



*NSF International Standard /
American National Standard*

NSF/ANSI 336 - 2011

Sustainability Assessment for
Commercial Furnishings Fabric



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NSF International Standard/
American National Standard
for Sustainability —

Sustainability assessment for commercial furnishings fabric

Standard Developer
NSF International

NSF International Board of Directors

Designated as an ANSI Standard
March 23, 2011

American National Standards Institute

Prepared by
The NSF Joint Committee on Sustainable Textiles

Recommended for Adoption by
The NSF Council of Public Health Consultants

Adopted
March 2011

Published by

NSF International
P.O. Box 130140, Ann Arbor, Michigan 48113-0140, USA

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Foreword²

This American National Standard, NSF/ANSI 336 Sustainability Assessment for Commercial Furnishings Fabric, has been developed as part of the ongoing efforts of a number of interested parties to document and improve the sustainability profile of commercial fabric products using established and/or advanced scientific principles, practices, materials, and standards. Stakeholders involved in developing the Standard included textile mills, suppliers, end users such as interior design professionals, state agencies responsible for environmentally preferable product procurement practices, academics, and non-governmental organizations.

The purpose of the Sustainability Assessment for Commercial Furnishings Fabric Standard is to establish consistent requirements for sustainable commercial fabric products. These requirements are intended to form the basis of conformity assessment programs, such as third-party certification or registration.

The Sustainability Assessment for Commercial Furnishings Fabric Standard has been designed, in part, to satisfy the following criteria:

- Increase the economic value of sustainable textiles throughout the supply chain by enhancing market demand for sustainable textile products
- Provide information that enables specifiers to sort out the complex information on sustainable attributes
- Identify other consensus based standards and sustainable textiles
- Educate and instruct all stakeholders in the textiles supply chain
- Encourage competition between the various aspects of the supply chain to seek out or develop environmentally preferable processes, practices, power sources, and materials.
- Engender confidence in the various stakeholders (manufacturers, suppliers, regulators, and consumers) that products labeled with a third party certification mark consistently meet the requirements of this program.
- Encourage participation by all manufacturers of commercial furnishings fabric to maximize impact reductions and enhance environmental accomplishments.

Comments on this Standard should be sent to NSF International, Standards Department, P.O. Box 130140, Ann Arbor, Michigan 48113-0140, USA or to standards@nsf.org.

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NSF/ANSI Standard for Sustainability —

Sustainability assessment for commercial furnishings fabric

1 General

1.1 Purpose

This voluntary assessment tool is to provide guidance to suppliers, manufacturers, purchasers, fabricators, product specifiers, and users to assess the level of sustainability of commercial furnishings fabric. This Standard sets levels of conformance for commercial furnishings fabric to address environmental, economic and social responsibility elements of sustainability. This Standard may be applied throughout select aspects of the commercial furnishings fabric supply chain as the scope of each sustainability parameter allows.

1.2 Scope

This Standard provides pathways toward sustainability by establishing measurable criteria for multiple levels of achievement. It allows manufacturers flexibility in methods for conformance and certification. This Standard assesses product characteristics in the areas of material and component inputs, water and energy use, recycling practices and social accountability. This version of the Standard does not include specific criteria for calculating carbon footprint nor does it cover transportation.

This Standard is applicable to commercial fabrics commonly used in public occupancy settings, such as office, hospitality, healthcare, and institutional interiors. These include but are not limited to upholstery, vertical fabric (furniture system, wall, drapery, and cubicle), and top of the bed fabrics. Fabrics may be formed by combining yarns, fibers, or filaments in a variety of ways including but not limited to woven, non-woven, knitted, bonded, felted, and composite materials. This Standard is applicable to fabrics manufactured in one or multiple facilities, in one or multiple countries.

While this Standard may be useful for applications beyond the commercial furnishings here outlined, the Standard is not intended to address fabrics developed for automotive, apparel, bedding, napery, toweling, military, medical or technical textiles applications.

A fabric in its final form is assessed according to this Standard. Any alterations made after the point of assessment, for example after-market treatments, will nullify the certification.

This standard assumes compliance with all applicable laws and regulations. Some criteria in the standard address activities that are also subject to regulation by local, state, or federal authorities. However, the standard does not change the regulatory requirements nor does it prescribe how compliance is to be achieved. Documentation of compliance with certain key regulations may be included in some sections of the standard, but this in no way changes the underlying regulatory requirements.

1.3 Alternate products or materials

While specific materials are stipulated in this Standard, products or components that incorporate alternate materials shall be acceptable when it is verified that the product or component meets the applicable requirements of the Standard based on its end use.

1.4 Sustainability measurement

1.4.1 Terminology for sustainability parameters, credits, and points

Criteria for assessing a fabric's sustainability are defined for fiber sourcing, safety of material inputs, water conservation and quality, energy, air quality, recycling practices, and social accountability. These divisions are referred to as sustainability *parameters*. Within each of these parameters, there are prerequisite and/or optional credits, and within each credit, *points* are awarded as a measure of conformance.

1.4.2 Pre-requisite and optional credits

Each sustainability parameter has pre-requisite and/or optional credits. All pre-requisites shall be met in order for a product to conform with the standard. Optional credits provide the manufacturer with additional means for further recognizing a fabric's sustainability.

1.4.3 Relative importance of sustainability parameters

The maximum number of points that can be awarded to a fabric is 100. Half of the maximum points are based on the fabric composition, and half are based on how the fabric is made. The maximum number of points for each sustainability parameter is as follows:

Fabric composition (50%):

- 20 pts Fiber Sourcing
- 30 pts Safety of Materials

How the fabric is made (50%):

- 12 pts Water Conservation and Water Quality
- 12 pts Energy
- 2 pts Air Quality
- 12 pts Recycling Practices in Manufacturing
- 12 pts Social Accountability

1.4.4 Levels of achievement

There are four levels of achievement to reflect increasing movement toward sustainability: Compliant, Silver, Gold, and Platinum. The level of achievement is based on a fabric's total point value. A product's total point value is the sum of points awarded for all sustainability parameters.

The table below identifies the levels, with the associated credit points needed to achieve each level.

Table 1.1 – Achievement levels

Level	Points required
Compliant	≥16
Silver	≥37
Gold	≥58
Platinum	≥79
Maximum Points	100

1.4.5 Measuring inputs from multiple sources

Because multiple entities are commonly involved in the scope of manufacturing a commercial fabric, credits can apply to multiple entities; thus, points can be awarded for inputs throughout the supply chain. The decision of whether to include suppliers and processes when calculating points depends upon the written scope for each sustainability parameter. Each applicable process that is listed in the scope shall be accounted for during the evaluation of a fabric.

The awarding of points is weighted according to the relative importance of the inputs. For example, if multiple yarns are supplied from different suppliers then points for each yarn are awarded based on each yarn's weight as a percentage of the finished fabric weight.

1.4.6 Instructions for rounding points

Because the nature of fabric production commonly includes multiple suppliers and processes, fractions of points (or decimals) will be awarded for each credit. The following guidelines shall be used to minimize rounding errors:

- for each *credit*, the resulting point value should be expressed as a decimal. Do not round (For never-ending values, round to the thousandth place).
- for each *sustainability parameter*, the resulting point value should be expressed as a decimal rounded to the tenths place. Rounding is acceptable (e.g. round 10.05 to 10.1; 10.04 to 10.0).
- for the *total score*, the resulting point value should be expressed as a whole number. Rounding is acceptable (e.g. round 10.5 to 11; round 10.4 to 10).

1.5 Conformance

Commercial Furnishings Fabric Sustainability Assessment, as with all ANSI standards, shall neither encourage nor discourage the use of third-party certification for conformity assessment. Organizations that choose to assess their commercial furnishings fabric to this standard may achieve first-party, second party, or third-party conformance. Organizations may show continuous improvement by moving products to higher levels of conformance.

1.6 Frequency of evaluation

Products must be reevaluated if significant changes to materials, processes or the facility occur that affect the eligibility for any credit within the scope of conformance at the time of the change. Regardless, the frequency of conformance evaluation shall not exceed five years.

2 Normative references and tools

The following documents contain provisions that, through reference, constitute provisions of this NSF Standard. At the time this Standard was balloted, the editions listed below were valid. All documents are subject to revision, and parties are encouraged to investigate the possibility of applying the recent editions of the documents indicated below. Additional information on use of this Standard is provided in Annex A.

2.1 Normative references

ASTM 6400-04. *Standard Specification for Compostable Plastics*.³

³ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2859 <www.astm.org>.

ASTM D6868-03. *Specification for Biodegradable Plastics Used as Coatings on Paper and Other Compostable Substrates*.³

Collaborative for High Performance Schools, Section 01350: Special Environmental Requirements Specification.⁴

European Union Regulation (EC) 648/2004 of 31 March 2004 on detergents.⁵

European Commission DG ENV, Final report, M0355008/1786Q/10/11/00. *Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption* – Annex 15. 10 November 2000.⁶

European Union Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances.⁶

International Labour Organisation, *Basics of Chemical Safety* – Annex 2, Risk Phrases.⁷

German Research Foundation (DFG), *The MAK-Collection for Occupational Health and Safety*.⁸

OECD, *OECD Guidelines for the Testing of Chemicals*, Section 3: Degradation and Accumulation, Test No. 301: Ready Biodegradability, May 1996.⁹

Maplecroft Global map of human rights risk.¹⁰

Social Accountability International, *SA8000*. 2008.¹¹

State of California Environmental Protection Agency. *Safe Drinking Water and Toxic Enforcement Act of 1986*.¹²

United Nations Economic Commission for Europe (UNECE). *Globally Harmonized System for Classification and Labeling*, Part 3: Health and Environmental Hazards.¹³

⁴ Collaborative for High Performance Schools (CHPS), 142 Minna Street, Second floor, San Francisco, CA 94105 <www.chps.net>.

⁵ Publications Office of the European Union, 2, rue Mercier, L-2985 Luxembourg <<http://eur-lex.europa.eu>>.

⁶ European Commission, Environment, DG, B - 1049 Brussels, Belgium <www.ec.europa.eu/environment>.

⁷ International Labor Organisation (ILO), CH-1211 Geneva 22, Switzerland <www.ilo.org>.

⁸ Deutsche Forschungsgemeinschaft (DFG), Kennedyallee 40, 53175 Bonn <www.dfg.de/en>.

⁹ Organization for Economic Cooperation and Development (OECD), 2 Rue Andre-Pascal, 75775 Paris Cedex 16, France <www.oecd.org>.

¹⁰ Maplecroft, The Towers, St Stephen's Road, Bath, BA1 5JZ United Kingdom <www.maplecroft.com>.

¹¹ Social Accountability International (SAI), 220 east 23rd Street Suite 605, New York NY, 10010 <www.sa-intl.org>.

¹² California Office of Environmental Health Hazard Assessment, PO Box 4010, Sacramento, CA 95812-4010 <www.oehha.ca.gov>.

¹³ United Nations Economic Commission for Europe, Information Service (UNECE), Palais des Nations, CH - 1211 Geneva 10, Switzerland <www.unece.org>.

US Environmental Protection Agency (USEPA) Office of Prevention, Pesticides and Toxic Substances. OPPTS 835.3110, *Ready biodegradability*.¹⁴

US Environmental Protection Agency (USEPA). *2007 Guidelines establishing test procedures for the analysis of pollutants*, 40 CFR PART 136.¹⁴

US Environmental Protection Agency (USEPA), *Method 1631: Measurement of Mercury in Water*.¹⁴

US Environmental Protection Agency (USEPA), *Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*.¹⁴

US Environmental Protection Agency (USEPA), Clean Water Act, Section 307, *Status Report: State Numerical Water Quality Criteria for Toxics*, August 1989.¹⁴

US Environmental Protection Agency (USEPA), Clean Water Act, Section 307, *Priority Pollutants*.¹⁴

US Environmental Protection Agency (USEPA), Clean Air Act (CAA), 2004.¹⁴

US Environmental Protection Agency (USEPA), *Resource Conservation and Recovery Act (RCRA)*, 40 CFR Parts 239 through 259.¹⁴

2.2 Informational references

Directive 2002/95/EC of the European Parliament and of the Council, *Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)*, January 2003⁵

EN 13432: 2000 – *Proof of compostability of plastic products*.¹⁵

International Labour Organisation (ILO), Convention 138: *Minimum age convention*, 1973⁷

International Organization for Standardization (ISO) 16929: 2000, *Plastics – determination of the degree of disintegration of plastic materials under defined conditions in a pilot-scale test*.¹⁶

International Organization for Standardization (ISO) 6060:1989, *Determination of the chemical oxygen demand*.¹⁶

International Organization for Standardization (ISO) 11480: 1997, *Pulp, paper and board -- Determination of total chlorine and organically bound chlorine*.¹⁶

International Wool Textile Organization (IWTO) Draft Test Method 59: *Method for the Determination of Chemical Residues on Greasy Wool*.¹⁷

Stockholm Convention on Persistent Organic Pollutants (POPs)¹⁸

¹⁴ United States Environmental Protection Agency (USEPA), 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 <www.epa.gov>.

¹⁵ BSI British Standards, 389 Chiswick High Road, London, W4 4AL United Kingdom <www.bsi-global.com/en>.

¹⁶ International Standards Organization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland <www.iso.org>.

¹⁷ International Wool Textile Organisation (IWTO), Rue de l'Industrie 4, 1000 Brussels, Belgium <www.iwto.org>.

¹⁸ United Nations Environmental Programme, United Nations Avenue, Gigiri, PO Box 30552, 00100, Nairobi, Kenya. <www.chem.unep.ch>.

United Nations Environment Programme (UNEP) Governing Council Decision 18/32: *Persistent Organic Pollutants*, May 1995¹⁸

US Environmental Protection Agency (USEPA), *Method 8081A: Organochlorine pesticides by gap column gas chromatography*¹⁴

US Environmental Protection Agency (USEPA), *Method 8151A: Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzoylation Derivatization*¹⁴

US Environmental Protection Agency (USEPA), *Method 8141A (organophosphorus compounds)*¹⁴

US Environmental Protection Agency (USEPA), *8270 C (semi-volatile organic compounds)*¹⁴

3 Definitions

Terms used in this Standard that have a specific technical meaning are defined here.

3.1 bath ratio: The mass of the dye bath as compared to the mass of the textile goods in the dye machine.

3.2 bio-based polymer: A general term for fibers that are manufactured through chemically and/or physically modifying natural biological materials. Examples include but are not limited to polylactic acid (PLA) and polyhydroxyalkanoates (PHA) but do not include regenerated cellulose fibers such as acetate, triacetate, cuprammonium rayon, viscose rayon, lyocell, and bamboo.

3.3 biodegradable: Exhibiting the capability of being broken down (or decomposed or metabolized) by microorganisms and reduced to organic or inorganic molecules which may be further utilized by living systems.¹⁹

3.4 biomass: Organic, non-fossil material that is available on a renewable basis. Biomass includes all biological organisms, dead or alive, and their metabolic by-products that have not been transformed by geological processes into substances such as coal or petroleum. Examples of biomass are forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, and some municipal and industrial wastes.²⁰

3.5 chemical recycling: A recycling process whereby polymer or fabric waste is broken down into monomers or low molecular weight material using solvent(s), and re-polymerized to produce useable polymer.

3.6 chip: The solid form of a polymer before being melted or dissolved for extrusion.

3.7 child labor: Any work by a person less than 15 years of age, unless local minimum age law stipulates a higher age for work or mandatory schooling, in which the higher age would apply. If however, local minimum age law is set at 14 years of age in accordance with developing-country exceptions under ILO Convention 138, the lower age will apply.¹¹

3.8 climate change: Changes in earth's climate due to anthropogenic emissions.

3.9 commercial furnishings fabric: Fabrics used in commercial settings that add aesthetic value to the environment along with providing certain functional characteristics. Examples include but are not limited to upholstery, drapery, vertical surface coverings, decorative bed coverings, and cubicle (privacy)

¹⁹ Association for Contract Textiles (ACT) Green Glossary <www.contracttextiles.org>.

²⁰ The Dictionary of Sustainable Management <www.sustainabilitydictionary.com>.

curtains. Commercial furnishings fabric are typically used in office, institutional, hospitality, and healthcare settings. Commercial furnishings fabric is not intended to include carpet, napery, bedding (sheets, mattress covers, etc.), toweling or technical textiles that may also be used in these settings.

3.10 component: Any distinct material that is used to manufacture a fabric and remains present in the fabric in its final form.

3.11 compostable: Possessing the ability to break down into, or otherwise become part of, usable compost (e.g. soil-conditioning material, mulch) in a safe and timely manner.¹⁹

3.12 conformity assessments: Demonstration that specified requirements relating to a product, process, system, person, or body are fulfilled.

3.12.1 first party conformity assessment: conformity assessment activity that is performed by the person or organization that provides the product.

3.12.2 second party conformity assessment: conformity assessment activity that is performed by a person or organization that has a user or purchaser interest in the product.

3.12.3 third party conformity assessment: conformity assessment activity that is performed by a person or body that is independent of the person or organization that provides the product, and of the user or purchaser interests in that product.

3.13 credits: The criteria for assessing a fabric's sustainability. They may be prerequisite or optional. Within each credit, points are awarded as a measure of conformance.

3.14 designed for perpetual life: Designing a product so that it may be continuously recycled over and over again.

3.15 disciplinary practices: Engagement in or support the use of corporal punishment, mental or physical coercion, and verbal abuse.

3.16 energy recovery: The process of recovering the thermal energy produced when fuels are converted to gasses and residues through the combustion process.²¹

3.17 fabric: Any material formed by combining yarn, fibers, or filament in a variety of ways including, but not limited to, woven, nonwoven, knitted, bonded, felted, and composite materials. See also 3.38.

3.18 fiber: A chemically distinct unit of matter that exists naturally or is manufactured, but has a length at least 100 times its diameter [or width.] Fiber's elongated structure allows it to be either spun into yarn that may be made into fabric by methods such as weaving, knitting and braiding; or to be fabricated directly into fabric by non-woven methods such as felting. Fiber is, therefore, the basic component of which fabrics are constructed.

3.19 first-quality good: A good that does not include factory "seconds" or "rejects".

3.20 forced labor: All work or service that is extracted from any person under the menace of any penalty for which said person has not offered him/her voluntarily or for which such work or service is demanded as a means of repayment of debt.¹¹

3.21 freedom of association and right to collective bargaining: Right of all personnel to form and join trade unions of their choice and to bargain collectively. In those situations in which the right to

²¹ American Chemistry Council (ACC) Plastics Glossary, 700 Second St., NE, Washington, DC 20002 <www.americanchemistry.com>.

freedom of association and collective bargaining are restricted under law, the manufacturer must facilitate parallel means of independent and free association and bargaining for all such personnel.¹¹

3.22 garnet: A technique for opening up hard and soft waste fabric with a view to recycling them.

3.23 greige: Fabric that has received no preparation, dyeing, or finishing treatment after having been produced by any textile process.²²

3.24 Integrated Pest Management (IPM): An effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment. [for more information, see: <http://www.epa.gov/pesticides/factsheets/ipm.htm>].

3.25 least-processed fibers: Used to differentiate natural fibers from man-made cellulosic (regenerated cellulose) which are both derived from rapidly-renewable and renewable resources. Least processed state refers to natural fibers which require less processing than man-made cellulosic (regenerated cellulose) fibers.

3.26 manufactured fibers: Also known as man-made fibers. A class name for various genera of fibers (including filaments) produced from fiber-forming substances which may be:

- polymers synthesized from chemical compounds, e.g., acrylic, nylon, polyester, polyethylene, polyurethane, and polyvinyl fibers;
- modified or transformed natural polymers, e.g., alginic and cellulose-based fibers such as acetates and rayons; and
- minerals, e.g., glasses.

The term manufactured usually refers to all chemically produced fibers to distinguish them from the truly natural fibers such as cotton, wool, silk, flax, etc.

3.27 mechanical recycling: A recycling process whereby polymer or fabric waste is melted, shredded, garneted, granulated, or similarly undergoes a transformation using a mechanical process to convert the waste into a new, useable form.

3.28 natural fibers: Fibers that occur in nature; they may be categorized according to their origin into animal, vegetable, and mineral fibers.

3.29 non-discrimination: Absence of interference of hiring, remuneration, access to training, promotion, termination or retirement based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, or age.¹¹

3.30 non-renewable resources: Relating to a natural resource such as petroleum or a mineral ore that cannot be replaced once it has been extracted or procured.

3.31 off-quality materials: Any materials resulting from the fiber, yarn, or fabric formation processes that are the same form or shape as the product but that do not meet the original product specifications.

3.32 organic fibers (certified): Fibers that are natural fibers grown without the use of synthetic inputs, such as synthetic fertilizers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation. Certified organic fibers are grown according to an organic

²² Fairchild's Dictionary of Textiles, 7th Edition, PO Box 5121, New York, NY 10087, <www.fairchildbooks.com>.

standard for a minimum period, typically three years, and certified through a certification body that is accredited through IFOAM or USDA.

3.33 organic transitional/in-conversion (certified): Organic fibers are natural fibers grown without the use of synthetic inputs, such as synthetic fertilizers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation. Certified transitional/in-conversion organic fibers are grown during the period the farm is changing from conventional farming to organic farming and certified as such through a certification body that is accredited through IFOAM or USDA.

3.34 organohalogen: An organic (i.e. carbon-containing) compound that incorporates a halogen element including fluorine, bromine, iodine, or chlorine.

3.35 pad batch dyeing: The basic technique of saturating the prepared fabric with a premixed dye liquor and passing it through a padder, which forces the dyestuff inside the fabric for greater penetration while removing excess dye solution.

3.36 points: Each credit has a point value that accumulates toward a level of conformance.

3.37 post-consumer recycled material: Proportion, by mass, of recycled material within a product that has been recovered or diverted from the solid waste stream after consumer use. For examples of what may and may not constitute this type of material, refer to the US Government Federal Trade Commission's "Green Guides" <http://www.ftc.gov/bcp/grnrule/guides980427.htm>.

3.38 pre-consumer recycled material (post-industrial): Proportion, by mass, of recycled material within a product that has been recovered or diverted from the solid waste stream after the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it. For examples of what may and may not constitute this type of material, refer to the US Government Federal Trade Commission's "Green Guides" <http://www.ftc.gov/bcp/grnrule/guides980427.htm>.

3.39 product: A fabric construction that includes some or all of the following variables: fiber type, yarn formation type, fabric formation type, colorant method, and process routing. Grouping of products with a high level / degree of uniformity shall be allowed. See also 3.17.

3.40 product stewardship: A product-centered approach to environmental protection. It calls on those in the product lifecycle—manufacturers, retailers, users, and disposers—to share responsibility for reducing the environmental impacts of products.

3.41 rapidly renewable fibers: A resource capable of being replaced in a short period of time (less than 3 years) by natural ecological cycles. Examples include but are not limited to natural fibers, bio-based polymers, and regenerated bamboo but do not include regenerated cellulose fibers such as acetate, triacetate, cuprammonium rayon, viscose rayon, and lyocell.

3.42 recyclable solid waste: Any secondary material that meets the US EPA definition (see 73 FR 64668; 40 CFR 261) for 'legitimate recycling' and is not abandoned but is recycled by one of the following methods: placed on the land, burned for energy recovery, including "emission-comparable fuels", reclaimed from by-products or spent materials, or accumulated speculatively.

3.43 recycled content: Proportion, by mass, of recycled material within a product that has been recovered or diverted from the solid waste stream, either during the manufacturing process (pre-consumer / post-industrial) or after consumer use (post-consumer).

3.44 regenerated cellulose: A general term for fibers that are manufactured through chemically and/or physically modifying natural cellulosic materials. Examples include but are not limited to acetate, triacetate, cuprammonium rayon, viscose rayon, lyocell, and regenerated bamboo.

3.45 renewable energy: Energy from a source that is replenishable and replenished on some reasonable time scale. Potential renewable energy sources include, but are not limited to wind, solar, heat from the earth's interior, oceans, rivers, and eligible biomass (including landfill gas). This does not include high-impact hydroelectric energy.

3.46 renewable fiber: A resource capable of being replaced by natural ecological cycles of greater than 3 years but less than 20 years. Examples include but are not limited to natural bamboo and regenerated cellulose fibers such as acetate, triacetate, cuprammonium rayon, viscose rayon, rayon from bamboo, and lyocell. (See also rapidly renewable fiber).

3.47 significant industrial user: All users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N; and any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

3.48 synthetic fibers: A sub-set of manufactured fibers that are made from polymers built up from chemical elements or compounds derived from petroleum, coal, or natural gas. Examples include but are not limited to polyester (PET), olefins, nylon, acrylic, spandex and polyvinylchloride (PVC). Fibers which may be made from a combination of fossil fuel and non-fossil fuel raw materials, such as poly [trimethylterephthalate] (PTT), may also be considered synthetic fibers.

4 Defining product process boundaries

The manufacturer shall provide definition of the boundaries of its manufacturing operations. This definition, typically in the form of one or more block flow diagrams, shall include general processes as well as specific unit operations within the general processes. Significant material feeds to the processes from first-tier suppliers shall be included. General processes may include, but are not limited to, the following:

- fiber sourcing;
- yarn formation;
- yarn dyeing;
- fabric formation;
- piece dyeing; and
- finishing.

See Annex D for examples of manufacturing block flow diagrams, including general processes and specific unit operations.

5 Fiber sourcing

5.1 Purpose

The criteria in this section is to reduce the use and depletion of finite, non-renewable resources such as fossil fuels and to recognize fibers that are grown or produced with reduced or less toxic chemical inputs.

5.2 Scope

This section applies to the non-dyed and non-pigmented fiber composition (by weight) used in the manufacture of the candidate fabric. There are criteria applicable to:

- fibers that are not fossil-fuel based (rapidly renewable, renewable and recycled) (5.4.1); or
- fibers that are grown or produced with less toxic chemical inputs and/or reduced emissions (5.4.2).

5.3 Prerequisite credits

There are no prerequisite credits for this section.

5.4 Optional Credits

5.4.1 Selection of fibers that are not fossil fuel based

5.4.1.1 Rapidly-renewable fibers

Recognizes fibers that are replaced by natural ecological processes within a short period of time (three years or less).

Rapidly-renewable resources include:

- Natural fibers may be categorized into plant (seed, bast, leaf) and animal sources. Examples of each type:
 - seed: cotton, kapok;
 - bast: hemp, flax, ramie, jute, kenaf and natural bamboo;
 - leaf: sisal, abaca;
 - husk: coir; and
 - animal: wool (sheep, goat, llama, alpaca, camel), silk and angora.
- Bio-based fibers from rapidly renewable resources include polylactic acid (PLA) and polyhydroxyalkanoates (PHA) but do not include regenerated cellulose fibers such as acetate, triacetate, cuprammonium rayon, viscose rayon, lyocell and rayon from bamboo.

A manufacturer using rapidly-renewable fibers shall provide documentation of fabric composition. A minimum of 10% by weight of rapidly-renewable content shall be documented in order for points to be awarded.

A manufacturer shall earn up a maximum of 12 points by demonstrating its use of rapidly-renewable fibers. The number of points awarded for this credit shall be calculated by multiplying the percentage of rapidly renewable content (by weight) by the number of available points. For example, 100% rapidly-renewable content shall earn 12 points and 50% rapidly-renewable content shall earn 6 points.

5.4.1.1.1 Selection of least-processed fibers (natural fibers)

This credit differentiates natural fibers from man-made cellulosic (regenerated cellulose) which are both derived from rapidly-renewable resources. Least processed refers to natural fibers (as listed in 5.4.1.1) which are less processed than man-made cellulosic (regenerated cellulose) fibers.

A manufacturer shall earn up to 2 points by demonstrating its use of natural fibers. The number of points awarded for this credit shall be calculated by multiplying the percentage of natural fiber content (by

weight) by the number of available points. For example, 100% natural fiber content by weight shall earn 2 points, and 50% natural fiber content by weight shall earn 1 point.

5.4.1.2 Renewable fibers

This section recognizes fibers that are replaced by natural ecological processes (greater than 3 years and less than 20 years).

Renewable fibers include those produced from regenerated cellulose from wood sources such as rayon from bamboo, acetate, triacetate, cuprammonium rayon, viscose rayon and lyocell.

A manufacturer using renewable fibers shall provide documentation of fabric composition. A minimum of 10% by weight of renewable content shall be documented in order for points to be awarded.

A manufacturer shall earn up to 6 points by demonstrating its use of renewable fibers. The number of points awarded for this credit shall be calculated by multiplying the percentage of renewable content (by weight) by the number of available points. For example, 100% renewable content shall earn 6 points and 50% renewable content shall earn 3 points.

5.4.1.3 Recycled fibers

This section recognizes fibers that contain post-consumer or pre-consumer recycled content.

A manufacturer using post-consumer or pre-consumer recycled content fibers shall provide documentation of fabric composition with supporting documentation to verify the source of recycle. A manufacturer shall earn points under 5.4.1.3.1 and 5.4.1.3.2 credits, but no more than 16 points shall be awarded for the two credits combined.

5.4.1.3.1 Pre-consumer (post-industrial) recycled fibers

A manufacturer using pre-consumer recycled content shall provide documentation of fabric composition. A minimum of 10% by weight of pre-consumer recycled content shall be documented in order for points to be awarded.

A manufacturer shall earn up to 8 points by demonstrating its use of pre-consumer recycled fibers. The number of points awarded for this credit shall be calculated by multiplying the percentage of pre-consumer recycled content (by weight) by the number of available points. For example, 100% pre-consumer recycled content shall earn 8 points and 50% pre-consumer recycled content shall earn 4 points.

NOTE - 50:100 pre-consumer:post-consumer ratio is the same as LEED for Commercial Interiors²³

5.4.1.3.2 Post-consumer recycled fibers

A manufacturer using post-consumer recycled content shall provide documentation of fabric composition. A minimum of 10% by weight of post-consumer recycled content shall be documented in order for points to be awarded.

A manufacturer shall earn up to 16 points by demonstrating its use of post-consumer recycled fibers. The number of points awarded for this credit shall be calculated by multiplying the percentage of post-consumer recycled content (by weight) by the number of available points within that credit. For example,

²³ U.S. Green Building Council, 1800 Massachusetts Avenue NW, Suite 300, Washington, DC 20036
<www.usgbc.org>.

100% post-consumer recycled content shall earn 16 points and 50% post-consumer recycled content shall earn 8 points.

5.4.2 Selection of fibers with reduced toxic chemical inputs

This section recognizes fibers that are grown or produced with reduced toxic chemical inputs and/or reduced emissions when compared with the same fiber types.

Fiber content may achieve points for either the organic requirements in (5.4.2.1) or the transitional organic/in-conversion organic credit (5.4.2.2). Fiber content that achieved points in the organic or transitional organic credit (5.4.2.1 or 5.4.2.2) cannot claim points through the integrated pest management credit (5.4.2.3), the cotton credit (5.4.2.4), the wool credit (5.4.2.5), or the bast fiber credit (5.4.2.6).

5.4.2.1 Organic

This section recognizes fibers that are grown using organic principles (i.e., without the use of synthetic fertilizers, pesticides and genetically modified organisms (GMOs)).

A manufacturer shall earn up to 6 points by demonstrating its use of organic content. The number of points awarded for this credit shall be calculated by multiplying the percentage of organic content (by weight) by the number of available points. For example, 100% organic content shall earn 6 points and 50% organic content shall earn 3 points.

5.4.2.2 Transitional-organic/in-conversion-organic

This section recognizes fibers that are grown using organic principles, (i.e., without the use of synthetic fertilizers, pesticides and genetically modified organisms (GMOs)), but that are grown while the farm that produces the fibers is in an 'in-conversion' period.

A manufacturer shall earn up to 3 points for the use of transitional/in-conversion organic content. The number of points awarded for this credit shall be calculated by multiplying the percentage of transitional/in-conversion organic content (by weight) by the number of available points. For example, 100% transitional/in-conversion organic content shall earn 3 points and 50% transitional/in-conversion organic content shall earn 1.5 points.

5.4.2.3 Integrated Pest Management (IPM)

This section recognizes fibers that are grown using Integrated Pest Management (IPM) practices (see 3.24). IPM is a broad range of practices focused on demonstrating reductions of highly toxic chemicals in the production of natural fibers.

A manufacturer utilizing fibers grown using IPM practices shall provide the following documentation:

- (a) IPM farming systems/practices used; and
- (b) The fiber is obtained from production practices that do not use the highly toxic chemicals cited in the sources in Annex A section A.2.2.3b; and
- (c) The fiber grower must demonstrate either:
 - no use of chemicals; or
 - chemical use is below the region average; or
 - reductions in chemical use for the preceding three years; and
- (d) [Optional] Chain-of-custody documentation demonstrating 'GMO Free' status.