This case study describes the approaches taken to minimise and manage plasterboard waste during a major PFI development project at Ipswich Hospital.
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
Summary

The Garrett Anderson Centre is a new £26m treatment centre being constructed for the Ipswich Hospital NHS Trust by Kier Eastern. Once complete this will be a four storey, 8000 m² development linked to the existing hospital, containing a range of medical departments and care facilities.

As part of their environmental policy, Kier Eastern have made a strategic commitment to reduce the amount of waste generated by their business. Plasterboard waste generation could have been potentially significant on this project, so they have undertaken a number of approaches to minimise and manage this waste.

This case study describes the approaches taken on the project, and how they have been possible through the relationship between Kier Eastern, Knauf Drywall, BR Hodgson and Wastefile UK.

It is estimated that Kier Eastern will use around 22,000 m² (295 tonnes) of plasterboard on the Garrett Anderson Centre. By April 2007 the project had recycled approximately 81 tonnes of plasterboard waste through the waste management approach taken.

This was cost effective and has helped Kier Eastern to improve their environmental performance by reducing the quantities of waste disposed of to landfill.
Background

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 alternatives are to minimise the amount of waste produced, and to recycle any waste that is produced. The companies working together on the Garrett Anderson Centre are using both these principles to reduce the amount of plasterboard waste being sent to landfill.
Project overview

Prospect Healthcare, comprising Kier Group and HSBC, has a PFI contract for the Garrett Anderson Centre, a new £26million treatment centre for the Ipswich Hospital NHS Trust. The total £41million private finance initiative project involves financing, designing, building and maintaining the facilities under a 30-year concession.

The four-storey facility, linked to the existing hospital via a corridor, is being built by Kier Eastern and will provide Ipswich with a state-of-the-art building on the existing hospital site. The centre will include a new emergency department, a critical care centre, a day surgery suite, and theatres and beds dedicated to planned or elective care. The construction project has an 89-week contract programme which commenced March 2006, and is due for completion by December 2007. Kier Managed Services, also part of the Kier Group, will then maintain the building over the concession period.

As part of their environmental policy, Kier Eastern have made a strategic commitment to reduce the amount of waste generated by their business. Plasterboard waste generation could have been potentially significant on this project, so they investigated a number of approaches to minimise and manage this waste.

As part of this Knauf Drywall, the supplier of plasterboard, suggested entering into a waste take back scheme to Kier Eastern. Knauf Drywall supplies the plasterboard to the site and, on their behalf, Wastefile UK establish and manage a collection system.

BR Hodgson is responsible for the plasterboard installation and on site segregation of the waste. Wastefile UK collect and transport the segregated waste plasterboard to Knauf Drywall, who process it into its constituent parts: gypsum and paper. The recycled gypsum is then used as feedstock in the manufacture of new Knauf plasterboard.
Company overviews

**Main Contractor**

**Supplier of plasterboard**

**Drywall contractor and site supervisor responsible for onsite waste segregation**

**Plasterboard waste management contractor**

**Incorporate recycled gypsum into new product**

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**Kier Eastern (Kier Group plc)**

Kier Group plc is a leading construction, development and service group specialising in building and civil engineering, support services, private house building, property development and the Private Finance Initiative. The group employs 8,300 people worldwide and has an annual turnover in excess of £1.84 billion.
The construction division comprises a UK-wide network of regional contracting businesses and major projects expertise in the UK and overseas. In support services, they provide a full life-cycle service for buildings in both public and private sectors including reactive and planned buildings maintenance, grounds maintenance and a host of other services. They also have private house building and commercial property interests and an infrastructure investment division specialising in the delivery of Private Finance Initiative projects.

Kier Eastern is a regional arm of the Kier Group and operates from offices located in Wisbech, Witham and Norwich. Kier Eastern is responsible for the construction of the Garrett Anderson Centre, and has overall responsibility for the plasterboard installation and waste management scheme on site.

**Knauf Drywall (Knauf Group)**

The Knauf Group was founded in 1932 as a gypsum processor and has since expanded and diversified to become a corporation with worldwide activities in construction products and materials.

The UK plasterboard business started in 1988 with the construction of their first plasterboard plant in Sittingbourne, Kent. A second plasterboard plant at Immingham, NE Lincolnshire, and expansion of the Sittingbourne plant closely followed. Knauf Drywall is now one of the largest suppliers of gypsum-based building materials in the UK. They have always recycled their own manufacturing waste back into the production of new product, and in 2006 began to take back plasterboard waste from new construction.

The Garrett Anderson Centre is one of many commercial projects where they are operating a take back scheme for waste plasterboard, in addition they also have a nationwide scheme on all Barratt and Kingsoak sites utilising bulk bags as a collection
method. Knauf are currently recycling waste plasterboard at both their manufacturing sites in Immingham and Sittingbourne.

**BR Hodgson Ltd (BR Hodgson Group)**

The BR Hodgson Group was created in 1976 and now consists of four companies that specialise in providing trade packages, including dry lining, structural framing, insulated renders and cladding systems, to major contractors, construction managers and management contractors over a wide geographical area in the U.K. with current turnover in excess of £20m.

BR Hodgson Ltd is one of the four companies, with offices based in Bristol and London. BR Hodgson Ltd has developed a strong reliable relationship with Kier Eastern, and have been contracted to provide the drylining installation at the Garrett Anderson Centre. In addition they provide on-site supervision for the construction work, which includes clearing of all waste.

**Wastefile UK**

Wastefile UK provide waste and environmental management solutions, delivering a range of services sourced from independent suppliers in markets driven to growth via government legislation and environmental concerns. In addition to providing waste recycling and disposal solutions, they aim to achieve significant reductions in the quantity of waste produced per development through continuous proactive waste minimisation on site.

Over the past decade, Wastefile UK have implemented Site Waste Management Policies and on-site source-segregated ‘Managed Waste Systems’ of individual waste streams throughout their client base. In addition to total waste reductions, these systems have provided significant savings in associated disposal costs by moving waste up the waste hierarchy, with the additional knock-on effect of raising awareness amongst employees and subcontractors.
Wastefile UK and Knauf Drywall have developed an excellent working relationship over the past year and have an agreement that Wastefile UK will provide a plasterboard waste management service for all Knauf’s clients. At the Garrett Anderson Centre, Wastefile UK has worked closely with Kier Eastern to ensure that appropriate segregation and collection facilities are established on the site.
The approach

**Planning Stage**

Kier Group’s environmental statement sets out a strategic commitment to target the amount of waste generated by their business. At the Garrett Anderson Centre plasterboard waste generation was addressed as part of the site-wide waste management programme in the following ways.

**Design to minimise waste generation**

Kier Eastern involved the design expertise of Knauf Drywall in the early stages of the project to assist with reducing wastage through the rationalisation of drylining systems. The aspects developed included the following:

- Reducing the layers of plasterboard and varying the types limited the requirement to only five types of plasterboard for the whole project;

- A three-metre high (room height) plasterboard to eliminate horizontal joints below the ceiling. This helped the programme and reduced wet trades within the building;

- The infill sections at the head of the walls within the profiled decking, needed to achieve the acoustic requirements, were manufactured off site to the exact profile of the decking. This had additional beneficial effects on both the programme and the quality of installation.
Typical internal metal stud partition. The size of plasterboard was selected to reduce wastage.

Profiled plasterboard faced mineral fibre batts awaiting fitting to the head of the internal metal stud partitions.
Cost benefit analysis of disposal routes

Kier Eastern undertook a cost benefit analysis of disposal to landfill compared to a take back scheme, based on a 10% wastage of plasterboard. This concluded that the take back scheme was cost neutral.

On site segregation and collection, for onward recycling

Site audits

On-site recycling targets were set for a range of materials including plasterboard. These were established during the planning stages by the Wastefile UK Regional Sales Manager and Kier Eastern Site Manager carrying out a project and site audit. This assessed:

- Expected quantities and timings of plasterboard waste generation, to ensure containers would be provided in the right place at the right time;
- Available space for siting the recycling containers; and
- Timing for collection of the containers.

A site waste management plan was then established. For the construction phase, this required the segregation of a range of materials including metals, aggregates and excavation waste, concrete, and plasterboard.

During the later interior fitting-out stage another audit will be undertaken, as the material streams change and the focus will then be on recycling of plastics and cardboard packaging waste.
Containers

Wastefile UK reviewed which collection containers would be most suitable for the site; options included:
- 35- or 40-cubic yard roll-on roll-off containers;
- 1 m³ bulk waste bags;
- Standard skips of various sizes; and
- Wheelie bins.

The type of container selected depended on projected waste arisings, ease of use, space available, and access to site. The option selected was 35-cubic yard open top roll-on roll-off containers as these were the most cost effective solution. This option was feasible as there is sufficient space to place the container on the site, and access to manoeuvre the vehicles. The containers can either be top loaded or front loaded through a manual door, and their high sides make them suitable for large, bulky construction waste.

Segregation and collection on site

Responsibility

BR Hodgson Ltd is responsible for the plasterboard installation on site. They also provide supervision to manage all the construction work, and they have an important role in ensuring effective segregation of waste. They ensure that construction workers carry out the efficient unloading of materials and removal of waste from the workface in the building. As part of their role, they are responsible for segregating all waste and placing it in the designated containers.
Contamination

At the initial stages of the scheme low levels of plasterboard waste contamination of less than 2% were set in accordance with contamination specifications agreed with Knauf Drywall. All collection containers have to be filled with clean plasterboard waste only, excluding certain Added Value specialist boards (for example, vinyl or foil backed boards).

Kier Eastern were confident about adhering to these requirements as the plasterboard waste generated would be only clean cut-offs from new sheets, and had not arisen from demolition work where the plasterboard could potentially be contaminated with paint, nails, timber or screws. Contamination in the containers of anything other than clean plasterboard could have potentially resulted in additional charges.

Methodology

Mini-skips on a loading platform are provided in the building for the collection of waste. The mini-skips are used to clear the building of all types of waste, but they only clear one waste type at a time.

A crane is used to lift the mini-skips from the loading platform to beside the correct waste skip or container. In the case of plasterboard, the waste is loaded into the roll-on roll-off container by the construction workers through the door. The plasterboard is stacked flat to maximise the volume of material in the container.

Moisture on plasterboard was not an issue for Knauf Drywall as it helps suppress dust when it is processed; it has been found that dry plasterboard can cause lumps to be formed and hence affect the efficiency of their process.
**Reporting**

The plasterboard collection scheme is making use of Wastefile UK’s bespoke IT waste production monitoring and data reporting system. This system accounts for the total tonnage of waste from the site, average tonnage per skip and percentage contamination, and therefore allows Kier Eastern to track the success of the scheme.

**Haulage of the waste**

Kier Eastern is responsible for arranging a collection when the containers are full by contacting Wastefile UK, who are in turn responsible for the haulage of the waste plasterboard to Knauf Drywall recycling facility in Sittingbourne.

The advantage of the close working relationship and clear understanding between the parties on this project is that there has not been any incidence of unacceptable contamination.

The frequencies of collections are tending to be every two weeks, with an empty container being exchanged for the full one. The data reporting system shows that the typical quantity of plasterboard waste in a skip is approximately 9.3 tonnes.

**Plasterboard recycling**

Upon delivery of the waste plasterboard, Knauf Drywall stockpiles the material for processing. They then process the waste plasterboard using the recycling plant, which removes the paper and produces a recycled gypsum product which is in a suitable form to be used back in the plasterboard manufacturing process.

This completes the closed-loop recycling of gypsum through plasterboard manufacturer and installation.
Benefits

- By involving Knauf Drywall in the early stages of design, Kier Eastern have rationalised the drylining systems and varieties of plasterboard on the project. This helped to minimise wastage and simplify the supply chain to site.

- It is estimated that Kier Eastern will use around 22,000 m² of plasterboard on the project. By April 2007 81.1 tonnes of plasterboard waste had been collected in 8 roll-on roll-off containers. All of this plasterboard waste was recycled and incorporated back into new plasterboard.

- By entering into a take back agreement with Knauf Drywall, Kier Eastern have established a recycling system for their plasterboard waste which is cost neutral compared to disposal to landfill.

- The close working relationship and clear understanding between the parties on this project has resulted in no incidence of unacceptable contamination in the waste plasterboard collected. This has resulted in all plasterboard collected being recycled, and no additional charges being imposed.
Conclusions

This case study has illustrated that plasterboard waste management can be successfully implemented in construction projects. At the Ipswich Hospital Garrett Anderson Centre development this was influenced by a number of factors:

- A corporate commitment by Kier Eastern to reduce the volume of waste sent to landfill and improve the company's environmental performance. Their holistic approach to site waste management resulted in the early analysis of the project's waste streams, examination of ways to design out waste, and a search for new opportunities to recycle.

- Kier Eastern and Knauf Drywall working together to design out waste through rationalising the drylining systems and varieties of plasterboard used on the project, and using bespoke sized boards.

- Knauf Drywall having been proactive in suggesting a take back scheme to help Kier Eastern find alternatives to landfill disposal for their plasterboard waste.

- Knauf Drywall having developed a supply chain partnership with Wastefile UK, which allows the efficient collection, transport and processing of plasterboard waste to produce recycled gypsum.

- Wastefile UK, BR Hodgson and Kier Eastern working together to ensure efficient management of plasterboard waste.

Kier Eastern consider that the approaches taken to minimise and manage plasterboard waste on this project have been very successful. They have found that Knauf Drywall have developed a flexible take back scheme that would be easy for construction projects of varying sizes and in different geographical locations to implement. In addition, through legislative changes and increasing disposal costs, economic paybacks can be realised by using the waste minimisation and management approaches. These incentives have reinforced Kier Eastern's commitment to address plasterboard waste on all their projects.
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