Environmental Product Declaration
Aluminium Window System
Environmental Product Declaration
This environmental product declaration (EPD) is for a CEN standard window frame produced by Kawneer (UK) Ltd in Runcorn, England. It has been developed using a Life Cycle Analysis (LCA) study that we commissioned in 2016 and carried out in accordance with the principles of ISO 14040:2006, ISO 14040: 2006 and EN 15804:2012.

This EPD discloses the average impacts and resources used to supply a standard Kawneer window frame.

Kawneer Window Systems
Kawneer window ranges are designed to offer optimum weather and thermal performance. Multiple ranges are available to meet bespoke customer requirements. This study considers the AA 541 Casement Window and AA 542 Pivot Window ranges.

Analysis
This EPD has been developed using an LCA study undertaken by 3Keel LLP, an independent third party sustainability consultancy.

Kawneer (UK) Ltd
Astmoor Road
Astmoor Industrial Estate
Runcorn, Cheshire, WA7 1QQ
United Kingdom
Product Description

The window systems assessed in this study are standard window frames exclusive of glazing and furniture. Kawneer windows are designed with aesthetics and energy efficiency in mind, both in terms of real world customer use and its production process.

Materials

- Kawneer windows use simple materials that maximise the opportunity for reuse and recycling at their end of life.
- Frame materials are 100% recyclable and Kawneer extruded aluminium includes more than 75% recycled content.

Production process

The window systems assessed in this EPD are produced by Kawneer in Runcorn, England. Aluminium billets containing primary and secondary aluminium are extruded to form the profile of the frame and assembled with a thermal break. Extrusions are then aged before being coated, packaged and supplied to customers for fabrication and installation. Windows are then delivered to construction sites for fitting and glazing installation.

Many of Kawneer’s window systems are listed in the BRE Global Green Guide and achieve A and A+ ratings and are suitable for projects that require sustainable and environmental advantages.

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### Material Declaration

<table>
<thead>
<tr>
<th>Material Declaration</th>
<th>Weight (kg)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>12.93</td>
<td>83%</td>
</tr>
<tr>
<td>Thermal break</td>
<td>2.14</td>
<td>14%</td>
</tr>
<tr>
<td>Coating</td>
<td>0.43</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>15.5</td>
<td>100%</td>
</tr>
</tbody>
</table>

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An LCA determines the cradle-to-grave impacts of a product. At Kawneer we take all our responsibilities very seriously. We’re dedicated to creating products and systems that promote integrated, whole-building design practices. LCA helps us measure and review our products to minimise the resources and impacts associated with their use from cradle-to-grave.

This EPD covers ‘cradle-to-gate’ + end of life processes.

**Declared Unit**
The declared unit is a single CEN standard window and frame system (1230mm x 1480mm).

**Key Considerations**
- Kawneer production and supply chain data was used for extrusion and coating processes.
- Data were provided for 2015 production and were collated under EN 15804 guidelines.
- All significant inputs were included covering more than 95% of inputs and neglected inputs are likely near 0%.
- The analysis includes the resources and impacts associated with the production of frame components ready for fabrication by Kawneer’s customers. It excludes final assembly, furniture, and then building installation.

**Assumptions**
- UK construction sector waste statistics provided by Defra (2015) were used to assess the end of life management routes.
- Aluminium has a high market value and has a strong recycling rate in the UK construction industry. Recycling of aluminium has a substantially lower environmental impact than the production of virgin alloy, however this analysis only considers the environmental benefits of Kawneer’s use of recycled aluminium in purchased billets and third party supplied extrusions.
- Ecoinvent 3.2 was used to assess the environmental impact of purchased materials and processes.
The majority of impacts associated with the production and supply of windows occur before they reach Kawneer as part of the raw material supply that goes into the extrusion process. This is expected and consistent with other analyses assessing the impacts of extruded aluminium products.

Manufacturing impacts are the second biggest contributor across almost all impact and resource categories, except for waste.

A median product profile was used to calculate the average impact of Kawneer window frames.

Although the specific impact may vary, the relative contribution to each life cycle stage does not change as the materials used are adjusted in a similar proportion.
Raw Material Impacts
- Aluminium material for the frame is the single biggest raw material impact.
- Using recycled, rather than primary (virgin), aluminium can reduce the impact of its use by over 85%.

Extrusion Impacts
- The energy used in the extrusion process – particularly electricity – is the primary contributor to Kawneer’s manufacturing impact.
- Improving production efficiency and using renewable energy within the production process can significantly reduce these impacts.

End of Life Impacts
- Recycling aluminium when a window frame is removed from a building will substantially reduce its disposal impacts.
- Approximately 87% of all construction waste is recovered in the UK and aluminium frames are considered to have a 98% recovery rate.
<table>
<thead>
<tr>
<th>Window</th>
<th>Unit</th>
<th>A1 Raw Materials</th>
<th>A2 Material Transport</th>
<th>A3 Manufacturing</th>
<th>C2 Transport to Disposal</th>
<th>C4 Disposal*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental impact per unit</td>
<td>kg CO2e</td>
<td>8.481E+01</td>
<td>6.625E-01</td>
<td>2.418E+01</td>
<td>6.767E-01</td>
<td>8.092E-01</td>
</tr>
<tr>
<td></td>
<td>kg CFC-11e</td>
<td>6.280E-06</td>
<td>1.216E-07</td>
<td>2.601E-06</td>
<td>1.140E-07</td>
<td>1.168E-07</td>
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<tr>
<td></td>
<td>kg SO2e</td>
<td>5.109E-01</td>
<td>3.020E-03</td>
<td>7.261E-02</td>
<td>3.786E-03</td>
<td>3.051E-03</td>
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<tr>
<td></td>
<td>kg PO43-e</td>
<td>1.703E-01</td>
<td>5.978E-04</td>
<td>1.812E-02</td>
<td>6.787E-04</td>
<td>6.175E-04</td>
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<tr>
<td></td>
<td>kg C2H4e</td>
<td>3.689E-02</td>
<td>1.117E-04</td>
<td>3.630E-03</td>
<td>1.189E-04</td>
<td>1.070E-04</td>
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<tr>
<td></td>
<td>kg Sb e</td>
<td>5.397E-01</td>
<td>4.836E-03</td>
<td>1.882E-01</td>
<td>4.215E-03</td>
<td>3.784E-03</td>
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<tr>
<td>Abiotic Depletion Potential – Elements (ADPE)</td>
<td>MJ e</td>
<td>1.142E+03</td>
<td>1.013E+01</td>
<td>4.175E+02</td>
<td>8.818E+00</td>
<td>7.991E+00</td>
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<tr>
<td>Abiotic Depletion Potential – Fossil Fuels (ADPF)</td>
<td>MJ NCV</td>
<td>2.738E+02</td>
<td>1.314E-01</td>
<td>1.429E+01</td>
<td>3.968E-02</td>
<td>1.300E+00</td>
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<tr>
<td>Resource use per unit</td>
<td>MJ NCV</td>
<td>2.486E+02</td>
<td>7.442E-05</td>
<td>7.427E-03</td>
<td>1.496E-05</td>
<td>9.075E-04</td>
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<tr>
<td>Primary Energy – renewable energy (PERE)</td>
<td>MJ NCV</td>
<td>2.738E+02</td>
<td>1.314E-01</td>
<td>1.429E+01</td>
<td>3.970E-02</td>
<td>1.301E+00</td>
</tr>
<tr>
<td>Primary Energy – renewable energy as raw materials (PERM)</td>
<td>MJ NCV</td>
<td>9.491E+02</td>
<td>1.058E+01</td>
<td>3.495E+02</td>
<td>9.455E+00</td>
<td>7.970E+00</td>
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<tr>
<td>Total primary renewable energy resources (PERT)</td>
<td>MJ NCV</td>
<td>9.491E+02</td>
<td>1.058E+01</td>
<td>3.495E+02</td>
<td>9.455E+00</td>
<td>7.970E+00</td>
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<td>Non-renewable primary energy (PENRE)</td>
<td>MJ NCV</td>
<td>9.491E+02</td>
<td>1.058E+01</td>
<td>3.495E+02</td>
<td>9.455E+00</td>
<td>7.970E+00</td>
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<tr>
<td>Total use of non-renewable primary energy (PENRT)</td>
<td>MJ NCV</td>
<td>9.491E+02</td>
<td>1.058E+01</td>
<td>3.495E+02</td>
<td>9.455E+00</td>
<td>7.970E+00</td>
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<tr>
<td>Fresh water (FW)</td>
<td>m3</td>
<td>1.034E+00</td>
<td>1.943E-03</td>
<td>1.787E-01</td>
<td>9.033E-04</td>
<td>7.013E-03</td>
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<td>Waste to disposal</td>
<td>kg waste</td>
<td>1.258E-01</td>
<td>6.163E-06</td>
<td>3.389E-04</td>
<td>3.054E-06</td>
<td>1.409E-04</td>
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<td>Hazardous waste disposal (HWD)</td>
<td>kg waste</td>
<td>1.726E+01</td>
<td>4.729E-01</td>
<td>4.278E+00</td>
<td>4.376E-02</td>
<td>1.234E+01</td>
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<td>Non-hazardous waste disposal (NHWD)</td>
<td>kg waste</td>
<td>5.202E-03</td>
<td>6.904E-05</td>
<td>1.539E-03</td>
<td>6.462E-05</td>
<td>7.278E-05</td>
</tr>
</tbody>
</table>

* The Disposal Module includes waste processing that cannot be separated out.

References
Company information

Kawneer UK Ltd is part of Arconic Building and Construction Systems, and enjoys the extensive resources of the entire Arconic organisation, allied to the specific glazing systems experience of Kawneer’s many operations around the world. As a result of this our partners and customers have direct access to one of the largest pools of technical expertise in the construction industry.

3Keel LLP has conducted this life cycle assessment in accordance with data provided by Kawneer (UK) Ltd. 3Keel has exercised due care in assessing the quality of information provided, but has not independently verified information provided by others.