Addendum to the MBMA 2013 LCA report[1)] in accordance with SCS 2015 PCR[2)], ULE 2012 PCR[3)] and ULE 2015 EPD Template[4)]

Athena Sustainable Materials Institute,
November 10th, 2015

1. MBMA, April 2013., Life Cycle Assessment of MBMA Primary and Secondary Structural Steel and Wall and Roof Panel Products, Prepared by: Mr. Jamie Meil, Dr. Lindita Bushi, Athena Institute, Final Report,

2. SCS Global Services, May 5, 2015., North American Product Category Rule for Designated Steel Construction Products,

3. UL Environment, October 9, 2012., Product Category Rule for Insulated Metal Panels & Metal Composite Panels, and Metal Cladding: Roof and Wall Panels.

4. UL Environment, 2015., EPD Template and Design Guidelines, Provided to Athena Institute, June 17, 2015.

Goal of the Addendum

To support the preparation of three (3) ISO 14025- compliant Environmental Product Declarations (EPDs) as per UL Environment's Program Operator Rules as follows:

- Primary Structural EPD according to SCS PCR and ULE EPD template [2], [4],
- Secondary Structural EPD according to SCS PCR and ULE EPD template [2], [4], and
- Metal Wall and Roof Cladding EPD according to ULE PCR and ULE EPD template [3], [4].

Content of the Addendum

This addendum is divided in two parts:

Part 1 Presents in detail all changes/revisions to the MBMA LCA report to fulfill the requirements of the SCS PCR, ULE PCR, and ULE EPD template [2], [3], [4].

Part 2 Presents the MBMA LCA results for primary and secondary structural EPD and metal wall and roof cladding EPD in accordance with SCS PCR, ULE PCR, and ULE EPD template [2], [3], [4].

Part 1: MBMA LCA Report Revision Matrix

The following revisions were made to fulfill the reporting requirements of the SCS PCR, ULE PCR and ULE EPD template [2], [3], [4]:

Table 1 MBMA LCA Report Revision Matrix

No.	MBMA LCA Report Revision Matrix per Selected Metal Product
1	**Primary Structural EPD** according to SCS PCR and ULE EPD template [2], [4]
1.1	*1.1 Section 6.3.2, Declared Unit [2], pg.12.* 1.1.1 Table 36, pg.77 [1]- LCA results are reported per 1 short ton (2000 lb) of primary frame; As per SCS PCR [2], LCA results are also reported per 1 metric ton of primary frame in the same table.
1.2	*1.2 Section 6.5, Impact Assessment [2], Table 1, pg.17.* 1.2.1 Depletion of abiotic resources (fossil) indicator is calculated and reported in Table 36, Part A, Addendum (an update of Table 36, pg. 77 [1]). 1.2.2 Table 36, Part A, Addendum- Four (4) TRACI's impact indicators (respiratory effects, ecotoxicity, human health cancer and human health non-cancer) are not required by SCS PCR [2] and dropped from the Table 36, pg. 77 [1].
1.3	*1.3 Section 7.2.4, Parameters describing resource use [2], Table 2, pg.22.* 1.3.1 As per SCS PCR, Table 2 below [2], the following resource use parameters are calculated and added in Table 36, Part B, Addendum. Table 2 Parameters describing resource use [2], [3], [4]

Parameter	Required Units (per metric ton of steel product)	Optional Units (per short ton of steel product)
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value (LHV) [1)]	BTU, LHV
Use of renewable primary energy resources used as raw materials	MJ, LHV	BTU, LHV
Total use of renewable primary energy resources	MJ, LHV	BTU, LHV
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, LHV	BTU, LHV
Use of non-renewable primary energy resources used as raw materials	MJ, LHV	BTU, LHV
Total use of non-renewable primary energy resources	MJ, LHV	BTU, LHV
Use of secondary material	kg	short ton
Use of renewable secondary fuels	MJ, LHV	BTU, LHV
Use of non-renewable secondary fuels	MJ, LHV	BTU, LHV
Net use of fresh water	m3	gallons

<table>
<tr><th>No.</th><th>MBMA LCA Report Revision Matrix per Selected Metal Product</th></tr>
<tr><td>1.3</td><td>Note: [1)]“Lower” to “Higher” heating value ratio (syn. net to gross calorific value) of 0.95 for fossil fuels is applied based on Table 6, EPA report (http://www.epa.gov/ttnatw01/utility/fnl_biomass_cogen_TSD_04_19_07.pdf) and (http://www.claverton-energy.com/wordpress/wp-content/uploads/2012/08/the_energy_and_fuel_data_sheet1.pdf?386918). Both PCRs [2], [3] require the energy indicators to be reported in LHVs. MBMA LCA report energy indicators are reported in HHVs as per CED methodology [1]. All required energy indicators are calculated and reported in MJ (LHV). The LHV/HHV ratio is provided to allow the interested parties to calculate back the HHV, if required.</td></tr>
<tr><td>1.4</td><td>1.4 Section 7.2.5, Other environmental information describing different waste categories and output flows [2], Tables 3&4, pg.23.
1.4.1 As per SCS PCR, Table 3 &4 below [2], the following waste categories and output flows are calculated and added in Table 36, Part C, Addendum.

Table 3 Other environmental information describing different waste categories [2], [3], [4]
<table>
<tr><th>Parameter</th><th>Required Units
(per metric ton of steel product)</th><th>Optional Units
(per short ton of steel product)</th></tr>
<tr><td>Hazardous waste disposed</td><td>kg</td><td>short ton</td></tr>
<tr><td>Non hazardous waste disposed</td><td>kg</td><td>short ton</td></tr>
<tr><td>Radioactive waste disposed</td><td>kg</td><td>short ton</td></tr>
</table>
Table 4 Other environmental information describing output flows [2], [3], [4]
<table>
<tr><th>Parameter</th><th>Required Units
(per metric ton of steel product)</th><th>Optional Units
(per short ton of steel product)</th></tr>
<tr><td>Components for re-use</td><td>kg</td><td>short ton</td></tr>
<tr><td>Materials for recycling</td><td>kg</td><td>short ton</td></tr>
<tr><td>Materials for energy recovery</td><td>kg</td><td>short ton</td></tr>
<tr><td>Exported energy</td><td>MJ per energy carrier</td><td>BTU per energy carrier</td></tr>
</table></td></tr>
<tr><td>2</td><td>Secondary Structural EPD according to SCS PCR and ULE EPD template [2], [4]</td></tr>
<tr><td>2.1-2.4</td><td>All above requirements (1.1.1 to 1.4.1) are addressed for the Secondary Structural EPD as well. Table 38, Part A to C, Addendum (an updated of Table 38, pg. 81 [1] is developed to address all PCR requirements for Secondary Structural EPD.</td></tr>
</table>

No.	MBMA LCA Report Revision Matrix per Selected Metal Product
3	**Metal Wall and Roof Cladding EPD** according to ULE PCR [3]
3.1	*3.1 Section 2.3, Declared/Functional Unit [3], pg. 8.* 3.1.1 The wall and roof cladding as captured in the MBMA LCA report represents a weighted average of all gauges (wall- 28, 26, 24, 22 and 18 ga.; roof- 26, 24 and 22 ga.) and substrates (CRC, HDG and galvalume) used to produce both products. Table 43, pg.87 [1] and Table 48, pg.93 [1] LCIA results are presented for 1 short ton of weighted average profile of wall and roof claddings, respectively. As per ULE PCR [3], LCA results are presented for 1000 sq. ft. of wall and roof claddings. The following weighted average conversion factors are applied: - wall cladding: 2000 lbs yields 2035 sq. ft., see section 2.2.2, pg. 15 [1]; and - roof cladding: 2000 lbs yields 1975 sq. ft., see section 2.2.2, pg. 15 [1]. Section 2.2.2 pg. 15, the conversion factor for wall cladding is corrected to 2035 sq.ft.
3.2	*3.2 Section 2.8, Impact Assessment [3], pg. 15.* 3.2.1 Depletion of abiotic resources (fossil) indicator are calculated and reported in Tables 43 & 48, Part A, Addendum (an update of Tables 43 & 48 [1]); 3.2.2 Tables 43 & 48, Part A, Addendum - Four (4) TRACI's impact indicators (respiratory effects, ecotoxicity, human health cancer and human health non-cancer) are not required by ULE PCR [3] and dropped from the Tables 43 & 48 [1].
3.3	*3.3 Section 3.3.3, Parameters describing resource use [3], pg. 26.* 3.3.1 As per ULE PCR [3], the following resource use parameters are calculated and added in Tables 43 & 48, Part B, Addendum. Please note ULE PCR does not require reporting of EPD results in “optional” units. This was conducted to be in line with the primary and secondary structural EPDs conducted in accordance with SCS PCR [2].

Parameter	**Required Units** (per 1000 sq. ft. of wall/roof cladding)	**Optional Units** (per 1 short ton of wall/roof cladding)
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value (LHV) [1)]	BTU, LHV
Use of renewable primary energy resources used as raw materials	MJ, LHV	BTU, LHV
Total use of renewable primary energy resources	MJ, LHV	BTU, LHV
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, LHV	BTU, LHV
Use of non-renewable primary energy resources used as raw materials	MJ, LHV	BTU, LHV
Total use of non-renewable primary energy resources	MJ, LHV	BTU, LHV
Use of secondary material	kg	short ton
Use of renewable secondary fuels	MJ, LHV	BTU, LHV
Use of non-renewable secondary fuels	MJ, LHV	BTU, LHV
Net use of fresh water	m3	gallons

All required energy indicators are calculated and reported in MJ (LHV). A conservative “Lower” to “Higher” heating value ratio of 0.95 for fossil fuels will be applied (see note 1.3.1 above for details).

<table>
<tr><th>No.</th><th>MBMA LCA Report Revision Matrix per Selected Metal Product</th></tr>
<tr><td>3.4</td><td>3.4 Section 3.3.4, Other environmental information describing different waste categories and output flows [3], pg. 27.
3.4.1 As per ULE PCR [3], the following waste categories and output flows are calculated and added in Table 43 & 48, Part C, Addendum. Please note ULE PCR does not require reporting of EPD results in “optional” units. This was conducted to be in line with the primary and secondary structural EPDs conducted in accordance with SCS PCR [2].
<table>
<tr><th>Parameter</th><th>Required Units
(per 1000 sq. ft. of wall/roof cladding)</th><th>Optional Units
(per 1 short ton of wall/roof cladding)</th></tr>
<tr><td>Hazardous waste disposed</td><td>kg</td><td>short ton</td></tr>
<tr><td>Non hazardous waste disposed</td><td>kg</td><td>short ton</td></tr>
<tr><td>Radioactive waste disposed</td><td>kg</td><td>short ton</td></tr>
<tr><td>Components for re-use</td><td>kg</td><td>short ton</td></tr>
<tr><td>Materials for recycling</td><td>kg</td><td>short ton</td></tr>
<tr><td>Materials for energy recovery</td><td>kg</td><td>short ton</td></tr>
<tr><td>Exported energy</td><td>MJ per energy carrier</td><td>BTU per energy carrier</td></tr>
</table></td></tr>
<tr><td>General note 1</td><td>The environmental burden of the outbound transportation of the selected MBMA finished products (primary structural, secondary structural, wall and roof cladding) is not included in the weighted average LCA profiles (see Tables 36, 38, 43 and 48) [1].
Out-bound product transportation data of the finished products (Tables 7, 9, 11 and 13) is only reported for transparency and to support any future MBMA member company “cradle-to-gate” EPD including construction-installation process (modules A1 to A5).</td></tr>
<tr><td>General note 2</td><td>The following five parameters for the four NA steel LCI products (CRC, HRC, HDG and Plate) as well as “scrap” LCI (global profile) are provided by SRI in Nov 2015 to complement the input/output profiles from Feb 2013 and used to calculate the total mandatory parameters for the four MBMA EPDs.
1. Abiotic resource depletion (elements)- CML 2.1 – in kg Sb eq./per kg NA steel product;
2. Hazardous waste disposed (HWD)- in kg/ per kg NA steel product;
3. Non-hazardous waste disposed (NHWD) – in kg/ per kg NA steel product; and
4. Radioactive waste disposed (RWD) – in kg/ per kg NA steel product.
5. Waste for recovery (WR)- in kg/ per kg NA steel product.

Waste for recovery is an additional environmental parameter. Most of the non hazardous solid waste of steel products are recovered and not disposed. This parameter is reported to give a complete picture of the solid waste flows.</td></tr>
</table>

Part 2: MBMA LCA results for primary and secondary structural EPD and metal wall and roof cladding EPD in accordance with SCS PCR, ULE PCR and ULE EPD template

2.1 Primary Structural EPD results in accordance with SCS PCR and ULE EPD template [2], [4]

Table 36.1 (Addendum): Weighted Average Primary Structural Cradle-to-Gate (C2G) LCA Results for EPD – Absolute Basis, per Metric Ton and Short Ton of Primary Frame

Part A: Parameters describing environmental impacts					
Parameter		**Required Units** (per metric ton of primary structural)	**Quantity**	**Optional Units** (per short ton of primary structural)	**Quantity**
GWP	Global warming potential	kg CO_2 eq	1489.0	kg CO_2 eq	1350.8
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 eq	5.0E-06	kg CFC-11 eq	4.5E-06
AP	Acidification potential	kg SO_2 eq	5.8	kg SO_2 eq	5.2
EP	Eutrophication potential	kg N eq	0.259	kg N eq	0.235
POCP	Photochemical ozone creation potential	kg O_3 eq	81.8	kg O_3 eq	74.2
ADP-elements	Abiotic depletion potential for non-fossil resources	kg Sb eq	1.96E-04	kg Sb eq	1.78E-04
ADP-fossil fuels	Abiotic depletion potential for fossil resources	MJ, LHV	19,769	BTU, LHV	1.7E+07
Part B: Parameters describing resource use					
Parameter		**Required Units** (per metric ton of primary structural)	**Quantity**	**Optional Units** (per short ton of primary structural)	**Quantity**
PERE	Renewable primary energy as energy carrier	MJ, LVH	54	BTU, LHV	4.7E+04
PERM	Renewable primary energy resources as material utilization	MJ, LVH	0	BTU, LHV	0

Parameter		Required Units (per metric ton of primary structural)	Quantity	Optional Units (per short ton of primary structural)	Quantity
PERT	Total use of renewable primary energy resources	MJ, LVH	54	BTU, LHV	4.7E+04
PENRE	Non-renewable primary energy as energy carrier	MJ, LVH	19,769	BTU, LHV	1.7E+07
PENRM	Non-renewable primary energy as material utilization	MJ, LVH	0	BTU, LHV	0
PENRT	Total use of non-renewable primary energy resources	MJ, LVH	19,769	BTU, LHV	1.7E+07
SM	Use of secondary material	kg	904	short ton	0.904
RSF	Use of renewable secondary fuels	MJ, LVH	0	BTU, LHV	0
NRSF	Use of non-renewable secondary fuels	MJ, LVH	0	BTU, LHV	0
FW	Net use of fresh water	m^3	6.3	gallons	1.5E+03
Part C: Other environmental information describing different waste categories and output flows					
Parameter		**Required Units** (per metric ton of primary structural)	**Quantity**	**Optional Units** (per short ton of primary structural)	**Quantity**
HWD	Hazardous waste disposed	kg	30.5	short ton	0.031
NHWD	Non hazardous waste disposed	kg	10.7	short ton	0.011
RWD	Radioactive waste disposed	kg	0.60	short ton	0.001
WR	Waste for recovery	kg	20.3	short ton	0.020
CRU	Components for re-use	kg	0	short ton	0
MFR	Materials for recycling	kg	79	short ton	0.079
MER	Materials for energy recovery	kg	0	short ton	0
EE	Exported energy	MJ per energy carrier	0	BTU per energy carrier	0

Table 36.2 (Addendum): Weighted Average Primary Structural Cradle-to-Gate (C2G) LCA Results for EPD – Percentage Basis

Part A: Parameters describing environmental impacts				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Global warming potential	100%	92%	4%	4%
Depletion potential of the stratospheric ozone layer	100%	0%	0%	100%
Acidification potential	100%	72%	7%	21%
Eutrophication potential	100%	66%	8%	25%
Photochemical ozone creation	100%	71%	13%	16%
Abiotic depletion potential for non-fossil resources	100%	116%	0%	-16%
Abiotic depletion potential for fossil resources	100%	85%	4%	11%
Part B: Parameters describing resource use				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Renewable primary energy as energy carrier	100%	1%	0%	99%
Renewable primary energy resources as material utilization	n/a			
Total use of renewable primary energy resources	100%	1%	0%	99%
Non-renewable primary energy as energy carrier	100%	85%	4%	11%
Non-renewable primary energy as material utilization	n/a			

Parameter	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
Total use of non-renewable primary energy resources	100%	85%	4%	11%
Use of secondary material	100%	100%	0%	0%
Use of renewable secondary fuels	n/a			
Use of non-renewable secondary fuels	n/a			
Net use of fresh water	100%	107%	0%	-7%
Part C: Other environmental information describing different waste categories and output flows				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Hazardous waste disposed	100%	100.1%	0.0%	-0.1%
Non hazardous waste disposed	100%	9%	0%	91%
Radioactive waste disposed	100%	93%	0%	7%
Waste for recovery	100%	100.4%	0.0%	-0.4%
Components for re-use	n/a			
Materials for recycling	100%	0%	0%	100%
Materials for energy recovery	n/a			
Exported energy	n/a			

2.2 Secondary Structural EPD results in accordance with SCS PCR and ULE EPD template [2], [4]

Table 38.1 (Addendum): Weighted Average Secondary Structural Cradle-to-Gate (C2G) LCA Results for EPD – Absolute Basis, per Metric Ton and Short Ton of Secondary Frame

Part A: Parameters describing environmental impacts					
Parameter		**Required Units** (per metric ton of secondary structural)	**Quantity**	**Optional Units** (per short ton of secondary structural)	**Quantity**
GWP	Global warming potential	kg CO_2 eq	2400.3	kg CO_2 eq	2177.5
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 eq	3.4E-06	kg CFC-11 eq	3.1E-06
AP	Acidification potential	kg SO_2 eq	9.9	kg SO_2 eq	9.0
EP	Eutrophication potential	kg N eq	0.460	kg N eq	0.418
POCP	Photochemical ozone creation potential	kg O_3 eq	161.9	kg O_3 eq	146.9
ADP-elements	Abiotic depletion potential for non-fossil resources	kg Sb eq	1.69E-02	kg Sb eq	1.53E-02
ADP- fossil fuels	Abiotic depletion potential for fossil resources	MJ, LHV	29,217	BTU, LHV	2.5E+07
Part B: Parameters describing resource use					
Parameter		**Required Units** (per metric ton of secondary structural)	**Quantity**	**Optional Units** (per short ton of secondary structural)	**Quantity**
PERE	Renewable primary energy as energy carrier	MJ, LVH	39	BTU, LHV	3.4E+04
PERM	Renewable primary energy resources as material utilization	MJ, LVH	0	BTU, LHV	0
PERT	Total use of renewable primary energy resources	MJ, LVH	39	BTU, LHV	3.4E+04

Parameter		**Required Units** (per metric ton of secondary structural)	**Quantity**	**Optional Units** (per short ton of secondary structural)	**Quantity**
PENRE	Non-renewable primary energy as energy carrier	MJ, LVH	29,217	BTU, LHV	2.5E+07
PENRM	Non-renewable primary energy as material utilization	MJ, LVH	0	BTU, LHV	0
PENRT	Total use of non-renewable primary energy resources	MJ, LVH	29,217	BTU, LHV	2.5E+07
SM	Use of secondary material	kg	308	short ton	0.308
RSF	Use of renewable secondary fuels	MJ, LVH	0	BTU, LHV	0
NRSF	Use of non-renewable secondary fuels	MJ, LVH	0	BTU, LHV	0
FW	Net use of fresh water	m^3	9.0	gallons	2.2E+03
Part C: Other environmental information describing different waste categories and output flows					
Parameter		**Required Units** (per metric ton of secondary structural)	**Quantity**	**Optional Units** (per short ton of secondary structural)	**Quantity**
HWD	Hazardous waste disposed	kg	24.2	short ton	0.024
NHWD	Non hazardous waste disposed	kg	12.3	short ton	0.012
RWD	Radioactive waste disposed	kg	0.46	short ton	0.0005
WR	Waste for recovery	kg	37.2	short ton	0.037
CRU	Components for re-use	kg	0	short ton	0
MFR	Materials for recycling	kg	51	short ton	0.051
MER	Materials for energy recovery	kg	0	short ton	0
EE	Exported energy	MJ per energy carrier	0	BTU per energy carrier	0

Table 38.2 (Addendum): Weighted Average Secondary Structural Cradle-to-Gate (C2G) LCA Results for EPD – Percentage Basis

Part A: Parameters describing environmental impacts				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Global warming potential	100%	95%	3%	2%
Depletion potential of the	100%	29%	0%	71%
Acidification potential	100%	87%	4%	9%
Eutrophication potential	100%	87%	6%	7%
Photochemical ozone creation	100%	87%	8%	5%
Abiotic depletion potential for non-fossil	100%	105%	0%	-5%
Abiotic depletion potential for fossil resources	100%	85%	4%	11%
Part B: Parameters describing resource use				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Renewable primary energy as energy carrier	100%	25%	0%	75%
Renewable primary energy resources as material utilization	n/a			
Total use of renewable primary energy resources	100%	25%	0%	75%
Non-renewable primary energy as energy carrier	100%	92%	3%	5%

Parameter	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
Non-renewable primary energy resources as material utilization	n/a			
Total use of non-renewable primary energy resources	100%	92%	3%	5%
Use of secondary material	100%	100%	0%	0%
Use of renewable secondary fuels	n/a			
Use of non-renewable secondary fuels	n/a			
Net use of fresh water	100%	103%	0%	-3%
Part C: Other environmental information describing different waste categories and output flows				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Hazardous waste disposed	100%	100.1%	0.0%	-0.1%
Non hazardous waste disposed	100%	35%	0%	65%
Radioactive waste disposed	100%	94%	0%	6%
Waste for recovery	100%	100.2%	0.0%	-0.2%
Components for re-use	n/a			
Materials for recycling	100%	0%	0%	100%
Materials for energy recovery	n/a			
Exported energy	n/a			

2.3 Wall and Roof Cladding EPD results in accordance with ULE PCR and ULE EPD template [2]

Table 43.1 (Addendum): Weighted Average Wall Cladding Cradle-to-Gate (C2G) LCA Results for EPD – Absolute Basis, per 1000 sq. ft. and Short Ton of Wall Cladding[1]

Part A: Parameters describing environmental impacts					
Parameter		**Required Units** (per 1000 sq. ft. of wall cladding)	**Quantity**	**Optional Units** (per 1 short ton of wall cladding)	**Quantity**
GWP	Global warming potential	kg CO_2 eq	1221.7	kg CO_2 eq	2486.2
ODP	Depletion potential of the stratospheric	kg CFC-11 eq	0	kg CFC-11 eq	1.0E-05
AP	Acidification potential	kg SO_2 eq	5.6	kg SO_2 eq	11.3
EP	Eutrophication potential	kg N eq	0.26	kg N eq	0.54
POCP	Photochemical ozone creation potential	kg O_3 eq	82.1	kg O_3 eq	167.1
ADP-elements	Abiotic depletion potential for non-fossil resources	kg Sb eq	3.73E-02	kg Sb eq	7.58E-02
ADP-fossil fuels	Abiotic depletion potential for fossil resources	MJ, LHV	15,130	BTU, LHV	2.9E+07
Part B: Parameters describing resource use					
Parameter		**Required Units** (per 1000 sq. ft. of wall cladding)	**Quantity**	**Optional Units** (per 1 short ton of wall cladding)	**Quantity**
PERE	Renewable primary energy as energy carrier	MJ, LVH	71	BTU, LHV	1.4E+05
PERM	Renewable primary energy resources as material utilization	MJ, LVH	0	BTU, LHV	0

[1] The impacts for wall cladding are based on a weighted average of gauges processed during the LCA reporting period [1].

Parameter		**Required Units** (per 1000 sq. ft. of wall cladding)	**Quantity**	**Optional Units** (per 1 short ton of wall cladding)	**Quantity**
PERT	Total use of renewable primary energy resources	MJ, LVH	71	BTU, LHV	1.4E+05
PENRE	Non-renewable primary energy as energy carrier	MJ, LVH	15,130	BTU, LHV	2.9E+07
PENRM	Non-renewable primary energy resources as material utilization	MJ, LVH	0	BTU, LHV	0
PENRT	Total use of non-renewable primary energy resources	MJ, LVH	15,130	BTU, LHV	2.9E+07
SM	Use of secondary material	kg	118	short ton	0.265
RSF	Use of renewable secondary fuels	MJ, LVH	0	BTU, LHV	0
NRSF	Use of non-renewable	MJ, LVH	0	BTU, LHV	0
FW	Net use of fresh water	m^3	10.3	gallons	5.5E+03
Part C: Other environmental information describing different waste categories and output flows					
Parameter		**Required Units** (per 1000 sq. ft. of wall cladding)	**Quantity**	**Optional Units** (per 1 short ton of wall cladding)	**Quantity**
HWD	Hazardous waste disposed	kg	10.8	short ton	0.024
NHWD	Non hazardous waste disposed	kg	5.4	short ton	0.012
RWD	Radioactive waste disposed	kg	0.22	short ton	0.0005
WR	Waste for recovery	kg	18.9	short ton	0.042
CRU	Components for re-use	kg	0	short ton	0
MFR	Materials for recycling	kg	28	short ton	0.062
MER	Materials for energy recovery	kg	0	short ton	0
EE	Exported energy	MJ per energy carrier	0	BTU per energy carrier	0

Table 43.2 (Addendum): Weighted Average Wall Cladding Cradle-to-Gate (C2G) LCA Results for EPD – Percentage Basis

Part A: Parameters describing environmental impacts				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Global warming potential	100%	97%	3%	0%
Depletion potential of the stratospheric ozone layer	100%	95%	0%	5%
Acidification potential	100%	92%	4%	4%
Eutrophication potential	100%	94%	4%	2%
Photochemical ozone creation potential	100%	90%	7%	3%
Abiotic depletion potential for non-fossil resources	100%	101%	0%	-1%
Abiotic depletion potential for fossil resources	100%	85%	4%	11%
Part B: Parameters describing resource use				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Renewable primary energy as energy carrier	100%	88%	0%	12%
Renewable primary energy resources as material utilization	n/a			
Total use of renewable primary energy resources	100%	88%	0%	12%
Non-renewable primary energy as energy carrier	100%	95%	3%	2%
Non-renewable primary energy resources as material utilization	n/a			

Parameter	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
Total use of non-renewable primary energy resources	100%	95%	3%	2%
Use of secondary material	100%	100%	0%	0%
Use of renewable secondary fuels	n/a			
Use of non-renewable secondary fuels	n/a			
Net use of fresh water	100%	103%	0%	-3%
Part C: Other environmental information describing different waste categories and output flows				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Hazardous waste disposed	100%	100.2%	0.0%	-0.2%
Non hazardous waste disposed	100%	43%	0%	57%
Radioactive waste disposed	100%	93%	0%	7%
Waste for recovery	100%	100.3%	0.0%	-0.3%
Components for re-use	n/a			
Materials for recycling	100%	0%	0%	100%
Materials for energy recovery	n/a			
Exported energy	n/a			

Table 48.1 (Addendum): Weighted Average Roof Cladding Cradle-to-Gate (C2G) LCA Results for EPD– Absolute Basis, per 1000 sq. ft. and Short Ton of Roof Cladding[2]

Part A: Parameters describing environmental impacts					
Parameter		**Required Units** (per 1000 sq. ft. of roof cladding)	**Quantity**	**Optional Units** (per 1 short ton of roof cladding)	**Quantity**
GWP	Global warming potential	kg CO_2 eq	1259.0	kg CO_2 eq	2486.4
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 eq	5.9E-06	kg CFC-11 eq	1.2E-05
AP	Acidification potential	kg SO_2 eq	5.4	kg SO_2 eq	10.7
EP	Eutrophication potential	kg N eq	0.27	kg N eq	0.53
POCP	Photochemical ozone creation potential	kg O_3 eq	79.1	kg O_3 eq	156.1
ADP-elements	Abiotic depletion potential for non-fossil resources	kg Sb eq	4.36E-02	kg Sb eq	8.61E-02
ADP-fossil fuels	Abiotic depletion potential for fossil resources	MJ, LHV	15,405	BTU, LHV	2.9E+07
Part B: Parameters describing resource use					
Parameter		**Required Units** (per 1000 sq. ft. of roof cladding)	**Quantity**	**Optional Units** (per 1 short ton of roof cladding)	**Quantity**
PERE	Renewable primary energy as energy carrier	MJ, LVH	85	BTU, LHV	1.6E+05
PERM	Renewable primary energy resources as material utilization	MJ, LVH	0	BTU, LHV	0
PERT	Total use of renewable primary energy resources	MJ, LVH	85	BTU, LHV	1.6E+05
PENRE	Non-renewable primary energy as energy carrier	MJ, LVH	15,405	BTU, LHV	2.9E+07

[2] The impacts for roof cladding are based on a weighted average of gauges processed during the LCA reporting period [1].

Parameter		**Required Units** (per 1000 sq. ft. of roof cladding)	**Quantity**	**Optional Units** (per 1 short ton of roof cladding)	**Quantity**
PENRM	Non-renewable primary energy resources as material utilization	MJ, LVH	0	BTU, LHV	0
PENRT	Total use of non-renewable primary energy resources	MJ, LVH	15,405	BTU, LHV	2.9E+07
SM	Use of secondary material	kg	97	short ton	0.210
RSF	Use of renewable secondary fuels	MJ, LVH	0	BTU, LHV	0
NRSF	Use of non-renewable secondary fuels	MJ, LVH	0	BTU, LHV	0
FW	Net use of fresh water	m^3	9.7	gallons	5.1E+03
Part C: Other environmental information describing different waste categories and output flows					
Parameter		**Required Units** (per 1000 sq. ft. of roof cladding)	**Quantity**	**Optional Units** (per 1 short ton of roof cladding)	**Quantity**
HWD	Hazardous waste disposed	kg	10.9	short ton	0.024
NHWD	Non hazardous waste disposed	kg	5.3	short ton	0.012
RWD	Radioactive waste disposed	kg	0.20	short ton	0.0004
WR	Waste for recovery	kg	19.5	short ton	0.042
CRU	Components for re-use	kg	0	short ton	0
MFR	Materials for recycling	kg	23	short ton	0.050
MER	Materials for energy recovery	kg	0	short ton	0
EE	Exported energy	MJ per energy carrier	0	BTU per energy carrier	0

Table 48.2 (Addendum): Weighted Average Roof Cladding Cradle-to-Gate (C2G) LCA Results for EPD – Percentage Basis

Part A: Parameters describing environmental impacts				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Global warming potential	100%	97%	3%	0%
Depletion potential of the stratospheric ozone layer	100%	92%	0%	7%
Acidification potential	100%	92%	4%	4%
Eutrophication potential	100%	93%	4%	3%
Photochemical ozone creation potential	100%	89%	7%	4%
Abiotic depletion potential for non-fossil resources	100%	101%	0%	-1%
Abiotic depletion potential for fossil resources	100%	85%	4%	11%
Part B: Parameters describing resource use				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Renewable primary energy as energy carrier	100%	89%	0%	11%
Renewable primary energy resources as material utilization	n/a			
Total use of renewable primary energy resources	100%	89%	0%	11%
Non-renewable primary energy as energy carrier	100%	95%	3%	2%
Non-renewable primary energy resources as material utilization	n/a			

Parameter	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
Total use of non-renewable primary energy resources	100%	95%	3%	2%
Use of secondary material	100%	100%	0%	0%
Use of renewable secondary fuels	n/a			
Use of non-renewable secondary fuels	n/a			
Net use of fresh water	100%	102%	0%	-2%
Part C: Other environmental information describing different waste categories and output flows				
Parameter	**Total**	**A1 Raw Material Supply**	**A2 Transport**	**A3 Manufacturing**
Hazardous waste disposed	100%	100.1%	0.0%	-0.1%
Non hazardous waste disposed	100%	42%	0%	58%
Radioactive waste disposed	100%	94%	0%	6%
Waste for recovery	100%	100%	0%	0%
Components for re-use	n/a			
Materials for recycling	100%	0%	0%	100%
Materials for energy recovery	n/a			
Exported energy	n/a			