

SITE WASTE MANAGEMENT PLANS, THE DESIGNER AND THE CDM PRINCIPAL CONTRACTOR

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The Site Waste Management Plans Regulations 2008 (SWMP) have as their purpose the requirement for the elimination, recycling or re-use of construction waste so as to reduce the use of landfill. The results of a survey carried out to establish designers' involvement in waste reduction during the design stage shows a lack of understanding and commitment to this process. A second survey shows that information from the designer on the quantity and type of waste, which the principal contractor is expected to manage once the construction phase commences, is lacking. It is argued that as a result, any waste reduction achieved during the construction phase would be at the initiative of the CDM principal contractor, thus placing an unreasonable responsibility on him to reduce waste resulting from a design over which he has had no control. This could result in increased health and safety risks for the CDM 2007 principal contractor as he would have no prior knowledge of the designer-imposed waste management activity required of him (site storage/working areas required for materials recycling or re-use, et cetera) once the construction phase commences, thus having increased risk of environmental damage and/or pollution resulting from his unplanned site-based waste triage activities.

Keywords: construction planning, design management, environmental impact, health and safety, recycling.

INTRODUCTION

UK construction sites use around 360 million tons of resources each year and generate some 100 million tons of waste (equivalent to a third of all UK waste).

Estimates suggest that 10-30% of the materials that end up as waste on-site have never actually been used – a major waste of resources. The true cost of waste (Envirowise, 2007) can be up to 15 times more than the cost of waste disposal. Available landfill sites are rapidly being used up. In tandem with the general policies of re-use and recycling and with the aim of reducing our carbon footprint, the government have introduced a landfill tax (HM Government 1996) to act as a disincentive to sending waste to landfill. The objective is to increase the re-use or recycling of waste.

The Site Waste Management Plans Regulations 2008

The Site Waste Management Plans Regulations 2008 (HM Government 2008) came into force on 6th April 2008. These Regulations are known as SWMP 2008 (HM Government 2008) in their short form. Currently these Regulations only apply to construction projects carried out in England.

The purpose of SWMP 2008 (HM Government 2008) is to protect the environment by reducing the amount of construction waste being sent to landfill. This is to be achieved by identifying materials that can be re-used or recycled. In order to do this,

the SWMP 2008 (HM Government 2008) regulations impose a duty on any client who intends to carry out a project on any one construction site, with an estimated cost greater than £300,000 excluding VAT, to prepare a site waste management plan before construction work begins. To facilitate this process, Regulation 6 stipulates that the client must record any decision taken before the site waste management plan was drafted on the nature of the project, its design, construction method or materials employed in order to minimize the quantity of waste produced on site. The client must appoint a (SWMP) principal contractor. Once the construction phase begins, then the SWMP principal contractor should ensure that the site waste management plan (SWMP) is updated as work proceeds. However, SWMP 2008 (HM Government 2008) imparts no clear duty of enforcement (Baldwin 2010) with any particular body. Either the Environment Agency, any local government area with a principal authority, any district or county council or, in the City of London the council, may enforce the SWMP Regulations. This lack of clear direction could lead to non-compliance by industry.

In Wales devolved power is given to ministers in the Welsh Assembly Government to require developers and contractors to produce a written site waste management plan for both construction and demolition projects. In the meantime, and in the absence of formal legislation, Local Authority planning departments are also promoting resource efficiency and recycling in the form of guidance.

In Scotland, whilst the Scottish Government supports site waste management plans as a tool to reduce waste generated through construction and demolition work and with a view to halving the amount of waste sent to landfill by 2012, there is no intention (Association for Project Safety, 2010b) to legislate to require site waste management plans – although it retains the option to make them compulsory if necessary, through the powers in the Climate Change (Scotland) Act 2009 (Scottish Parliament 2009).

The Construction (Design and Management) Regulations 2007

The CDM 2007 Regulations (HM Government 2007a) are intended to focus attention, from design concept onwards, on planning and management throughout construction projects. These Regulations apply to the whole of the UK. The aim of CDM 2007 (HM Government 2007a) is for health and safety considerations to be treated as an essential, but normal part of a project's development – not an afterthought or bolt on extra. In order for him to fulfil his duties for notifiable projects (those construction projects which are expected to last more than 30 days or involve more than 500 person days) under CDM2007 (HM Government 2007a), the client will appoint a (CDM) principal contractor. His responsibility is to manage the construction phase of the project, to produce (before commencement on site) a suitable construction phase plan – and then update it during the course of the works.

DISCUSSION

Although site waste management has been the subject of numerous studies over the last twenty years or more, industry does not appear to have overcome the challenges that, without clear client/designer buy-in to the process, seem impossible to surmount.

Decisions will need to be made and waste minimization plans initiated by designers in all senses of the term (Coventry *et al.* 1998) but designers have traditionally been appointed by clients on the basis of the aesthetics of their design, and not on their waste reduction performance. Should clients leave the successful tendering principal contractor to be the party relied upon to manage waste generated on site, the perceived

costs to the principal contractor and his contractors will naturally have been reflected in the tender price to the client. Putting the financial benefits to the client of waste reduction during the design stage of his project to one side, there are also health and safety matters that need to be considered. This is because there is a common connection between health and safety implications of the design and of the waste management process, of the contents of the construction phase plan required by CDM 2007, (HM Government 2007a) and of the site waste management plan (HM Government 2008). Each designer needs to discuss the type and format of supporting information with the client's CDM-Co-ordinator who has to identify and provide information to those who need it" (Association for Project Safety 2007a). At design stage this person would be the Lead Designer. Unfortunately there appears to be a lack of joined-up thinking in Government about how this should be achieved. These two pieces of legislation, both closely linked and interchangeable with construction waste reduction and health and safety (Price *et al.* 2009), have been put together at almost the same time (2007 for CDM and 2008 for SWMP) and by two different government departments – the Health and Safety Executive (HSE) for CDM 2007 and the Department for Environment, Food and Rural Affairs (DEFRA) for SWMP 2008. There is no evidence of a common dialogue.

Once the design has been completed and the construction contract awarded, it is the principal contractor who now has to accept any residual risk to the design (including waste management). One of the control measures outlined in CDM 2007 (HM Government 2007a) is the requirement that risk management proposals/methods that the designers have assumed or decided will be appropriate (Association for Project Safety 2007b) will be made available for development of the construction phase plan by the (CDM) principal contractor. This is based on the advice embodied in Paragraph 125 of The Approved Code of Practice to CDM 2007 (HM Government 2007b), which makes it clear that measures should be taken in order to 'avoid foreseeable risks' of any design.

Even when if the designer has reduced waste in his design as far as is possible there will still be waste to manage. It cannot be totally eradicated, only reduced. Therefore, it is important to the CDM 2007 (HM Government 2007a) principal contractor that before he tenders for the works the client should inform him of the likely quantity and type of materials that he would be expected to re-use, recycle or send to landfill should he be successful in winning the construction contract. Thus, the CDM principal contractor would be able to transmit this information to his sub-contractors in order for them to mimic his waste management process in their price submissions to him. Bearing in mind that considerable savings can be achieved by adopting site based strategies for handling waste (McDonald and Smithers 1998) and that source separation requires less effort and results in better segregation of inert and non-inert wastes (Poon *et al.* 2001) as compared with waste sorting centrally carried out at a designated area either on or off-site, the CDM principal contractor will need to know, through the pre-construction information pack, where the client has deemed that any on-site waste storage and/or triage activities should be situated, or if the SWMP (HM Government 2008) principal contractor has decided that he wishes to send his waste as mixed waste away to an external triage station. The CDM principal contractor will, if the SWMP (HM Government 2008) principal contractor wishes to segregate waste at source, perhaps by the strategic siting of bins in live working areas on site, have additional housekeeping issues such as fire safety and manual handling to manage.

This is one area, and there are others, where the crossover between SWMP 2008 (HM Government 2008) and CDM 2007 (HM Government 2007a) occurs.

Although design is only one of the influencing factors in the volume of waste produced on construction sites (Coventry *et al.* 1998) it can play a major part in reducing the volume that goes to disposal. Therefore, by his input to the site waste management plan, the designer could indicate the likely volume and type of waste that the CDM principal contractor may wish, by using a site guide to waste minimization, (Guthrie *et al.* 1997) to re-use, recycle or send to landfill. As this will be occurring in parallel with development of the construction phase plan (Association for Project Safety 2008), this information, because of the health and safety issues relating to waste management on site, should be incorporated into the construction phase plan. There may also be useful contents of any site waste management plan that could be added to the health and safety file (Association for Project Safety 2009). In particular, information could be given on materials which the designer has envisaged should be re-cycled or re-used and how, using a deconstruction plan, such a process should be carried out so as to minimize damage to those materials and to include instructions on how the designer has envisaged that their retrieval can be carried out safely (Price *et al.* 2009). Mention could also be made of those materials that, because of any physical properties that they may have acquired during their installation in a given structure, may place restrictions on their use once recycled. For example, steelwork originally used in the construction of a magnetic resonance imaging suite may be affected by residual magnetization (Price *et al.* 2010) and therefore would not be re-useable in an area where this newly acquired physical property could affect electronic equipment.

Even if a CDM principal contractor was efficient in his process of re-using waste construction materials during the construction phase, real savings by the use of recycled materials is still not fully accepted by architects who are often reluctant to specify recycled materials in their projects. This is mainly due to: concerns relating to their properties (Sassi 2004); uncertainties that a guaranteed standard can be achieved, and because of lack of knowledge (Coventry *et al.* 2001, Osmani *et al.* 2008).

The Site Waste Management Plans Regulations 2008 (HM Government 2008) misnomer (Philip A. Baker, personal communication, April 2010) could lead the construction industry to believe that it is the site that bears responsibility for reducing construction waste sent to landfill. This research sets out to test this hypothesis.

RESEARCH AIMS AND OBJECTIVES

Under the Site Waste Management Plans Regulations 2008 (HM Government 2008) clients are responsible for preparing the site waste management plan for a given project. The aim of this work is to identify, through a survey of designers and principal contractors, if any decisions were taken by designers in order to minimize the quantity and type of waste produced on site once the construction phase begins, and if this information was included in the pre-construction information pack for the successful tendering CDM 2007 (HM Government 2007a) principal contractor to incorporate into his construction phase plan.

The objective is to highlight the risks to which the client may be exposed if information on the estimated quantity and type of waste, as well as advice regarding viable on-site locations for the waste management process, is not forthcoming from the designer via the pre-construction information pack (CDM 2007a) at tender stage of the project.

Table 1: Project cost, project description and designer speciality

Designer identification reference	Value excluding VAT (£)	Project Type	Designer speciality
1	965,000	Hospital x-ray department extension	Health
2	783,000	New offices with two shop units below	Offices
3	348,000	Library extension	Public Works
4	321,000	New children's paddling pool and play area	Public Works
5	315,000	New doctors' surgery	Health
6	302,000	New electrical sub-station and civils infrastructure	Utilities (Power)
7	318,000	New engineering factory	Industrial
8	763,000	Bus station	Public Works
9	426,000	New retail warehouse	Industrial/retail
10	512,000	New school classrooms and cafeteria extension	Schools

RESEARCH METHOD

In order to achieve the objective, it was decided to conduct a survey of middle size designers and principal contractors whose portfolio covered a broad range of disciplines, but with project values the minimum value of which was set at £300,000 and the maximum as £1,000,000, both figures excluding VAT. This research has the limitations that the results may not apply to projects that have a greater or lower value than those studied, and that it did not include any design and build contracts.

Data collection process

By consulting Chambers of Commerce and using telephone calls to obtain their agreement to participating in the survey, an ad hoc selection of ten design practices and ten principal contractors was made from ten counties of England.

The questionnaires

Designers were chosen based on their project speciality and value of the project, as in Table 1. CDM principal contractors were chosen simply because it was they who had won the construction contract. Survey questionnaires were sent as hard copies to those designers and principal contractors who had previously agreed to participate. Although three designers and two principal contractors had to be reminded of their commitment to the survey, a final return rate of 100% was eventually achieved.

RESULTS

Replies to the questionnaires sent both to designers are shown in Table 2 and to CDM principal contractors in Table 3. The questionnaires contain similar questions so as to be able to compare two different CDM duty-holder (designer and principal contractor) biased results. This allowed validation of the replies, with the designer answering the questionnaire from his experiences and the principal contractor from his.

From Table 1, it can be seen that a range of project types were chosen so as to maximize the value of the survey. Table 2 shows that designers have little knowledge of their responsibilities under SWMP (HM Government 2008), generally leaving the management of waste minimization to the principal contractor once he arrives on site. From the replies in Table 2, one may agree with the designers' view that waste is mainly produced during site operations (Osmani *et al.* 2007) and rarely generated during design stages; however about one-third of construction waste could essentially arise from design decisions.

Table 2: Designer questionnaire

	Yes	No
(a) As designers are you aware of the design out waste tool for buildings for use with RIBA Stages A-C?	2	8
(b) Are you aware of Regulation 6 of SWMP 2008? (Requirements for a site waste management plan)	4	6
(c) Do your clients normally request you to minimize waste in your design submissions to them?	2	8
(d) If clients do not request waste to be minimized in the design do you normally carry out the process of waste reduction on your own initiative?	2	8
(e) If clients do not request waste to be minimized in the design, do you inform them of their obligations under SWMP 2008?	1	9
(f) Do you always prepare a site waste management plan for the client to give to his SWMP champion?	2	8
(g) Do you discuss waste reduction with the Client's CDM-co-ordinator during your CDM 2007 Design co-ordination meetings with him?	2	8
(h) Have you ever been asked by the client's CDM co-ordinator to include your prepared SWMP in the CDM 2007 pre-construction information pack?	2	8
(i) If you have not been asked for your prepared SWMP to be included in the CDM 2007 pre-construction information pack by the Client's CDM co-ordinator, then do you send it him along with your Designer's Residual Hazard and Risk Log?	0	10
(j) Do you ever receive information within the CDM 2007 information pack on where principal contractor might set up his waste triage facilities on site?	0	10

SWMP 2008 (HM Government 2008) only requires designers to record any (waste reduction) decision made. Where no decision has been made there is no statutory requirement on them to do anything more. The evidence from the survey intimates that designers really have no interest in waste reduction during the design phase of a project, and unless asked by CDM co-ordinator, take no further action in this respect. Table 2 also shows that there is a gap in information transfer between the principal contractor (whether CDM or SWMP) and the CDM health and safety file.

Table 3 demonstrates that CDM 2007 (HM Government 2007a) principal contractors receive little information on their responsibilities from neither SWMP 2008 (HM Government 2008), designers nor CDM co-ordinators. The replies show that

Table 3: CDM 2007 principal contractor questionnaire

	Yes	No
(a) As principal contractor are you aware of the design out waste tool for buildings for use with RIBA Stages A-C?	2	8
(b) Are you aware of Regulation 6 of SWMP 2008? (Requirements for a site waste management plan)	4	6
(c) Do your clients normally give you (either through the CDM-C or the Client's SWMP 2008 Champion) designers' waste minimization information?	2	8
(d) If clients do not request waste to be minimized in the design, do you normally carry out the process of waste reduction on your own initiative?	2	8
(e) If clients do not supply you with waste minimization information, do you inform them of their obligations under SWMP 2008?	1	9
(f) Do you always receive a Site Waste Management Plan for the client to give to his SWMP Champion?	2	8
(g) Do you ever discuss waste reduction with the Client's CDM-Co-ordinator?	2	8
(h) Have you ever been asked by the client's CDM co-ordinator to include your prepared SWMP in the CDM 2007 pre-construction information Pack?	2	8
(i) If you have not been asked for your prepared SWMP to be included in the CDM 2007 pre-construction Information Pack by the Client's CDM co-ordinator, then do you send it him along with your information for the health and safety file?	0	10
(j) Do you ever receive information within the CDM 2007 information pack on where you as principal contractor should set up your waste triage facilities on site?	2	8

responsibilities for waste minimization are left to the CDM principal contractor once he arrives on site. This confirms previous research (Baldwin 2010) in that Clients did not believe that they were responsible for the SWMP (HM Government 2008) either at design stage or during the construction process. Late designers need to be avoided or recognized as soon as possible, as substantial amount of waste is directly related to late design changes during site operations, (Coventry *et al.* 2001) and could alter the type or quantity of building materials required at later stages of the construction phase. This places additional (and possibly unforeseen) burdens on the CDM principal contractor in managing health and safety on site. The questionnaire to principal contractors in Table 3 seeks to confirm the replies received from designers.

It is also evident from Table 3 that the CDM 2007 (HMG 2007a) principal contractor is aware that the client's designers should record any decision taken before the site waste management plan was drafted, but as is the case with designers, he does not discuss methods of waste reduction, re-use or recycling with the clients CDM co-ordinator – nor of its inclusion in the health and safety file.

CONCLUSIONS

Given the lack of specificity of designers' duties in SWMP 2008 (HM Government 2008) and the previous research findings that duty-holders (Baldwin 2010) do not have a good understanding of their duties and responsibilities, or of the considerable potential (Waste and Resources Action Programme 2009a) that exists for reducing key environmental burdens resulting from construction, the results in Tables II and III above are not particularly surprising.

The survey questionnaires confirm previous research in that it is contractors who bear the brunt of the responsibility (Baldwin, 2010) for waste reduction on construction sites. There is a perception (Osmani *et al.* 2008) that waste is produced as a consequence of contractor's poor site planning, misinterpretation of architect's drawings and specification, and on-site logistical and operational activities. Although this may be true to some extent, the need for better client leadership (Briscoe *et al.*, 2004) is confirmed by the evidence from Tables II and III above. This demonstrates the fact that in the surveys undertaken, the principal contractor is unable to rely on receiving adequate information from designers (who are working under the directions of the client) on waste reduction measures and/or the likely quantity, type and location of waste triage activities required by him once the construction phase begins. This leaves the CDM 2007 (HM Government 2007a) principal contractor in a position where he will be unable to plan his waste triage activities, including the placement of the necessary facilities on his site, until the construction phase commences. Hence, the client could be accused of not allowing him, the CDM 2007 principal contractor, sufficient time for planning and preparation before work is expected to start on site.

Despite the health, safety and environmental implications and self-imposed extra costs as a result of him not ensuring that the designer designs out waste, and that this information is transmitted to the CDM principal contractor at tender stage, evidence from the research shows the client to be ignoring this important designer function.

Figure 1 shows the financial implication for the client, management of health and safety for the CDM principal contractor and the risk of environmental damage for the community where inadequate waste management information has been supplied.

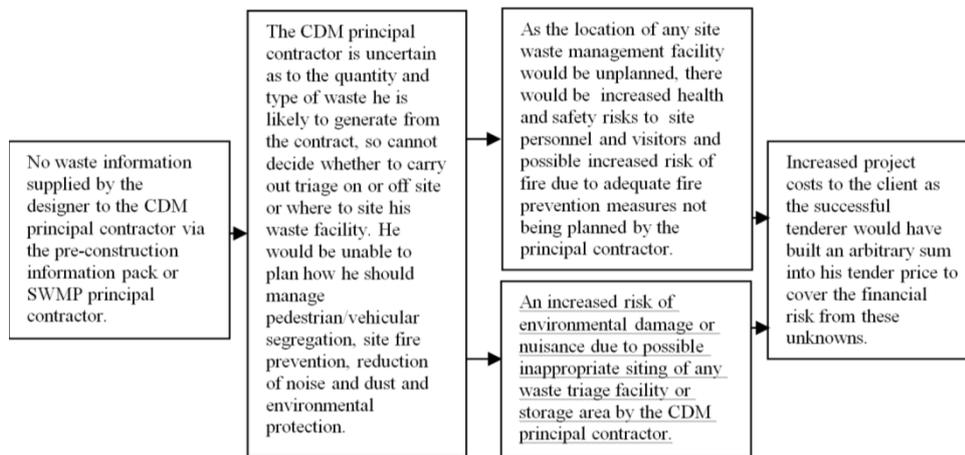


Figure 1: Consequences of inadequate waste management information

In such a situation, the question for the CDM Co-ordinator to ask himself is whether he can justifiably advise the client to allow the construction phase to commence whilst the information required on waste triage for re-use or recycling is absent from the principal contractor's construction phase plan. This point is explicitly supported in Schedule 2(1) of SWMP 2008 (HM Government 2008) under 'additional duties on the client' where the client must give reasonable directions to any contractor so far as is necessary to enable the principal contractor to comply with these (SWMP 2008) Regulations.

RECOMMENDATIONS

SWMP 2008 (HM Government 2008) only requires designers to record any (waste reduction) decision made and where no decision has been made, there are no sanctions against either the Client or the Designer. CDM 2007 (HM Government 2007a) is currently under review by the HSE. It is therefore an opportune moment for SWMP 2008 (HM Government 2008) to be integrated into CDM 2007 (Price *et al.* 2009) so as to allow the CDM Co-ordinator to co-ordinate designers in both their waste reduction and their health and safety design processes. Designers' take-up and use of the Designing Out Waste Tool for Buildings (Waste and Resources Action Programme, 2009b) could be used as part of a Key Performance Indicator process for use by clients in choosing designers for their future projects. Additionally, the Institution of Civil Engineers have issued a demolition protocol (Institution of Civil Engineers 2008) which could be used by designers to provide a framework for the use of buildings, infrastructure, products, etc. whilst at the same time helping to deliver more sustainable processes by establishing quantities and targets for recovering materials and identifying the potential for procuring recovered materials for use in a new build project. It could be cheaper for the client if he could choose a designer who as well as being able to produce a design which, as well as pleasing the client aesthetically, also reduced waste generated by the principal contractor and his contractors once on site.

Relevant SWMP-related information on substantial residual design risks should be given to the CDM co-ordinator for him to insert into the CDM health and safety file. This health and safety file would then contain (Price *et al.* 2009) relevant waste management information (safe de-construction methods, et cetera) that could be valuable at the end of the life of building. The current requirement (HM Government 2008) is for the site waste management plan to be held by the CDM principal

contractor either at his principal place of business or at the site of the project for the statutory two years and then perhaps being lost or discarded.

Should a construction phase event occur that could be remotely attributed to the client having given inadequate waste management information to the CDM principal contractor, then this could give rise to a contractual claim. This relevant waste management information could be deemed to include designer's calculations of quantities, types of waste likely to be produced by the works, or where any on-site waste triage activities were to be situated. At tender stage the CDM principal contractor would be oblivious to this information unless told. Therefore, it may be in the client's best interest to insist that designers do actually make decisions before the site waste management plan is drafted and that their advice is taken, in conjunction with the CDM co-ordinator, of the location of any site waste storage and/or triage activities and the likely volume and type of waste to be produced during the works.

FURTHER WORK

The apparent reticence of the client to engage their designers in waste reduction measures could be the subject of further work. This could examine reasons why clients seemingly prefer, as the evidence from the survey shows, to subject the principal contractor to a *fait accompli* to manage a designer-imposed waste management process of which he has had neither input, nor control.

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