

Environmental Product Declaration (EPD)  
According to ISO 14025 and EN 15804+A2



# VSH Shurjoint Fittings Galvanized

Registration number: EPD-Kiwa-EE-000504-EN

Issue date: 25.06.2026

Valid until: 25.06.2031

Declaration owner: Aalberts integrated piping systems B.V.

Publisher: Kiwa-Ecobility Experts

Program operator: Kiwa-Ecobility Experts

Status: verified



## 1 General information

### 1.1 PRODUCT

VSH Shurjoint Fittings Galvanized

### 1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-000504-EN

### 1.3 VALIDITY

Issue date: 25.06.2026

Valid until: 25.06.2031

### 1.4 PROGRAM OPERATOR

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### 1.5 OWNER OF THE DECLARATION

**Declaration owner:** Aalberts Integrated Piping Systems B.V.

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**Website:** <https://aalberts-ips.eu/>

Production location: Taiwan

**Production location:** No. 295, Section 3, Wandan Road, Wandan, Pingtung, Taiwan.

### 1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External



Dr. Ing. Morteza Nikravan

(Third party verifier)

### 1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The program operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

## 1.8 PRODUCT CATEGORY RULES

### Kiwa-EE GPI R. 4.0

Kiwa-Ecobility Experts, General Programme Instructions “Product Level”, Program EE 1201 (18.12.2025)

### Kiwa-EE GPI R. 4.0 Annex B1

Kiwa-Ecobility Experts, General Programme Instructions “Product Level” – Annex B1 Environmental Information Programme according to EN 15804 / ISO 21930, SOP EE 1203\_R. 4.0 (18.12.2025)

## 1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

## 1.10 CALCULATION BASIS

**LCA method:** EN15804+A2 (2019)

**LCA software:** Ecochain Helix version 4.3.1

**Characterization method:** EN15804+A2 (2019)

**LCA database profiles:** Ecoinvent version 3.9.1 & Nationale Milieudatabase v3.9

**Database version:** Ecoinvent 3.9.1 Cut-Off & Nationale Milieudatabase v3.9

## 1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the following report: ‘VSH Shurjoint Fittings Galvanized 260601’

## 2 Product

### 2.1 PRODUCT DESCRIPTION

“VSH Shurjoint Fittings Galvanized” are ductile iron, galvanized fittings with machined external grooves for use in mechanical piping systems; joints are made with gasketed couplings whose keys engage the groove and are tightened with bolts and nuts. The range covers numerous configurations (elbows, tees, reducers, adapters, caps and more) and sizes from ½” (DN15) up to 104” (DN2600); the declared reference article is a 90° elbow, model 7110, 2-1/2in approx., with a weight of 1.274 kg (≈ 1.245 kg ductile iron + 0.0290 kg zinc). Typical applications include heating, cooling, compressed air, sprinkler and dry extinguishing lines, with an expected service life of more than 50 years and no use-phase maintenance is expected or declared (modules B declared not relevant). Products are manufactured in Pingtung (Taiwan), shipped by container vessel and by trucks to the Aalberts IPS warehouse in Zeewolde (NL), and distributed to customers within Europe (average outbound distance ~561 km); packaging includes a plastic bag and wooden box.

#### PRODUCT SPECIFICATION

The reference article, VSH Shurjoint elbow 90°, model 7110 (2 x groove), 73.0 mm (DN65), (171100025003), galvanized, has the following composition:

The final composition of the product is described in the following table:

| Materials    | Weight [m-%] |
|--------------|--------------|
| Ductile Iron | 97.72        |
| Zinc         | 2.28         |
| Total        | 100          |

### 2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Shurjoint grooved fittings are mechanical pipe-joining components intended for use in pressurized or non-pressurized systems for water, HVAC, fire protection, gas and various industrial fluids. Shurjoint grooved-end fittings are manufactured and designed to meet ASTM F1548 and ANSI/AWWA C606 requirements for use with grooved mechanical couplings conforming to ASTM F1476.

### 2.3 REFERENCE SERVICE LIFE

#### RSL PRODUCT

A reference service life of at least 50 years has been declared by the manufacturer for VSH Shurjoint Fittings Galvanized. The reference service life depends on the conditions of use described in this EPD and on the specific characteristics of the product. Under normal application conditions, no planned maintenance, repair, replacement or refurbishment is required during the declared reference service life.

The declared reference service life applies only to this specific EPD. It does not provide information on the actual lifetime of an individual product and does not constitute a guarantee of product performance, durability or warranty conditions.

The product consists primarily of a galvanized ductile iron fitting body and is designed as a passive component for mechanical piping systems. No operational energy or water use is required by the fitting during its service life, and no in-use emissions are expected under normal use conditions.

#### USED RSL (YR) IN THIS CALCULATION:

50

### 2.4 TECHNICAL DATA

Ductile iron is an ideal material for VSH Shurjoint components because it provides the same or greater strength than forged or cast steel pipe materials, such as forged steel flanges – ASTM A105, steel valves – ASTM A216 WCB, forged steel pipe – ASTM A53 grade B, etc. Most VSH Shurjoint parts are made of ductile iron and comply with ASTM A536 grade 65-45-12. The range VSH Shurjoint Fittings Galvanized covers numerous configurations (elbows, tees, reducers, adapters, caps) and sizes from ½” (DN15) up to 104” (DN2600).

Technical data, including size ranges and specifications, can be found on the Aalberts IPS website under the product’s Dimensions tab. A more detailed document is available under the product’s Downloads tab in the Datasheet file. Link to the Datasheet file can be found in the Reference chapter.

### 2.5 SUBSTANCES OF VERY HIGH CONCERN

No substances included in the REACH 'Candidate List of Substances of Very High Concern (SVHC)' are present in this product at a concentration exceeding 0.1% (w/w).

## 2.6 DESCRIPTION PRODUCTION PROCESS

The process tree covers all processes that cause environmental impacts over the declared life cycle of the VSH Shurjoint Fittings Galvanized, including raw material procurement, transport of these resources to the production facility, manufacturing, distribution to the customer, installation packaging treatment, end-of-life treatment and potential benefits beyond the system boundary. The process tree for the reference product #7110 (73.0) 2-1/2 Galvanized 171100025003 is visualized in Figure 1. The modules included in this EPD are defined by the system boundaries and are summarized below.

Raw material supply, transport and manufacturing (A1-A3) are included. A1 covers the extraction and processing of the incoming materials, primarily the ductile iron melting mix consisting of pig iron, externally sourced compressed iron scrap, internal scrap, graphite and noduliser. Zinc, packaging materials and ancillary materials such as moulding sand, clay, water and lubricants are also included where relevant. A2 covers the transport of these raw and ancillary materials from suppliers to the manufacturing facility in Pingtung, Taiwan, using supplier-specific transport distances where available.

A3 covers the production processes at the Pingtung facility. The ductile iron is melted, cast in moulds, cleaned and finished by blasting, grinding or machining where applicable. Further, the fitting is transported to a galvanizing facility, where it undergoes hot-dip galvanizing before being returned to the factory. Internal scrap is recycled back into the melting process on site; the additional energy and process inputs required for this loop are included in A3. Production waste that leaves the site, such as used sand, slag, metal related waste and small metal scrap streams, is modelled with transport and treatment in A3. Product packaging that leaves the factory is also assigned to the relevant modules.

Transport to the customer and the construction-installation process (A4-A5) are included. A4 covers road transport from the manufacturing facility to the export port in Taiwan, container vessel transport to Rotterdam, road transport from Rotterdam to the Aalberts IPS warehouse in Zeewolde, and distribution from Zeewolde to European customers.

A5 covers the construction-installation process. The fittings are installed with hand tools. The treatment of packaging waste reaching the construction site is included in A5, and related recovery benefits are reported in module D where applicable.

Modules B1-B7 are declared as modules not relevant (MNR). The product is a passive fitting with no in-use emissions, no planned maintenance, repair, replacement or refurbishment within the declared reference service life, and no operational energy or water use. Therefore, no activities occur during the stage that would lead to measurable impacts per EN 15804+A2. The declared reference service life is 50 years, based on the default value used for buildings in LCA studies by the European Commission Joint Research Centre and on Aalberts IPS internal expectations for

comparable products and materials.

De-construction, transport, waste processing and disposal (C1-C4) are included. C1 is declared without product-specific inputs because the fittings are small components removed manually during refurbishment or as part of mixed demolition waste, and no dedicated machinery or ancillary materials can reasonably be attributed to the declared unit. C2 covers transport from the demolition site to waste processing using the European default end-of-life transport scenario. C3 includes sorting and pressing of the ductile iron and zinc fraction. C4 covers final disposal of residual material fractions that are not recycled or recovered.

Reuse, recovery and recycling potential (D) is included. Module D reports the potential benefits and loads beyond the system boundary from recycling and energy recovery. Recycling benefits for the ductile iron fraction are adjusted to avoid double counting the high secondary material share already present in the A1 melting mix. Benefits related to recovered packaging material and energy recovery from packaging waste are also reported in module D in accordance with the modularity and polluter-pays principles of EN 15804+A2.

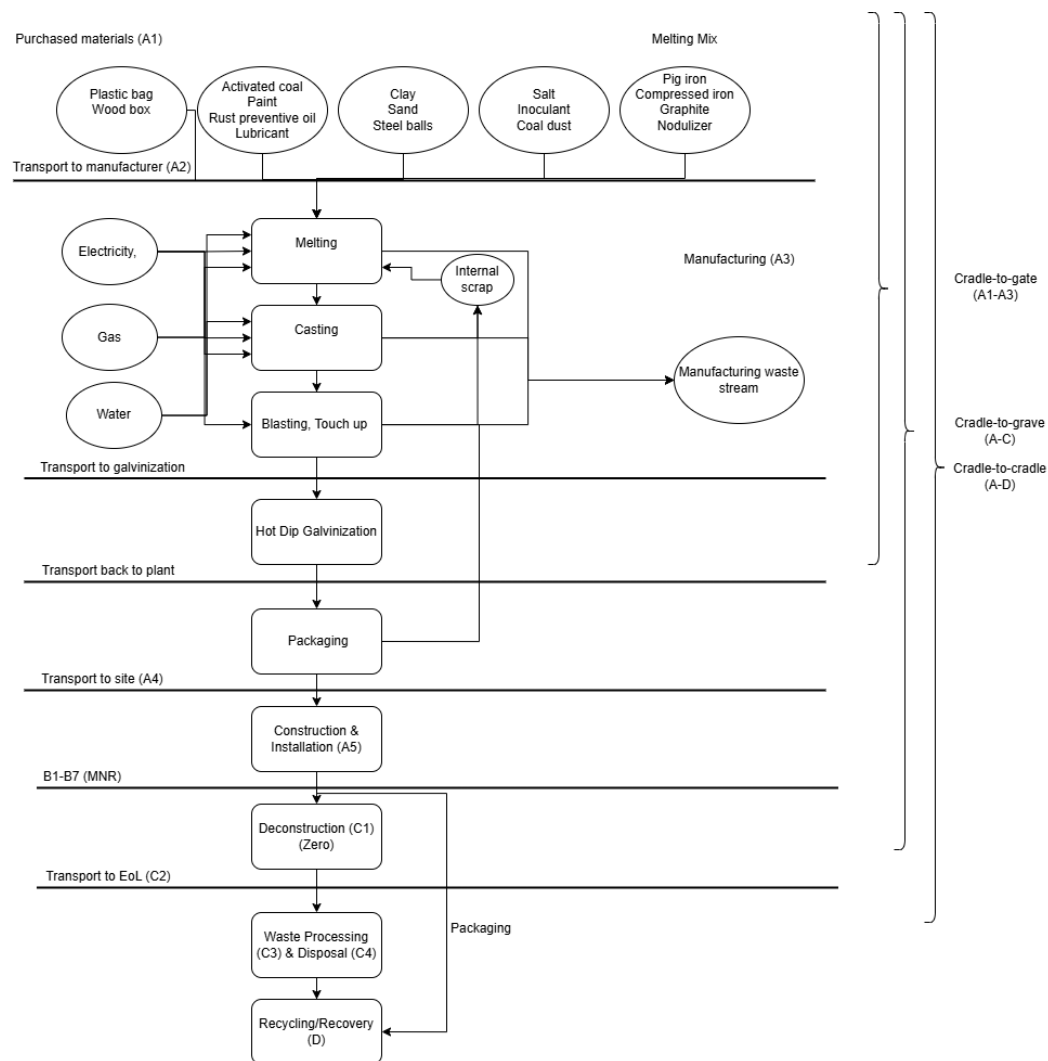


Figure 1: Process tree of #7110 (73.0) 2-1/2 Galvanized 171100025003

## 2.7 CONSTRUCTION DESCRIPTION

During the installation process, no relevant environmental impacts are considered as installation is completed by hand tools.

### 3 Calculation rules

#### 3.1 DECLARED UNIT

This is the worst-case EPD. The declared unit for this EPD is 1 kg of VSH Shurjoint Galvanized ductile iron fitting. The product group is represented by the VSH Shurjoint 90° elbow, model 7110 (2 x groove), 73.0 mm (DN65), galvanized, article number 171100025003, with a weight of 1.274 kg per piece. This product was chosen because this product has the highest environmental impact per kilogram of product within the assessed product range.

#### 3.2 CONVERSION FACTORS

| Description                    | Value | Unit     |
|--------------------------------|-------|----------|
| Reference unit                 | 1     | kg       |
| Weight of article used for LCA | 1.274 | kg/piece |
| Conversion factor to 1 kg      | 0.785 | Piece/kg |

#### 3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This EPD can be regarded as a cradle-to-gate with options, A4-A5, C1-C4 and D. The following phases are considered not relevant for this product range: B1-B7.

The life cycle stages included are as shown below:

(X = module declared, ND = module not declared)

| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|
| X  | X  | X  | X  | X  | ND | ND | ND | ND | ND | ND | ND | X  | X  | X  | X  | X |

The modules of EN15804+A2 contain the following:

|                                                 |                                                                    |
|-------------------------------------------------|--------------------------------------------------------------------|
| Module A1 = Raw material supply                 | Module B5 = Refurbishment                                          |
| Module A2 = Transport                           | Module B6 = Operational energy use                                 |
| Module A3 = Manufacturing                       | Module B7 = Operational water use                                  |
| Module A4 = Transport                           | Module C1 = De-construction / Demolition                           |
| Module A5 = Construction - Installation process | Module C2 = Transport                                              |
| Module B1 = Use                                 | Module C3 = Waste Processing                                       |
| Module B2 = Maintenance                         | Module C4 = Disposal                                               |
| Module B3 = Repair                              | Module D = Benefits and loads beyond the product system boundaries |
| Module B4 = Replacement                         |                                                                    |

#### 3.4 REPRESENTATIVENESS

This EPD is representative for VSH Shurjoint galvanized ductile iron grooved fittings, a product group of Aalberts Integrated Piping Systems B.V.

This is a product group EPD covering similar galvanized ductile iron fittings in multiple sizes. The products are manufactured from the same core materials and follow the same main production processes, including casting and finishing at the production facility in Pingtung, Taiwan. Except, hot dip galvanizing which is outsourced and then brought back to the facility. The main differences between the products are size, geometry and resulting mass.

The 2-1/2" article, #7110 (73.0) 2-1/2 Galvanized, article number 171100025003, is used as the representative product of the product group because it is a typical representation of the range in terms of materials and manufacturing technology and is a high-volume product.

For the environmental results tables, a conservative worst-case approach is applied.

The results are declared per 1 kg and are based on the smallest assessed article, #7110 (73.0) 2-1/2 Galvanized, article number 171100025003, because this article has the highest environmental impact per kilogram within the assessed product range. Results for the remaining covered products can be derived by weight-based scaling, as their environmental impacts are considered directly proportional to product mass. The results of this EPD are representative for European Union.

Environmental results for other sizes covered by this EPD are available upon request or on the Aalberts-ips.eu website under the Sustainability tab of the VSH Shurjoint fittings product line. These results are calculated by applying the product weight to the LCA result table based on the declared unit of this EPD.

Main Input material representativeness

| Item                                  | Dataset geography | Actual input geography |
|---------------------------------------|-------------------|------------------------|
| Melting mix - Ferrosilicon            | GLO               | TW                     |
| Melting mix - Graphite                | GLO               | TW                     |
| Melting mix - Pig iron                | RoW               | TW                     |
| Melting mix - Iron scrap (processing) | RoW               | TW                     |
| Zinc                                  | GLO               | TW                     |
| Wood box                              | RoW               | TW                     |

### 3.5 CUT-OFF CRITERIA

All relevant inputs and outputs, including materials, energy use, emissions, transport and waste flows, have been considered in this LCA. Any excluded flows are limited to minor inputs that fall below the cut-off criteria of EN 15804+A2. Per unit process, excluded flows do not exceed 1% of total primary energy use and 1% of total mass input. Per information module, the sum of excluded flows does not exceed 5% of total primary energy use and 5% of total mass input.

Excluded flows mainly concern minor packaging-related materials used at the manufacturing site and the product plastic film, which have a very small mass and environmental relevance compared with the total production volume. No relevant fixed components of the product system have been omitted. Relevant inputs and outputs such as emissions, energy and materials have been considered in this LCA. In accordance with EN15804, the total neglected input flows per module does not exceed 5% of energy usage and mass.

### 3.6 ALLOCATION

Allocation was applied in accordance with EN 15804+A2 where inputs and outputs

could not be directly assigned to the assessed product group. Product-specific material inputs were modelled directly where available. Shared production inputs and outputs, such as energy, ancillary materials, water use and production waste, were allocated using representative production-based methods, including production quantities and product mass where applicable.

Background datasets were selected from recognised LCA databases, including ecoinvent v3.9.1 and Nationale Milieudatabase v3.9. For ecoinvent datasets, the system model “allocation, cut-off by classification” was applied. End-of-life loads and benefits were assigned according to the modularity and polluter-pays principles of EN 15804+A2, with benefits from recycling and energy recovery reported separately in module D.

### 3.7 DATA COLLECTION & REFERENCE TIME PERIOD

Primary data, including raw materials, packaging materials, energy consumption and ancillary materials, were collected for the reference period from 2023-01-01 to 2023-12-31.

### 3.8 ESTIMATES AND ASSUMPTIONS

Generic background data from ecoinvent v3.9.1 and Nationale Milieudatabase v3.9 (based on ecoinvent 3.6/3.9.1) were used where supplier-specific environmental data or EPDs were not available. Background datasets were selected to represent the relevant material, energy, transport and waste treatment processes as closely as possible. Where no exact dataset was available, a representative or conservative proxy dataset was applied. Minor flows have been excluded only where they fall below the cut-off criteria of EN 15804+A2 and are not expected to materially influence the results.

#### Raw Material Supply (A1):

Material inputs were modelled based on available product and production data. Representative datasets from ecoinvent or NMD were applied. Secondary metallic input is included in the manufacturing mix and is modelled in accordance with EN 15804+A2, with related recycling benefits accounted for only where double counting in module D is avoided.

#### Transport To Manufacturer (A2):

Transport of raw and ancillary materials from suppliers to the production facility in Pingtung, Taiwan, was modelled using the actual transport distances available for the supplying site. A representative road transport dataset was applied for these inbound flows.

#### Manufacturing (A3):

Production processes at the Pingtung facility, including melting, casting, finishing, are

based on primary site data for the reference year 2023. Electricity is modelled using the Taiwanese electricity mix, applied as a location-based approach since no market-based renewable electricity instruments were retired during the inventory year. Internal recycling of production scrap is modelled within the manufacturing stage exclusively through the additional energy usage. Production waste leaving the site is modelled using available treatment information or conservative treatment assumptions. Wood box packaging that accompanies the product is included in this stage.

Galvanization occurs at a separate facility (31,5 km away by truck. Full 72km transport is modelled in A3 for the total product metal weight), through hot dip galvanization. The semi-finished products are then transported back to the main Shurjoint manufacturing facility to be finished and packaged.

#### **Transport To Construction Site (A4):**

Transport to customers was modelled using representative logistics routes from the production site in Pingtung, Taiwan, to the European market. The scenario includes road transport to the export port in Taiwan, container vessel transport to Rotterdam, road transport to the Aalberts IPS warehouse in Zeewolde, and onward distribution by road to European customers. The customer transport distance is based on the 2023 sales-country distribution and is calculated as a single weighted-average European distance. Conservative truck datasets were applied.

#### **Construction Installation Process (A5):**

Module A5 impacts mainly represent treatment of packaging waste and biogenic carbon balancing of the wooden box packaging. The declared fittings are installed using hand tools, installation energy is considered negligible and therefore set to zero. Product installation losses are also set to zero, as no cutting or processing losses occur during normal installation and reported damage or rejection rates are negligible compared with total sales volumes. Packaging waste generated at the construction site is included in module A5, with related recovery benefits reported in module D where applicable.

#### **Use Stage (B1-B7):**

Modules B1-B7 are declared as modules not relevant. The fittings have no in-use emissions, no planned maintenance, repair, replacement or refurbishment, and no operational energy or water use during the declared reference service life of 50 years.

#### **End Of Life (C1-C4):**

End-of-life scenarios are based on representative European waste treatment assumptions. Module C1 is declared with a value of zero, as no product-specific deconstruction energy or machinery can reasonably be attributed to the declared unit;

the fittings are typically removed manually during refurbishment or fall out with mixed demolition waste. Module C2 covers transport from the demolition site to waste processing using a representative European default distance. Module C3 includes sorting and pressing of the ductile iron and zinc fraction. Module C4 covers final disposal of residual fractions that are not recycled or recovered.

#### **Reuse, Recovery and Recycling Potential (D):**

Module D includes potential benefits and loads beyond the system boundary from material recycling and energy recovery. Recycling benefits for the ductile iron fraction are adjusted to avoid double counting the secondary material already present in the product system. Benefits from recovered packaging material and energy recovery from packaging waste are reported separately in this module.

#### **Biogenic Carbon:**

The product itself contains no biogenic carbon. Biogenic carbon is present only in wooden packaging and is balanced over the life cycle in accordance with EN 15804+A2.

### **3.9 DATA QUALITY**

The data quality of this LCA can be rated as good. Foreground (manufacturing) data are based on primary 2023 production records from the manufacturing site in Pingtung, Taiwan, including material inputs, energy consumption, waste streams and transport distances. The processes and input at the manufacturing plant have not changed since the data collection point.

Background data were sourced from recognised LCA databases (ecoinvent v3.9.1, system model "allocation, cut-off by classification"; Nationale Milieudatabase v3.9; and World Steel) and are considered representative of the technologies used. Where no exact dataset was available, a representative or conservative proxy dataset was applied. Datasets were selected with geographical priority Taiwan > Asia > Rest-of-World > Global for manufacturing, and Europe > Switzerland > Rest-of-World > Global for end-of-life and downstream modules.

The data quality of all foreground and background datasets has been assessed in accordance with EN 15804+A2:2019, §6.3.8, on three dimensions: geographical, technological and time representativeness. Foreground data are assessed as very good across all three dimensions. Background data are assessed as good to fair, depending on the availability of region- and technology-specific datasets.

The LCA was conducted in accordance with EN 15804:2012+A2:2019, using JRC characterization factors from the EN 15804 reference package based on EF 3.1. Global Warming Potential is assessed on a 100-year time horizon. Biogenic carbon is present only in wooden packaging and is fully balanced over the life cycle in accordance with

EN 15804+A2.

The study is reproducible based on the documented process descriptions, datasets and references. A summary of the data quality assessment is shown in the table below.

| Quality requirement                 | Specific requirement                                                                                             | Data quality level | Notes                                                                                 |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------|
| <b>Time-related coverage</b>        | Age of data and minimum time period for data collection.                                                         | Good               | Primary data from 2023;                                                               |
| <b>Geographical coverage</b>        | Upstream: Unit process for raw material should be collected for respective geographic region                     | Fair               | Region-specific datasets used where available; otherwise, RoW/GLO proxies applied     |
|                                     | Core: Unit process for production should represent the real site.                                                | Fair               | Foreground data from the Pingtung site; Taiwan electricity mix used for manufacturing |
|                                     | Downstream: End-of-life disposal should represent the region of disposal.                                        | Fair               | European average end-of-life scenarios applied (NMD/ecoinvent)                        |
| <b>Technical representativeness</b> | Qualitative assessment of the degree to which the data set reflects the true population of interest (technology) | Good               | Datasets selected to closely match the actual production and treatment technologies   |

### 3.10 Power Mix

The manufacturing site in Pingtung, Taiwan, did not procure or retire any contractual instruments during the inventory year 2023. No market-based renewable electricity

claim is therefore applied in this LCA.

Electricity consumption in module A3 is modelled using a location-based approach, based on the Taiwanese grid electricity mix. The GWP intensity of this electricity mix is approximately 0.78 kg CO<sub>2</sub>-eq/kWh.

## 4 Scenarios and additional technical information

### 4.1 TRANSPORT TO CONSTRUCTION SITE (A4)

Transport from the factory in Pingtung, Taiwan, to the warehouse in Zeewolde, Netherlands, is carried out by Aalberts integrated piping systems and logistical partners. The main means of transport is by average {GLO} trucks and per container ship {GLO}. Transportation to customers within Europe from the warehouse in Zeewolde is carried out by logistical partners. The main means of transport in Europe is by Class Euro5 trucks. The average transportation distance is calculated at 561km.

### 4.2 TRANSPORT END-OF-LIFE (C2)

The transport of waste from the demolition site to the respective end-of-life treatment facilities was modelled in accordance with the default waste scenarios prescribed by the NMD Bepalingsmethode. The following transport distances were used based on the type of end-of-life processing that the materials undergo. The transport dataset used is "t\*km 0363-tra&Transport, vrachtwagen, waterstof (o.b.v. Transport, freight, lorry >32 metric ton, EURO5 {RER}| transport, freight, lorry >32 metric ton, EURO5".

| End-of-Life Scenario | Prescribed Distance [km] |
|----------------------|--------------------------|
| Recycling            | 50                       |
| Landfill             | 100                      |
| Incineration         | 150                      |

### 4.3 END OF LIFE (C3, C4)

#### Module C3 - Waste processing

The ductile iron product body is sorted and pressed for recycling, reaching end-of-waste status as ferrous scrap suitable for reuse in steelmaking or iron foundry operations. 90% of zinc mass is treated by incineration (recycling of EAF dust) with no energy recovery.

#### Module C4 - Disposal

A conservative landfill share is assumed for the residual fractions that are not recycled or recovered. For the ductile iron body, 10 % of the mass is assumed to go to inert waste landfill. A similar assumption of 10% landfill disposal is applied to zinc mass. This is considered a conservative assumption, as in practice metal recycling rates in the European construction sector are generally higher; selecting a 10 % landfill share therefore avoids overestimating module D credits and overstating recycling performance.

### 4.4 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

Module D reports the potential net benefits and loads beyond the system boundary resulting from material recycling and energy recovery of end-of-life and packaging waste. The scenario follows the modularity and "polluter-pays principles" of EN 15804+A2 and uses the recycling and energy recovery rates defined for module C and module A5.

#### Material Recycling

The recycling credit for the ductile iron product body is modelled using the NMD module D steel substitution dataset (0282-reD), based on the World Steel methodology. The credit is calculated as the net difference between secondary, scrap-based electric arc furnace steel production and primary, ore-based converter steel production. This dataset is used as the closest available module D substitution profile for the recovered ferrous fraction.

The credit is adjusted to avoid double counting of the secondary material already present in the production input: only the primary fraction of the recovered metal qualifies for a module D credit. With an end-of-life recycling rate of 90 % for construction-sector iron and steel and a high secondary material share in the production input, the resulting net recycling output flow used for module D is approximately 12.9 % of the product body mass ( $\approx -0.129$  kg per 1 kg of declared product).

The wood box packaging is partially recycled (46 % of mass), with the recycling benefit modelled as substitution of virgin sawn wood beam production using the corresponding NMD module D wood substitution dataset.

#### Energy Recovery

For materials sent to incineration, module D credits the avoided external energy production based on the lower heating value of the incinerated material and the efficiencies of the applicable waste-to-energy datasets (18 % electric and 31 % thermal).

The incinerated share of the wood box (54 %) is credited using the avoided renewable energy production dataset, since wood is a biogenic fuel.

| Component          | End-of-life share                           | Module D substitution / recovery                                                                  |
|--------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------|
| Ductile iron body  | 90 % recycling, 10 % landfill               | Net steel recycling credit (NMD 0282-reD, World Steel methodology), SM-adjusted to net ~12.9 % of |
| Zinc               | 90 % incineration (recycling), 10% landfill | No recovery since zinc is highly recyclable, conservative approach                                |
| Wood box packaging | 46 % recycling, 54 % incineration           | Substitution of virgin sawn wood beam + avoided renewable energy production from waste-to-energy  |

## 5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about endpoints of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows. These LCA results are based on one kilogram of the smallest, highest-emitting assessed size (2-1/2). For all other products covered by this worst-case EPD, the results are calculated from this baseline using a weight-based conversion. The data is available upon request or on the official Aalberts IPS website inside the covered product's sustainability tab.

### 5.1 ENVIRONMENTAL IMPACT INDICATORS PER KILOGRAM OF PRODUCT #7110 (73.0) 2-1/2 Galvanized.

#### CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

| Abbreviation | Unit                      | A1       | A2       | A3        | A1-A3     | A4        | A5       | C1       | C2       | C3       | C4       | D         |
|--------------|---------------------------|----------|----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|-----------|
| AP           | mol H <sup>+</sup> eqv.   | 5.98E-03 | 3.10E-04 | 6.82E-03  | 1.31E-02  | 6.08E-03  | 1.23E-05 | 0.00E+00 | 1.37E-05 | 2.84E-04 | 5.06E-06 | -1.38E-03 |
| GWP-total    | kg CO <sub>2</sub> eqv.   | 1.00E+00 | 5.35E-02 | 1.68E+00  | 2.74E+00  | 3.11E-01  | 1.45E-01 | 0.00E+00 | 3.13E-03 | 2.61E-02 | 5.37E-04 | -1.98E-01 |
| GWP-b        | kg CO <sub>2</sub> eqv.   | 9.56E-03 | 2.47E-05 | -9.62E-02 | -8.66E-02 | -3.34E-06 | 1.45E-01 | 0.00E+00 | 1.30E-05 | 8.67E-05 | 1.96E-06 | -8.24E-05 |
| GWP-f        | kg CO <sub>2</sub> eqv.   | 9.90E-01 | 5.34E-02 | 1.78E+00  | 2.82E+00  | 3.11E-01  | 7.68E-04 | 0.00E+00 | 3.11E-03 | 2.59E-02 | 5.35E-04 | -1.98E-01 |
| GWP-luluc    | kg CO <sub>2</sub> eqv.   | 1.19E-03 | 1.96E-05 | 1.58E-03  | 2.80E-03  | 1.85E-04  | 7.08E-07 | 0.00E+00 | 1.88E-06 | 3.75E-05 | 1.49E-07 | -1.13E-04 |
| EP-m         | kg N eqv.                 | 1.16E-03 | 1.09E-04 | 1.15E-03  | 2.42E-03  | 1.54E-03  | 5.31E-06 | 0.00E+00 | 3.13E-06 | 6.46E-05 | 1.75E-06 | -3.26E-04 |
| EP-fw        | kg P eqv.                 | 5.93E-05 | 5.39E-07 | 1.31E-04  | 1.91E-04  | 1.79E-06  | 2.76E-08 | 0.00E+00 | 6.70E-08 | 1.16E-06 | 6.03E-09 | -9.60E-06 |
| EP-T         | mol N eqv.                | 1.36E-02 | 1.20E-03 | 1.28E-02  | 2.76E-02  | 1.70E-02  | 6.06E-05 | 0.00E+00 | 3.47E-05 | 7.39E-04 | 1.93E-05 | -4.66E-03 |
| ODP          | kg CFC 11 eqv.            | 3.94E-08 | 1.18E-08 | 2.40E-08  | 7.52E-08  | 3.85E-08  | 4.55E-11 | 0.00E+00 | 6.12E-10 | 4.02E-10 | 2.19E-10 | -9.59E-09 |
| POCP         | kg NMVOC eqv              | 4.67E-03 | 3.44E-04 | 4.22E-03  | 9.24E-03  | 4.65E-03  | 1.64E-05 | 0.00E+00 | 1.48E-05 | 2.21E-04 | 5.59E-06 | -1.59E-03 |
| ADP-f        | MJ                        | 1.27E+01 | 8.06E-01 | 2.40E+01  | 3.75E+01  | 4.12E+00  | 1.13E-02 | 0.00E+00 | 8.95E-02 | 3.43E-01 | 1.49E-02 | -1.43E+00 |
| ADP-mm       | kg Sb-eqv.                | 4.33E-03 | 1.35E-06 | 1.71E-06  | 4.34E-03  | 1.81E-06  | 3.04E-09 | 0.00E+00 | 1.11E-07 | 1.56E-06 | 4.89E-09 | -7.27E-04 |
| WDP          | m <sup>3</sup> world eqv. | 2.71E-01 | 2.88E-03 | 2.91E-01  | 5.65E-01  | 1.10E-02  | 1.10E-04 | 0.00E+00 | 1.87E-03 | 4.21E-03 | 6.47E-04 | -4.04E-02 |

**AP**=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

**ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2**

| Abbreviation | Unit              | A1       | A2       | A3       | A1-A3    | A4       | A5       | C1       | C2       | C3       | C4       | D         |
|--------------|-------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| ETP-fw       | CTUe              | 6.51E+01 | 7.18E-01 | 1.54E+01 | 8.12E+01 | 3.27E+00 | 1.39E-02 | 0.00E+00 | 4.34E-02 | 1.31E+00 | 1.20E-02 | -1.50E+01 |
| PM           | Disease incidence | 2.86E-07 | 4.80E-09 | 2.43E-08 | 3.15E-07 | 1.60E-08 | 1.11E-10 | 0.00E+00 | 4.33E-10 | 3.89E-09 | 9.84E-11 | -2.05E-08 |
| HTP-c        | CTUh              | 2.71E-08 | 2.33E-11 | 4.96E-10 | 2.76E-08 | 1.59E-10 | 9.83E-12 | 0.00E+00 | 1.61E-12 | 3.87E-11 | 2.41E-13 | -2.23E-10 |
| HTP-nc       | CTUh              | 6.08E-08 | 7.86E-10 | 1.36E-08 | 7.52E-08 | 2.91E-09 | 3.64E-11 | 0.00E+00 | 7.64E-11 | 1.86E-09 | 8.70E-12 | 2.98E-08  |
| IR           | kBq U-235 eqv.    | 3.14E-02 | 3.38E-03 | 1.46E-01 | 1.81E-01 | 1.07E-02 | 4.98E-05 | 0.00E+00 | 1.41E-04 | 9.13E-04 | 6.17E-05 | 2.10E-03  |
| SQP          | Pt                | 4.89E+00 | 6.99E-01 | 1.43E+01 | 1.99E+01 | 1.46E+00 | 4.85E-03 | 0.00E+00 | 8.42E-02 | 6.14E-01 | 3.15E-02 | -2.95E+01 |

**ETP-fw**=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation, human health (IR) | **SQP**=Land use (SQP)

**CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS**

| ILCD classification | Indicator                                                                                           | Disclaimer |
|---------------------|-----------------------------------------------------------------------------------------------------|------------|
| ILCD type / level 1 | Global warming potential (GWP)                                                                      | None       |
|                     | Depletion potential of the stratospheric ozone layer (ODP)                                          | None       |
|                     | Potential incidence of disease due to PM emissions (PM)                                             | None       |
| ILCD type / level 2 | Acidification potential, Accumulated Exceedance (AP)                                                | None       |
|                     | Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater) | None       |
|                     | Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)         | None       |
|                     | Eutrophication potential, Accumulated Exceedance (EP-terrestrial)                                   | None       |
|                     | Formation potential of tropospheric ozone (POCP)                                                    | None       |
|                     | Potential Human exposure efficiency relative to U235 (IRP)                                          | 1          |
|                     | Potential Human exposure efficiency relative to U235 (IRP)                                          | 1          |
| ILCD type / level 3 | Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)                          | 2          |
|                     | Abiotic depletion potential for fossil resources (ADP-fossil)                                       | 2          |
|                     | Water (user) deprivation potential, deprivation-weighted water consumption (WDP)                    | 2          |
|                     | Potential Comparative Toxic Unit for ecosystems (ETP-fw)                                            | 2          |
|                     | Potential Comparative Toxic Unit for humans (HTP-c)                                                 | 2          |
|                     | Potential Comparative Toxic Unit for humans (HTP-nc)                                                | 2          |
|                     | Potential Soil quality index (SQP)                                                                  | 2          |

**Disclaimer 1** – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

**Disclaimer 2** – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

## 5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

### PARAMETERS DESCRIBING RESOURCE USE

| Abbreviation | Unit           | A1       | A2       | A3       | A1 – A3  | A4       | A5       | C1       | C2       | C3       | C4       | D         |
|--------------|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| PERE         | MJ             | 9.80E-01 | 1.19E-02 | 1.34E+00 | 2.34E+00 | 4.57E-02 | 1.07E-03 | 0.00E+00 | 2.01E-03 | 5.32E-02 | 1.62E-04 | -3.77E+00 |
| PERM         | MJ             | 0.00E+00 | 0.00E+00 | 7.84E-01 | 7.84E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| PERT         | MJ             | 9.80E-01 | 1.19E-02 | 2.13E+00 | 3.12E+00 | 4.57E-02 | 1.07E-03 | 0.00E+00 | 2.01E-03 | 5.32E-02 | 1.62E-04 | -3.77E+00 |
| PENRE        | MJ             | 1.35E+01 | 8.43E-01 | 2.57E+01 | 4.01E+01 | 4.31E+00 | 1.19E-02 | 0.00E+00 | 8.97E-02 | 3.64E-01 | 1.54E-02 | -1.04E+00 |
| PENRM        | MJ             | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| PENRT        | MJ             | 1.35E+01 | 8.43E-01 | 2.57E+01 | 4.01E+01 | 4.31E+00 | 1.19E-02 | 0.00E+00 | 8.97E-02 | 3.64E-01 | 1.54E-02 | -1.04E+00 |
| SM           | kg             | 7.69E-01 | 0.00E+00 | 0.00E+00 | 7.69E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| RSF          | MJ             | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| NRSF         | MJ             | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00  |
| FW           | m <sup>3</sup> | 4.60E-02 | 9.89E-04 | 2.43E-02 | 7.14E-02 | 2.32E-03 | 9.53E-05 | 0.00E+00 | 2.39E-04 | 8.63E-04 | 8.12E-05 | 7.12E-03  |

**PERE**=renewable primary energy ex. raw materials | **PERM**=renewable primary energy used as raw materials | **PERT**=renewable primary energy total | **PENRE**=non-renewable primary energy ex. raw materials | **PENRM**=non-renewable primary energy used as raw materials | **PENRT**=non-renewable primary energy total | **SM**=use of secondary material | **RSF**=use of renewable secondary fuels | **NRSF**=use of non-renewable secondary fuels | **FW**=use of net fresh water

### OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

| Abbreviation | Unit | A1       | A2       | A3       | A1 – A3  | A4       | A5       | C1       | C2       | C3       | C4       | D         |
|--------------|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| HWD          | kg   | 1.96E-03 | 2.45E-05 | 1.86E-04 | 2.17E-03 | 1.14E-04 | 2.29E-07 | 0.00E+00 | 6.81E-07 | 9.39E-06 | 3.96E-07 | -1.75E-04 |
| NHWD         | kg   | 2.62E+00 | 2.54E-01 | 2.41E+00 | 5.28E+00 | 4.87E-01 | 2.34E-03 | 0.00E+00 | 3.57E-02 | 5.21E-02 | 4.89E-01 | 1.71E-01  |
| RWD          | kg   | 1.14E-04 | 8.79E-07 | 2.56E-04 | 3.71E-04 | 4.21E-06 | 1.75E-07 | 0.00E+00 | 2.55E-07 | 3.41E-06 | 1.22E-08 | 9.67E-06  |

**HWD**=hazardous waste disposed | **NHWD**=non-hazardous waste disposed | **RWD**=radioactive waste disposed

## ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

| Abbreviation | Unit | A1       | A2       | A3       | A1 - A3  | A4       | A5       | C1       | C2       | C3       | C4       | D        |
|--------------|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| CRU          | kg   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MFR          | kg   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | 0.00E+00 | 8.98E-01 | 0.00E+00 | 0.00E+00 |
| MER          | kg   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.20E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EET          | MJ   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.39E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EEE          | MJ   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.07E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

**CRU**=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy Thermic | **EEE**=Exported Energy Electric

## 5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER KILOGRAM

### BIOGENIC CARBON CONTENT

The following information describes the biogenic carbon content in (the main parts of) the product at the factory gate per kilogram of product:

| Biogenic carbon content                           | Amount | Unit |
|---------------------------------------------------|--------|------|
| Biogenic carbon content in the product            | 0      | kg C |
| Biogenic carbon content in accompanying packaging | 0.0593 | kg C |

### UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

| Uptake biogenic carbon dioxide | Amount | Unit                          |
|--------------------------------|--------|-------------------------------|
| Product                        | 0      | kg CO <sub>2</sub> (biogenic) |
| Packaging                      | 0.2176 | kg CO <sub>2</sub> (biogenic) |

## 6 Interpretation of results

### 6.1 Contribution analysis

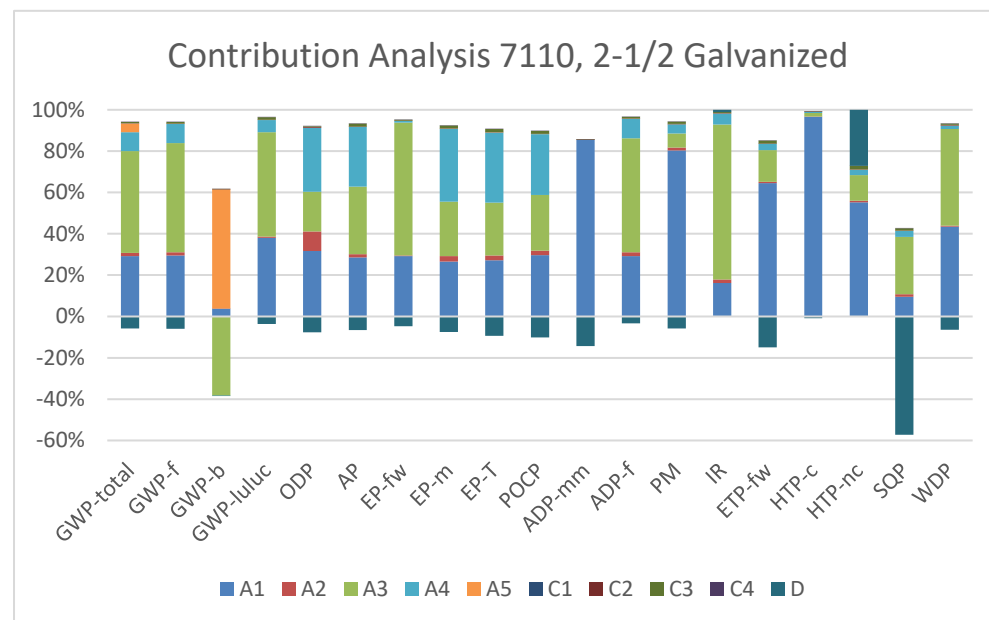


Figure 2: Contribution Analysis #7110 environmental impact. Product #7110 (73.0) 2-1/2 Galvanized.

Figure 2 illustrates the contribution of the different life cycle stages to the environmental indicators for product #7110 (2-1/2" galvanized). The results show that the majority of environmental impacts are concentrated in module A1 (raw material supply) and module A3 (manufacturing). The primary driver of Module A3 impacts is electricity consumption required for the manufacturing processes.

Within module A1, some of the highest shares are observed for impact categories such as GWP-total, GWP-fossil, ADP and PM, indicating that raw material supply is the dominant contributor. This is primarily related to the material requirements of the product, which consist mainly of the metal body. In addition, the galvanization of the fitting introduces zinc as a coating material, further contributing to the impacts associated with raw material extraction, processing and surface treatment.

Module A3 also contributes significantly to the environmental impacts, although reflecting the manufacturing and finishing processes required to produce the fitting, including the galvanization step.

For GWP-biogenic, the largest contribution occurs in module A5, which is associated with packaging biogenic carbon balancing.

The benefits reported in module D are relatively limited. This is consistent with the high share of secondary material input, which reduces the additional benefits that can be assigned beyond the system boundary.

## 7 References

### ISO 14040

ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

### ISO 14044

ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14044:2006

### ISO 14025

ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

### EN 15804+A2

EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

### Kiwa-EE GPI R.4.0 (2025)

Kiwa-Ecobility Experts, General Programme Instructions “Product Level”, SOP EE 1201\_R.4.0 (18.12.2025)

### Kiwa-EE GPI R.4.0 Annex B1 (2025)

Kiwa-Ecobility Experts, General Programme Instructions “Product Level” – Annex B1  
Environmental Information Programme

### Background database

ecoinvent version 3.9.1

NMD Determination Method V3.9

### Wood box packaging

Ikenze, N., Rizos, V., & Nipius, L. (2024, November 12). Improving waste wood circularity in the EU: Classification frameworks and policy options. CEPS

### Shurjoint Galvanized Fittings Datasheet

<https://aalberts.compano.com/Data/Environments/000001/Attachment/Bijlage/PRD/ProductGroup/Shurjoint/Datasheet/Grooved%20End%20Fittings.pdf>

## 8 Contact information

| Publisher                                                                                                                                                                                                                                                                                                                 | Operator                                                                                                                                                                                                                                                                                                                  | Owner of the declaration                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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