



Guidelines

Sustainability of steel sheet piles



Dyke reinforcement with steel sheet piles © D&K

Environmental Product Declarations and Life Cycle Assessments

What is a Life Cycle Assessment?

A Life Cycle Assessment (LCA) is a systematic analysis and evaluation of the environmental impacts of a product (or service) for its entire life cycle.

The life cycle of a product in the construction industry includes the extraction of raw materials and their further processing, transport, manufacture, all further processing steps before installation at the construction site, the use phase, disassembly and finally the reuse or recycling of the product.

What is an Environmental Product Declaration?

An Environmental Product Declaration (EPD) is a document that describes the environmental impacts of a product based on a life cycle assessment with quantitative data. An EPD enables manufacturers to transparently communicate the environmental impacts of products. EPDs in turn form the basis for the ecological assessment of buildings and other construction projects.

ArcelorMittal's EPDs are verified by independent experts and published at the *Institut Bauen und Umwelt e.V.* (IBU). EPDs can be used for the LEED certification program.

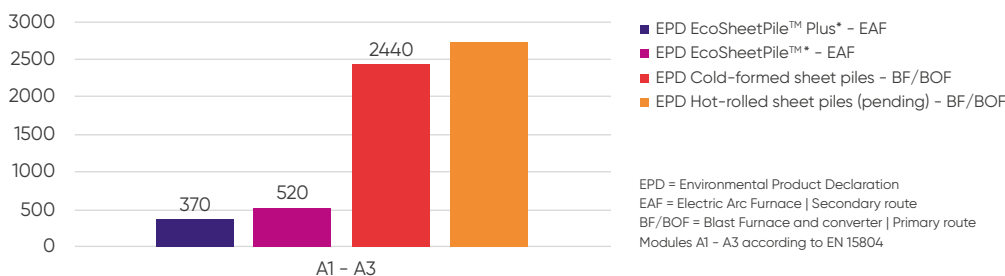
What EPDs does ArcelorMittal Sheet Piling have?

- EcoSheetPile™ Plus*: secondary route, 100 % steel scrap, 100 % renewable electricity
- EcoSheetPile™ *: secondary route, 100 % steel scrap
- Cold-formed sheet piles: primary route, 11 % steel scrap
- Hot-rolled sheet piles: primary route, 15 % steel scrap (pending)

Steel can be produced via the primary route (blast furnace and converter) or via the secondary route (electric arc furnace). Scrap-based production via the secondary route is far more environmentally friendly than conventional production with a blast furnace and converter, as no iron ore or coal is used. For EcoSheetPile™ and EcoSheetPile™ Plus, steel scrap sourced from Europe is melted down and reprocessed in the electric arc furnace. This is closed-loop recycling. Scrap-based steel production thus conserves natural resources while emitting significantly less greenhouse gases.

When 100% electricity from renewable energy sources is used during production, the carbon footprint of a tonne of sheet piles is reduced by a further 30%. The chart below compares the Global Warming Potential (GWP) of sheet pile production for different production routes based on EPDs.

Global Warming Potential [kg CO₂e / metric ton of sheet pile]



Note: all weights in this document are expressed in metric tons. They are indicated either as "metric ton" or "tonne", or "t".

* The EPDs are recognized by the North American program holder, UL Environment, and listed in their online database.

Taking environmental criteria into account

Public sector projects are usually subject to numerous expectations from the political and social environment. For this reason, infrastructure projects should also take a holistic approach of the sustainability of the construction project, which is based on 3 pillars: economic, social and environmental. Far too often, the environmental pillar is neglected in public tenders. This seems inconceivable when one considers that the production of building materials is responsible for 10% of global greenhouse gas emissions**.

The inclusion of environmental criteria in public tenders allows contractors to offer sustainable construction solutions with a low carbon footprint without being penalized.

Besides elementary requirements such as the use of recycled and recyclable building materials, there are already far better ways of taking environmental criteria into account in tenders. The monetization method applied in the Netherlands is worth mentioning. With the help of EPDs or generic data, as well as environmental indicators, all environmental impacts of a product are monetarized.

This results in an Environmental Cost Indicator (ECI) for each product. An overall ECI is then calculated, which includes the quantities of materials that have a large impact on the environmental footprint of the project. The total ECI is converted into a financial credit (fictional bonus). The credit is subsequently deducted from the total price of the bid. Thus, the contract is not necessarily awarded to the contractor with the lowest bid.

The method leads to the most sustainable solution based on the most economically advantageous offer. This approach is an incentive for contractors and manufacturers to invest in research and development and to optimize design and execution in order to reduce the environmental impact of each project. For more information on the monetization method, as well as the opportunities and risks of life cycle assessments, see a separate brochure from ArcelorMittal.

Steel sheet piles and the circular economy

Steel is the most recycled material in the world. One of the reasons for the high recycling rates is the intrinsic properties of steel, such as magnetism, which makes it easier to separate from other materials.

Steel sheet piles from ArcelorMittal score particularly well on the following principles of the circular economy:

- **Reduce:** through engineering optimization of sheet piling solutions, the profiles used have become lighter and lighter (-50 %) over the past decades, yet still meet the same requirements. These increases in efficiency are mainly due on the one hand to optimized sheet piling profiles such as the AZ-800 and on the other hand to the development of steel grades with higher yield strengths.

- **Reuse:** when the sheet piles are used for temporary projects, they can be extracted again after use and reused up to ten times, reducing the environmental impact for each individual phase of use.
- **Recycle:** in the context of foundation elements, recovering building materials for a recycling process can be difficult for some construction materials. Sheet piles, on the other hand, can be extracted at the end of a structure's service life and eventually recycled in an electric furnace. Steel can be recycled again and again - without any loss of quality.

Case studies

ArcelorMittal is committed to demonstrate the low environmental impact of steel foundation solutions compared to other construction solutions through studies carried out by independent engineering companies.

** IEA, *Global Status Report, 2021*

