



*NSF International Standard /
American National Standard*

NSF/ANSI 426 - 2017

**Environmental Leadership and
Corporate Social Responsibility
Assessment of Servers**



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NSF International Standard/
American National Standard
for Sustainability—

Environmental Leadership and Corporate Social Responsibility Assessment of Servers—

Standard Developer

NSF International

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Foreword²

This American National Standard, NSF/ANSI 426 Environmental Leadership and Corporate Social Responsibility Assessment of Servers, has been developed as part of the ongoing efforts of a number of interested parties to document and improve the environmental and corporate performance profile of servers using established and advanced scientific principles, practices, materials, and standards.

The purpose of this Standard for servers is to establish product environmental performance criteria and corporate performance metrics that exemplify environmental leadership and corporate social responsibility in the market. These performance criteria are intended to form the basis of conformity assessment programs, such as third-party certification or registration.

Suggestions for improvement of this Standard are welcome. This Standard is maintained on a Continuous Maintenance schedule and can be opened for comment at any time. Comments should be sent to Chair, Joint Committee on Environmental Standard for Servers at standards@nsf.org, or NSF International, Standards Department, P.O. Box 130140, Ann Arbor, Michigan 48113-0140, USA.

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NSF/ANSI Standard for Sustainability—

Environmental Leadership and Corporate Social Responsibility Assessment of Servers—

1 Overview

1.1 Scope

This Standard defines environmental and corporate social responsibility performance criteria for computer servers as defined in the ENERGY STAR Server specification³.

This Standard establishes criteria for multiple levels of environmental leadership and corporate social responsibility performance throughout the product life cycle, relating to energy efficiency; management of substances; preferable materials use; product packaging; design for repair, reuse and recycling; product longevity; responsible end-of-life management; and corporate responsibility.

1.2 Purpose

The purpose of this Standard for servers is to establish product environmental performance criteria and corporate performance metrics that exemplify environmental leadership and corporate social responsibility in the market.

The Standard provides a framework and standardized set of performance objectives for manufacturers and the supply chain in the design and manufacture of servers and server components. For purchasers, this Standard provides a consensus-based definition of key environmental and corporate social responsibility attributes and performance metrics, alleviating individual purchasers from the arduous and complex task of defining environmental and corporate social responsibility performance for servers and server manufacturers. This Standard can be used within an established system for the identification of environmentally preferable products by purchasers and to provide market recognition for conforming products and brand manufacturers.

This Standard is an environmental leadership and corporate social responsibility Standard, defined with the recognition that only leading products, i.e., approximately 25 – 35% of the products available in the marketplace, would be likely to qualify to the base or Bronze level, and even fewer at the Silver and Gold levels, at the date of publication of this Standard, although this Standard does not limit the number of products that can so qualify. As the environmental performance of products and that are available in the marketplace, and corporate social responsibility of server manufacturers, improves, it is intended that the criteria will be updated and revised to set a higher performance Standard for leadership products.

This Standard will be continually maintained and periodically reviewed to ensure that the definition of environmental leadership and corporate social responsibility, as reflected in the performance criteria, progresses with the evolution of technology and services and environmental and corporate social responsibility improvements in the product sector.

³ ENERGY STAR 1200 Pennsylvania Ave NW Washington, DC 20460 <www.energystar.gov>

2 Normative references

The following referenced documents are indispensable for the application of this document. Each referenced document is cited in text and its relationship to this document is explained. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies. European Union Directives, which contain the adoption date in their title, shall not be treated as “dated Standards or regulations” (as defined above). Unless explicitly indicated otherwise, when a European Union Directive is referenced in this Standard, a new or updated European Union Directive shall apply as the referenced Directive upon its enforcement date.

80 Plus⁴

American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) *Thermal Guidelines for Data Processing Environments*, 4th Edition⁵

ANSI/AIHA/ASSE Z10, Occupational Health and Safety Management System⁶

ASTM D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics⁷

ASTM D7611/D7611M, Standard Practice for Coding Plastic Manufactured Articles for Resin Identification⁷

BizNGO Chemical Alternative Assessment Protocol⁸

BS EN 15343:2007, Plastics. Recycled plastics. Plastics recycling traceability and assessment of conformity and recycled content⁹

Clean Cargo Working Group (CCWG)¹⁰

Conflict Free Tin Initiative¹¹

DIN 6120-1 - *Marking of packaging and packaging materials for recycling purposes - Plastics packaging and packaging materials - Part 1: Graphical symbols*¹²

EcoTransIT¹³

ECMA-341 Environmental Design Considerations for ICT & CE Products, 4th Edition / December 2010¹⁴

⁴ Ecova Plug Load Solutions 5000-1313 North Atlantic Street Spokane, Washington USA 99201 <<http://www.plugloadsolutions.com>>

⁵ American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305 <www.ashrae.org>

⁶ ASSE International Office, 901 Canterbury, Suite A, Westlake, OH 44145 <www.asse.org>

⁷ ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428 <www.astm.org>

⁸ Clean Production Action 1310 Broadway, Suite 101 Somerville, MA 02144 <<http://www.bizngo.org/>>

⁹ British Standard, 389 Chiswick High Road, London W4 4AL United Kingdom <www.bsi-global.com>

¹⁰ Business for Social Responsibility 5 Union Square West, 6th Floor New York, NY 10003, USA <www.bsr.org>

¹¹ Conflict Free Tin Initiative <<http://solutions-network.org/>>

¹² European Standards Krimicka 134 318 13 Pilsen Czech Republic VAT: CZ7908212026 <<http://www.en-standard.eu/>>

¹³ EcoTransIT World IVE mbH Lützerodestraße 10 D-30161 Hanover Germany <<http://www.ecotransit.org/>>

¹⁴ ECMA International Rue du Rhone 114 CH-1204 Geneva, Switzerland <<https://www.ecma-international.org>>

Electronic Industry Citizenship Coalition (EICC) Code of Conduct¹⁵

EN 16258 Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers)¹²

EN 50581, Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances¹²

EN 50625 *Collection, logistics & treatment requirements for WEEE*¹²

ENERGY STAR *Program Requirements for Computer Server Version 2.1*³

e-Stewards *Standard for Responsible Recycling and Reuse of Electronic Equipment*¹⁶

European Chemicals Agency, *Guidance on requirements for substances in articles*¹⁷

European Commission Joint Research Centre, *International reference Life Cycle Data System (ILCD) Handbook*¹⁸

European Union, Eco-Management and Audit Scheme (EMAS)¹⁹

European Union, European Commission Directive 94/62/EC of the European Parliament and of the Council on Packaging and Packaging Waste²⁰

European Union, European Commission Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE)²⁰

European Union, European Commission Directive 2006/66/EC of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC²⁰

European Union, European Council former Directive 2002/95/EC as amended by 2005/618/EC and 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)²⁰

European Union Product Environmental Footprint Guide²¹

European Union Regulation (EC) No. 1907/2006, Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)¹⁹

Global Logistics Emissions Council (GLEC) Framework²²

¹⁵ Electronic Industry Citizenship Coalition 1737 King Street Suite 330 Alexandria, VA 22314 USA <<http://www.eiccoalition.org/>>

¹⁶ e-Stewards 206 First Avenue South, Suite 410 Seattle, WA 98104 USA <<http://e-stewards.org/>>

¹⁷ European Chemicals Agency P.O. Box 400 00121 Helsinki Finland <<http://echa.europa.eu/>>

¹⁸ European Commission Joint Research Centre JRC Directorate D – Sustainable Resources D1 Bio-Economy Via E. Fermi 2749 I-21027 Ispra (VA) Italy < <http://eplca.jrc.ec.europa.eu/>>

¹⁹ European Commission Environment DG B - 1049 Brussels Belgium <<http://ec.europa.eu/environment/emas> >

²⁰ European Union Directives are available at <<http://europa.eu>>

²¹ European Union Product Environmental Footprint Guide < <http://eur-lex.europa.eu>>

²² Global Logistics Emissions Council P.O. Box 11772, 1001 GT Amsterdam, Netherlands <<http://www.smartfreightcentre.org/>>

Global Reporting Initiative²³

GreenScreen® for Safer Chemicals methodology²⁴

IEC 62321-3-1, Determination of certain substances in electrotechnical products - Part 3-1: Screening - Lead, mercury, cadmium, total chromium and total bromine using X-ray fluorescence spectrometry²⁵

IEC 62321-3-2, Determination of certain substances in electrotechnical products - 3-2: Screening - Total bromine in polymers and electronics by Combustion - Ion Chromatography²⁵

IEC 62474, Material declaration for products of and for the electrotechnical industry²⁵

IEC TR 62635 Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment²⁵

IEC 63000, Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances²⁵

IEEE 1680.2-2012 Standard for the Environmental Assessment of Imaging Equipment²⁶

IEEE 1874 – IEEE Standard for Documentation Schema for Repair and Assembly of Electronic Devices/Manual³²

International Accreditation Forum (IAF)²⁷

International Air Transportation Association (IATA) RP1678²⁸

International Maritime Organization (IMO)²⁹

Interstate Chemicals Clearinghouse (IC2) *Alternatives Assessment Guide, Hybrid or Sequential Frameworks*³⁰

IPCC Guidelines for National Greenhouse Gas Inventories, 2006³¹

ISO 179, Plastics—Determination of Charpy impact properties³²

²³ Global Reporting Initiative PO Box 10039 1001 EA Amsterdam The Netherlands <<https://www.globalreporting.org/>>

²⁴ Clean Production Action 1310 Broadway, Suite 101 Somerville, MA 02144 <<https://www.greenscreenchemicals.org/>>

²⁵ International Electrotechnical Commission 3, rue de Varembé, 1st floor P.O. Box 131 CH - 1211 Geneva 20 - Switzerland <<http://www.iec.ch/>>

²⁶ The Institute of Electrical and Electronics Engineers 445 Hoes Lane Piscataway, NJ 08854-4141 USA <<http://standards.ieee.org/>>

²⁷ International Accreditation Forum <<http://www.iaf.nu/>>

²⁸ International Air Transportation Association IATA USA, 1201 F Street, N.W. Suite 650, Washington DC – 20004 <<http://www.iata.org>>

²⁹ International Maritime Organization 4, Albert Embankment London SE1 7SR United Kingdom <www.imo.org>

³⁰ Interstate Chemicals Clearinghouse 89 South Street, Suite 600 Boston, MA 02111-2651 <<http://www.theic2.org/>>

³¹ Intergovernmental Panel on Climate Change 7bis Avenue de la Paix C.P. 2300 CH- 1211 Geneva 2, Switzerland <<http://www.ipcc.ch/>>

³² International Organization for Standardization Chemin de Blandonnet 8 CP 401 - 1214 Vernier, Geneva, Switzerland <<http://www.iso.org/>>

ISO 180, Plastics—Determination of Izod impact strength³²

ISO 1043, Plastics—Symbols and Abbreviated Terms³²

ISO 11469, Plastics—Generic identification and marking of plastics products³²

ISO 14001, Environmental management systems—Requirements with guidance for use³²

ISO 14021, Environmental Labels & Declarations—Self-declared environmental claims (Type II environmental labelling)³²

ISO 14025, Environmental labels and declarations—Type III environmental declarations—Principles and procedures³²

ISO 14040, Environmental management—Life cycle assessment—Principles and framework³²

ISO 14044, Environmental management—Life cycle assessment—Requirements and guidelines³²

ISO 17021-1, Conformity assessment – Requirements for bodies providing audit and certification of management systems³²

ISO/IEC 17065, Conformity assessment – Requirements for bodies certifying products, processes and services³²

ISO 50001 - Energy management systems — Requirements with guidance for use³²

LCA Society of Japan, Life-cycle Impact Assessment Method based on Endpoint modeling³³

Model Toxics in Packaging Legislation [compilation was developed by CONEG and is administered by the Toxics in Packaging Clearinghouse (TPCH)]³⁴

National Academies of Science, *Design and Evaluation of Safer Chemical Substitutions – A Framework to Inform Government and Industry Decisions*³⁵

OECD, *Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*³⁶

OHSAS 18001, Occupational Health and Safety Management³⁷

SmartWay³⁸

Social Accountability International (SA) 8000³⁹

³³ LCA Society of Japan LCA Development Office, 2-1, Kajicho 2-chome, Chiyoda-ku, Tokyo, 101-0044 <<http://lca-forum.org/english/>>

³⁴ Model Toxics in Packaging Legislation c/o NERC, 139 Main ST., Suite 401, Brattleboro, VT 05301 <<http://www.toxicsinpackaging.org/>>

³⁵ National Academies of Science 500 Fifth St. N.W. | Washington, D.C. 20001 <<http://www.nap.edu>>

³⁶ Organisation for Economic Co-operation and Development (OECD) 2, rue André Pascal 75775 Paris Cedex 16 France <<https://mneguidelines.oecd.org>>

³⁷ OHSAS 18001, BSI Group <<http://www.bsigroup.com>>

³⁸ USEPA, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268 <www.epa.gov>.

³⁹ Social Accountability International 15 West 44th Street, 6th Floor New York, NY 10036 <<http://www.sa-intl.org/>>

Solutions for Hope¹¹

Substitution Support Portal (SUBSPORT)⁴⁰

Sustainable Electronics Recycling International *Responsible Recycling ("R2") Standard for Electronics Recyclers*⁴¹

UL ECVP 2809 (2nd edition), Environmental Claim Validation Procedure (ECVP) for Recycled Content⁴²

United Nations Protocol on Pollutant Release and Transfer Registry⁴³

University of Leiden Institute of Environmental Sciences (CML), *Handbook on LCA*⁴⁴

U.S. Department of Energy Superior Energy Performance (SEP)⁴⁵

U.S. Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, Section 1502⁴⁶

U.S. EPA GHG Reporting Rule, Subpart I³⁸

U.S. EPA, *Life Cycle Assessment: Principles and Practice*, Office of Research and Development. National Risk Management Research Laboratory, Editor 2006, U.S. EPA: Cincinnati, OH.³⁸

U.S. EPA *Protocol for Measuring Destruction or Removal Efficiency (DRE) of Fluorinated Greenhouse Gas Abatement Equipment in Electronics Manufacturing* (U.S. EPA DRE Protocol)³⁸

U.S. EPA *Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI)* 2.1³⁸

U.S. EPA Toxics Release Inventory³⁸

U.S. Securities Exchange Act of 1934, Rule 13p-1⁴⁶

WEEELABEX Treatment Standard⁴⁷

⁴⁰ Substitution Support Portal Kooperationsstelle Hamburg IFE GmbH Harburger Schlossstrasse 6-12 D-21079 Hamburg Germany <<http://www.subsport.eu>>

⁴¹ Sustainable Electronics Recycling International <<http://www.sustainableelectronics.org/r2-documents/>>

⁴² Underwriters Laboratories, Inc., 33 Pfingsten Road, Northbrook, IL 60062 <www.ul.com>

⁴³ United Nations Economic Commission for Europe Palais des Nations CH-1211 Geneva 10 <<http://www.unece.org/>>

⁴⁴ Universiteit Leiden Institute of Environmental Sciences Rapenburg 70, 2311 EZ Leiden, Netherlands <<http://cml.leiden.edu>>

⁴⁵ U.S. Department of Energy 1000 Independence Ave. SW Washington DC 20585 <www.energy.gov>

⁴⁶ U.S. Securities and Exchange Commission 100 F Street, NE Washington, DC 20549 <<https://www.sec.gov>>

⁴⁷ WEEELABEX U Habrovky 11/24714000 Praha 4 Czech Republic <<http://www.weeelabex.org>>

3 Definitions, special terms, acronyms, and abbreviations

3.1 Definitions

3.1.1 additives and fillers: Substances or compounds such as pigments and stabilizers added to polymers to improve processing, properties and end-use performance.

3.1.2 bezel: Partial or full front facing cover of a product unit that may include openings for one or more drives or other replaceable devices.

NOTE — When extra drives or other replaceable devices are not installed, these bays are usually filled with blanks (see cosmetic blank/dummy) which are not technically part of the bezel.

3.1.3 blade server³: A computer server that is designed for use in a blade chassis. A blade server is a high-density device that functions as an independent computer server and includes at least one processor and system memory, but is dependent upon shared blade chassis resources (e.g., power supplies, cooling) for operation. A processor or memory module that is intended to scale up a standalone server is not considered a blade server.

3.1.4 bulk packaging: Single primary package used to ship more than one product.

3.1.5 central processing unit (CPU): The logic circuitry that responds to and processes the basic instructions that drive a server. A typical CPU is a physical package to be installed on the server motherboard via a socket or direct solder attachment. The CPU package may include one or more processor cores.

3.1.6 commonly available tools: A hand operated tool which is readily available for purchase by any individual or business without restrictions.

3.1.7 competent authority: The governmental authority designated to be responsible, within such geographical areas as the Party may think fit, for receiving notifications of transboundary movements and any related information and for responding to such notifications.⁴⁸

3.1.8 computer server³: Hardware system providing services and manage networked resources for client devices (e.g., desktop computers, notebook computers, thin clients, wireless devices, PDAs, IP telephones, other computer servers, or other network devices).

NOTE 1 — For the purposes of this Standard, the definition of computer server aligns with ENERGY STAR Program Requirements for Computer Servers 2.1. A computer server:

- is sold through enterprise channels for use in data centers and office/corporate environments;
- is primarily accessed via network connections, versus directly-connected user input devices such as a keyboard or mouse;
- is marketed and sold as a computer server;
- is designed for and listed as supporting one or more computer server operating systems (OS) and, or hypervisors;
- is targeted to run user-installed applications typically, but not exclusively, enterprise in nature;
- provides support for error-correcting code (ECC) and, or buffered memory (including both buffered dual in-line memory modules (DIMMs) and buffered on board (BOB) configurations);
- is packaged and sold with one or more AC-DC or DC-DC power supplies; and

⁴⁸ United Nations Environment Program, Basel Convention.

- is designed such that all processors have access to shared system memory and are visible to a single OS or hypervisor.

NOTE 2 — also see *Product*.

3.1.9 conflict free: A product that does not contain minerals that directly or indirectly finance or benefit armed groups in the Democratic Republic of the Congo (DRC) or an adjoining country.

NOTE 1 — Conflict minerals that a manufacturer or its supplier(s) obtains from recycled or scrap sources, are considered conflict free.

NOTE 2 — The term “armed group”^{45 46} means an armed group that is identified as perpetrators of serious human rights abuses in the annual Country Reports on Human Rights Practices under sections 116(d) and 502B(b) of the Foreign Assistance Act of 1961 (22 U.S.C. 2151n(d) and 2304(b)) relating to the Democratic Republic of the Congo or an adjoining country.

3.1.10 conflict minerals^{45 46}:

- columbite-tantalite (coltan), cassiterite, gold, wolframite, or their derivatives, which are limited to tantalum, tin, and tungsten; and
- any other mineral or its derivatives determined by the U.S. Secretary of State to be financing conflict in the Democratic Republic of the Congo or an adjoining country.

3.1.11 conformity assessment body: An independent, third-party organization that conducts audits and determines conformance against the requirements of a specific Standard.

3.1.12 conformance assurance process: Process used by the manufacturer to manage compliance of the product to a restricted substance requirement. The process includes:

- a description of how supplier, materials, parts, and/or subassemblies risk factors are evaluated and allocated.
- the utilization of risk rating (or high risk status) to determine what evidence is required for suppliers, materials, parts, and/or subassemblies, as determined to be applicable by the manufacturer.
- the collection and evaluation of the evidence determined necessary for applicability, quality and accuracy, and associated action taken for a negative result. note that analytical testing is an option, but is not required.
- a procedure to refresh the evidence as appropriate, based on the manufacturer’s evaluation of risk.

3.1.13 cosmetic blank/dummy: Cover or mockup provided as a placeholder for option(s).

3.1.14 de-installed: Unplugged equipment that is destined for, or intended to be destined for, removal from a customer site.

3.1.15 disclosure: Information made available to the audience specified in criterion (e.g. purchasers, public, etc.).

3.1.16 direct reuse: The using again, by a person other than its previous owner, of equipment and components that are not waste for the same purpose for which they were conceived without the necessity of repair, refurbishment or hardware upgrading.

3.1.17 disposal: Any operation which does not lead to materials recovery, recycling, reclamation, or reuse of equipment or components, with or without energy reclamation. This includes operations which result in: the deposition of waste into, or on, land or water, or treatment via incineration.

3.1.18 documentation: Information to be provided at time of verification or certification.

3.1.19 electronic components: An individual part or combination of parts that, when together, perform a design function(s) and are typically directly attached to a printed circuit board.

NOTE — Examples include cables, connectors, sockets, discrete printed circuit board components and integrated circuits.

3.1.20 elemental chlorine free (ECF): Packaging material produced with pulp from virgin content that has been bleached using a chlorine derivative such as chlorine dioxide (ClO₂), but without the use of elemental chlorine (Cl), or has not been bleached with chlorine compounds.

3.1.21 end-of-life: Life cycle stage of electronic equipment and components when they are no longer intended for use and are destined, or intended to be destined for, dismantling, material recovery, recycling or disposal.

3.1.22 energy recovery: An operation where the material is used principally as a fuel or to generate energy.

3.1.23 ENERGY STAR certified: A product has been found to be in conformance with the ENERGY STAR Computer Servers eligibility criteria by an ENERGY STAR approved third-party certification body, and the product is listed on the ENERGY STAR Qualified Product List located at www.energystar.gov.

3.1.24 environmental management system³²: Part of the management system used to manage environmental aspects, fulfil compliance obligations, and address risks and opportunities.

NOTE 1 — Management system: set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives. A management system can address a single discipline or several disciplines (e.g. quality, environment, occupational health and safety, energy, financial management). The system elements include the organization's structure, roles and responsibilities, planning and operation, performance evaluation and improvement. The scope of a management system can include the whole of the organization, specific and identified functions of the organization, specific and identified sections of the organization, or one or more functions across a group of organizations.

NOTE 2 — Environmental aspects: element of an organization's activities or products or services that interacts or can interact with the environment.

3.1.25 external enclosure: The outside casing of the product that houses its components.

3.1.26 fan: An instrument for producing a current of air, comprised of 1) an impeller, or assembly of blades attached to an integral hub; and 2) an enclosure that surrounds the blades and hub and attaches to the hub.

3.1.27 feedstock: Raw material used in a manufacturing process.

3.1.28 fiber-based: Cellulose material derived from trees and other plants, including but not limited to wood, hemp, kenaf, palm, bamboo, straw and bagasse.

3.1.29 final disposition: The last facility or operation managing equipment and or components and materials derived from them at which they either:

— cease to be a waste by being processed into materials that will be used directly in manufacturing new products or processes;

- have arrived for disposal and are finally disposed.

3.1.30 firmware: Combination of a hardware device and computer instructions or computer data that reside as read-only software on the hardware device.

3.1.31 first customer: Organization or individual who first acquires (purchases, leases, receives by donation, etc.) and then uses the new product.

3.1.32 idle state³ The operational state in which the OS and other software have completed loading, the computer server is capable of completing workload transactions, but no active workload transactions are requested or pending by the system (i.e., the computer server is operational, but not performing any useful work). For systems where ACPI Standards are applicable, idle state correlates only to ACPI System Level S0.

3.1.33 impact assessment categories³⁸: Classifications of human health and environmental effects caused by a product throughout its life cycle.

3.1.34 initial service providers: Companies who contract directly with manufacturers or companies who contract with an agent acting on behalf of the manufacturer to provide one or more of the following take-back services: preparation for reuse or treatment of product/equipment/components.

3.1.35 inventory data: The identification and quantification of energy, resource usage, and environmental emissions for a particular product, process, or activity.

3.1.36 Life cycle assessment (LCA)³²: Compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle.

3.1.37 manufacturer: Any natural, legal person or entity who:

- manufactures a product, or
- has a product designed or manufactured, or
- places a brand label on a ready-made product,

and places it on the market under their own name or trademark.

3.1.38 multi-node server³: A computer server that is designed with two or more independent server nodes that share a single enclosure and one or more power supplies. In a multi-node server, power is distributed to all nodes through shared power supplies. Server nodes in a multi-node server are not designed to be hot-swappable.

3.1.39 optical components: An individual part or combination of parts that are used in the creation, transmission, manipulation, or detection of light.

3.1.40 packaging: All materials of any nature to be used for the containment, protection, handling, delivery and presentation of products from the manufacturer to the user or the customer.

NOTE — for the purposes of this Standard, unless otherwise noted, the term “packaging” only applies to sales packaging or primary packaging, i.e. packaging that contains and protects and is designed to deliver a product unit to the final user or customer, and does not include pallets or the mechanism such as nails, screws and bolts that is used to temporarily attach primary packaging to pallets.

3.1.41 packaging component³⁴: Any individual assembled part of packaging such as, but not limited to, any interior or exterior blocking, bracing, cushioning, weatherproofing, exterior strapping, coatings, closures, inks, and labels.

3.1.42 pedestal server³: A self-contained computer server that is designed with PSUs, cooling, I/O devices, and other resources necessary for stand-alone operation. The frame of a pedestal server is similar to that of a tower client computer.

3.1.43 postconsumer recycled material³²: Material generated by households or by commercial, industrial and institutional facilities, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

NOTE — This definition applies to materials such as plastic, fiber, metal, etc.

3.1.44 prepared for reuse: Equipment and components that have been checked, tested, cleaned, and/or repaired, and determined to be safe and fully functional with the intent to be placed back on the market in their original use or in their upgraded state, without further processing.

3.1.45 principal storage device: Primary hardware in the product that stores the operating system, applications and data.

3.1.46 printed circuit board: A thin board made of fiberglass, composite epoxy, or other laminate material with conductive pathways etched or "printed" onto the board, with the purpose of or to be used for the connection of different components on the board, such as transistors, resistors, and integrated circuits.

3.1.47 processed chlorine free (PCF): Packaging material produced with pulp from virgin and/or recycled content that has been bleached without any type of chlorine, or that has not been bleached at all. Recycled content may have originally been bleached with chlorine or chlorine derivatives.

3.1.48 processor (CPU): See *Central processing unit (CPU)*.

3.1.49 product: A computer server:

- within the scope of the ENERGY STAR Program Requirements for Computer Servers Version 2.1, including managed servers and blade servers, and
- a marketing model with one or more specific configurations identified, inclusive of the product's full range of configurations and as tested for compliance with ENERGY STAR.

NOTE 1 — ENERGY STAR Program Requirements for Computer Servers Version 2.1 defines a computer server as all hardware and materials contained within the chassis, including the power supply unit.

NOTE 2 — also see *Computer Server*.

NOTE 3 — also see *Blade Server*. Only the blade server and not the blade chassis (i.e., shared blade chassis resources required for operation of the blade server) is within the scope of this Standard.

3.1.50 product specification: Product details of key parametric information, such as, but not limited to, number of CPUs, amount of memory, number of internal disk drives, I/O bandwidth, and enclosure dimensions.

3.1.51 publicly available: Obtainable to the public without restriction of access; for example, cannot require member only access. A requirement to provide a name and, or organization to obtain access is not considered a "restriction of access".

3.1.52 rack-mounted server³: A computer server that is designed for deployment in a Standard 19-inch data center rack as defined by EIA-310, IEC 60297, or DIN 41494. For the purposes of this Standard, a blade server is considered under a separate category and excluded from the rack-mounted category.

3.1.53 recovery: Operations that are part of a process to recapture elements, compounds, or materials and transform them into commodities.

3.1.54 recyclable: Materials that can be removed or recovered from the whole product and put back into productive use as a material, not including energy recovery.

3.1.55 recycled content³²: Proportion, by weight, of recycled material in a product or packaging. Only preconsumer and postconsumer materials shall be considered as recycled content.

3.1.56 recycling: Operations by which products, components, materials, or waste are processed and converted into raw materials for use in the production of new products or in processes, not including energy recovery or disposal.

3.1.57 refurbishment: Functional or aesthetic maintenance or repair of a product to restore to original or upgraded functional state.

3.1.58 reuse: Using again, equipment or components for the originally intended purpose, a similar purpose, or in an upgraded state, possibly after refurbishment, repair or hardware upgrading.

3.1.59 reuse operator: The entity responsible for preparing equipment or components for reuse.

3.1.60 sensitivity analysis³⁸: A systematic evaluation process for describing the effect of variation of inputs to a system on the output.

3.1.61 supplier: Entity that provides goods or services to the manufacturer.

3.1.62 totally chlorine free (TCF): Packaging material produced with pulp from virgin content that has been bleached without any type of chlorine, or that has not been bleached at all.

3.1.63 treatment: Material recovery or disposal operations, including preparation prior to recovery or disposal.

3.1.64 treatment facility: Location where end-of-life equipment, components, or materials undergo treatment.

3.1.65 treatment operator: The entity responsible for the treatment of equipment or components.

3.2 Special terms, acronyms and abbreviations

3.2.1 ANAB: ANSI-ASQ National Accreditation Board

3.2.2 BOB: Buffered on board

3.2.3 BIOS: Basic input/output system

3.2.4 CAS: Chemical abstract number

3.2.5 CCWG: Clean Cargo Working Group

3.2.6 CPU: Processor or central processing unit

3.2.7 CSR: Corporate sustainability report

3.2.8 DDR: Double data rate

3.2.9 DIMMs: Dual in-line memory modules

3.2.10 DRC: Democratic Republic of the Congo

- 3.2.11 EC:** European community number
- 3.2.12 ECC:** Error-correcting code
- 3.2.13 ECF:** Elemental chlorine free
- 3.2.14 EICC:** Electronic Industry Citizenship Coalition
- 3.2.15 EMAS:** European Union Eco-Management and Audit Scheme
- 3.2.16 EMI:** Electromagnetic interference
- 3.2.17 EMS:** Environmental management system
- 3.2.18 ESD:** Electrostatic discharge
- 3.2.19 EPA:** Environmental Protection Agency
- 3.2.20 F-GHG:** Fluorinated greenhouse gas
- 3.2.21 GHG:** Greenhouse gas
- 3.2.22 GLEC:** Global Logistics Emissions Council
- 3.2.23 HTML:** Hypertext markup language
- 3.2.24 IAF:** International Accreditation Forum
- 3.2.25 IPSA:** independent private sector audit
- 3.2.26 IATA:** International Air Transportation Association
- 3.2.27 IMO:** International Maritime Organization
- 3.2.28 IS:** International System of Units
- 3.2.29 LCA:** Life cycle assessment
- 3.2.30 OECD:** Organisation for Economic Co-operation and Development
- 3.2.31 OS:** Operating system
- 3.2.32 PCR:** Postconsumer recycled
- 3.2.33 PCF:** Processed chlorine free
- 3.2.34 PDF:** Portable document format
- 3.2.35 PSU:** Power supply unit
- 3.2.36 QR:** Quick response
- 3.2.37 SASB:** Sustainability Accounting Standards Board
- 3.2.38 SEC:** Securities and Exchange Commission

3.2.39 SVHC: Substances of Very High Concern

3.2.40 TCF: Totally chlorine free

3.2.41 URL: Uniform Resource Locator

3.2.42 WEEE: Waste electrical and electronic equipment

3.2.43 VAP: Validated Audit Process

3.2.44 XML: Extensible markup language

4 Conformance, evaluation and assessment

This Standard is divided into eight performance categories consisting of required criteria and optional criteria:

- energy efficiency
- management of substances
- preferable materials use
- product packaging
- design for repair, reuse and recycling
- product longevity
- responsible end-of-life management
- corporate responsibility

4.1 Criteria

A summary of all criteria in this Standard, including required criteria and optional points, is provided in Annex A.

4.1.1 Required criteria

Each category has required criteria that must be met in order to conform to this Standard.

Table 4.1- Required criteria

5 Energy efficiency
5.1.1 Required - ENERGY STAR
5.2.1 Required - Allowable temperature and humidity specifications
6 Management of substances
6.1.1 Required - Conformance with provisions of European Union RoHS Directive
6.1.2 Required - Conformance with substance restriction requirements of the European Union Battery Directive
6.1.3 Required - Reduction of Bromine and Chlorine content of plastic parts > 25 grams
6.1.5 Required – Conformance with supply chain communication provisions of European Union REACH Regulation
7 Preferable materials use
7.1.1 Required – Declaration of postconsumer recycled plastic content
7.1.2 Required - Minimum postconsumer recycled content in external enclosures
8 Product packaging
8.1.1 Required—Elimination of added heavy metals in packaging
8.1.2 Required—Restriction on the use of elemental chlorine as a bleaching agent in paper-based packaging material
8.2.1 Required - Enhancing recyclability of packaging materials
8.3.1 Required - Recycled fiber content in corrugated packaging
9 Design for repair, reuse and recycling
9.1.1 Required - Design for repair, reuse and recycling
9.1.2 Required - Design for plastics recycling
9.1.4 Required - Product recyclability calculation and minimum 90% recyclability rate
9.2.1 Required - Information and reporting in preparation for reuse and recycling
10 Product longevity
10.1.1 Required - Replacement components availability
11 Responsible end-of-life management
11.1.1 Required – Provision of product take-back service (corporate)
11.2.1 Required - End-of-life processing requirements (corporate)
11.2.2 Required - Trans-boundary movements (corporate)
12 Corporate responsibility
12.1.1 Required - Environmental management system (EMS) (corporate)
12.3.1 Required - Public disclosure of use of conflict materials in products (corporate)
12.4.1 Required - Manufacturer conformance with occupational health and safety performance (corporate)

4.1.2 Optional points

Once the required criteria are met, products may achieve higher levels of conformance by meeting a specified percentage of optional criteria.

4.1.3 Product and corporate criteria

This Standard includes two types of criteria.

- product criteria: applies to the product declared to conform to the Standard.
- corporate criteria: applies to the company that declares products to conform to this Standard.

4.1.4 Country or region specific criteria

All criteria in the Standard are applicable only in countries or regions for which the product is declared to conform to this Standard. Each criterion shall specify either of the following statements below on geographic applicability:

- “This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Standard. The approach used to conform to this criterion may vary by country or region”; or
- “A manufacturer may declare this criterion differently in each country or region for which the product is declared to conform to this Standard.”

NOTE — Region means countries and territories whose independence may not be recognized by all countries (e.g., Taiwan).

4.1.5 Units of measure

Unless specified otherwise, units of measure within this Standard shall be reported in the International System of Units (SI).

4.2 Levels of conformance

There are three levels of conformance:

- Bronze – meets all required criteria
- Silver – meets all required criteria plus at least 50% of the optional criteria points
- Gold – meets all required criteria plus at least 75% of the optional criteria points

The optional points can come from any of the performance categories. More than one point may be assigned to each optional criterion. If an optional criterion is not applicable (as noted in the criterion), those points are not included in the denominator of the calculation of percentage of optional criteria points.

5 Energy efficiency

5.1 ENERGY STAR

5.1.1 Required - ENERGY STAR

The product shall conform with the most current version of the ENERGY STAR Computer Servers program, as per the requirements in Table 5.1 below.

Table 5.1

Region or country	Requirement
U.S. and Canada	— product shall be ENERGY STAR certified
ENERGY STAR international partner countries or regions	— product shall conform with the international partner country's or region's current ENERGY STAR Computer Servers Qualification Criteria Or — product shall be on the country's or region's ENERGY STAR qualified product listing
Countries or regions that are not ENERGY STAR international partners	— product shall conform with the current version of the U.S. and Canada ENERGY STAR Computer Servers Eligibility Criteria

Geographic applicability: This criterion shall be met the in all countries or regions for which the product is declared to conform to this Standard. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- identification of which of the above requirements in Table 5.1 to which the product conforms.
- documentation demonstrating that product meets the relevant requirements in Table 5.1.
- for products that are not ENERGY STAR certified or listed on an international partner's ENERGY STAR qualified product listing, test results from an ENERGY STAR accredited lab⁴⁹ demonstrating that product conforms with the current version of the U.S. and Canada ENERGY STAR Computer Servers Eligibility Criteria.

References and details: None

5.2 Allowable temperature and humidity specifications

5.2.1 Required - Allowable temperature and humidity specifications

Product shall support Class A2 allowable environmental operating range published in the *American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) Thermal Guidelines for Data Processing Environments*, 4th Edition, in Table 2.1.

If the product is liquid cooled, "Not Applicable" may be declared.

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Standard. The approach used to conform to this criterion may vary by country or region.

Verification Requirements:

- documentation that the product can operate in ASHRAE Class A2 conditions, including the estimated number of hours per a specified time period that the server can operate in the allowable range without materially affecting the server.

References and details: None

⁴⁹ https://www.energystar.gov/index.cfm?fuseaction=recognized_bodies_list.show_RCB_search_results

5.2.2 Optional – Liquid cooled server or air cooled servers operable at ASHRAE Class A3/A4 Temperature Ranges

The product shall be shipped with capability to liquid cool the processor and system memory (DIMMs and associated independent buffers) at a minimum. Liquid cooling involves the direct transfer of the heat from the processor and memory system to a liquid for removal of the heat from the information technology (IT) equipment;

Or

The air cooled server shall have allowable equipment environmental ranges as specified in *ASHRAE TC9.9 Thermal Guidelines for Data Processing Environments* (4th edition, 2015) of Class A3 or A4.

Optional points to be awarded as follows:

Table 5.2

Server type	Criterion	Optional points
other (non resilient) air cooled server	server operable in ASHRAE class A3 conditions	1
resilient air cooled server	server operable in ASHRAE class A3 conditions	2
other (non resilient) air cooled server	server operable in ASHRAE class A4 conditions	2
resilient air cooled server	server operable in ASHRAE class A4 conditions	3
liquid cooled server	server shipped with capability to liquid cool the processor and system memory (DIMMs and associated independent buffers) at a minimum	3

Point value: 3 maximum

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Standard. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- documentation indicating whether the product is classified as a Resilient or Non Resilient Server, and indicating to which ASHRAE classification that the equipment can operate (ASHRAE Class A3 or Class A4). The documentation shall specify the estimated number of hours per a specified time period that the server can operate in the allowable range without materially affecting the server reliability.

Or

- documentation indicating the capability to liquid cool the processor and system memory (DIMMs and associated independent buffers) at a minimum.

References and details: ASHRAE TC9.9 Thermal Guidelines for Data Processing Environments (4th Edition, 2015) Criteria for determination of “Resilient” Server to be taken from latest ENERGY STAR Product Specification for Servers³.

5.3 Power supply efficiency

5.3.1 Optional - 80 plus program

Power supply/supplies shipped with the product shall have been tested as in conformance with the requirements of the 80 Plus[®] program Titanium level⁴.

Points shall be awarded as detailed in Table 5.3 below.

Table 5.3 - 80 Plus Titanium Level

Power supply unit	Total points
single output	1
multi output	2

If the product does not ship with power supply/supplies, “Not Applicable” may be declared. For blade servers, manufacturer shall declare “Not Applicable” for this criterion.

Point value: 1 or 2

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Standard. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) statement from manufacturer indicating whether product contains single output or multi-output power supply.
- b) test report from independent, third-party laboratory demonstrating conformance with 80 Plus[®] Titanium level requirements.

References and details: None

5.4 Active and Inactive Power States

5.4.1 Optional— Active State Power Management Enablement

Product shall be shipped with all of the following active state power management states enabled:

- processor dynamic voltage and frequency scaling: Processors have the ability to dynamically change the voltage and frequency of the processor system based upon the load demand or activity level of the processor.
- processor low power idle state: Idle processor cores are able to reduce applied voltage below minimum operating voltage during periods of inactivity.
- dynamic memory low power state: Memory devices are put into low power states during periods of inactivity such as the current self-refresh implementations in DDR memory.