

## Chapter 35

# Standards for Recycling Oriented Deconstruction and Classification of Waste



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**Abstract** Construction and Demolition (C&D) Waste is a priority waste stream due to the substantial amounts of such waste generated. There is a high potential for reuse and recycling of waste and byproducts. The Construction and Demolition Waste Strategy for Malta supports the transition towards a more circular economy and closes the loop of construction products life cycle. The quality of recycling and recovery of this waste stream needs to be improved, for market conditions to be developed to increase the demand for secondary raw materials. The paper reviews the strategic framework leading to the design, development and eventual implementation of National Standards for Excavation, Construction and Demolition Waste in Malta. The Standards presented, consist of two complimentary documents, developed to cover deconstruction, excavation and classification of waste and recycled aggregate. Standard SM810—Recycling-oriented Deconstruction, Controlled Excavation Works and Classification of Waste: Requirements for planning and execution, sets to prioritise the reduction of waste generation and highlights the importance of saving raw material resources. Standard SM820—Classification of Recycled Aggregate, sets out technical engineering attributes for the classification of waste aggregate, enabling its exploitation as a resource. A regulatory and legislative framework was developed for the implementation of the Standards. This important development sets the scene for the effective implementation of Circular Economy in the Construction Industry in the Maltese Islands.

**Keywords** Excavation · Construction and demolition waste standards · Recycling · Deconstruction

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433

## **35.1 Construction and Demolition Waste**

### ***35.1.1 Circular Economy and C&D Waste***

The European Union has identified Construction and Demolition (C&D) Waste as a priority waste stream due to the substantial amounts of such waste generated. Given that several components within the waste stream have a high resource value, there is a high potential for the re-use and also recycling of such waste. To this aim, the quality of recycling and recovery of this waste stream needs to be increased, in order for market conditions to be developed to increase the demand for secondary raw materials. Therefore, construction materials and resources are maintained in the economy for as long as possible, supporting a proper transition towards a circular economy [1]. A circular economy, from construction through the demolition at the end of life, or to recycling of waste in new construction work, supports growth in the construction industry. This paper reviews the strategic framework developed, leading to the design, development and eventual implementation of National Standards for Excavation, Construction and Demolition Waste in Malta. The Standards presented in this paper, consist of two complimentary documents developed to cover deconstruction, excavation and classification of waste (SM810) and the classification of recycled aggregate (SM820).

### ***35.1.2 Resources and Waste***

The construction sector is responsible for contributing, through innovation-led growth, to build up a carbon-neutral society and economy, as per intended goals of the European Commission. The construction industry is currently the largest consumer of raw materials and resources and as a consequence one of the largest contributors to carbon dioxide emissions, mainly coming from the operational life of buildings and structures. It is also one of the largest producers of waste, with construction and demolition waste accounting for 30–40% of the solid waste produced worldwide [2, 3]. One of the main reasons for the high share in both CO<sub>2</sub> emissions and waste production can be identified in the need to renovate the building stock in developed countries, as well as population growth and urbanization in developing countries [4]. The largest share in the environmental footprint of construction interventions is represented by construction materials [4], with cement and concrete contributing to the largest share, since concrete, and cement as its main constituent, is the mostly used construction material in the world [5]. The large production of solid waste from the construction industry also results in problems related to transportation and storage of C&D Waste before processing and disposal to landfill sites. In the European Union (EU), construction and demolition activities generate 850 million tonnes of construction and demolition waste per year, and C&D Waste generation across

the EU member states is correlated with their respective national construction sector turnover, population, and gross domestic product [6].

### ***35.1.3 The Waste Framework Directive***

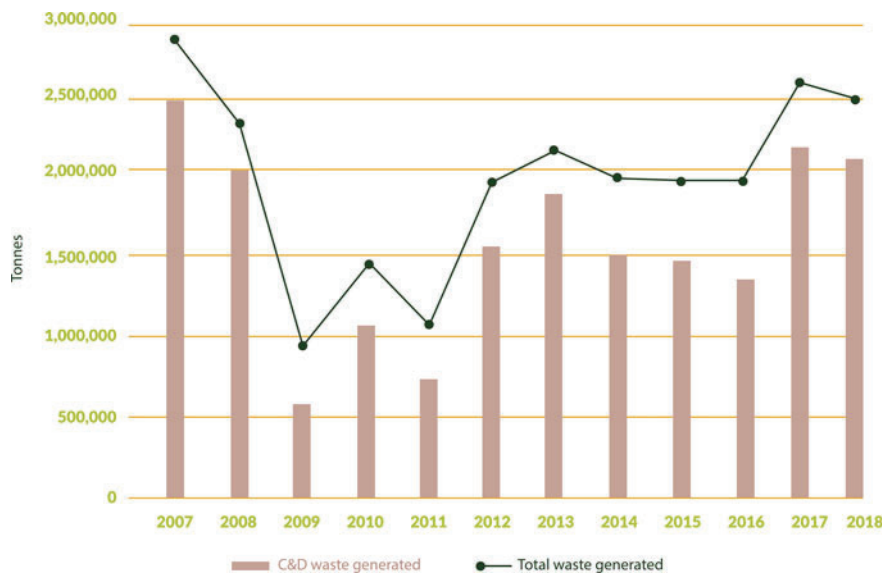
There is an increased awareness about the need to effectively address the high resource consumption and waste generation through construction and demolition activity. The Waste Framework Directive (WFD) 2008/98/EC provides a general framework for waste management, setting definitions for EU member states [7]. The Waste Framework Directive refers the stage when waste ceases to be waste and lays down end-of-waste criteria that provide a high level of environmental protection and an environmental and economic benefit. The Directive identifies possible categories of waste for which 'end-of-waste' specifications and criteria should be developed including construction and demolition waste, some ashes and slags, scrap metals, aggregates, tyres, textiles, compost, waste paper and glass. The Directive refers to recovery operations for the purposes of reaching end-of-waste status [7]. The WFD introduces a detailed clarification of the "waste hierarchy," which makes prevention the top waste management priority, followed by preparation for reuse, recycling, and recovery, with landfilling being the least desirable option. It also requires that responsible authorities in all European member states establish one or more waste management plans covering their entire geographical territory. Member states are required to implement measures to recover a minimum of 70% (by weight) of non-hazardous C&D Waste (excluding soils) by 2020. Europe as a whole has achieved the target of recovery for the year 2020, including backfilling [6]. However, 15 member States have already reached the 70% recovery target set in the WFD; while 11 member States still need to improve their recovery performance in order to achieve the EU target, with the recovery rate varying from 10 to 95% among the member States. In this context, the construction sector is actively promoting initiatives to address resource consumption and waste generation through the exploitation of C&D Waste in recycling, which could reduce both waste disposal and also demands for natural resources [8, 9].

### ***35.1.4 C&D Waste in Malta***

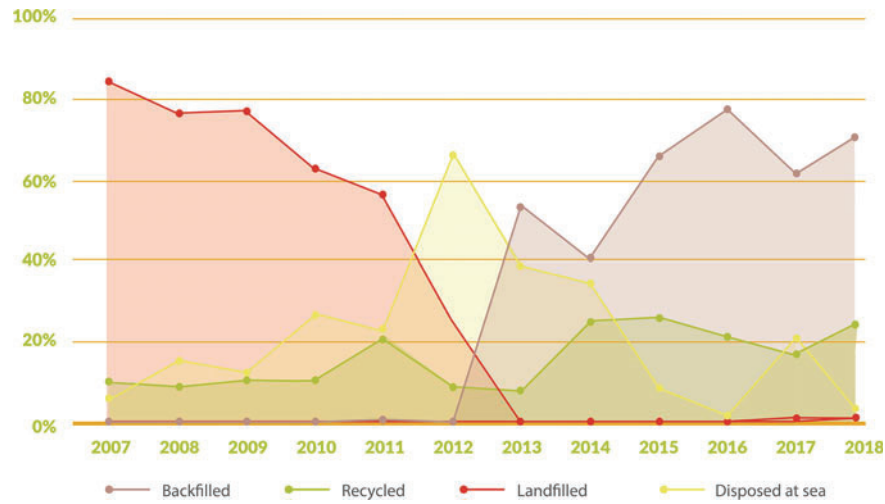
Construction industry activities including construction of buildings and civil infrastructure, demolition of buildings and excavation generate large amounts of waste. C&D waste is the heaviest and most voluminous waste stream generated in Malta (over 1.5 million tonnes of waste generated annually) [1]. This constitutes the largest share of waste generated in Malta, accounting to roughly 80% of the total waste arising each year. This percentage share is considered as significantly high, particularly when compared to the EU average, which accounts to approximately 25–30%

of all waste generated in the EU [1]. Mineral waste from excavation and construction and demolition constitutes the largest share amounting to approximately 74% of all C&D waste generated annually (Fig. 35.1). Prior to 2012, Malta relied heavily on the disposal of C&D waste, both on land and at sea; between 2007 and 2012 circa 65% of all C&D waste treated was disposed in inert landfills; another 25% were disposed at sea, and only around 10% were recycled. During this period, although spent quarries were accepting C&D waste for rehabilitation purposes, they were permitted as inert landfills and thus considered as disposal [1]. In 2012, the reviewing of existing permits for spent quarries enabled backfilling operations, considered as a recovery operation. This resulted in a drastic shift from disposal to recovery of inert waste with backfilling of excavation voids for the management of such waste (Fig. 35.2). In 2016 Malta recorded the highest percentage rate of inert waste directed for backfilling; thereby 77% of the total C&D waste treated was backfilled. This backfilling activity has significantly contributed towards Malta's achievement in attaining the target to prepare for re-use, recycle and recover a minimum of 70% by weight of the C&D waste generated (WFD). Malta has to put greater effort by promoting reuse and recycling of construction, demolition and excavated waste, and therefore reducing reliance on backfilling.

Recycling of C&D waste remained constant over the years, with an annual average of 16% being recycled, reaching an all-time peak of 26% in 2015. Approximately 90% of the total C&D waste recycled annually, is recycled locally. Recycled material in Malta is primarily used for the following: aggregates for concrete and roadworks; crushed material as 'torba'; other material used for renovation works. Other waste



**Fig. 35.1** The Construction and Demolition Waste generated, compared to the total waste generated in the period 2007–2018. *Source* ERA [1]



**Fig. 35.2** Treatment of Construction and Demolition Waste in Malta (2007–2018). *Source* ERA [1]

deriving from construction and demolition activities, namely iron, steel and other mixed metals are exported for recycling. Given the lack of local facilities for the treatment of hazardous waste, such waste arising from the construction and demolition industry, including construction waste containing asbestos is also exported for further treatment. Intensive development and the subsequent large volumes of waste arising from excavations and construction and demolition activities, coupled with the high reliance on backfilling of inert waste, is causing a major problem as a result of the lack of void space for disposal available in Malta. In the coming years the volume of authorised void space might not meet the increasing demand for the backfilling of C&D waste [1]. Through the Tax Credit (Construction Waste Recycling) Rules, S.L. 123.186 [10], the Government announced a tax incentive, aiming to increase backfilling space, whereby operators of quarries authorised to accept C&D waste may claim a tax credit equivalent to 25% of the gross fees paid to them where the price of C&D waste accepted does not exceed €8 per tonne [1].

## **35.2 Construction and Demolition Waste Management Strategy**

### ***35.2.1 The Strategy***

The Construction and Demolition Waste Management Strategy for Malta [1] presents concrete measures intended for the short and long-term, designed for a change towards a more circular economy. The Construction and Demolition Waste Strategy for Malta [1] refers to the drive by the European Commission towards a Circular Economy. The Strategy supports the transition towards a more circular economy and close the loop of construction product life cycle. The ultimate goal of the Strategy is to strengthen environmental protection and human health from waste related pollution while reducing the consumption of raw materials. In addition, the goal of the Strategy is to increase the quality and quantities of C&D waste recycled in the Maltese Islands as an archipelagic State. The Strategy consists of a framework acting “as a driver intended to bring about a cultural and behavioural shift within the sector in terms of its attitude towards excavation, demolition and construction methods” [1].

### ***35.2.2 The Implementation Programme and Proposed Measures***

The implementation programme consists of four main priority areas (Fig. 35.3), intended to identify options for C&D Waste Management. Each priority area is assigned specific measures to be implemented in the short and long-term, fulfilling the respective objectives. The Strategy refers to periodic review of implementation timeframes to adapt to changing circumstances and operational needs. The measures proposed in the Construction and Demolition Waste Strategy for Malta (2021–2030) are presented in Table 35.1.

## **35.3 The Strategic Framework: C&D Waste Standards**

### ***35.3.1 Waste Management Strategy and Standards***

The Waste Management Strategy presents the required development of National Standards as a key measure [1]. The Strategy refers to the Standards development through the Building Industry Consultative Council and referred to in Sects. 35.3.2 and 35.3.3 below. The Strategy aims to build upon the measure highlighted in the Waste Management Plan for the Maltese Islands, by putting in place a set of standards, presented as follows:



**Fig. 35.3** Construction and demolition waste strategy—implementation plan. *Source* ERA [1]

**Table 35.1** The measures proposed: C&D waste strategy for Malta 2021–2030 ERA [1]

References	Proposed measure
1	Establish Standards for the Construction Industry
2	Promote Innovation through Research and Development
3	Introduce a New Regulatory Framework
4	Allow for the Provision of Training
5	Improve Waste Classification and Source Separation
6	Encourage Home Restoration Projects
7	Recognise the need for Resource Recovery and Storage Depots
8	Explore ways of applying the Polluter-Pays Principle
9	Extraction of Resources at Development Sites
10	Promoting markets for secondary raw materials
11	Set Re-use and Recycling Targets
12	Enforce Recovery through Restoration of Void Spaces
13	Discourage Landfilling
14	Explore the viability for Land Reclamation
15	Set Standards in Tenders Published by Government Entities

1. Best practices for (de)construction, aimed at reducing the C&D waste generated and purifying the resulting waste streams;
2. The classification of C&D waste by type, material, composition and weight, aimed to encourage on-site separation as well as improve the quality of the waste streams for subsequent re-use or recycling;
3. Appropriate excavation works, with the aim to re-use excavated rock for the purposes of construction;

The Strategy refers to the incorporation of the Standards within the regulatory framework, as an essential requirement prior to the issuance of an executable Development Permit [1].

### ***35.3.2 The Strategic Framework***

The Strategic framework for Excavation, C&D Waste in Malta was developed by the Building Industry Consultative Council (BICC) Research and Innovation Committee [11] and presented to BICC members and other stakeholders, including the Environment and Resources Authority in 2018. The Waste Strategy for Malta [1] refers to this action in Measure No. 1 (Table 35.1). The Framework was developed through stakeholder consultation and with reference to key strategic action at the following levels: (A) Policy and Legislation; (B) Waste Management, Technical Development and Research; (C). Waste Standards for Malta. The document presents action organised in different, yet complimentary components. The policy and legislation component refers to different policy recommendations which are intended to support the implementation of Circular Economy in Malta. The Waste Management, technical development and research component, presents recommendations for storage depots where the classification of waste can be implemented, recommendations for the research agenda and proposed technical developments of different high-performance products based on industrial byproducts and waste. The National Standards component is key in supporting the Strategic framework.

### ***35.3.3 The C&D Waste Standards***

The Standards were developed by the University of Malta, Construction Material Engineering Research Group through research-based approaches led by the Research Group including: (i.) the C&D Waste Research Standards activity developed in the period 2007–2009; (ii.) the C&D Waste Research Project (2019–2021). The first activity was based on the results of the European Union funded twinning research project: Recycling of Construction and Demolition Waste in Malta [12] and on further development of new draft standards in 2009 by the University of Malta Construction Materials Research Group together with the Malta Standards Authority. The second



activity started in 2013 by the Building Industry Consultative Council, Research and Innovation Work Group leading to the setting up of a new National Technical Committee (TC800) in 2017 within the Malta Competition and Consumer Affairs Authority (MCCAA) on the request of the University of Malta, Construction Materials Research Group. These initiatives led to a research project developed by the Group [13] with the presentation of two draft National Standards at the BICC National Conference in December 2021. The Standards Framework was proposed based on two new key Standards for Malta: (1) Recycling Oriented Deconstruction and Classification of Waste [14]; (2) The Classification of Recycled Aggregate [15]. The National Technical Committee (TC800) was tasked with the final presentation and development leading to the public consultation and eventual publication of the C&D Waste Standards [14, 15]. The Standard SM810 was published in 2022 addressing the National Strategy [1], Measure No. 1: Standards for the Construction Industry. The Standard was published for public consultation and eventually as a New National Standard: SM 810:2022—*Recycling-oriented Deconstruction, Controlled Excavation Works and Classification of Waste—Requirements for planning and execution* [16]. The new Standard was rendered mandatory in the Maltese islands through its inclusion in the Construction Management Site Regulations (S.L. 623.08) [17], Legal Notice 340 of 2022 of the Government of Malta. The standard SM820—*Classification of Recycled Aggregate*, has been presented to the MCCAA committee TC800 for final development and review [18].

#### **35.4 Recycling Oriented Deconstruction, Controlled Excavation and Classification of Waste**

The SM810 Standard [16] is intended as a guide for good practice and a reference for building owners, developers, designers, and contractors. The document is set to prioritise the reduction of waste generation and highlights the importance of saving raw material resources. The Standard is intended to serve as an aid for the construction industry stakeholders to facilitate planning, classification of waste and conducting demolition operations, through deconstruction, and excavation operations with a view to reuse and recycling: the standard refers to recycling oriented deconstruction and controlled excavation works to reduce/eliminate waste disposal. This standard also makes reference to the code of practice for demolition operations as presented in BS 6187:2011 [19] and also to SM 820 Classification of Recycled Aggregates [18]. The standard applies to all demolition, deconstruction and excavation work in all projects in the Maltese Islands. It is noted that the applicability of this standard should take into consideration the type and the scale of deconstruction and excavation being undertaken and work practices on different sites should be adapted accordingly. The framework as presented in SM810, applies also to waste generated during construction operations [16]. The deconstruction process at end of life

of a building needs to be supported through the principle of design for deconstruction. The ultimate goal of the Design for Deconstruction is to responsibly manage end-of-life building materials to minimise consumption of raw materials. SM810 refers to Deconstruction and Controlled Excavation, with the objective of reducing waste generated, and reusing/recycling building elements and components [18]. The Standard also promotes the reduction of waste primarily through the adaptation and retrofit of existing building assets. Deconstruction is encouraged, instead of demolition for the following reasons: (a) Deconstruction allows for reduced generation of waste; (b) Preservation of primary raw material resources; (c) Reducing reliance on backfilling; (d) Better management of waste at end of life, and facilitation of reusing and recycling. The Standard presents Controlled Excavation as an important principle. Waste classification is also presented as an essential step in the proper management of waste generated during deconstruction and controlled excavation processes; any waste generated during such activities shall be managed according to the waste hierarchy as laid down in Regulation 4A. of S.L. 549.63 Waste Regulations. The Standard foresees the compilation of a waste catalogue. The Standard presents key considerations for developers and contractors to guide through best practices during the planning and the execution of deconstruction and/or controlled excavation operations. Deconstruction operations shall be planned through a structured approach, supported with an engineering appraisal. Deconstruction shall be oriented towards recycling to enable and facilitate the recyclability of materials originating from building/excavation sites. For this to be possible, the Standard presents the classification of waste arising prior, during and after deconstruction. Controlled excavation works are proposed as a first consideration in excavation sites. Controlled excavation shall give due consideration to the potential resources that may be extracted from the site in the form of blocks instead of traditional excavation, to minimise the generation of waste. It is noted that excavation waste, primarily limestone, accounts for the largest volume of waste generated in Malta. The Standard refers to storage requirements, as the deconstruction and controlled excavation processes yield waste streams which may require temporary storage prior to recycling. SM810 refers to Skills and Training; operators in deconstruction, demolition, and excavation works are required to follow the National Occupational Standards including NOS for Excavation and Demolition, the training regime and respective skill cards.

### **35.5 Classification of Recycled Aggregate**

The Standard SM820 for the Classification of Recycled Aggregate [18]; sets out technical engineering attributes for the classification of waste aggregate, enabling its exploitation as a resource. SM820 provides a first classification of Construction, Demolition and Excavation waste in the Maltese Islands. The purpose of the standard is to enable the classification of waste in order to transform it into a resource for construction which is of adequate quality and safe to consumers and the environment. The standard gives the opportunity to different stakeholders, to exploit waste,

as a key resource in construction, enabling the production of construction materials for intended applications. The classification is designed to respect the possible current and future applications of materials in construction, in the context of the construction products regulations, and to provide the designer and producer with the necessary tools to enable wide exploitation of materials with respect to the principles of sustainable use [18].

### 35.6 Conclusion

The Strategy [1] proposes that the measures highlighted therein should not only be introduced as legislation but should be followed up by further discussions with the relevant stakeholders, and accompanied by standards and adequate training, in order to ensure effective implementation and positive change. The Construction and Demolition Waste Strategy for Malta is intended as an opportunity for efficient and an effective C&D waste management system. The success of such a Strategy however relies on monitoring of the implementation of the measures and its periodical review.

A key measure presented in the Construction and Demolition Waste Strategy for Malta 2021–2030 refers to the development and implementation of National Standards which are also integrated in the regulatory framework. Standards for deconstruction, recycling oriented deconstruction and classification of waste and recycled aggregate, need to refer to the characteristics of buildings and have to be designed for the waste groups in a territory. Standards SM810 and SM 820, developed for the Maltese Islands, are complimentary Standards and considered to be an important and strategic milestone, intended specifically to support the implementation of Circularity in the Construction Industry in Malta.

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