ENVIRONMENTAL PRODUCT DECLARATION
CLARKDIETRICH COLD-FORMED STEEL PRODUCTS

ClarkDietrich Building Systems
9100 Centre Pointe Dr., Ste. 210
West Chester, OH  45069
p. 513-870-1100
www.clarkdietrich.com

Certification is specific to ClarkDietrich Building Systems due to the declared system boundary of data collection. It is not applicable to the same or similar products produced by other manufacturers.
## EPD INFORMATION

<table>
<thead>
<tr>
<th>Program Operator</th>
<th>NSF International</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration Holder</td>
<td>ClarkDietrich Building Systems</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Cold-Formed Steel Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved</td>
<td>June 30, 2015</td>
</tr>
<tr>
<td>Valid Until</td>
<td>December 30, 2020</td>
</tr>
<tr>
<td>Declaration #</td>
<td>EPD10056</td>
</tr>
</tbody>
</table>


- Internal
- External

Lori Bestervelt  
Bestervelt@nsf.org

This life cycle assessment was independently verified by in accordance with ISO 14044 and the reference PCR:

Jack Geibig  
jgeibig@ecoform.com

## LCA INFORMATION

<table>
<thead>
<tr>
<th>Basis LCA</th>
<th>ProSTUD® Drywall Framing System &amp; Cold-Formed Steel Products, May 15, 2015</th>
</tr>
</thead>
</table>
| LCA Preparer                                | thinkstep  
Takuma Ono  
takuma.ono@thinkstep.com                     |

This life cycle assessment was critically reviewed in accordance with ISO 14044 by:

Jack Geibig  
EcoForm  
jgeibig@ecoform.com

## PCR INFORMATION

<table>
<thead>
<tr>
<th>Program Operator</th>
<th>SCS Global Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference PCR</td>
<td>North American Product Category Rule for Designated Steel Construction Products</td>
</tr>
<tr>
<td>Date of Issue</td>
<td>May 5, 2015</td>
</tr>
</tbody>
</table>

PCR review was conducted by:

Dr. Thomas Gloria, Ph. D. (Chair)  
Industrial Ecology Consultants  
t.gloria@industrial-ecology.com
ABOUT US

ClarkDietrich Building Systems offers a comprehensive lineup of steel construction products and services across the United States and abroad. Using cold-formed steel, we manufacture innovative products for interior framing, interior finishing, exterior framing and floor framing, as well as clips, connectors, metal lath and accessories.

Within our facilities we actively recycle 100% of steel waste from all aspects of our processing, beginning with the slitting of the master coil and continuing through to the final roll-forming of our product. Every day at every plant. Steel is fully recyclable and we have always been diligent in this effort.

Product development is focused on labor savings systems, which incorporates optimal utilization of all raw materials. From concept to launch, our product offering consciously engages optimal use of material as well as ease of construction.

Formed in 2011 through the combination of two established market leaders—ClarkWestern Building Systems and Dietrich Metal Framing—ClarkDietrich is in an unprecedented position to help you bring change to the built environment.

Manufacturing Sites:
- Baltimore, MD
- Baytown, TX
- Bristol, CT
- Dade City, FL
- Dallas, TX
- Kapolei, HI
- McDonough, GA
- Riverside, CA
- Rochelle, IL
- Sacramento, CA
- Warren, OH East
- Warren, OH West

PRODUCT

Product Description and Application
Cold-formed steel framing products have bare steel thicknesses in the range of 0.0120 inches to 0.1180 inches. These products include interior framing, interior finishing trims and accessories, exterior framing, floor framing, clips/connectors, expanded metal lath, plaster trim and accessories.

Using cold-formed steel, innovative products are manufactured for use as interior framing, interior finishing, exterior framing, floor framing, as well as clips, connectors, metal lath and accessories. These products are most commonly used in compliance with the International Building Code and the International Residential Code.

Common applications of cold-formed steel framing products are as follows:
- Interior Framing – Nonstructural
- Interior Finishing – Nonstructural
- Exterior Framing – Structural Load-Bearing
- Floor Framing – Structural Load-Bearing
- Roof Framing – Structural Load-Bearing
- Exterior Finishing
Technical Data
The following table lists metal thicknesses and strengths for all ProSTUD®, structural products and clips/connectors:

<table>
<thead>
<tr>
<th>Product</th>
<th>Gauge</th>
<th>Mils</th>
<th>Bare Steel Thickness (inches)</th>
<th>Design Thickness (inches)</th>
<th>Yield Strength (ksi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>26 min</td>
<td>12 min</td>
<td>0.012 min</td>
<td>0.01224 min</td>
<td>N/A</td>
</tr>
<tr>
<td>DW</td>
<td>25 to 20</td>
<td>15 to 33</td>
<td>0.0150 to 0.0329</td>
<td>0.0158 to 0.0346</td>
<td>33 to 65</td>
</tr>
<tr>
<td>STRUC</td>
<td>20 to 12</td>
<td>33 to 97</td>
<td>0.0329 to 0.0966</td>
<td>0.0346 to 0.1017</td>
<td>33 to 50</td>
</tr>
<tr>
<td>HDS</td>
<td>20 to 12</td>
<td>33 to 97</td>
<td>0.0329 to 0.0966</td>
<td>0.0346 to 0.1017</td>
<td>33 to 50</td>
</tr>
<tr>
<td>TradeReady</td>
<td>18 to 12</td>
<td>43 to 97</td>
<td>0.0428 to 0.0966</td>
<td>0.0451 to 0.1017</td>
<td>33 to 50</td>
</tr>
<tr>
<td>Clips/Connectors</td>
<td>20 to 10</td>
<td>33 to 118</td>
<td>0.0329 to 0.1180</td>
<td>0.0346 to 0.1242</td>
<td>33 to 50</td>
</tr>
</tbody>
</table>

NOTE: For more detailed product line information go to http://www.clarkdietrich.com/products.

Constructional Data
Placing on the market / Application rules
Most commonly used and referred to codes in the steel framing industry. List is not intended to be all-inclusive or comprehensive.

Manufacturing Codes
- ASTM C645, Specification for Nonstructural Steel Framing Members
  - Interior Framing – Nonstructural
- ASTM C955, Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases
  - Exterior Framing – Structural Load-Bearing
  - Floor Framing – Structural Load-Bearing
  - Roof Framing – Structural Load-Bearing
- ASTM C1047, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
  - Interior Finishing – Nonstructural
- ASTM C847, Specification for Metal Lath
- Metal Lath

Construction and Building Codes
- International Building Code (IBC)
  - Chapter 22, Section 2210, Cold-Formed Steel
  - Chapter 25, Section 2505, Shear Wall Construction
  - Chapter 25, Section 2506, Gypsum Board and Gypsum Panel Product Materials
  - Chapter 25, Section 2507, Lathing and Plastering
- International Residential Code (IRC)
  - Section R505: Cold-Formed Steel Floor Framing
  - Section R603: Cold-Formed Steel Wall Framing
  - Section R804: Cold-Formed Steel Roof Framing
Structural Engineering Codes

- American Iron and Steel Institute (AISI)
  - AISI S100: North American Specification for the Design of Cold-Formed Steel Structural Members
  - AISI S200: North American Standard for Cold-Formed Steel Framing – General Provisions
  - AISI S201: North American Standard for Cold-Formed Steel Framing – Product Data
  - AISI S210: North American Standard for Cold-Formed Steel Framing – Floor and Roof System Design
  - AISI S211: North American Standard for Cold-Formed Steel Framing – Wall Stud Design
  - AISI S212: North American Standard for Cold-Formed Steel Framing – Header Design
  - AISI S213: North American Standard for Cold-Formed Steel Framing – Lateral Design
  - AISI S214: North American Standard for Cold-Formed Steel Framing – Truss Design
  - AISI S220: North American Standard for Cold-Formed Steel Framing – Nonstructural Members
  - AISI S230: Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings
- American Society of Civil Engineers (ASCE)
  - ASCE 7: Minimum Design Loads for Buildings and other Structures

Delivery Status / Packaging

All of the various steel framed products are packaged and shipped using one of the following methods: skids, boxes, and buckets or cartons.

Structural Load-Bearing Members – Skid (See Figure 1)
- Products are generally nested together in pairs, then stacked with other sets of nested pairs and are held together using banding and wood dunnage

Nonstructural Framing Members – Skid (See Figure 2)
- Products are generally nested together in pairs, then stacked with other sets of nested pairs and are held together using banding and wood dunnage.

Metal Lath – Skids (See Figure 3)
- Product sheets are stacked on top of each other in a bundle and held together with plastic strapping. The bundles are stacked on top of each other and held together using banding and wood dunnage.

Corner Beads, Trims and Finishing Products – Boxes (See Figure 4 and 5)
- Desired quantity of products are stacked on top of each other, then secured inside of a cardboard box. Then cardboard boxes are stacked together with other boxes to form a skid of product and held together using banding and wood dunnage.

Clips and Connectors – Buckets or Cartons (See Figure 6 and Figure 7)
- Products are placed in a carton or plastic buckets then secured into the buckets with a plastic lid. The buckets or cartons are stacked together with other buckets or cartons to form a skid of product and held together using banding and wood dunnage.
Package Figures:

Figure 1: Skid of Structural Framing

Figure 2: Skid of Nonstructural Framing

Figure 3: Skid of Metal Lath

Figure 4: Box of Corner Bead

Figure 5: Skid of Corner Bead Boxes

Figure 6: Plastic Bucket of Clips

Figure 7: Carton of Clips
Base Materials / Ancillary Materials
Cold-formed steel framing products are made from coils of low alloy sheet steel with various metallic and conversion coatings for corrosion protection. Primary product components as follows:

<table>
<thead>
<tr>
<th>Component Name</th>
<th>Mass by % of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Metal</td>
<td>&gt; 97.9%</td>
</tr>
<tr>
<td>Metallic Coating</td>
<td>&lt; 2.1%</td>
</tr>
</tbody>
</table>

Manufacture
Definitions:
- Prime Steel Coil - Manufactured in North America
- Steel coils that are purchased to meet or exceed the specifications needed to manufacture a specific product or products.
- Secondary Steel Coils
- Steel coils that are purchased on the secondary market that may or may not match exact specifications needed but can be roll reduced and coated to meet desired specifications.
- Steel coil production took place at either a domestic or foreign steel mill located in United States (77.5%), Canada (8.6%), Mexico (5.7%), India (3.1%), China (2.9%), or Italy (2.2%).

Process for Prime Steel
Prime Steel Coils are received into the warehouse from external suppliers. The Prime Steel Coils are slit into appropriate widths in a continuous slitting process. Then the slit coils are loaded into the roll forming machinery where continuous roll formers shape the slit coils into finished products. The finished products are packaged into skids, and the skids are loaded onto a truck where they will be shipped to the customer.

Process for Secondary Steel
Secondary Steel Coils are received into the warehouse. Where necessary secondary steel coils are cold reduced to the appropriate thickness. The Secondary Steel Coils are slit into narrow coils, then the narrow coils are loaded into the roll forming machinery where they are roll formed into finished products. The finished products are packaged into skids, and the skids are loaded onto a truck where they will be shipped to the customer.
The diagram below shows the flow of cold-formed steel products through major processes. The arrows between processes indicate transportation of intermediate products. Material input flows have associated inbound transportation.
LCA CALCULATION RULES

Declared Unit
The declared unit of calculation is one metric ton of steel construction product (1000 kg).

<table>
<thead>
<tr>
<th>Name</th>
<th>Required Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declared Unit</td>
<td>Metric Ton</td>
<td>1</td>
</tr>
<tr>
<td>Density</td>
<td>kg/m³</td>
<td>7,850</td>
</tr>
</tbody>
</table>

System Boundary
The declared system boundary is cradle-to-gate. Cradle-to-gate includes the PCR life cycle modules A1, A2, and A3. The declared system boundaries are shown below:

Reference Service Life
Due to a cradle-to-gate declaration, a reference service life for steel products is not declared.

Scope
Temporal
All primary data were collected specific to the US. Where country / region specific secondary data were unavailable, proxy data were used but this is more an exception than the norm. Geographical representativeness is thus considered to be good.

Geographic
All primary data were collected for the year 2013. All secondary data come from the GaBi 2013 databases and are representative of the years 2009-2013. As the study intended to compare the product systems for the reference year 2013, temporal representativeness is good.

Data Quality Assessment
To ensure consistency, all primary data were collected with the same level of detail, while all background data were sourced from the GaBi databases. Allocation and other methodological choices were made consistently throughout the model.
Background Data
Most of the necessary life cycle inventories for the basic materials are available in the GaBi database. The last update of the database was 2013. Further LCIs for materials of the supply chain of the basic materials are approximated with LCIs of similar materials or estimated by the combination of available LCIs as documented in the background report. All datasets used in the major unit processes are provided in later sections of this report along with the description of the individual unit processes.

There is limited regional background data for steel that is specific to the US. There we have used the “NA: Steel hot dip galvanized” from worldsteel as the best available dataset for steel inputs. It must be noted that, the worldsteel data set does not report waste and net water consumption flows as required by the PCR. However, as the worldsteel methodology is in line with ISO 14044 allocation rules and is the best publicly available dataset for US steel, the use of this data set is justified. Water and waste indicators shall not be reported as explained in the background report.

Foreground Data
The foreground data collected by the manufacturer are based on yearly production amounts and extrapolations of measurements on specific machines and plants. The production data refer to an average of the year 2013.

Primary data for the production of cold-formed steel products were collected by ClarkDietrich using a specifically developed spreadsheet provided by thinkstep. Cross-checks concerning the plausibility of mass and energy flows were carried out by thinkstep on the data received via email, telephone consultation and teleconferencing.

Statement of Comparability
Any comparison of EPDs shall be subject to the requirements of ISO 21930. For comparison of EPDs which report different module scopes, such that one EPD includes Module D and the other does not, the comparison shall only be made on the basis of Modules A1, A2, and A3. Additionally, when Module D is included in the EPDs being compared, all EPDs must use the same methodology for calculation of Module D values.

Declaration of Environmental Impact Derived from LCA
Disclaimer: This Environmental Product Declaration (EPD) conforms to ISO 14025, ISO 14040, ISO 14044, and ISO 21930.

Scope of Results Reported: The PCR requires the reporting of a limited set of LCA metrics; therefore, there may be relevant environmental impacts beyond those disclosed by this EPD. The EPD does not indicate that any environmental or social performance benchmarks are met nor thresholds exceeded.

Accuracy of Results: This EPD has been developed in accordance with the PCR applicable for the identified product following the principles, requirements and guidelines of the ISO 14040, ISO 14044, ISO 14025 and ISO 21930 standards. The results in this EPD are estimations of potential impacts. The accuracy of results in different EPDs may vary as a result of value choices, background data assumptions and quality of data collected.

Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. Such comparisons can be inaccurate, and could lead to the erroneous selection of materials or products which are higher - impact, at least in some impact categories. Any comparison of EPDs shall be subject to the requirements of ISO 21930. For comparison of EPDs which report different module scopes, such that one EPD includes Module D and the other does not, the comparison shall only be made on the basis of Modules A1, A2, and A3. Additionally, when Module D is included in the EPDs being compared, all EPDs must use the same methodology for calculation of Module D values.
Parameters Describing Environmental Impacts
In accordance to the guiding PCR, the characterization method will be based on TRACI March 2012 v2.1 and CML 2012 v4.1.

Environmental impact: 1 metric ton of Cold-Formed Steel product

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>LCIA Method</th>
<th>A1 – A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP</td>
<td>[metric ton CO₂-eq.]</td>
<td>TRACI (version 2.1)</td>
<td>2.39</td>
</tr>
<tr>
<td>ODP</td>
<td>[metric ton CFC11-eq.]</td>
<td>TRACI (version 2.1)</td>
<td>5.07E-08</td>
</tr>
<tr>
<td>AP</td>
<td>[metric ton SO₂-eq.]</td>
<td>TRACI (version 2.1)</td>
<td>0.0134</td>
</tr>
<tr>
<td>EP</td>
<td>[metric ton N eq.]</td>
<td>TRACI (version 2.1)</td>
<td>5.55E-04</td>
</tr>
<tr>
<td>POCP</td>
<td>[metric ton O₃ eq.]</td>
<td>TRACI (version 2.1)</td>
<td>0.185</td>
</tr>
<tr>
<td>ADPE*</td>
<td>[metric ton Sb eq.]</td>
<td>CML Baseline Method, Version 4.1 (October 2012)</td>
<td>4.58E-5</td>
</tr>
</tbody>
</table>

GWP = Global warming potential excluding biogenic carbon; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADFP = Abiotic depletion potential for fossil resources

*This indicator is based on assumptions regarding current reserves estimates. Users should use caution when interpreting results because there is insufficient information on which indicator is best for assessing the depletion of abiotic resources.

Parameters Describing Resource Use
Resource use: 1 metric ton of Cold-Formed Steel product

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1 – A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERE</td>
<td>[MJ]</td>
<td>1800</td>
</tr>
<tr>
<td>PERM</td>
<td>[MJ]</td>
<td>0</td>
</tr>
<tr>
<td>PERT</td>
<td>[MJ]</td>
<td>1800</td>
</tr>
<tr>
<td>PENRE</td>
<td>[MJ]</td>
<td>2950</td>
</tr>
<tr>
<td>PENRM</td>
<td>[MJ]</td>
<td>0</td>
</tr>
<tr>
<td>PENRT</td>
<td>[MJ]</td>
<td>2950</td>
</tr>
<tr>
<td>SM</td>
<td>[metric ton]</td>
<td>0.447</td>
</tr>
<tr>
<td>RSF</td>
<td>[MJ]</td>
<td>0</td>
</tr>
<tr>
<td>NRSF</td>
<td>[MJ]</td>
<td>0</td>
</tr>
<tr>
<td>FW</td>
<td>[M³]</td>
<td>Not reported</td>
</tr>
</tbody>
</table>

PERE = Use of renewable primary energy as raw materials; PERM = Use of renewable primary energy as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy as raw materials; PENRM = Use of non-renewable primary energy as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water
Parameters Describing Waste Categories and Output Flows
Output flows and waste categories: 1 metric ton of Cold-Formed Steel product

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1- A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWD</td>
<td>[metric ton]</td>
<td>Not reported</td>
</tr>
<tr>
<td>NHWD</td>
<td>[metric ton]</td>
<td>Not reported</td>
</tr>
<tr>
<td>RWD</td>
<td>[metric ton]</td>
<td>Not reported</td>
</tr>
<tr>
<td>CRU</td>
<td>[metric ton]</td>
<td>0</td>
</tr>
<tr>
<td>MFR</td>
<td>[metric ton]</td>
<td>0.056</td>
</tr>
<tr>
<td>MER</td>
<td>[metric ton]</td>
<td>0</td>
</tr>
<tr>
<td>EEE</td>
<td>[MJ]</td>
<td>0</td>
</tr>
<tr>
<td>EET</td>
<td>[MJ]</td>
<td>0</td>
</tr>
</tbody>
</table>

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

FW, HWD, NHWD and RWD flows have not been reported as the worldsteel dataset used does report on waste and net water consumption flows in sufficient detail. The dataset is otherwise representative of the technology and conforms to ISO 14044.

Interpretation – Cold-Formed Steel
Module A1 dominates across all impact categories, contributing to over 90% of impacts except for primary energy from renewable resources (PERT), where the contribution is lower at about 65%. Apart from PERT, contributions from A3 range from about 0 – 2% across the impact categories/indicators.

As a whole, module A2 also contributes very little. It impacts across the categories with a maximum of about 2.7% in the case of Eutrophication potential (EP).