex Hospital Annex (ID 17360)

The results presented below will help you identify opportunities to design out waste. For example, you may choose to focus your efforts on:

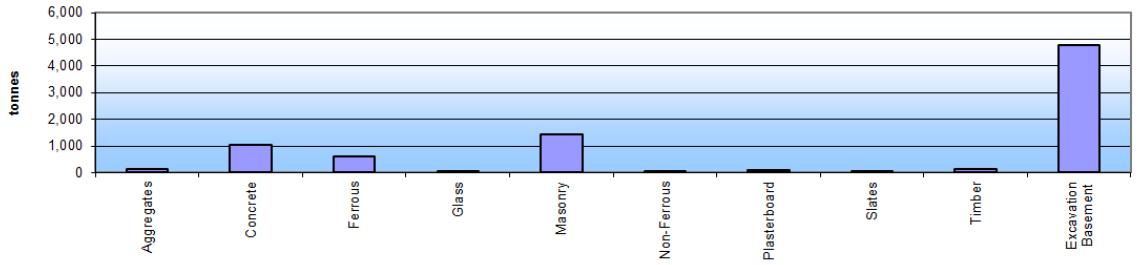
- reducing the quantity of materials required in the building elements that consume the most material
- reducing wastage in the building elements that will generate the most waste
- reducing the mass of demolition or excavation materials leaving the site
- incorporating more recycled aggregate in the construction

WRAP's Designing out Waste: A design team guide for buildings.
This guide will help you identify and pursue design solutions to prevent or reduce construction watse.

1 Potential improvement in waste arisings, cost of waste and CO_2

	Waste arisings (t)	Waste to landfill (t)	Value of materials wasted (£)	Cost of disposal (£)	Total cost of waste (£)	Loss of embodied CO_2	Recycled content
Baseline	477	239	£332,082	£19,072	£351,153	511	25%
Good practice	252	126	£170,043	£9,947	£179,989	304	33%
Potential improvement	**226**	**113**	**£162,039**	**£9,125**	**£171,164**	**208**	**8%**

2 Demolition and excavation materials available for reuse

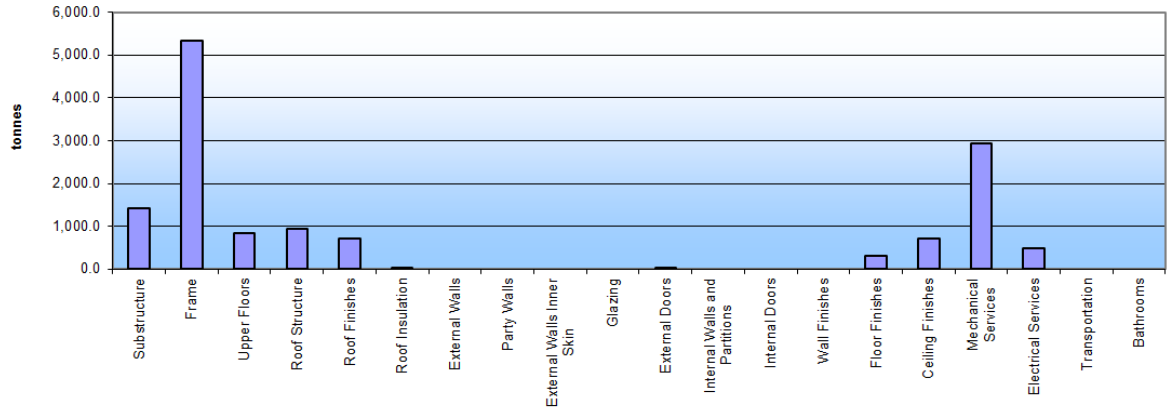


Material type	Quantity available for reuse (t)
Aggregates	120
Concrete	1,030
Ferrous	599
Glass	4
Masonry	1,436
Non-Ferrous	40
Plasterboard	80
Slates	16
Timber	144
Excavation Basement	4,800
Total	**8,269**

Key questions :

- Can materials from demolition of the building or other phases be reused in the design?
- When materials are reused, can they be reused at their highest value?
- Can any excavation materials be reused?
- Can cut and fill balance be achieved? How can it be optimised to avoid removal of spoil from site?

3 Quantity of materials consumed



Element	Materials consumed* (t)
Substructure	1,424.0
Frame	5,335.2
Upper Floors	828.8
Roof Structure	935.6
Roof Finishes	709.6
Roof Insulation	3.8
External Walls	0.0
Party Walls	0.0
External Walls Inner Skin	0.0
Glazing	0.0
External Doors	0.6
Internal Walls and Partitions	0.0
Internal Doors	0.0
Wall Finishes	0.0
Floor Finishes	315.3
Ceiling Finishes	715.7
Mechanical Services	2,938.4
Electrical Services	484.7
Transportation	0.0
Bathrooms	0.0
Total	**13,691.8**

* this is the same quantity of materials that will be generated as waste at the end of the building's life

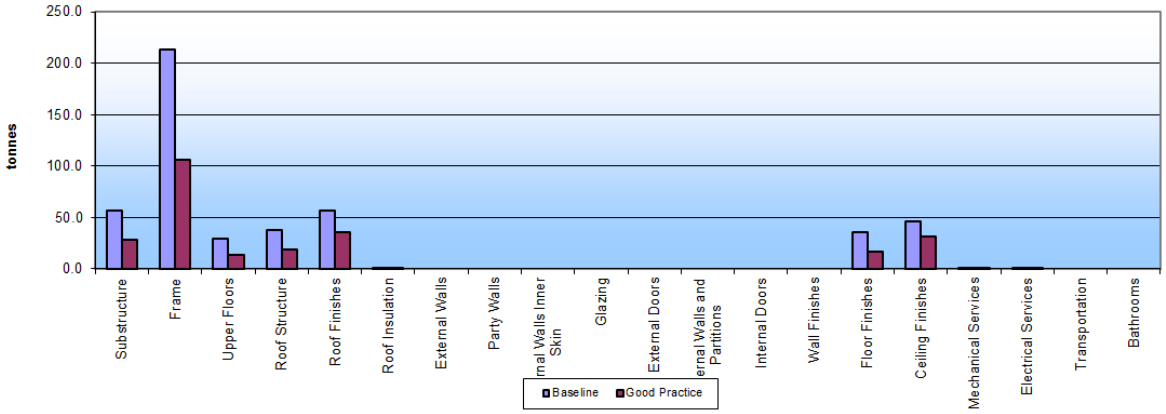
Key questions :

- Can the design, form and layout be simplified without compromising the design concept?

Key questions for reducing waste to landfill at the end of the building's life:

- Is the design adaptable for a variety of purposes during its life span?
- Can building elements and components be maintained, upgraded or replaced without creating waste?
- Does the design incorporate reusable/recyclable components and materials?
- Are the building elements/components/materials easily disassembled?
- Can a Building Information Modeling (BIM) system of building handbook be used to record which and how elements/ components/materials have been designed for disassembly?

4 Potential reduction in waste arisings

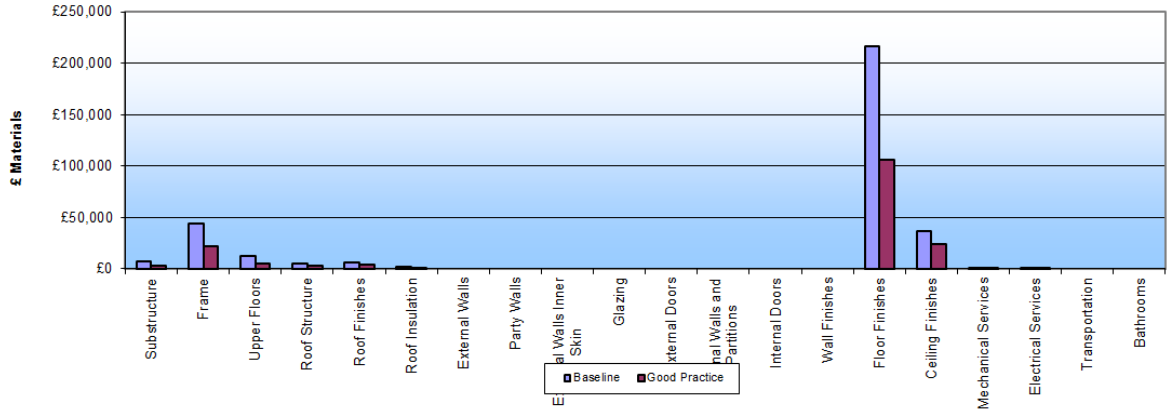


Element	Waste arisings (t)		
	Baseline	Good practice	Potential reduction
Substructure	57.1	28.5	28.6
Frame	213.4	106.7	106.7
Upper Floors	29.8	14.1	15.7
Roof Structure	37.4	18.7	18.7
Roof Finishes	56.8	35.5	21.3
Roof Insulation	0.6	0.2	0.4
External Walls	0.0	0.0	0.0
Party Walls	0.0	0.0	0.0
External Walls Inner Skin	0.0	0.0	0.0
Glazing	0.0	0.0	0.0
External Doors	0.0	0.0	0.0
Internal Walls and Partitions	0.0	0.0	0.0
Internal Doors	0.0	0.0	0.0
Wall Finishes	0.0	0.0	0.0
Floor Finishes	35.3	16.7	18.6
Ceiling Finishes	46.6	31.0	15.5
Mechanical Services	0.2	0.1	0.1
Electrical Services	0.9	0.6	0.3
Transportation	0.0	0.0	0.0
Bathrooms	0.0	0.0	0.0
Total	**478.0**	**252.1**	**225.9**

Key questions :

- Can the design or any part of the design be manufactured off site?
- Can site activities become a process of assembly rather than construction?
- Can the design be coordinated to avoid/minimise excess cutting and jointing of materials that generate waste?
- Is the building designed to standard material dimensions?
- Can the range of materials required be standardised to encourage reuse of offcuts?
- Is there repetition & coordination for the design, to reduce the number of variables and allow for operational refinement?
- Have specialist contractors been consulted on how to reduce waste in the supply chain?
- Have the project specifications been reviewed to select elements/components/materials and construction processes that reduce waste?
- Can construction methods that reduce waste be devised through liaison with the contractor and specialist sub-contractors?

5 Potential reduction in value of materials wasted

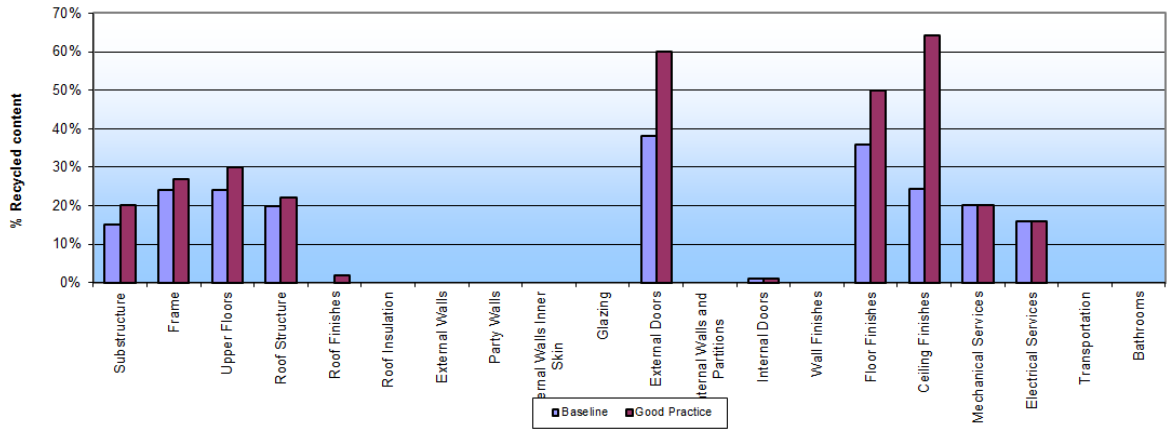


	Waste arisings (£)		
Element	Baseline	Good practice	Potential reduction
Substructure	£7,731	£3,492	£4,240
Frame	£43,680	£21,840	£21,840
Upper Floors	£12,114	£5,720	£6,393
Roof Structure	£5,766	£2,883	£2,883
Roof Finishes	£6,336	£3,960	£2,376
Roof Insulation	£1,750	£583	£1,167
External Walls	£0	£0	£0
Party Walls	£0	£0	£0
External Walls Inner Skin	£0	£0	£0
Glazing	£0	£0	£0
External Doors	£0	£0	£0
Internal Walls and Partitions	£0	£0	£0
Internal Doors	£0	£0	£0
Wall Finishes	£0	£0	£0
Floor Finishes	£217,053	£106,558	£110,495
Ceiling Finishes	£36,888	£24,592	£12,296
Mechanical Services	£975	£370	£605
Electrical Services	£1,432	£955	£477
Transportation	£0	£0	£0
Bathrooms	£0	£0	£0
Total	**£333,726**	**£170,953**	**£162,772**

Key questions :

- Can the design or any part of the design be manufactured off site?
- Can site activities become a process of assembly rather than construction?
- Can the design be coordinated to avoid/minimise excess cutting and jointing of materials that generate waste?
- Is the building designed to standard material dimensions?
- Can the range of materials required be standardised to encourage reuse of offcuts?
- Is there repetition & coordination for the design, to reduce the number of variables and allow for operational refinement?
- Have specialist contractors been consulted on how to reduce waste in the supply chain?
- Have the project specifications been reviewed to select elements/components/materials and construction processes that reduce waste?
- Can construction methods that reduce waste be devised through liaison with the contractor and specialist sub-contractors?

6 Potential increase in recycled content



Element	Recycled content (%)		
	Baseline	Good practice	Potential increase
Substructure	15%	20%	5%
Frame	24%	27%	3%
Upper Floors	24%	30%	6%
Roof Structure	20%	22%	2%
Roof Finishes	0%	2%	2%
Roof Insulation	0%	0%	0%
External Walls	0%	0%	0%
Party Walls	0%	0%	0%
External Walls Inner Skin	0%	0%	0%
Glazing	0%	0%	0%
External Doors	38%	60%	22%
Internal Walls and Partitions	0%	0%	0%
Internal Doors	1%	1%	0%
Wall Finishes	0%	0%	0%
Floor Finishes	36%	50%	14%
Ceiling Finishes	24%	64%	40%
Mechanical Services	20%	20%	0%
Electrical Services	16%	16%	0%
Transportation	0%	0%	0%
Bathrooms	0%	0%	0%

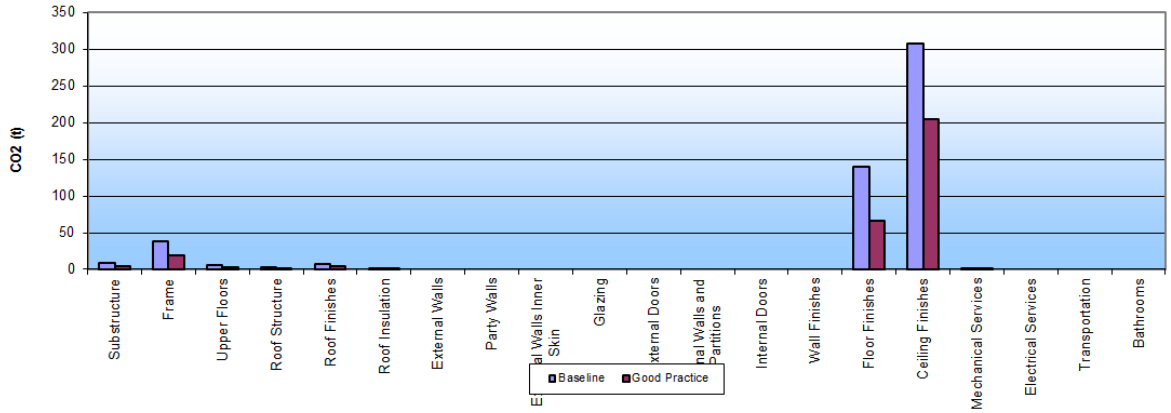
Key questions :

- Can products with good practice levels of recycled content be procured? WRAP's Net Waste Tool can be used to identify specific opportunities to increase recycled content. WRAP's Recycled Products Guide can be used to identify products with good practice recycled content.

Link: WRAP Recycled Content Products Guide
Link: WRAP Reclaimed Products Guide

7 Potential reduction in the embodied carbon lost as wasted material

This graph shows embodied carbon at baseline (typical practice) and good practice (i.e. applying good practice wastage rates).
Embodied carbon relates to the extraction of materials, but not to transport or other areas of carbon impact.



Element	Embodied CO_2 (t)		
	Baseline	Good practice	Potential reduction
Substructure	9	5	5
Frame	38	19	19
Upper Floors	5	2	3
Roof Structure	3	2	2
Roof Finishes	7	4	3
Roof Insulation	1	0	1
External Walls	0	0	0
Party Walls	0	0	0
External Walls Inner Skin	0	0	0
Glazing	0	0	0
External Doors	0	0	0
Internal Walls and Partitions	0	0	0
Internal Doors	0	0	0
Wall Finishes	0	0	0
Floor Finishes	140	66	74
Ceiling Finishes	307	205	102
Mechanical Services	0	0	0
Electrical Services	0	0	0
Transportation	0	0	0
Bathrooms	0	0	0
Total	**511**	**304**	**208**

How to quantify the impact of design solutions

When you have decided on solutions to design out waste, you can use the Designing out Waste Tool for Buildings to quantify the combined impact of your solutions (e.g. diversion from landfill or cost savings). The Tool's Impacts and Solutions screen will ask you to input data at the component level (one or more components make up an element, e.g. piles, foundations and slab make up substructure).

The data required by the Tool depends on the Designing out Waste principle that your solution(s) relates to. The table below explains what data the Tool requires for each principle.

Designing out waste principle	Data required by the Tool (at component level, as appropriate)
Design for Re-use and Recovery	Proposed quantity of reclaimed/reused material (t)
Design for Off Site Construction	Proposed quantity of materials consumed (t)
	Proposed wastage rate (%)
Design for Materials Optimisations	Proposed quantity of materials consumed (t)
	Proposed wastage rate (%)
Design for Waste Efficient Procurement	Proposed wastage rate (%)
Design for Deconstruction and Flexibility	% materials that can be diverted from landfill at the end of the components life.

For example, if you change the dimensions of the design and thereby reduce the quantity of materials consumed, you would enter the proposed quantity of materials consumed (for each component within the element). If you choose to pursue off-site construction for the same element, you could also enter proposed wastage rates for each component (off site construction typically results in less wastage on site).

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