ARENCOS

ARCHITECTURAL + ENGINEERING CONSULTANCY SERVICES

Good Design Doesn't Cost the Earth

BEST PRACTICE GUIDE

to improving waste management on construction sites in Crete, Greece.

About this guide

This guide is part of the Biophilic Design Approach by ARENCOS, for waste prevention and carbon footprint reduction, including reusing and recycling building materials on construction projects in Crete, Greece. It provides detailed, best practice advice to assist with the prevention and reduction of waste as well as recycling of materials on construction sites. This guide is aimed to present some of the best Waste Prevention opportunities and methods to effectively manage the waste generated during the construction, renovation and demolition of buildings.

It is difficult to provide exact numbers of construction waste produced on a typical construction site in Crete, Greece, but it is estimated that it is as much as 30-35 percent of the overall weight of building materials delivered to a building site. Approximately, 50 million tons of construction waste has been dumped in the country and much of it could be salvaged and recycled. ARENCOS makes a significant contribution towards a more resource-efficient and circular economy by promoting waste management, recycling, sustainability energy efficiency and zero waste methods.

We offer exceptional architectural and engineering services, delivered by our team of implementation advisors, engineers and technical specialists, will help you to identify cost saving opportunities for your project in Crete, Greece.

For more details call us today on 0030 282112777, email info@arencos.com or visit our website at arencos.com to discover more.

Contents

How to use this guide

This guide is to be used on-site by contractors, project managers and supervisors, all of whom can establish effective waste management on-site by using best and innovative practices and methods. It is designed to meet the needs of residential and commercial buildings towards a circular economy, and includes examples of how teams and/or worker groups can work together to ensure a reliable and practical waste management strategy. The worker groups are described as:

Group 1:
Those who involved in the construction site for a long-term period and produce a significant amount of waste. It is considered as the group that has direct responsibility for managing the waste, for example the project supervisor and/or the contractor.

Group 2:
Those who produce waste but do not have direct responsibility for it, for example contractors who may only be onsite for a limited period of time to install a special equipment or professionals responsible to fulfill specific project requirements.

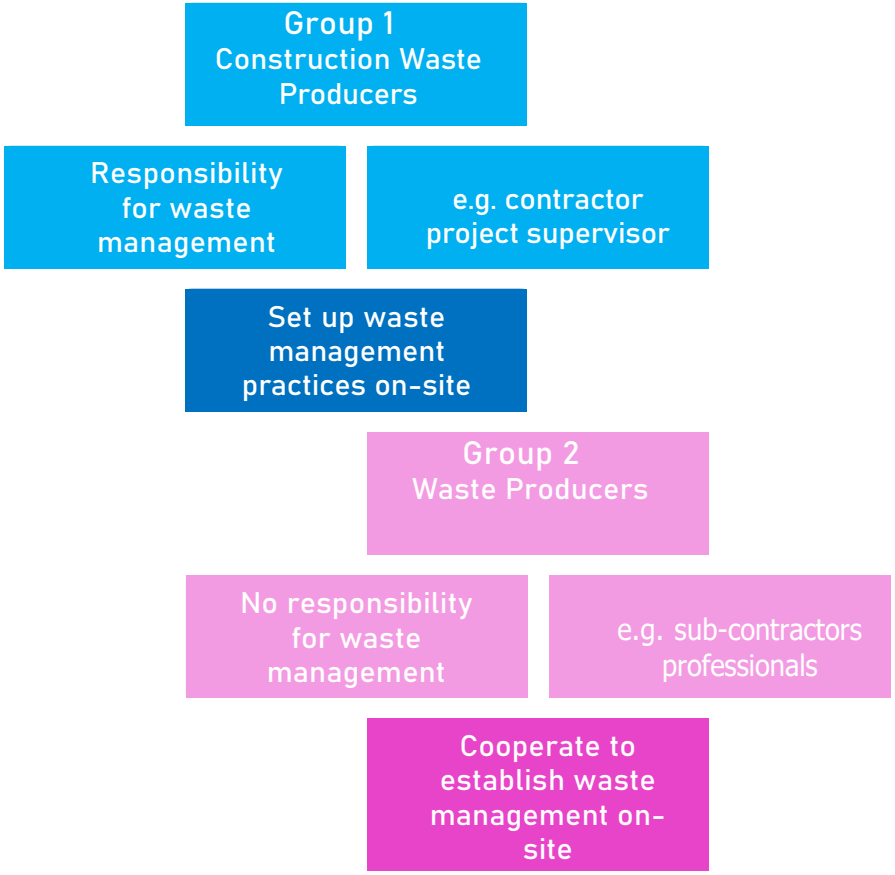
Key to symbols in this document:

Likely applicable to Group 1.

Primarily aimed at Group 2.

Relevant to both Groups 1 and 2: opportunities for working together

Figure 2: Effective waste management influencers



The importance of best practice on-site

Simple, yet practical changes on-site to reduce, re-use and recycle construction waste can generate a wide-range of benefits and establish technically viable and economically feasible projects. The case study in this guide can help you to quickly understand how and why construction waste is created and how to manage it.

Construction and demolition wastes (CDW) consist of fragments/debris that come from construction, renovation and demolition of buildings. Construction firms play a significant role in the sustainable development of the circular economy in Crete, Greece. For a sustainable construction project, one of the biggest challenges is waste management.

The major construction wastes are surplus concrete, broken bricks, wood and steel, glass, plastics, green wastes (small trees, bushes) and excavated soil. Green construction is the new standard for homebuyers, investors renters and commercial tenants in Crete. Unfortunately, many sustainable and eco-friendly features remain unreliable and not sustainable at all.

Demolition represents 85% of the CDW while new construction represents only 15% of total CDW produced. However, the types and composition of onsite wastes are highly variable, depending on the construction/demolition techniques used.

Implementing best practice on your projects can save you money, along with many other benefits for the environment and the circular economy:

- Reduced CO^2 Emissions
- Increased Environmental Performance
- Reduced Construction Costs
- Regulatory Compliance
- Enhanced Building Sustainability
- Enhanced Ecotech and Sustainable Construction
- Improved Procurement Practices
- Improved Waste Composition and Quantification
- Reduce Project Costs

A case study example

This net-zero detached house, designed and constructed by ARENCOS, is an exceptional project that successfully illustrates how careful design and biophilic practice activities can positively impact both construction operability and environmental integrity.

Our advisors divided construction and demolition waste into four main types as follows: materials which are (1) potentially valuable in construction and which can easily reused/recycled, including concrete, stone masonry, bricks, tiles/pipes, and soil; (2) materials not capable of being recycled on-site but may be recycled elsewhere, including timber, glass, plastic and metal, (3) materials not easily recycled or which required special care and disposal, including chemicals, asbestos and plaster and (4) materials not capable of been recycled. Key highlights from the off-grid house in Akrotiri included:

- Whenever possible, used wood that has been certified by the Forest Council.
- Preference was specified to construction materials that contained a high percentage of recycled content. The house produced less than four tonnes of construction waste (not including excavation waste) compared to the average of 14 tonnes waste generated on an average 3 bed detached house in the same area.
- Materials with high recycling rates that are reclaimed, salvaged, or refurbished: The construction site achieved an overall recycling rate of 90%, and 98% of excavation waste was recycled.
- The house met the highest biophilic design standards and achieved net zero carbon emissions.
- The house holds an Energy Performance rating of A. The average rating for a similar property in the area is C.

The Off-grid House in Akrotiri, Chania, Crete.

Actions to take pre-construction

Designing out waste management

Ensuring solid and flexible design decisions not only mitigate waste generation in the first place, but also significantly improve the sustainable character and circular economy of a project.

The Zero Waste Approach of ARENCOS covers this topic in detail and focuses on the seven Designing out Waste (DoW) principles:

- Prioritizing materials that are harvested and manufactured locally or regionally.
- Designing with focus on materials that contain a high percentage of recycled content.
- Designing for waste-efficient projects
- Designing for materials sustainable operation and maintenance
- Designing for off-site construction
- Designing for re-use
- Designing for green buildings compliance.

Construction projects should always plan and design to avoid waste being produced on-site, however where this is not possible, it is important to follow the waste management hierarchy (Figure 3):

Reduce the amount of waste generated, by means of waste prevention measures.
Re-use materials to avoid waste being created.
Recycle materials from site where materials cannot be re-used.

Figure 3: The waste management hierarchy

Waste mitigation through procurement

This section highlights the most significant steps that can be implemented during the procurement of contractors to assist allocate ownership of waste and reduce construction waste production. If you intend to use a construction firm for your project in Crete, Greece, you should ensure that the team you choose has the right skills and commitment to reducing waste or allowing for reusable materials.

This also applies to any main contractor you intend to use in your project. Contractual agreements set up between the project owner, constructors, designers, project managers, contractors and sub-contractors can influence the handling and management of construction waste.

When tendering for contractors, you should take careful steps to ensure that waste reduction is a key performance indicator in their business and every day philosophy. For many construction firms in Crete, resource scarcity was once something to deal with due to periodic disruption, as we saw during the COVID-19 pandemic.

Given how factors like climate change impact the availability and cost of materials, and the expected long-term impact of the Russian-Ukrainian war, resource scarcity and high costs are likely to become a “new normal” for most supply chains.

Site Waste Management Plans

The best practice is to effectively managed Construction and demolition wastes (CDW) through a dedicated Site Waste Management Plan (SWMP) designed and developed exclusively for each project. Implementing a SWMP in a construction or demolition project is considered to be among the best practices and provides you with an exceptional construction plan that will produce less waste and allow for reusable materials.

There are four main objectives of a Site Waste Management Plan:

- Promote a circular economy by reusing materials and components and specifying materials with recycled content.
- Ensure that procedures on the construction site facilitate waste segregation and recycling
- Set applicable goals for waste reduction and facilitate design for deconstruction and flexibility principles
- Design energy and structural efficient buildings that use less material for the same performance

An efficient SWMP also facilitates the identification and implementation of recycling opportunities during the construction, which will reduce to reduce material and energy usage.

Waste management and disposal best practice in Crete, Greece.

The following pages present examples that can be considered and / or implemented on-site by those who are responsible for the management and disposal of waste, both for their own activity and that of sub-contractors on-site.

General green best practices

Site logistics and staff training

- Plan for the deconstruction of materials and components during the entire project life-cycle.
- Investigate the site to determine the reuse of building components.
- Ensure waste disposal facilities onsite that will be suitable and appropriate for each phase of the development.
- Avoid the creation of waste by applying Value Engineering principals. Select materials that can perform multiple functions.
- Where possible, avoid materials which are sensitive to damage, contamination, environmental exposure, or spoilage on-site.
- Use a waste press to reduce the need for transport.
- Ensure proper storage and handling, to avoid damaged raw materials.
- Cooperate with your local society and municipality authorities and find potential stakeholders who can make use of the recycled materials.
- Conduct training for the most appropriate management of wastes identified at each phase, and implement business practices and priorities of project owners and contractors to facilitate knowledge sharing and value creation.

Refer to page 3 for key to symbols

Rejoice and endorse success

- Highlight waste management success to project owners, sub-contractors, stakeholders, on-site staff and the public. This could include signs to show tonnes successfully recycled.
- Creating meaningful pressure for the preferred waste management policies.
- Energizing workforce and building a shared purpose can significantly influence the waste management plan success.

Monitor

- Review waste management plan practices and check the containers to ensure that the proper materials are going into them.
- Apply preventive strategies to deal with damaged materials and equipment.
- Consider carrying out an environmental audit of the construction site.

Reducing waste

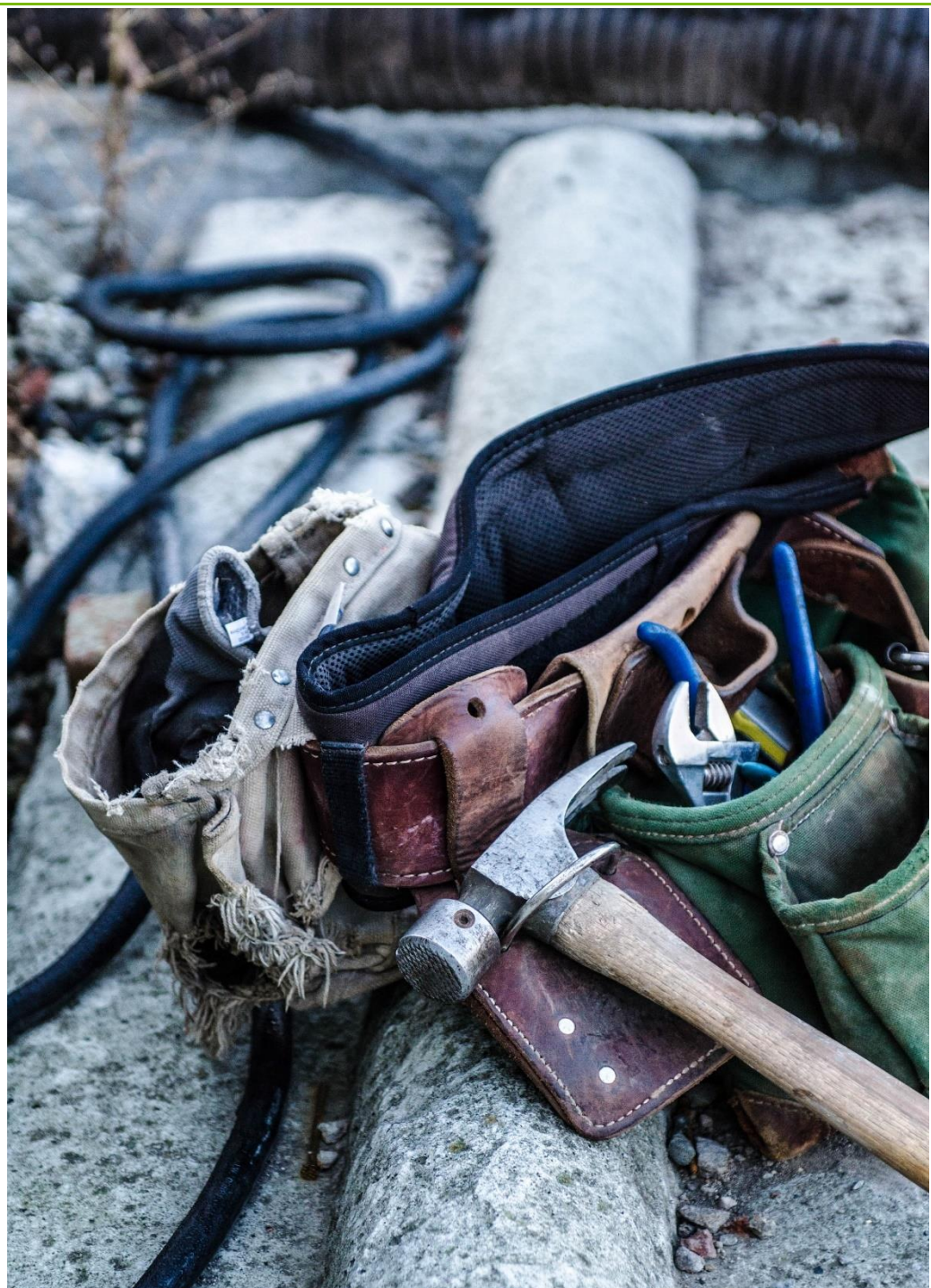
The best environmental and cost-effective solution is to reduce the amount of waste created. The following pages provide suggestions for maximising waste prevention on-site.

Plan deliveries and avoid mistakes

- Reduce construction mistakes.
- Order the right amount of materials and avoid materials being stored on-site for a long period of time reduce the risk of damage.
- Recycle and reuse.
- Use mortar silos wherever possible.

Material storage

- Choose building products with minimal packaging.
- When bad weather is expected, pay extra attention to securing and protecting materials and equipment.
- Often small design changes can bring large waste reductions and, therefore, significant project cost savings.
- Reject materials which have been damaged during shipment and demand they be returned to the supplier.



Remove unnecessary packaging

- For construction materials and equipment not vulnerable to weather damage, reject unnecessary packaging and request its return to the supplier.
- Consider suppliers that offer recyclable and or ecological packaging.
- Reduce the number of packs and the amount of packaging materials, especially those not possible to reuse or difficult to recycle.
- Reduce transport protection and strapping.
- Stocks of sand, gravel, soil and other similar material should not be packaged but located in an appropriate location so that they do not spill and cannot be washed onto the adjacent street;
- Promote good packaging removal awareness as part of an effective waste management strategy.

Re-using materials

Where material use and waste generation cannot be reduced, re-use should be considered as the next practice to effectively manage the construction waste. This section presents some indicative re-using procedures and methods.

Deconstruction

- Prefer easy to use and install materials and equipment associated with temporary works (e.g. timber hoarding, hand rails, signs etc.) so they can be dismantled and re-used many times.
- Use mechanical highly recyclable materials such as bolts, screws and nails instead of sealants and adhesives.
- No hazardous and highly recyclable materials may have a higher purchase cost, but will be cheaper in the long term.
- Considering renovating or refurbishing an existing building, rather than demolishing and rebuilding;

Make best use of materials

- Return, sell or donate unused and recovered materials.
- Reuse rock, soil and vegetation on site for landscaping.
- Repair broken or obsolete items so they can be re-used or returned to the supplier.
- Classify demolition materials and identify the materials that can be reused.

Materials that can generally be recycled from construction sites include:

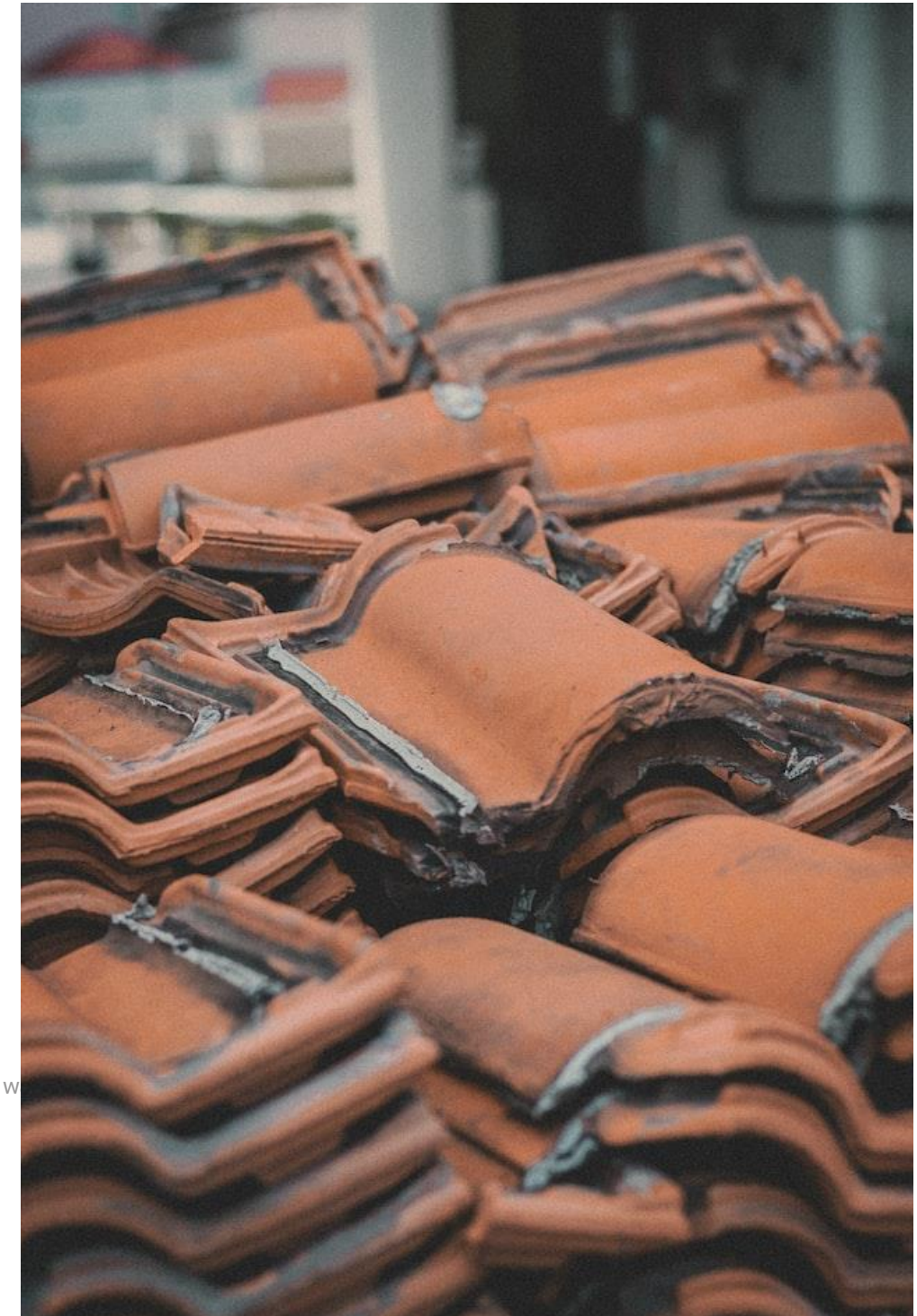
- steel
- concrete
- timber
- aluminum
- plastics
- paper and cardboard
- untreated timber
- topsoil
- terracotta tiles
- electrical wiring
- paint

Recycling Waste

Construction waste recycling is the separation and recycling of recoverable waste materials generated during construction and remodeling. The most significant step for construction waste recycling is on-site separation. Nevertheless, this will take some additional effort and training. Many waste products unable to be reused directly, can be reprocessed into new products. However, successful waste minimization requires the proper handling of waste on site at all stages of development. In particular:

Material segregation

- Sort waste materials on-site according to type, use and quality.
- Use waste containers to facilitate waste segregation.
- Ensure waste and containers are kept clean and free of contaminants.
- Train staff to manage and handle materials and equipment to maximize their re-use, recycling and recovery potential.
- Provide for ongoing waste management
- If on-site segregation is not possible consider sending your mixed waste to a Materials Recovery Facility (MRF) instead of a landfill site.



Get in touch

For more details about construction support and waste management in Crete, Greece contact our team at info@arencos.com

ABOUT ARENCOS

ARENCOS is an architectural and engineering business based in Chania, Crete. The firm also provides consulting and real estate advisory services to private clients and investors spanning multiple industries. With a highly qualified team of engineers, architects, topographers, interior designers, renewable energy engineers and researchers, ARENCOS brings world-class capabilities and high-quality service to clients, delivering the insights they need to identify and establish exceptional real estate opportunities and address the most complex construction challenges.

ARENCOS services are devoted to becoming the standard of excellence.

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