

Halving Waste to Landfill – How design can help

Malcolm Waddell WRAP



Overview of presentation

- About WRAP
- Halving waste to landfill
- Work areas
- Design for Resource
 Efficiency with focus on
 Offsite Construction





What is WRAP?

- Waste & Resources Action Programme
- Not-for-profit organisation
- Funded by Defra, the Scottish Government, the Welsh Assembly and the Northern Ireland Assembly
- Delivery body for UK waste strategies

WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.





- Landfill Tax
- SWMP regulation
- Procurement/funding requirements
- Voluntary commitment

2012 ¹⁄₂ waste to landfill



Zero waste to landfill

Commitment actions: Halving Waste to Landfill

We will:

MIGK

- set a <u>target</u> for reducing waste to landfill
- embed the target within corporate <u>policy</u> and processes
- set corresponding requirements in project <u>procurement</u> and engage with our supply chain
- measure performance at a project level relative to a corporate baseline
- <u>report</u> annually on overall corporate performance





Material change for a better environment



Halving

Waste to Landfill

University of the

West of England

UNIVERSIT

1824

Thames

Water

The

Of

University of Worcester

University

Sheffield.

Who's signed up already? - Clients Sainsbury's Ramily **Department for Business** BIS Targetfollow J Innovation & Skills stanmore college Lend Lease Trustland 🖸 Department for DWP Imperial College Work and Pensions Longhurst Group better building London defro FORTH PORTS PLC VEOLIA STANHOPE haxtedestates INVIRONMEMENT Environment BRISTOL ANDERSON Agency Edinburgh Napier sterecycle Crossra UNIVERSITY OF LEEDS The Berkeley Group Holdings plc BOVIS John laing **Home Office** making infrastructure happen St.Leger Homes BIRMINGHAM **City University** MANCHESTER **Network Rail** keepmoat HOMES CITY COUNCIL Sandwell Homes MANCHESTER Crest MEPC The University of Manchester L&Q **ROADS** Service ÐE SEGRO ASDA **DEFENCE ESTATES** HOUSING















principles

The 5 Design for Resource Efficiency





Design for :

- 1. Reuse and recovery
- 2. Off site construction
- 3. Material optimisation
- 4. Waste efficient procurement
- 5. Deconstruction & flexibility

five principles





design for reuse & recovery



key questions

- Can materials from demolition be reused in the design?
- Can reclaimed products or components be reused?
- Can materials be reused at their highest value?
- Can excavation materials be reused?
- Can cut and fill balance be achieved? How can it be optimised to avoid spoil removal from site?

reuse & recovery





design for off site construction



key questions

Can any part of the design be manufactured off site?

Can site activities become a process of assembly rather than construction?

off site construction



Off-site construction case studies

Specific case studies examples developed by WRAP looking at:

- Volumetric methods CAD CAM software helps reduce waste <0.6%</p>
- Pre-fabrication: Pods post production waste
 <1%
- Pre-cast concrete Bison have reduced waste to landfill <1% using their system</p>
- Timber frame <2% waste sent to landfill
- Light Steel Frame materials requirements down
 5% and wastage reduced from 12% to <1%

and the second		
wipp holidates		
Case cluig		
Volumet	tric	
Waste Minimis	ation Through Offsile Constr	uction
wtop finisiesie		
Case shuly		
PODs		
WIDP RESIDENCE		
Case shuly		
Pre-cas	t Concrete	
Waste Minimis		
WIDD BUILDING		
Case study		
wipp Bassacce		
Case study		
Light Ste	eel Frame	
Waste Minimisa	ation Through Offsite Constru	ction
		Up the form the two the two two the transmission of the point of two
Anner, Lightfilterfilterer, en dy far å storey. Ag far, Sjør sladet CAD-CAM self sent over å in fra denig i storge.		Francisco Siluttion - Heji-Performance en Made Rescutori Ne Natar Netzania Antonio Siluttion - Contenting and optimization depriment programmet by Francisco Siluttions - An depriment programmet by Francisco Siluttions and an efficient based on service products in the Lating and through temp in order on Siluttions and an efficient based on durate table is under TM efficience Siluttions and invariant in the Instantion of the matterial provided in and an efficient and any distance Siluttion and Siluttions and Siluttions and any distance Siluttion and Siluttions and Siluttions and any

a provide every part to place in or both or clients and or another of the orbits into place data part or source that considerations project is so that in L.SF. Then, the sign provides a structure of a structure and a and to be not an at a structure and a structure as the and to be not an at a structure relation provide. It is that show the structure relation provide. It is that has a structure to the the structure to the structure or the structure to the structure to the structure.



Objectives of Monitoring on-site

- Exemplars will be provide a more detailed business case than previous case studies.
- Identify waste amount/type/cause using BRE's SMARTWaste tool
- Assess labour cost (man hours), demonstrating on site efficiency of using OSM
- Assess Health and Safety records in relation to pre-fabricated components
- Assess time taken for work packages and planning
- Consider bill of quantities to assess costs and material (e.g. recycled content, recyclable content)
- Use carbon calculator to evaluate the 'footprint' of OSM systems
- Logistics from manufacturing, to transport, to on-site.
- One housing and one commercial exemplar



Ropemaker, central London

Client: British Land 900,000sqft, 21 storeys, 3 basement levels

Breeam excellent:

- biomass boiler
- solar thermal
- solar PVs,
- green terraces

Off-site components being monitored:

- Podwall toilets and ceilings
- Technik flooring



Process – one full time observer for 8 weeks using CaliBRE and SMARTWaste; comparison data (traditional method) collected on shower cubicles and screed flooring on site.



Podwall and Technik Flooring

Technik Flooring

- Composite raised flooring tiles
- Waste reduction vs wet screed
- Reduced installation period
- Traditionally required stone thickness reduced by 50%
- Primary support component = 95% recycled and 5% Gypsum.

Podwall

- Bespoke wall system with toilets and wash basins attached. Includes ceiling cassettes and finished facing
- Modules ready for simple installation, reducing time to construct and waste produced.









South Somerset Homes, Chard



- Housing Association 64 affordable units
- EcoHomes Very Good Rating
- Using Advanced Panel System timber frame
- 14 weeks monitoring on site using CaliBRE and SMARTWaste, ends March 09
- One home takes 14 weeks to build; the data collection therefore covers the entire construction process
- Evaluating physical waste, labour waste / efficiency, and the carbon footprint of materials used.



Conclusions

- Offsite products can have higher direct cost than traditional, but considering all scenarios can be cost neutral or offer savings.
- Significantly less labour
- Labour cost reduced (reduced time and higher productivity as less remedial tasks)
- Less material storage on site meaning site can be kept cleaner
- Packaging could be reduced or reused in most of applications measured.
- Use carbon calculator to evaluate the 'footprint' of OSM systems
- Logistics varies depending on point of manufacture, but will offer savings when located conveniently.



WIOD

starial change is

Case Study

Benefits of off site manufacture

Jocelyn Park, Somerset

Jocelyn Park is a housing development owned and managed by South Somerset Homes Housing Association. There are 64 homes on site designed by Calford Seadon, reaching EcoHomes 'very good', and intended for rent and shared equity sale. Advanced Panel System (APS) manufactured the timber frame.

The construction of 37 dwellings using the APS semi closed panel timber frame system was monitored for 13 weeks between December 2008 and March 2009. A site measurement analyst recorded and analysed site skip content twice daily, as well as operative's site activity every hour using CaliBRE and SMARTAudit tools. This case study provides a comprehensive comparison between the APS semi closed panel timber frame system used in Jocelyn Park and a brick and block system used on SmartLIFE project also fully assessed using BRE monitoring tools. Both sites were EcoHomes 'very good', which is broadly equivalent of Code for Sustainable Homes 3.

Start on site - February 2008 Completion - July 2009



Completed house

To assess the use of Advanced Panel System (APS) in construction of homes against traditional brick and block method in relation to:

- waste (site and factory);
- resource required on site:
- site efficiency and productivity (value added time);
- environmental impact analysis and end of life assessment;
- cost Direct and Indirect;
- installation time
- health and safety.

- The APS system has a very similar cost to traditional brick and block (see page 7).
- Volume of waste reduced by 27.3% during construction using APS semi-closed panel timber frame system.
- 27% less labour required for house construction using APS.
- APS reduces non added value time compared to traditional build
- There were no reported Health and Safety incidents for operatives working on the off site manufactured products.
- The Green Guide rating of environmental impact is the same for APS and traditional construction.
- The APS semi closed panel timber frame system used here is not the most advanced APS product but still demonstrates significant waste savings. If their close panel system was used further reductions could be made.

WIOP

Meterial change for a better environmeni

Ropemaker is a British Land commercial building on a prominent London city site. The site has 586,000 square foot net lettable space, with 21 storeys and three basement levels. The high profile development has impressive green credentials, including a BREEAM 'excellent' rating, and has exploited a number of opportunities for Off Site Manufacture

This study reviews two products manufactured off site including Podwall washrooms supplied by Swift Horsman and Technik flooring supplied by Grants Ltd. Both systems were monitored on site using CaliBRE and SMARTWaste tools to evaluate the efficiency of the construction process and measure the waste generated. Other environmental and cost factors were also assessed.

Start on site - 11 September 2006 Completion (shell and core) - 8 May 2009 Project, Construction and Cost management - Mace

Aims of the research

To assess off site manufactured products in comparison to traditional methods of construction in relation to:

- waste (site and factory); resource required on site;
- site efficiency and productivity
- (value added time);
- environmental impact analysis and end of life assessment:
- cost Direct and Indirect: installation time and
- health and safety.



Results of this research show:

- The Technik floor product reduces
- overall waste and costs compared with traditional flooring.
- The Podwall product brings impressive gains in site labour efficiency and waste reduction, leading to a cleaner and more organised site, with the cost of the product being similar to traditional construction
- There were no reported Health and Safety incidents for operatives working on the off site manufactured products.
- The waste generated in a factory can be controlled and more easily managed both at point of manufacture and on site. Off cuts are reduced, packaging can be reused and recycled, and remedial work is minimised (reducing waste and non value added time during construction).
- Technik flooring has a lower overall environmental impact than screeded and tiled flooring (measured in Ecopoints).

Overall, British Land have been impressed with the quality of the finished washroom units and flooring.





design for materials optimisation



key questions

- Can the design, form and layout be simplified?
- Can the design be coordinated to minimise excess cutting and jointing?
- Is the building designed to standard material dimensions?
- Can the range of materials required be standardised to encourage reuse of off-cuts?
- Is there repetition and co-ordination of design to reduce number of variables? materials optimisation

design for waste efficient procurement







key questions

- Has research been carried out by the Design Team to identify where onsite waste arises?
- 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?

waste efficient procurement





design for deconstruction & flexibility



key questions

- Is the design adaptable for a variety of purposes during its life span?
- Does the design incorporate reusable/recyclable components and materials?
- Are the building elements/components/materials easily disassembled?

deconstruction & flexibility



For more information:

www.wrap.org.uk www.wrap.org.uk/construction





Ipportanties to use anyolid automatic or preference balleting works and use engineering



wasp militate

Halving construction waste to Landfill by 2012



in increasing a provide space and the state of the state

And a state of the second second



