Waste management on the building site

Towards a sustainable management of plastic construction and demolition wastes in Europe

Building site brochure
The APPRICOD project aims to develop a partnership between various European actors to promote the selective collection of plastic waste from construction and demolition (C&D) activities. It is co-funded by the European Commission's LIFE-Environment programme.

Objectives
- To optimise the selective collection of plastic waste from C&D sites. To achieve this, a variety of sorting and selective collection scenarios were evaluated in pilot projects
- To evaluate the costs associated with the selective collection of plastic C&D waste
- To disseminate at European level examples of sustainable management of plastic C&D waste

Partners
The project is coordinated by IBGE-BIM. A varied and complementary range of partners are involved in the project.

Construction and demolition sector
- Belgian Building Research Institute—BBRI : www.bbri.be
- Brussels Confederation of Construction- CCB-C/CBB-H : www.cobobru.be
- European Demolition Association - EDA : www.eda-demolition.com

Local and regional authorities
- Agència de Residus de Catalunya – ARC : www.arc-cat.net
- Brussels Institute for the Management of the Environment - IBGE/BIM : www.ibgebim.be
- Provincia di Ancona : www.provincia.ancona.it
- Serviço Intermunicipalizado de Gestão de Resíduos do Grande Porto – LIPOR : www.lipor.pt

Plastics Industry
- PlasticsEurope, formerly Association of Plastics Manufacturers in Europe-APME : www.plasticseurope.org
- European Council of Vinyl Manufacturers - ECVM : www.ecvm.org
- European Plastics Converters – EuPC : www.eupc.org
- European Plastics Recyclers - EuPR : www.eupr.org
Introduction

The purpose of this building site brochure is to help make those working on building sites more aware of the sorting of wastes, plastics in particular. The content is based on the experience of the APPRICOD project « Assessing the Potential of Plastic Recycling in the Construction and Demolition activities » whose objective was to optimise the selective collection of plastic wastes on construction and demolition building sites with a view to improving the recycling of these wastes. This tool contains several documents addressed to building site managers with a view to raising the awareness of their team(s). These documents are there to support the sensitisation and propose an active approach on the building site. They are well-suited for meetings such as « kick-off meetings » or « toolbox meetings ».

The explanatory brochure will permit you to respond to the following questions, among others :
→ The implications of recycling on the sorting of wastes
→ Sorting construction and demolition waste
→ Check-list
→ The various plastic wastes present on the building site and their requirements
→ Practical example of management waste plan

This brochure will help building site managers set up their waste management and also prepare their information sessions during building site meetings.

In order to raise the awareness of those working on the building site, it seems essential to be able to explain in a few words why one needs to recycle wastes before proposing the approach chosen for a specific building site.

The PowerPoint presentation is based on the content of the brochure.

The practical sheets can be printed out and used as a visual support for the brochure during building site information meetings for the workers :
→ Sheet n° 1 : Recycling building site waste
→ Sheet n° 2 : Tips and tricks : some practical information for building site organisation
→ Sheet n° 3 : List of the different types of plastic
→ Sheet n° 4 : Examples of using products made of recycled plastics : Recyhouse
→ Four 4 models of posters for big-bags and containers

The webtool is a practical aid for making posters designed to clarify the content of the containers and big-bags (available on the site www.appricod.org).
1. The implications of recycling on the sorting of wastes

Practical support: sheet no. 1

This first part makes it possible to understand the recycling approach and the various constraints which influence the sorting of wastes on the building site.

To facilitate recycling, a minimum degree of sorting is necessary on the building site. Indeed, as far as possible, the wastes should be sorted at the moment they are generated because at that point they usually have not yet been mixed together.

The constraints due to recycling are:

- Not too many impurities: the higher the percentage of impurities, the more difficult the recycling will be because this reduces the (mechanical, etc.) characteristics of the material. Certain impurities must be proscribed:
  - Bricks or concrete
    Plastic waste is generally shredded before cleaning. These impurities are not welcome in the shredder, they could damage the machines.
  - Clay
    This impurity erodes the blades and knives used in the micronisation.
  - Metal
    Some small pieces of metal can easily be sorted out with an electromagnet, but large pieces have to be sorted before the shredding.
  - Cement or glue residues
    These impurities are not easy to separate from the material. For the recycling of PVC floor covering they don’t present any problem. But for PVC roofing membranes, these membranes have to be cleaned to avoid particles of glue or bitumen.
  - Oil, solvents or other dangerous substances:
    These contaminations are not acceptable for the recycling of plastics.

- If the plastics are too mixed up with one another, there are 2 possibilities.
  - Have the sorting done in sorting centre (not everything is always easily sorted) via a manual sorting or a flotation system (based on the different densities of the plastics).
  - Use this non-homogeneous material for other, less-demanding applications, in other processing applications.

- Energy recovery is also a good way to valorise the plastic. It is especially appropriate for mixed plastics.
2. Sorting construction and demolition waste

This second part assists at asking the right questions for better organising the sorting of own waste on the building site.

The various constraints of sorting at the building site

Sorting is essential in order to reduce the cost of evacuating waste, but also in order to be able to « purify » the inert waste. There are a lot of parameters which are to be taken into account to optimise the sorting and the collection of the waste. These parameters are:

- The kind and the dimensions of the building site
- The available space and the phasing of the work
  The different phases of the work generate different kinds of waste:
  ➢ Structural work: mostly inert waste
  ➢ Special techniques: cables, pipes, … : metal and plastics
  ➢ Finishing: mostly packaging.
- The number of sub-contractors
- The quantity and the quality of the waste (clean or not, easier to sort or not, …)
  Some sorting or recycling centres require a minimum quantity to make profitable the treatment of the waste profitable.
- The cost of the recycling in relation to the cost of the landfilling
  In the case of recycling, the contractor has to take into account the time spent sorting the waste on site.
- The cost of renting the containers, the roads, the transport
- The legislation
- The time available to sort the waste, on site or in a sorting centre, in relation to the delay of the work
- The existing sorting and recycling centres: the specificities and the conditions of the nearest centres

Analysing these parameters as a function of the specific building site will make it possible to implement a realistic sorting scenario.
The management of waste on the building site

By foreseeing, per type of waste, the quantities produced as a function of the phases of the building site, it is possible to optimise the sorting, the size of the containers and their removal frequency. It is therefore useful to create a waste management plan (see checklist p.8) which specifies, as a function of the progress of the building site, the level of separation to be reached per type of waste, the processing centres to be chosen, the quantities foreseen and the necessary resources (types and size of the means of transportation, of storage, etc.). The waste management can be of different types:

- The general contractor manages all of the waste and puts different containers at the disposal of all the various sub-contractors. In this case, each involved sub-contractors must benefit from the infrastructure made available for sorting his wastes into the specific containers. This method has the advantage of bringing together all of the wastes to fill the containers and limiting the costs of rental, transport, etc.

  In addition, the wastes are managed by a single person for the evacuation and replacement of the containers.

- Each sub-contractor can evacuate its own wastes: initially they are assembled and evacuated within the company. This method has the advantage of bringing together large quantities of wastes and thus of limiting the number of transports. However, it requires that at the end of the day each company takes its wastes back to its own site, which functions as a regrouping centre. During a renovation, in the case of very low quantities of wastes, this management becomes interesting because it does not require additional containers or big-bags on site.

- For some sub-contractors, such as heating specialists, plumbers or carpenters, the construction and renovation wastes are very specific (pipes, PVC frames, etc.) and thus more profitable to sort directly.
The waste management plan goes hand in hand with the contracts, regulations and other information meetings such as: health and safety plan, building site rules, contracts between subcontractors as well as the « kick-off meeting » to start up building site and the « toolbox meetings » to provide information to the workers.

Sorting scenarios
The sorting of plastic wastes at the building site generally fits into the framework of a general waste management.

The most frequent scenarios for plastic waste are:

**Scenario 1**
All the plastic waste is put in the same container as other waste (mixed waste). This scenario fits the building site with less than one big-bag of plastic waste.

**Scenario 2**
Plastic waste is sorted separately from the other type of waste. This scenario fits the small building site with a few big-bags of plastic waste.

**Scenario 3**
Different types of plastic waste to choose between:
- Hard plastics: window frames, pipes, ...
- Soft plastics: plastic films, ...
- PVC: the PVC is largely utilised in plastic constructions (window frames, shutters, pipes, ...)
- PE: is mostly utilised in pipes and for packaging.
- PP: is mostly utilised in pipes.
- Plastic packaging: in construction and renovation, plastic films are voluminous waste. Sometimes, for example in Belgium, packaging can benefit from some incentives from the manufacturers to collect these plastic wastes.

**The various means of collection**

Practical support: sheet no. 2

Most commonly used means are the containers (possibly the containers with a press for voluminous wastes such as packaging), big-bags and special bags (for packaging, for example).
3. Check-list

This list is designed to help the contractor to manage the waste on site, and especially plastic waste.

**Preparation of the site**
- Demolition and/or construction and/or renovation: Estimation of the quantities of waste (pay attention to the expansion to calculate the number of containers): plastics from the off-cuts on site, from demolition waste and from packaging.
- Estimation of the available space on the site to install the containers
- Estimation of the containers or big-bags that are needed on the site (one for inert waste, one for metal, one for plastic, ...)?
- Information, costs and requirements about the nearest existing processing centres (recycling, sorting, valorisation, incineration, ...)
- Calculation of the cost: rental of the containers and possibly rental of the road. The cost of the transport (not always included!), the cost of the recycling, ...
- Definition of the scenarios during all the different phases of the site

**On site**
- Training of the workers on the site during the tool box meetings (the why and how of the sorting, the why and how of the recycling, ...) + regular reminders
- Create an infrastructure on the site in relation to the chosen scenarios (easy access to the containers or big-bags, ...)
- Limit the generation of waste (ask for products without packaging)
- Combine the transports of waste as far as possible (big-bag(s) with one container, ...)

**Table of global cost**

<table>
<thead>
<tr>
<th>Type(s) of plastics to evacuate</th>
<th>Type(s) of storing</th>
<th>Presumed quantity (m³ and T)</th>
<th>Cost of collecting and transporting</th>
<th>Cost of evacuation (€/T)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recycling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Landfilling</td>
</tr>
</tbody>
</table>
4. The various plastic wastes present on the building site

Practical support : sheet no. 3

This fourth part covers the plastics most frequently encountered on the building site and the possibilities within the recycling context.

Management of the most frequent plastic wastes:

PVC frames, shutters, etc.

These wastes - of all sizes, but easily sortable - are generally stored in a container which permits practical storage, thus optimising their transport. A frame is a mixed waste in addition to PVC, it contains metal elements and glass. The hardware of the frames and the glass do not pose any problem for recycling. By contrast, clay is an impurity which seriously erodes the blades and knives used in the micronisation. It is therefore important to limit the « contamination » due to clay by immediately storing the frames in a container.

For buildings like single-family homes, a small-size container will suffice for its several frames. Some collection centres also put containers at disposal in order to collect and transport this type of waste, all at once, to a recycling centre.

The PVC frames are generally recycled in the same type of production (frames, shutters, etc.).

Membranes

Sometimes it is not obvious how to separate roofing PVC membranes, given the materials they are attached to. The membranes must not contain impurities such as glue or bitumen. They are collected by strips one metre wide to facilitate their storage in a big-bag or container if the quantities are high.

A collaboration between manufacturers of roofing membranes can help to set up a collection system in order to make it possible to regroup the quantities of wastes.

These wastes are recycled in the production of roofing membranes or other profiles.

Pipes

The wastes can be of different composition : primarily PVC, but also PE, PP, ABS. During construction, the pipes are easily sorted and stored. By contrast, these different types of pipes are not easily dissociable during demolition. The different types can thus be assembled in a big-bag, or a container if the quantities are high. In the event of large quantities, they can then be sorted in a specific centre.

The pipes can be recycled in the same production process with an internal layer and an external layer of non-recycled material, the middle layer being made of recycled material.

Packaging

The plastic packagings on the building site are mostly transparent or non-transparent plastic films. Some packaging can be avoided by choosing bulk materials. Other packagings (such as the big-bags) can be re-used.

Plastic films are readily compactable and permit easy transport in specific bags. Some systems make it possible to deposit these bags free of charge at the building materials dealer. The packagings are then sent to a recycling centre.

Some packagings are supported by a « take-back obligation » : obligation for any party responsible for packaging to attain a certain percentage of recycling for the packagings he puts on the market.
5. Practical example of management waste plan

The construction site is situated in centre of Brussels. This is a building with four floors: 13 apartments, the ground-floor for offices and a basement with a total area of 2350m². The building is located in a small one-way street. It has party walls. The characteristics of this construction is the small area: no place to have a container on the site.

Preparation of the site

During the construction, there are 3 different phases with different plastic waste.

**Structural work**: only a few vertical separators

**Special techniques**: mainly pipes

**Finishing**: plastic packaging, hard plastics and insulation. At least one big-bag for each.
Giving the location of the building site, the road only permits the temporary presence of one single container. But some big-bags might possibly be put on the building site.

The existing facilities around the site are:
- Recycling centre (30km)
- Sorting centre (20km) but without solutions for plastics
- Landfilling (15km)

The costs of this scenario are:
- Rental of the road: 1.25€/m²*working day
- Rental of the container: 54€
- Transport and deposit of the container: 105€/container or big-bag
- Recycling: 60€/T
- Landfilling: 80€/T

The total plastic waste was estimated to 1.08T. The waste can be landfilled or recycled. If it is recycled, it is cheaper than the landfilling but we have to add a factor for the time spent sorting the waste (30€/hour)

Summary table of the costs:

<table>
<thead>
<tr>
<th></th>
<th>Road rental</th>
<th>Container rental</th>
<th>Transport</th>
<th>Recycling/Landfilling</th>
<th>Manpower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfilling</td>
<td>1.25€/m²<em>18m²</em>no. of working days</td>
<td>54€</td>
<td>105€</td>
<td>80€/T*1.08T</td>
<td>-</td>
</tr>
<tr>
<td>Recycling</td>
<td>1.25€/m²<em>18m²</em>no. of working days</td>
<td>54€</td>
<td>105€</td>
<td>60€/T*1.08T</td>
<td>30€/hour*x hours</td>
</tr>
</tbody>
</table>

For the waste management decision, the cost of the manpower, as a function of the time necessary for the sorting, is thus determinant. Generally, the wastes are sorted as they are generated and thus do not require an enormous amount of additional time for sorting.

The scenarios chosen for the different phases of the work are:

**Structural work**: one container for mixed waste.

**Special techniques**: one container for mixed waste and one big-bag for pipes.

**Finishing**: one container for mixed waste and 3 big-bags for hard plastics, plastic films and insulation.
On the building site

Every month, a "toolbox meeting" is held to give the workers information. It takes about fifteen minutes and is sufficient to present the chosen scenarios and explain the waste management to them. In addition, the subcontractors are also informed of the waste management rules through their contract, through the building site regulations as well as during the « kick-off meeting ».

In order to facilitate the sorting, the workers created a special wooden structure to hold up the big-bags. Notices were also prepared in order to clearly indicate the types of waste accepted (or not) in the big-bags.