



LCA-report of Prolock bank protection

Cat. 1 LCA, GWW Section 41.1

Public version



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1 Introduction

This report is the public version of the LCA report. Confidential business information has been removed from this version, which means that names of suppliers and production volumes have been removed. The annexes have also been removed.

Profextru Productie B.V. is the producer of Prolock screens that are produced from recycled PVC. The screens are, for example, used as revetments, sheetpile walls and seepage screens. There are four types of Prolock screens: Sigma, Omega, Delta and Aqua.

In 2017, a life cycle analysis (LCA; also referred to as a life cycle assessment) was performed for the Prolock range for inclusion in the Dutch National Environmental Database (in Dutch: *Nationale Milieudatabase*, NMD). This report updates the LCA of the Prolock sheetpile walls in accordance with the current requirements and guidelines within the LCA methodology that describes the basic assumptions and results for Prolock sheetpile walls of Profextru. The results in this report will be published as product cards in the National Environmental Database. The description of the various product cards for the end user are provided in Chapter 2.

The civil engineering data in the National Environmental Database is used for calculating the Environmental Cost Indicator (ECI) of materials, products and processes for the realisation of a civil engineering work. This ECI is calculated by means of the specifications in the Environmental Performance Assessment Method for Construction Works¹. With software instruments such as DuboCalc², it is possible to calculate the ECI for a product, object and complete a project with the help of the National Environmental Database.

Clients in the civil engineering sector use these ECI calculations to make decisions about various materials or design options during the design phase of the project. They compare the ECI of the various solutions and can then choose the most sustainable material (the product with the lowest ECI). The invitation to tender for a project may also include an award criterion where the tenderer with the lowest ECI receives the highest fictional discount³.

1.1 Objective and target group

We define environmental profiles of several Prolock sheetpile walls in this study. The objective of the study is:

- To determine the environmental impact of the Prolock sheetpile wall throughout the entire life cycle in various combinations (with softwood (conifers), hardwood and steel piles);
- To transfer the information about these products to the National Environmental Database (category 1 data, proprietary and tested by third parties) so that it becomes available in software such as in DuboCalc;

¹ [More information about the Assessment Method](#)

² [More information about DuboCalc](#)

³ [More information about the use of the ECI as award criterion](#)

- To inform clients and other relevant parties about the environmental impact of the products.

This report is meant to document the choices made in materials and environmental data in order to provide accountability. The contents of the report is confidential. The end results, the environmental profiles of the Prolock sheetpile walls and the environmental statements are available to external parties via the National Environmental Database and DuboCalc. Profextru Productie B.V. itself may also provide the environmental profiles to parties.

This study has been drawn up for the following target groups:

- Profextru Productie B.V. as the owner of the data;
- Stichting National Environmental Database (NMD) as the manager of the National Environmental Database;
- Clients in the civil engineering sector as a basis for reference designs, exploratory (design) studies and for use in invitations to tender;
- Market parties such as engineering and consultancy firms and contractors active in the civil engineering sector as a source of information for the use of the National Environmental Database data via calculation instruments.

1.2 Accountability

We have performed the LCA in accordance with the requirements and guidelines in the *Environmental Performance Assessment Method for Construction Works (July 2020) including the amendment of 1 July 2019, the amendment of January 2020 and the amendment of February 2021 and the National Environmental Database testing protocol (version 1.0, July 2020 + Amendment 1, February 2021)*. The Assessment Method is based on ISO 14040 - ISO 14044 and EN 15804:2012+A2 (2019)⁴.

The data was collected in the period from August 2021 to November 2021 after which the calculations were made and the LCA file was drawn up.

1.3 Verification

SGS assessed the file with the CE Delft & Stimular “LCA report of Prolock bank protection, Cat. 1 LCA, Civil engineering Chapter 41.1” (final draft version of 10 February 2022 and received on 22 February 2022). The report describes the basic assumptions, the modelling and the results.

The conclusion states: The methodology, data collection and report comply with the requirements of the “Environmental Performance Assessment Method for Construction Works of structures”, version 1.0 - July 2020 with the amendments of October 2020 and February 2021, EN 15804 and underlying standards.

The 12 relevant product cards (5 Sigma, 4 Omega, 2 Aqua and 1 Delta) were published on 22 February 2022 and are available via the National Environmental Database. Reader’s guide

⁴ The only thing not included in ISO 14044 is the adding up of the environmental impact scores to obtain a total score (the ECI, see Section 4.6).

Chapter 2 describes the method for the LCA. This is where we set the scope, system limits and functional unit.

Chapter 3 deals with the life cycle inventory. The product description, product composition and the inventory of the LCA are discussed in this chapter.

Chapter 4 presents the results and the sensitivity analysis.

2 Method

2.1 Approach

This report describes several Prolock sheetpile walls. These sheetpile walls are the main product, constructed from various semi-finished products (see Section 2.3). We describe the entire life cycle of these semi-finished products.

We perform the LCA calculation with SimaPro version 9.2.0.2 software. The reference databases used are:

- Processes database, National Environmental Database, version 3.4.
- Ecoinvent database, version 3.6.

In addition where possible, for materials that may be used, we use material-specific LCA data of the material producers.

2.2 CROW scope

The study focuses on Chapter 41.1 of the Standaard RAW Bepalingen (Standard RAW Provisions) 2020 (CROW, 2020).

This LCA concerns a cradle-to-grave study. This means that we include the production of the raw materials and components of the sheetpile wall, the installation in a work up to and including the removal of the sheetpile wall and the processing of the materials (Modules A1 to D).

This concerns Category 1 (cat. 1) LCAs. A cat. 1 LCA is defined on the basis of brand-related data from manufacturers and suppliers⁵. The results of this LCA study have been published as product cards in the National Environmental Database, but the content of this report is confidential. A description of the Prolock sheetpile walls is given below.

2.3 Product descriptions

Prolock sheetpile walls are used for the bank protection of canals, rivers, lakes and marinas. These sheetpile walls are composed of semi-finished products: a screen of recycled PVC profiles and piles of softwood (mainly pine), hardwood or steel. Depending on the application of the sheetpile wall, the sheetpile wall is also fitted with a hardwood wale. A wale serves as a bumper and is regularly added to the Sigma and Omega sheetpile walls.

The screens are built up from profiles that are 0.5 m wide with a variable length. By combining the plastic screen and piles, relatively little plastic is needed. The length of the screen is thus shorter than the length of, for example, wooden or steel sheetpile walls in the same application.

The screen constructed of recycled PVC is produced by Profextru in the factory in Hardenberg. Profextru works together with several suppliers that produce the piles and

⁵ <https://milieudatabase.nl/en/database/dutch-environmental-database/>

transport them directly to the construction site where the piles are inserted in the Prolock screen. The components are fastened together at the construction site. The following section discusses the Prolock screens in more detail.

The top side of the revetment can be finished with the beautiful Prolock Omega waling. It is also possible to install the sheetpile walls as freestanding or anchored. Choosing to add waling or anchoring has no effect on the sheetpile walls. The waling and anchoring are not an integrated part of the product and are not applied to most sheetpile walls. This is why these two complementary components are not included in this LCA.

2.3.1 Variants of Prolock sheetpile walls

Profextru produces four types of Prolock profiles that can be used as screens in sheetpile walls:

1. Sigma.
2. Omega.
3. Delta.
4. Aqua.

Table 1 gives the properties of four sheetpile walls per type of Prolock screen.

Table 1 - Properties of Prolock sheetpile walls per type

	Sigma	Omega	Delta	Aqua
Function	Bank protection for ponds and ditches	Bank protection for canals, rivers, lakes and marinas	Protection against seepage water and piping	Underwater revetment for ponds and ditches
Application	Revetments and light sheetpile wall structures	Heavy sheetpile wall structure	Dikes, aqueducts, dams, water level separations and soil remediation	Underwater revetment
Piles	Two or four piles per metre of bank length Thinner piles than with Omega	Two piles per metre of bank length	None	Two or four piles per metre of bank length Comparable to Sigma
Length	The length of the screen and piles is variable and depends on the application	The length of the screen and piles is variable and depends on the application	Up to 12 metres	The length of the screen and piles is variable and depends on the application
Other			Watertight sealing lip	

The length of the screen and the dimensions of the piles varies and depends on the project-specific requirements and local conditions. The ratio of screen length when compared to the pile length varies as well. In addition, piles can be made from hardwood, softwood and steel. Omega and Sigma are used in relation to piles while Delta is used when piles are not used.

In this LCA, we calculate the environmental profile of twelve Prolock sheetpile walls with the most common screen length, pile length and pile thickness. These are given in Table 2. A translation of the sheetpile walls to one square metre is given in Section 3.2 (Table 7).