



# Standard Practice for Data Collection for Sustainability Assessment of Building Products<sup>1</sup>

This standard is issued under the fixed designation E 2129; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice offers a set of instructions for collecting data to be used in assessing the sustainability of building products for use in both commercial and residential buildings.

1.1.1 There are many features of a building that contribute to sustainability; one of them is the selection of products for use in a building. Other key features influencing sustainability include, but are not limited to: overall efficiency of the design of the building, the impact the building has on the habits of the occupants, and the impact the building has on the microclimate and macroclimate. This standard addresses sustainability issues related to building products. This standard does not address sustainability issues related to overall building design, site selection, building operations, or other features influencing sustainability.

1.1.2 While it is recommended that users rely on professional judgment informed by both environmental expertise and specific knowledge of the intended use of the product, this standard provides no instruction as to interpretation of the data obtained. Interpretation of the data obtained is the responsibility of the user of this standard.

1.1.3 This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title means only that the document has been approved through the ASTM consensus process.

1.2 This standard is organized according to the Construction Specifications Institute's (CSI) MasterFormat<sup>®</sup> sections to promote consistency in the evaluation of building products.

1.3 This standard includes general, comprehensive data requirements. Depending upon the building product, certain data requirements may not apply given the unique character-

istics of the product and the potential environmental impacts related to the intended use of the product. Depending upon the building product, certain data requirements may need to be added as appropriate to the unique characteristics of the product and the potential environmental impacts related to the intended use of the product.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

C 989 Specification for Ground Granulated Blast Furnace Slag for Use in Concrete and Mortars

C 1240 Specification for Silica Fume for Use in Hydraulic Cement Concrete and Mortar

D 5359 Specification Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber

D 6400 Specification for Compostable Plastics

E 631 Terminology of Building Constructions

E 1480 Terminology of Facility Management (Building-Related)

E 2114 Terminology for Sustainability Relative to the Performance of Buildings

### 2.2 Other Referenced Documents:

ANSI Standards<sup>3</sup>

ASHRAE Standards<sup>4</sup>

ASME Standards<sup>5</sup>

CSI's MasterFormat<sup>®</sup> Organization<sup>6</sup>

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.71 on Sustainability.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> ANSI standards can be found by searching "www.ansi.org"

<sup>4</sup> ASHRAE standards can be found by searching "www.ashrae.com"

<sup>5</sup> ASME standards can be found by searching "www.asme.org"

<sup>6</sup> CSI's MasterFormat<sup>®</sup> information can be found by searching "www.csine-t.org"

DOE's Federal Energy Management Program Product Efficiency Recommendations<sup>7</sup>  
 EPA's Toxics Release Inventory<sup>8</sup>  
 EPA's Comprehensive Procurement Guidelines<sup>9</sup>  
 EPA's EnergyStar® Program<sup>10</sup>  
 EPA's National Volatile Organic Compound (VOC) Emission Standards<sup>11</sup>  
 HUD Manufactured Home Construction and Safety Standards<sup>12</sup>  
 OSHA Regulations<sup>13</sup>  
 The National Fenestration Rating Council's (NFRC) standards<sup>14</sup>  
 The National Toxicology Program's Report on Carcinogens (RoC)<sup>15</sup>  
 The South Coast Air Quality Management District Regulations<sup>16</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 For terms related to the field of building, refer to ASTM E 631, Standard Terminology of Building Constructions.

3.1.2 For terms relating to the operation and management of buildings, refer to ASTM E 1480, Standard Terminology of Facility Management (Building-Related).

3.1.3 For terms related to sustainability relative to buildings, refer to ASTM E 2114, Standard Terminology for Sustainability Relative to the Performance of Buildings. Some of these terms are reprinted here for ease of use.

3.1.3.1 *biobased products, n*—products fabricated from alternative agricultural materials and/or forestry materials.

3.1.3.2 *life-cycle cost (LCC) method, n*—a technique of economic evaluation that sums over a given study period the costs of initial investment (less resale value), replacements, operations (including energy use), and maintenance and repair of an investment decision (expressed in present or annual value terms).

3.1.3.3 *post-consumer, adj*—refers to materials that are reclaimed from products that have already served their intended end-use as a consumer item. Waste from industrial processes are not considered post-consumer. Post consumer materials are a subset of recovered materials.

3.1.3.4 *pre-consumer, adj*—refers to materials that are reclaimed from manufacturing and other industrial processes,

and products which have not served their intended end-use as a consumer item such as overissue publications and obsolete inventories. Pre-consumer materials include: culls, trimmed materials, print overruns, overissue publications, and obsolete inventories.

3.1.3.5 *recovered materials, n*—waste material and by-products which have been recovered or diverted from the waste stream, but such term does not include those materials and by-products generated from, and commonly reused within, an original manufacturing process.

3.1.3.6 *recycled content products, n*—refers to products that contain pre-consumer or post-consumer material as all or part of their feedstock.

3.1.3.7 *renewable resource, n*—a resource that is grown, naturally replenished, or cleansed, at a rate which exceeds depletion of the usable supply of that resource. *Discussion*—A renewable resource can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grasslands, and fertile soil.

3.1.3.8 *sustainability, n*—the maintenance of ecosystem components and functions for future generations.

3.1.3.9 *sustainable development, n*—development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

#### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *building product, n*—refers to building elements and assemblies.

3.2.2 *corporate environmental policy, n*—as used in this standard, refers to the published and verifiable position a company maintains with respect to the manufacture of a building product. Corporate environmental policy may include both environmental and social aspects. Corporate environmental policy may include goals, programs, and specific requirements related to the materials, manufacturing process, operational performance, and IEQ.

3.2.3 *energy efficient, adj*—refers to a building product that requires less energy to manufacture and/or uses less energy when operating in comparison with a benchmark for energy use.

3.2.3.1 *Discussion*—For example, the product may meet a recognized benchmark, such as EPA's Energy Star® Program standards.

3.2.4 *indoor environmental quality (IEQ), n*—refers to the condition or state of the indoor built environment in which the building product is installed. Aspects of IEQ include: light quality, acoustic quality, and air quality.

3.2.5 *manufacturing process, n*—refers to the process of creating a building product and includes manufacturing, fabrication and distribution procedures.

3.2.6 *materials (product feedstock), n*—refers to the material resources that are required for the manufacture and/or fabrication of a building product.

3.2.6.1 *Discussion*—Material resources include raw materials and recycled content materials.

3.2.7 *operational performance (product installed), n*—refers to the functioning of a building product during its service life. Specific measures of operational performance will

<sup>7</sup> DOE's Federal Energy Management Program Product Efficiency Recommendations can be found at "www.eren.doe.gov/femp/procurement/begin.html"

<sup>8</sup> EPA's Toxics Release Inventory can be found at "www.epa.gov/tri"

<sup>9</sup> EPA's Comprehensive Procurement Guidelines can be found at "www.epa.gov/cpg"

<sup>10</sup> EPA's EnergyStar® Program can be found at "www.energystar.gov"

<sup>11</sup> EPA's National VOC Emission Standards for Architectural Coatings can be found at "www.epa.gov/ttn/atw/183e/aim/aimpg.html" and the National VOC Emission Standards for Consumer Products can be found at "www.epa.gov/ttn/atw/183e/cp/cppg.html"

<sup>12</sup> HUD standards can be found by searching "www.hud.org"

<sup>13</sup> OSHA information can be found by searching "www.osha.gov"

<sup>14</sup> National Fenestration Rating Council (NFRC) information can be found at "www.nfrc.org"

<sup>15</sup> The National Toxicology Program's Report on Carcinogens (RoC) can be found at "http://ntp-server.niehs.nih.gov/"

<sup>16</sup> SCAQMD regulations can be found at "www.aqmd.gov/rules"

vary depending upon the product. Aspects of operational performance include: durability, maintainability, energy efficiency, and water efficiency.

#### 4. Summary of Practice

4.1 This standard is organized according to CSI's Master-Format™ Organization (Divisions 1-16).

4.1.1 General questions are considered applicable to all building products.

4.1.2 Specific questions are considered applicable to particular building product types as indicated.

4.2 Depending on the particular building product and application, some of the questions may not be applicable. The user of this standard should indicate "not applicable" (N/A) in the response as appropriate.

4.3 The user of this standard may not know the answer to a certain question or the answer may not be available. In such cases, the user of this standard should indicate "unknown" (U/K) in the response.

4.4 To address sustainability issues in a consistent manner, there are five criteria categories referenced in this standard as follows: Materials (Product Feedstock); Manufacturing Process; Operational Performance of Installed Product; Indoor Environmental Quality; and, Corporate Environmental Policy.

4.4.1 In **Table 1**, the general questions are subdivided into these five criteria categories.

4.4.2 In **Table 2**, the specific questions indicate the criteria category(ies) affected with an "X" in the column entitled "Criteria Categories." The user may indicate additional criteria categories, as appropriate.

4.5 Depending on the particular building product and application, additional questions may be necessary. The user of this standard may choose to add additional questions as appropriate.

#### 5. Significance and Use

5.1 This standard provides a practice for data collection for the purpose of assessing the sustainability of building products. Such data can inform decisions relative to construction, renovation, repair, and maintenance of buildings with the goal of promoting sustainability and sustainable development.

5.1.1 The users of this standard include building industry professionals who possess a broad, general understanding of sustainability issues relative to the performance of buildings. Such users may include planners, developers, architects, engineers, interior designers, contractors, owners, financial organizations related to the buildings industry, building materials and product manufacturers, government agencies including building officials, and other building professionals.

5.1.2 Users should note that, subsequent to the preliminary assessment facilitated by the comparative information collected in accordance with this standard, additional detailed and more technical information may be required in order to adequately assess specific needs for specific applications.

5.2 There are many environmental features and issues, each with local, regional and global implications, involved in sustainability. It is becoming increasingly necessary to be able to quantify complex sustainability data relative to building industry information tools. This standard provides a format for

relating the commonly accepted sustainability principles to building industry data collection methods. Users may wish to consider other building product attributes for which sustainability principles are deemed to be important and/or measurement methodologies may exist. For example, energy used and greenhouse gases emitted over a product's lifecycle, which can have a significant effect on the overall sustainability of a building product, may be deemed important.

5.3 The format for data collection is intended to facilitate a cost-effective and efficient assessment of sustainability issues relative to building materials.

5.4 The scientific understanding of the functioning and interrelation of ecosystems continues to evolve; nevertheless, there are many accepted principles relative to the design, construction, and operation of buildings for improved sustainability. Commonly accepted environmental principles are addressed in the five criteria categories, with an emphasis on the following characteristics: the selection and acquisition of materials (Criteria Category 1), the manufacturing process (Criteria Category 2), the operational performance of the installed building product (Criteria Category 3), the impact of the building product on IEQ (Criteria Category 4), and the corporate environmental policy of the company manufacturing and/or fabricating the building product (Criteria Category 5).

5.5 To the greatest extent feasible, questions are designed to prompt simple yes-or-no responses.

5.5.1 For questions prompting a yes-or-no response, a "yes" response is typically indicative of the more sustainable response. However, this standard provides no instruction as to the degree of impact on sustainability of a "yes" response relative to a "no" response for a particular question; and, this standard provides no instruction as to the degree of impact on sustainability of one question relative to another question.

5.5.2 The user is cautioned to review each question and the comments associated with each question. Unique characteristics of a building product and unique applications of a building product may affect interpretation of the data.

5.5.3 Comments may be provided where there is information which will elucidate the topic and improve understanding relative to the complexities of the particular question.

5.5.4 "N/A" may be indicated where questions request information that is not applicable and/or not available.

5.5.5 "U/K" may be indicated where questions request information that is unknown or unavailable.

#### 6. Procedure

6.1 **Table 1**—General Questions and **Table 2**—Questions Related To Specific Building Products are data collection questionnaires intended to be completed on a product by product basis for the express purpose of facilitating comparisons between similar building products.

#### 7. Keywords

7.1 building product; energy efficiency; environmental; green building; indoor environmental quality (IEQ); sustainability; sustainable; sustainable development

**TABLE 1 General Questions**

Question	Yes or No	N/A	U/K	Comments
<b>DIVISION 1—GENERAL REQUIREMENTS</b>				
<b>Criterion No. 1—Materials (Product Feedstock)</b>				
1.1				Have efforts (such as mining management, site restoration, etc.) been made to minimize and/or avoid negative environmental impacts (such as impact to rare or endangered resources or species, releases of toxic chemicals or hazardous air pollutants, etc.) in obtaining raw materials for this product? If yes, describe these efforts.
1.2				Is the product a recycled content product? If YES, indicate what percentage of the product is recycled and differentiate between pre-consumer and post-consumer recycled content.
1.3				If applicable, does the recycled content product contain the percentage of recovered materials recommended by the U.S. EPA's Comprehensive Procurement Guidelines?
1.4				Is the product 100% recyclable? If NO, please indicate what percentage of the product is recyclable.
1.5				Is the product a biobased product (i.e. agricultural or forestry material)? If YES, please indicate the source and biobased content percentage. If percentage refers to a component rather than the entire product, please specify.
1.6				Is the product made from a renewable resource? If YES, indicate the renewable cycle time and what percentage of the product that resource represents.
1.7				Does the product, in the specified condition of use, meet EPA's National Volatile Organic Compound (VOC) Emission Standards?
1.8				Does the product in the specified condition of use, meet the requirements of South Coast Air Quality Management District Regulations for content of VOCs?
<b>Criterion No. 2—Manufacturing</b>				
2.1				Has the manufacturer taken steps to minimize the use of nonrenewable energy from the point at which raw materials are gathered to the point at which the final product is transported to the building site? If yes, describe these measures.
2.2				Is any of the waste produced in making this product reclaimed on-site? If yes, what percentage of the waste is reclaimed? Of the waste that is not reclaimed on-site, how is that waste handled?
2.3				Does the process for manufacturing this product avoid the use of listed substances above the levels that would require reporting under the U.S. EPA's Toxics Release Inventory? If NO, indicate how much of each substance is released per unit of product.
2.4a				Does the process for manufacturing the product avoid the addition of substances listed in the National Toxicology Program's Report on Carcinogens?
2.4b				If substances listed in the National Toxicology Program's Report on Carcinogens are added directly in the manufacturing process or are reported by suppliers on Material Safety Data Sheets (MSDS), do the concentrations fall below levels required to be reported under federal regulations on the products' MSDS? If NO, indicate the substance, classification and concentration per unit of product.
2.5				Have any recent improvements been made to limit negative environmental impacts relating to the manufacturing process? If yes, describe the benchmark against which the improvements are measured and the degree of improvement.
2.6				If water is used during the production process, have water conservation and/or recycling measures been initiated? If yes, describe the measures and what percentage of the total water usage they address.
2.7				Has the manufacturer undertaken any of the following actions? If yes, indicate when the action(s) was (were) taken and describe the benchmark against which the improvements are measured and the degree of improvement.
2.7a				Redesigned a production process to decrease greenhouse gas emissions?
2.7b				Redesigned a production process to decrease liquid effluents?
2.7c				Redesigned a production process to utilize less toxic materials?
2.7d				Substituted safer solvents in a production process?
2.7e				Instituted more stringent dust controls?
2.7f				Installed smoke-stack particulate collectors or gas scrubbers?
2.7g				Installed or improved in-plant solid and toxic waste reduction programs?
2.8				Does the manufacturing facility comply with OSHA requirements?
<b>Criterion No. 3—Operational Performance of Installed Product</b>				
3.1				If applicable, does the product qualify for an EPA EnergyStar® rating or meet the energy efficiency recommendations of the DOE's Federal Energy Management Program?
3.2				Describe the product's energy efficiency impacts.
3.3				Describe routine maintenance procedures for the product.
3.4				How long will the product last in the building if maintained properly with routine maintenance procedures?
3.5				Does the manufacturer provide detailed instructions with the product upon delivery to the job site for the proper use and maintenance required in order to ensure that this product will last this long?
<b>Criterion No. 4—Indoor Environmental Quality<sup>A</sup></b>				
4.1				Is there any other information about how this product contributes to indoor environmental quality (positively or negatively, e.g. acoustical properties, lighting, potential risks to workers during application, etc.) that has not already been reported, but that sender of this questionnaire should know? If yes, describe. (If this product is not intended to be used in the indoor environment or to interface with the occupants, indicate N/A.)

Question	Yes or No	N/A	U/K	Comments
<b>Criterion No. 5—Corporate Environmental Policy</b>				
5.1	Does the manufacturer have a written environmental policy? If yes, indicate how the sender of this questionnaire could obtain a copy of this policy upon request.			
5.2	Does the manufacturer have a reclamation program or any other program in place to facilitate the recycling or reuse of its product by accepting return of the product at the end of its useful life? If no, comment on the environmental impact of the product as a waste material. If yes, comment on how much of the product is actually reused or recycled at the end of the product's useful life.			
5.3	Does the manufacturer have a program in place to reduce the amount of the product's packaging? If yes, describe.			
5.4	Does the manufacturer have a program in place to facilitate the return, reuse, recycling, or composting of the product's packaging? If yes, describe.			
5.5	Does the manufacturer provide information on the service life of the product or encourage the use of professional guidelines to determine the service life of the product?			
5.6	Does the manufacturer provide information regarding natural disaster mitigation, such as performance of the product during a natural disaster or appropriate response after a natural disaster?			
5.7	Is documentation available to support the product's environmental claims? If YES, please indicate how copies may be obtained upon request.			
5.8	Is there other information, for which you could provide objective evidence, about the environmental quality of the building product you offer that you would like taken into consideration? If yes, describe the information and indicate how copies of this evidence could be obtained upon request.			

<sup>A</sup> Note that some of the questions under Criterion No. 1 (Materials [Product Feedstock]) refer to attributes of products, for example, toxicity, that pose concerns for indoor environmental quality as well. In the interest of avoiding repetition, those questions are not repeated here. Respondents are reminded to answer all questions in the general section of this questionnaire.

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**TABLE 2 Questions Related to Specific Building Products**

	Question	Yes or No	N/A	U/K	Criteria Category(ies)	Comments
<b>DIVISION 2—SITE CONSTRUCTION</b>						
<b>General</b>						
2-A	Does the manufacturer facilitate ultimate deconstruction of buildings and/or building products (in which components are taken apart for reuse) by, for example, designing products for disassembly? If YES, describe the process.				<input type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input checked="" type="checkbox"/> Corp. Env. Policy	
2-B	Does the product facilitate water treatment on site? If YES, describe the process and indicate the level of treatment.				<input type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input checked="" type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input checked="" type="checkbox"/> Corp. Env. Policy	
<b>Paving</b>						
2-C	Does the manufacturer offer surfaces with high albedo reflectance? What is the albedo reflectance?				<input type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input checked="" type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
2-D	Does the manufacturer offer pervious paving materials for non-landscaped areas (roadways, surface parking, plazas, pathways)?				<input type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input checked="" type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
<b>DIVISION 3—CONCRETE</b>						
3-A	Does the product meet the following standards, which refer to recovered materials?				<input checked="" type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
3-A.1	ASTM C 618 "Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete?"				<input checked="" type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
3-A.2	ASTM C 989 "Specification for Ground Granulated Blast Furnace Slag for use in Concrete and Mortars?"				<input checked="" type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
3-A.3	ASTM C 1240 "Specification for Silica Fume for Use in Hydraulic Cement, Concrete, and Mortar?"				<input checked="" type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
<b>DIVISION 4—MASONRY</b>						
4-A	Does the product meet the following standards, which refer to recovered materials?				<input checked="" type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
4-A.1	ASTM C 989 "Specification for Ground Granulated Blast Furnace Slag for use in Concrete and Mortars?"				<input checked="" type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
4-A.2	ASTM C 1240 "Specification for Silica Fume for Use in Hydraulic Cement, Concrete, and Mortar?"				<input checked="" type="checkbox"/> Materials <input type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
<b>DIVISION 5—METALS</b>						
5-A	Does the product have a factory finish or can it be installed unfinished? If NO, describe recommended field finishing properties.				<input type="checkbox"/> Materials <input checked="" type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
5-B	If a finish does exist, can the finish be easily removed to facilitate future recycling of the metal?				<input type="checkbox"/> Materials <input checked="" type="checkbox"/> Manufacturing <input type="checkbox"/> Op. Performance <input type="checkbox"/> IEQ <input type="checkbox"/> Corp. Env. Policy	
<b>DIVISION 6—WOOD AND PLASTICS</b>						
<b>Wood</b>						