

## **Demolition - Reuse And Recycling Of Materials**

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### **Introduction**

There are finite supplies of nearly all construction materials. It makes economic and environmental sense, therefore, to maximise the reuse of components and recycling of materials wherever possible. By doing this, the availability of these finite resources will be extended.

In addition, energy will be conserved which would have been used to produce new materials. For example - every tonne of recycled glass saves about 140 litres of oil. Reuse and recycling of demolished building materials both help to reduce greenhouse gas emissions and conserve natural resources.

Recycling of construction and demolition waste dates from Roman times. When rebuilding their roads, the Romans reused the stones from the previous road.

The recycling industry has been well established in Europe since the end of the Second World War when simple aggregate crushers were used to recycle rubble left from bomb damaged buildings and roads.

In Europe, it is a growing industry now that landfill space is running out. Currently about 75% of construction materials are recycled in the Netherlands. In other countries such as Germany and Belgium, the rate is around 50%.

Another important consideration, however, should be the design of modern buildings. They should be designed to be flexible allowing different usage by a variety of owners. This will maximise their useful life and avoid the need for demolition for a longer period. The design should also use materials and components which lend themselves more easily to reuse and recycling.

These materials are often mixed together when structures are demolished. A Department of the Environment Report "*Managing demolition and construction waste*" estimated that there were about 70 million tonnes of waste per year during the early 1990's.

It was estimated that about 60% of this was recycled. However, about 50% of this is used as poor quality waste near to its point of origin, usually as landfill and another 40% is used for land reclamation.

The recycling and reuse of materials needs to be increased. At present, the perception of this type of material is often that of reducing costs rather than a way of getting a quality product.

In addition, the cost of recycling some materials means that it is not economically viable. This problem needs government intervention to make it profitable by encouraging the use of recycled materials and putting a levy on the extraction of mineral resources.

In summary, the benefits of reusing construction materials and equipment are that environmental impacts from extracting resources, transportation of those resources, manufacturing of new products and disposal of old products are avoided.

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## **Demolition and construction wastes**

Demolition and construction wastes include:

- bituminous materials including road planings
- timber and timber products such as blockboard and chipboard
- windows and window glazing
- plasterboard and internal finishes
- metals, mainly steel and aluminium
- masonry - stone, blockwork, brickwork
- concrete - either unreinforced or reinforced with steel
- soils - often mixed with other materials

In 1995, the UK Government White Paper '**Making Waste Work**', had targets for increasing the recycling of waste materials as aggregates to 30 million tonnes per year by 2006. The tax on the disposal of waste materials in landfill sites (Landfill Tax) was imposed in 1996 as an economic incentive to increase the recycling of waste.

The UK Consultation Paper '**Opportunities for Change**', published in 1998, highlighted the need for more incentives to encourage the use of recycled materials. Currently the Building Research Establishment (BRE) is undertaking research into reducing the amount of waste and increasing the amount of recycling on construction sites:

- **BREWEB** is the BRE's Waste and Environmental Body. It uses some of the landfill tax to develop research projects, for example:
  - effective ways of managing waste
  - risks associated with landfill
  - safe development of brownfield sites
  - recycled and reclaimed building materials
- **SmartWaste** is a software tool, developed by the BRE, which records the source, cause, type, quality and cost of materials wasted on construction and demolition sites. It helps to reduce waste and maximise materials reclamation and recycling.

Waste materials from new construction are usually a mixture of unused or damaged materials as well as offcuts. These materials are usually relatively uncontaminated.

Demolition waste includes building components, such as timber joists. The largest single component of demolition waste is concrete, followed by brick and block, wood and metals. Demolition waste is often dirty or contaminated and materials are mixed together.

The BRE is currently developing a system of risk assessment for contaminants in construction and demolition waste.

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## **Conservation of resources**

Most resources are finite, so we need to conserve them. There are three main ways to conserve resources:

1. To reduce the amount of resource used
2. To reuse products as much as possible, and
3. To recycle materials as much as possible.

In this module, we shall study these three ways of conserving resources.

### **▪ Reducing the amount of resource used**

Approximately 35 to 45% of the cost of construction work is spent on materials. It is , therefore, important that they are used efficiently. Two common causes of waste include excess materials being left unused and damaged materials being unusable.

In order to control waste on site it is important that supervisors are suitable trained and are vigilant at all times. In addition, the site operatives should be trained in the correct handling, storage and use of materials.

It is important that trades operatives not only understand these requirements in relation to their own work but also of all the other trades who work alongside them.

Problems include:

- Careless offloading of materials when they arrive on site can cause waste  
E.g. clay drainage pipes are often damaged during offloading
- Incorrectly stacked materials and components may become damaged  
E.g. Materials stacked to high - lowest layer gets crushed
- Materials and components stored in an unsuitable environment may deteriorate or become contaminated.  
E.g. Damp surroundings can cause cement to harden and become unusable
- Materials and components kept in an unsecured area may be pilfered, stolen or vandalised .  
E.g. Small items such as electrical goods get pilfered.

As can be seen from the above, the correct storage and handling of materials is important to minimise waste. It is difficult to prescribe a set of rules which would prevent problems of theft and vandalism as sites vary so much in size and location. The problems involved differ widely and loss prevention measures take a variety of forms including :

- Checking deliveries
- Prevention of pilfering
- Control of vandalism
- Vigilance against theft

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## **Conservation of resources**

- **reuse materials and components**

Reuse and recycling involves collecting, reusing and / or reprocessing materials into new products. Reuse and recycling helps conserve natural resources that otherwise would be used by manufacturers. It also helps reduce the pollution that may result from the disposal of various waste materials. In addition, it conserves energy.

Nowadays, there are builders merchants who have many construction materials available for reuse, such as :

- stone
- bricks
- roofing tiles
- slates
- paving slabs

Materials which are commonly recycled include:

- **Concrete**

Concrete is reclaimed from building substructures and superstructures and from highway maintenance work. Recycled concrete is used mainly as a base material for roads, over which either a concrete or blacktop finish is placed.

- **Bituminous materials**

These are reclaimed from roadworks. Recycled bituminous materials are usually put back into the hot mix to be placed back on the road.

- **Timber**

Timber can be reclaimed from demolition waste and from new building construction. Recycling of timber presents many problems because of contamination from paint, varnishes, sealing compounds and other materials. Removal of these contaminants is difficult and limits the uses of the final product. The main use for recycled timber is in the production of board materials such as chipboard.

- **Gypsum**

Gypsum is recovered from plasterboard on demolition projects, waste from new construction work and rejects from plasterboard factories.

- **Metals**

Metals are recovered from demolition waste and recycled. This market has been well established for many years. Recently, prices paid for scrap metal have fluctuated considerably.

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## **Design to prevent waste**

Reusing and renovating a building instead of building a new one can reduce materials use and waste, as well as saving money. The useful life of a building is determined not only by the durability of the materials and quality of construction, but also by a building's adaptability to changing needs.

- **Flexibility**

Design for greater interior flexibility, allowing flats to be converted into smaller or larger dwellings as local demand changes. Factories and commercial buildings are often rented as shells. Perhaps residential buildings could have the same approach to enable future change of interior layout.

- **Materials**

Design to use less materials, including reducing the size of the building and internal spaces; elimination unnecessary structural and architectural materials; using modular and standard dimensioning and ensuring careful control to reduce waste during construction. Using standard sizes in the design prevents the creation of cut-off waste and optimises the use of materials.

- **Disassembly**

Design for disassembly rather than demolition at the end of the building's useful life. This means thinking about how the structure will be handled during refurbishment or disassembly rather than focusing on getting the project built or demolished as quickly and as cheaply as possible.

- **Recycling**

Design using materials which can be recycled or reused, reducing the number of different materials used and eliminating the use of toxic materials wherever possible. Government should set an example by requiring its own buildings to be constructed using these principles.

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## **Summary**

- **Conserving resources**

- reuse existing buildings
- design for less materials use
- design buildings to be adaptable
- design for disassembly

- **Waste management**

- recycle construction waste
- salvage and recycle demolition waste
- reduce and recycle packaging waste
- reduce and properly dispose of hazardous waste

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## **Assessment**

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**Questions 1 to 5 - Select the correct response for the following questions :**

1. Approximately what % of construction materials are recycled in the UK ?  
  - A 50%
  - B 60%
  - C 70%
  - D 80%
  
2. In which year was landfill tax introduced in the UK ?  
  - A 1996
  - B 1998
  - C 2000
  - D there is no landfill tax in the UK
  
3. What do the initials BRE stand for ?  
  - A Building Recycling Enterprise
  - B Building Recycling Establishment
  - C Building Research Establishment
  - D British Research Establishment
  
4. The BRE have developed a software tool to record the source, type, quantity and cost of waste. What is it called ?  
  - A SmartWeb
  - B WasteWeb
  - C BREWaste
  - D SmartWaste
  
5. Approximately what % of the cost of a construction contract is spent on materials ?  
  - A 15% to 25%
  - B 25% to 35%
  - C 35% to 45%
  - D 45% to 55%

**Questions 6 to 10 - Decide whether each of these statements is True (T) or False (F).**

6. i) Recycling of construction and demolition waste dates from Roman times. When rebuilding their roads, the Romans reused the stones from the previous road..  
ii) The recycling industry has been well established in Europe since the end of the Second World War when primitive aggregate crushers were used to recycle rubble from bomb damaged buildings..

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C ii) F ii) T  
D ii) F ii) F

7. i) The UK Government White Paper 'Making Waste Work' had targets for increasing the recycling of waste materials as aggregates to 60 million tonnes per year by 2006.  
ii) The UK Government Consultation Paper 'Opportunities for Change' published in 1998, highlighted the need for incentives to encourage the use of recycled materials.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F

8. i) Waste materials from new construction, usually a mixture of unused or damaged materials as well as off-cuts, are usually relatively uncontaminated.  
ii) Demolition waste is often dirty or contaminated and materials are mixed together.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F

9. i) Reuse and recycling helps conserve natural resources that otherwise would be used by manufacturers.  
ii) Reuse and recycling increases pollution and energy use.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F

10. i) The useful life of a building is determined only by the durability of materials and the quality of construction.  
ii) Buildings should be demolished as quickly and cheaply as possible.

Which option best describes the two statements?

- A i) T ii) T  
B i) T ii) F  
C i) F ii) T  
D i) F ii) F