Plasterboard case study

Reducing and recycling plasterboard waste on a site where space is a constraint

This case study describes the approaches taken to design out, recover and recycle plasterboard waste from a city centre location.
WRAP

WRAP (Waste & Resources Action Programme) 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.

Established as a not-for-profit company in 2000, WRAP is backed by Government funding from Defra and the devolved administrations in Scotland, Wales and Northern Ireland.

WRAP and plasterboard

Through its Construction Programme, WRAP is helping the construction industry cut costs and increase efficiency through the better use of materials.

WRAP receives funding from Defra through the Business Resource Efficiency and Waste (BREW) programme to divert plasterboard waste from landfill by working to overcome the barriers to plasterboard recycling. Additional funding is also received from the devolved administrations in Scotland, Wales and Northern Ireland.

WRAP is developing a number of initiatives which are supporting the segregation, collection and recycling of waste plasterboard, and the development of end-market uses for the resulting recycled gypsum.

More information on WRAP’s work can be found on www.wrap.org.uk
Overview

Developments in major city centres can often have space constraints, which limit the space available for material delivery, on site construction and waste collection. Due to the location there can also be increased demands for efficient transportation of materials and waste.

Early consideration of plasterboard waste prevention, minimisation and management can contribute to efficient site management, provide cost and time savings and improve environmental performance. This can include design to minimise plasterboard waste, developing methods for efficient material handling (such as undertaking board cutting activity off-site) and the effective segregation of waste and its collection to maximise the recycling of the waste generated.

New Street Square is a typical city centre development. It is a £200m project in the City of London, which occupies a prominent site on New Fetter Lane, EC4. The development will replace an assortment of 1960s buildings with cutting-edge sustainable architecture and has achieved an ‘Excellent’ Design and Procurement BREEAM rating for all four major buildings. The buildings (A – D) range from 19 storeys to 6 storeys. Office accommodation totals 65,513 m² and will house both large and small businesses. There will also be a mix of small shops and cafes on the ground floor. The project started in June 2005 and final completion is scheduled for April 2008.

Sir Robert McAlpine Ltd is the main contractor and is working with MPG Contracts Ltd which undertake the dry lining and plasterboard installation and PBRUK Ltd which collects and recycles any plasterboard waste generated. These three companies have collectively worked together to successfully minimise the amount of plasterboard waste generated and maximise the amount recycled on this project.
Plasterboard is made of a gypsum plaster core with a paper facing. It is a widely used construction material for applications such as forming partitions, lining walls and ceilings. Over 2.5 million tonnes of plasterboard are manufactured and used in the UK each year, and this is increasing.

From its use, plasterboard waste arises during installation through wasteful design, off-cuts, damaged boards, and over-ordering. Wastage of 10%-35% often occurs on sites, leading to around 300,000 tonnes of plasterboard waste being produced each year from this source. It also arises from its removal, such as from removing partitions, refurbishing wall and ceiling linings, repairing damaged linings, and from complete soft-strip before demolition of a building. It is estimated that in total more than one million tonnes of plasterboard waste is produced in the UK each year.

Although plasterboard waste from all these sources can be recycled, the vast majority is still disposed to landfill. It is increasingly necessary to find alternatives to this, due to factors such as:

- increases in landfill tax increasing the cost of disposal to landfill year on year;
- available space in landfill sites decreasing;
- the Landfill Regulations now requiring that quantities of gypsum-based materials being disposed of to landfill must be deposited in a specially engineered ‘high-sulphate monocell’ in a non-hazardous landfill site, leading to increased disposal costs.

Two solutions are to minimise the amount of waste produced, and to recycle any waste that is produced. The companies working together on the New Street Square development are adopting both these principles to reduce the amount of plasterboard waste being sent to landfill.
Company overviews

**Sir Robert McAlpine Ltd**

Sir Robert McAlpine Ltd is a UK based, privately-owned, family company operating in the building and civil engineering sector. In 2006 the company had a turnover of £905m.

They aim to minimise waste at source and recycle any waste generated, driven by the company’s ISO 14001 certification, CSR agenda, and client and local authority requirements, rather than necessarily cost.

They have extended this to their supply chain partners by making them responsible for their own hazardous waste and other types of waste which should be kept separate. This has proven to be a major incentive for sub-contractors to minimise and manage their waste more efficiently. Following success with this strategy across the London area, the company is currently assessing the feasibility of applying it more widely in other regions.

**MPG Contracts Ltd**

MPG Contracts Ltd is an internal finishings contractor established in 1974, with an annual turnover approaching £40m. MPG Contracts Ltd has recently achieved ISO14001:2004 accreditation and have implemented processes to reduce and recycle waste on many of their projects.

MPG Contracts Ltd understands that the design stage is vital to reducing the volume of plasterboard waste arising. For example, on previous projects it was able to offer a solution that took the existing specification down from a two layer partition to a single layer system, therefore reducing the volume of off-cuts. MPG Contracts Ltd also looks for opportunities to reduce manual handling, cutting boards to size off-site, using locally based...
distributors and trialling ‘chipper’ machines to increase volumes of waste in skips.

**PBRUK Ltd**

PBRUK Ltd was established in 2004 to provide a cost effective, environmentally sound alternative to the disposal of plasterboard waste. PBRUK Ltd recognised a gap in the market and set about identifying methods for collecting, processing and establishing end user clients for the recovered gypsum and paper.

PBRUK Ltd supplies a broad scope of service that includes the collection, storage and re-processing of plasterboard waste. Fixed costs per tonne (£75-110 dependent on geographical location) allow for an easy approach to contract tendering as clients can clearly estimate their waste disposal costs. Clients are informed of quantities of plasterboard waste received within the skips arriving at PBRUK Ltd, allowing them to assess their skip loading and packing technique as well as comparing predicted waste with actual.

PBRUK Ltd can process around 4,000 tonnes of plasterboard a month within its facilities and can also provide specific training for construction site personnel on the segregation and recycling of waste plasterboard.
Designing out waste

Early in the project, the MPG project team worked with Sir Robert McAlpine to identify opportunities to design out waste. At the design stage the specification was reviewed to explore what the project could achieve. Wherever possible the building has been designed to use full height boards, resulting in less off-cuts generated.
On site waste reduction

MPG Contracts Ltd is continually looking at ways to reduce plasterboard waste and improve efficiency of handling. Initially plasterboard was installed in the conventional method, i.e. full sheets which were then cut by the installers at the work face. It was estimated that this approach generated an additional 20 boards (72m²) worth of waste, which then needed to be removed from the building. To make this process more efficient MPG Contracts Ltd set up a cutting station on site to manage waste generation. The cutting station area provided a controlled environment to cut plasterboard and ensure that only the required plasterboard of the right shape and size was delivered to the place of installation. This had the benefits of reducing accidental damage, providing a tidier and safer working environment, and reducing the need to transport waste from the working area to the skips. A small container for plasterboard waste was made available at the cutting station to enable effective collection of off-cuts, providing efficiency gains.
When space and programme constraints meant that this area was no longer available, MPG Contract Ltd sourced an off-site facility through their supplier which enables boards to be cut to size and delivered to site, reducing waste on-site even further. This also reduces the amount of handling time spent offloading vehicles and removing waste from the building which saves an estimated one and a half person days per level on installation time. When considering that on one building 18 floors needed plasterboard fitting, this system adds up to a substantial programme saving.

Although using the off-site facility incurs some financial costs, this is rationalised by the reduced waste being produced on the working floors, reducing the amount of manual handling and increasing production. There have also been improvements in the quality of finishes when the boards are cut in a controlled environment.
Barriers to further waste reduction

A number of opportunities to reduce plasterboard waste generation further were identified, but unfortunately could not be feasibly developed further on this project.

- The design detail of the door jamb was highlighted as an area that could be redesigned to minimise waste, but unfortunately due to acoustic performance criteria the design could not be amended.

- The architect’s specification stated that horizontal joints below ceiling level were not permitted – a common specification in the UK. This meant that the boards could not be staggered to maximise the use of off-cuts. The figure below shows how the arrangement usually specified uses eight plasterboard sheets for a six metre linear wall. But by allowing horizontal joints below ceiling level by staggering boards and off-cuts the wall can be lined using seven boards. A saving of one board per six metre linear wall equates to a substantial saving over a whole building.
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Savings to be achieved by staggering the board layout

MPG Contract Ltd’s previous experience in Europe has proven that allowing horizontal joints below ceiling level can successfully reduce the amount of board used and subsequently the volume of waste created. The architects have stated that they would be willing to investigate the aesthetics of the staggered system, although the issue of stud positions and quality of the cut edges would have to be addressed.

**Plasterboard waste management**

Although a range of steps have been undertaken to reduce the volume of waste plasterboard generated on site, there is still a need for effective collection of waste material generated. One of
the key factors required to successfully manage waste on this space constrained site was detailed site planning to ensure there are designated areas for skips. Early discussions between Sir Robert McAlpine Ltd and MPG Contract Ltd were undertaken to assess the best options for the locations of containers and methodology for segregation and collection of waste plasterboard. A variety of options were considered, but the best environmental and economic option was to recycle plasterboard through PBRUK Ltd.

PBRUK Ltd provides the project with a flexible option for recycling plasterboard that is tailored to meet project requirements. A range of containers were considered. For example, the provision of 1 tonne bags was an option, but would not have been suitable due to limited space on floors and the unavailability of hoists and crane lifts. It was decided that the provision of a 40 cubic yard skip that is placed on-site and collected when full, at a time that is convenient for the project, was the most suitable option. This enabled a reduction in the number of collections and the associated vehicle movements around the site and congestion on local roads.

**Segregation and collection**

The waste plasterboard generated during installation is segregated into wheelie bins on each of the floors and emptied when full into the central 40 cubic yard skip.

Approximately 1000 operatives at maximum peak have worked on the New Street Square site. Key to ensuring plasterboard is properly segregated from other waste are weekly toolbox talks to brief staff on, among other issues, the correct way to manage the plasterboard waste. Site supervisors monitor the process by regularly checking the plasterboard skip to ensure there is no mixing of waste streams.
MPG Contracts Ltd has been on site since September 2006 and by June 2007 50% of the first building and 10% of the second had been completed. In this time PBRUK Ltd collected two 40 cubic yard skips, which equates to just over 20 tonnes. The first skip was filled in approximately two months, whereas the second skip took four months to fill which was a direct result from the designing out of waste and pre-cutting on and then off-site. As a result of this, MPG is choosing to reduce the size of the skip required to a 20 cubic yard version.

Later in the project, a plasterboard chipper will be used on New Street Square Building D following its successful use on another London project. By reducing the size of the pieces of waste plasterboard more efficient use can be made of the space within a skip, which will reduce costs of skip hire and transportation.
Recycling of the plasterboard waste

The full skips are transported to PBRUK Ltd’s facility in Edmonton, London, where the weight of plasterboard is recorded. Invoices are then issued, which record the date and tonnage of waste plasterboard received, together with copies of the original weighbridge tickets for reference.

On receiving the plasterboard, PBRUK Ltd removes all large contaminants (other materials in the skip with the plasterboard) by hand as they could affect the segregation process or damage the recycling equipment. Following screening and subsequent processing of the gypsum, magnets are used to remove any remaining ferrous metals (such as nails and screws). All of these contaminants are separately recycled where possible. PBRUK Ltd states that “contamination should be kept to an absolute minimum with the plasterboard being effectively segregated from other wastes; excessive levels of contamination can result in clients being charged for the removal and onward disposal of non-plasterboard waste”.

The composition of the final recycled gypsum product is 98-99% gypsum with the remainder being paper fibre from the plasterboard facing paper. The recycled gypsum is supplied to a number of different end-users at a lower cost than that of gypsum from conventional sources. These users include a number of plasterboard manufacturers and cement manufacturers. The facing paper stripped off the plasterboard is supplied to compost manufacturers who incorporate it into their product.
Benefits

- By June 2007 MPG Contracts Ltd had used around 300 tonnes of plasterboard on New Street Square. The approach taken has reduced plasterboard waste generation to approximately 20 tonnes; a wastage rate of under 7%. All waste plasterboard is being recycled, providing a cost neutral alternative to landfill disposal.

- It costs MPG Contracts Ltd approximately £75 to £80/tonne to recycle its plasterboard waste through PBRUK Ltd. This fixed cost allows MPG Contracts Ltd to manage its waste strategy effectively. This is useful when tendering for the work as it allows plasterboard fitters to estimate the cost of waste disposal with confidence as variables are reduced.

- Clear environmental benefits have been realised by reducing waste arising in the design stage and subsequently diverting any plasterboard waste generated from landfill.
Conclusions

By encouraging its sub-contractors to be responsible for their own waste, Sir Robert McAlpine has proven that this can be a major incentive for its supply-chain partners to minimise and manage their waste more efficiently.

Early discussion between MPG Contract Ltd and Sir Robert McAlpine ensured that the plasterboard waste strategy suited both the Sir Robert McAlpine corporate strategy and the restrictions on the New Street Square Project due to its city centre location.

This case study demonstrates that with appropriate drivers, good planning and a desire by all members of the project team to minimise plasterboard waste, a range of positive solutions can be developed. These included:

- design and specification to minimise waste generation;
- managing the source of waste generation effectively and efficiently;
- segregating and collecting the waste generated; and
- recycling the waste, so that it can be used in new products.
Contact details

Sir Robert McAlpine

Clare Masters
Environmental Manager
New Street Square

Tel - 0207 842 7500
Email - c.masters@sir-robert-mcalpine.com
www.sir-robert-mcalpine.com

MPG Group Ltd

Bill Jarman
Contracts Director
Stuart House
Queensgate
Britannia Road
Waltham Cross
Hertfordshire
EN8 7TF

Tel: (01992) 807200
Email – bill.jarman@mpg-contracts.ltd.uk
www.mpggroupltd.com
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