



IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays

Amendment 1: Editorial and Technical Corrections and Clarifications

IEEE Computer Society

Developed by the
Standards Activities Board

IEEE Std 1680.1a™-2020
(Amendment to IEEE Std 1680.1™-2018)

STANDARDS

IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays

Amendment 1: Editorial and Technical Corrections and Clarifications

Developed by the

Standards Activities Board
of the
IEEE Computer Society

Approved 30 January 2020

IEEE SA Standards Board

Abstract: IEEE Std 1680.1 was published in March 2018 with a number of editorial and technical errors. This amendment addresses, and is limited to, editorial and technical corrections and clarifications in IEEE Std 1680.1-2018. This amendment does not include deletion of any criteria, addition of any criteria, or any substantive revisions to criteria.

Keywords: amendment, computer, desktop, display, electronic product, electronic product design, environment, environmental impact, environmental leadership, environmental performance, IEEE 1680.1™, IEEE 1680.1a™, integrated desktop computer, monitor, notebook, portable all-in-one computer, slate/tablet, small-scale server, social responsibility, sustainability, thin client, workstation

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Introduction

This introduction is not part of IEEE Std 1680.1a-2020, IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays—Amendment 1: Editorial and Technical Corrections and Clarifications.

This amendment addresses a number of editorial and technical errors that were discovered following the publication of IEEE Std 1680.1 in March 2018. This amendment addresses, and is limited to, editorial and technical corrections and clarifications and does not include deletion of any criteria, addition of any criteria, or any substantive revisions to criteria.

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IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays

Amendment 1: Editorial and Technical Corrections and Clarifications

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~striketrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures, equations, or subclauses by removing the existing figure, equation, or subclause and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.¹

1. Overview

1.1 Scope

IEEE Std 1680.1-2018 defines environmental and social responsibility performance criteria for computers (i.e., desktop computers, notebook computers, integrated desktop computers, portable all-in-one computers, slates/tablets, small-scale servers, thin clients, and workstations) and displays (i.e., monitors and signage displays). The environmental and social responsibility performance criteria relate to substance management, materials selection, design for end of life, product longevity/life-cycle extension, energy conservation, end-of-life management, packaging, life cycle assessment and carbon footprint, corporate environmental performance, and corporate social responsibility.

¹ Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

1.2 Purpose

IEEE Std 1680.1 was published in March 2018 with a number of editorial and technical errors. This amendment addresses, and is limited to, editorial and technical corrections and clarifications in the standard. This amendment does not include deletion of any criteria, addition of any criteria, or any substantive revisions to criteria.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).^{2,3}

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

2. Normative references

Delete the following reference from Clause 2:

~~Electronics Industry Citizenship Coalition (EICC), Validated Audit Process~~

Insert the following reference into Clause 2 in alphanumeric order:

Responsible Business Alliance (RBA), Validated Audit Process⁴

Change the following reference in Clause 2 as shown:

U.S. DOE Superior Energy Performance 50001™ (SEP 50001™)

3. Definitions, acronyms, and abbreviations

3.1 Definitions

Change the location of the definition of “conformance assurance process” to be correctly located alphabetically between “conflict minerals” and “connector” in 3.1.

² The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

³ The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is used only in statements of fact.

⁴ Available at <http://www.responsiblebusiness.org/standards/vap/>.

3.2 Acronyms and abbreviations

Change the following acronym in 3.2 as shown:

SEP 50001TM Superior Energy Performance 50001TM

4. Environmental and social responsibility performance criteria

4.1 Substance management

4.1.5 Bromine and chlorine

4.1.5.1 Required—Reduction of bromine and chlorine content in plastic parts >25 g

Replace the text of 4.1.5.1 with the following:

Product criterion: Each plastic part in the product exceeding 25 g shall not contain greater than 1000 ppm chlorine or greater than 1000 ppm bromine at the homogeneous level, with the following exceptions:

- a) For parts that exceed the specified concentrations of bromine and chlorine, the manufacturer shall perform a hazard assessment in accordance with criterion 4.1.8.1 on the substance(s) responsible for exceeding the bromine and chlorine levels and the viable alternative substance(s) being considered. The manufacturer shall demonstrate either:
 - 1) The brominated and chlorinated compounds used in the product received a GreenScreen® for Safer Chemicals Benchmark score of 2, 3, and/or 4 or
 - 2) No viable alternatives to the brominated or chlorinated compounds can achieve a GreenScreen Benchmark score of 2, 3, and/or 4.All assessments shall consider the health and environmental impacts of transformation products associated with combustion. These assessments shall be verified by an independent third party.⁵
- b) Parts which exceed 25% post-consumer recycled content may contain a maximum of 5000 ppm chlorine and a maximum of 5000 ppm bromine.⁶
- c) Printed circuit boards, cables and wiring, fans, and electronic components are excluded.

If the product does not contain plastic parts > 25 g, the manufacturer may declare “Not Applicable.”

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.

Applies to: All covered products.

⁵ At the time of this publication, verification by Clean Production Action is an example of a third-party verification process. This information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of this verification process. Equivalent verification processes may be used.

⁶ Regulation (EU) 2019/1021 on persistent organic pollutants has entered into force in all EU Member States on 5 August 2019. Annex I has a new limit value for some bromodiphenylethers (BDEs) at 500 ppm. Manufacturers claiming conformity to this criterion using recycled plastics with a maximum Br limit of 5000 ppm will need to assess if their product can be placed in the European market.

Verification requirements:

- a) A list of each plastic part in the product exceeding 25 g
- b) Documentation that each applicable plastic part exceeding 25 g meets one of the following options:
 - 1) Test data showing that the part contains less than 1000 ppm chlorine and less than 1000 ppm bromine (e.g., using test method such as IEC 62321-3-1 [B11] and IEC 62321-3-2) [B12],⁷ or
 - 2) Documentation of a CAP that demonstrates conformity to this criterion.
 - 3) If using exception a), documentation as specified in the verification requirements of 4.1.8.1.
 - 4) If the part contains greater than 25% post-consumer recycled content and contains either greater than 1000 ppm chlorine or greater than 1000 ppm bromine:
 - i) Documentation from the supplier that demonstrates greater than 25% post-consumer recycled content (e.g., supplier letter, analytical test results, etc.), and
 - ii) Test data demonstrating conformance to the criterion

Additional details: See 4.1.8.1 regarding chemical assessment and selection.

The 25 g threshold applies only to the portion of the part composed of plastic. Coatings are not considered plastic parts.

4.1.10 Manufacturing chemicals

4.1.10.1 Optional—Reduce fluorinated gas emissions from flat panel display manufacturing

Replace the text, table, and equation of 4.1.10.1 with the following:

Corporate criterion: The manufacturer shall annually demonstrate that processes have been implemented at supplier flat panel display manufacturing facilities (fabs) that achieve a reduction of at least 90% of fluorinated greenhouse gas (F-GHG) emissions resulting from the production of flat panel displays, in accordance with the performance reflected in Table 4.

This criterion shall be achieved by at least 75% of flat panel display suppliers by annual spend (fiscal or calendar) that produce flat panel displays in products declared to conform to this standard. Scope may be at the supplier level, fab level, or for the portion of the fab used in products declared to conform to this standard for the manufacturer. Other flat panel displays may be included.

Performance results can be achieved through a calculation demonstrating that F-GHG emissions have been reduced by at least 90% across all fabs (or portions of fabs) in scope, based on an uncontrolled baseline using Equation (2) and other example equations in Appendix B.

$$\begin{aligned} \text{Total reduced emissions (\%)} = & \\ & 100 \times [\text{Uncontrolled emissions prior to implementation of reduction processes} - \\ & \quad \text{Emissions after implementation of reduction processes}] / \\ & \quad \text{Uncontrolled emissions prior to implementation of reduction processes} \end{aligned} \quad (2)$$

⁷ The numbers in brackets correspond to the numbers of the bibliography in Annex H.

Tools that are utilizing reduction approaches a), b), or c) (described below) may be excluded from the calculation, given that these approaches are known to result in a 90% or better F-GHG reduction. If all manufacturing and ancillary operations tools for all fabs in scope utilize reduction options a), b), or c), then no F-GHG reduction calculation is necessary.

Reduction Approaches:

- a) Installation (new or retrofitted), operation and maintenance of emission control technology designed specifically to recycle, remove or destroy F-GHG emissions used in the production of flat panel displays,
- b) Utilization of a gas(es) with global warming potential (GWP) of 2300 or less,
- c) Use of NF₃ remote plasma clean for cleaning chemical vapor deposition (CVD) chambers (only in combination with methods a) and/or b) above),
- d) Other reduction approaches that can be demonstrated to sufficiently reduce F-GHG emissions in accordance with this criterion. These may include, but are not limited to, process optimization, process change(s), use of gases that results in lower emissions, on a CO₂e basis, than the gases replaced, for example due to a higher utilization rate (after consideration of by-product generation), etc.

Table 4—Performance based on reduction in F-GHG emissions optional points

Performance	Total points
The reduction requirement of this criterion has been met for all fabs or portions of fabs in scope, excluding those in operation prior to 2007.	1
The reduction requirement of this criterion has been met for all fabs or portions of fabs in scope.	2

A maximum of two optional points may be claimed for this criterion. If all products declared by the manufacturer to conform to this standard do not contain flat panel displays, manufacturers shall declare “Not Applicable.”

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.

Applies to: All manufacturers with products declared to conform to this standard.

Verification requirements:

- a) Declaration that manufacturer met the requirements of this criterion for 75% of suppliers of flat panel displays in products declared to conform to this standard, by annual spend (fiscal or calendar).
- b) Supplier letter(s) or documentation that indicates the following:
 - 1) Which of the two performance results in Table 4 are being demonstrated, and
 - 2) The extent to which each fab is covered (e.g., at the supplier level, fab level, or for the portion of the fab used in products declared to conform to this standard for the manufacturer), and
 - 3) If performance is demonstrated for a portion of fab operations, the supplier shall provide the manufacturer with an explanation of how the relevant portions of the impacted fab(s) have been accounted for and/or calculated in order to demonstrate that the 90% emission reduction was achieved without including the non-relevant portions (e.g., allocation of F-GHGs used in manufacturing the flat panel displays for the product or product type vs. other products).

- c) Supplier letter(s) indicating which reduction approach(es) was used to achieve the performance in Table 4. Supplier letter(s) shall also include one or more of the following (based on which reduction approach(es) is used):
- 1) If calculating the 90% F-GHG emission reduction, the supplier letter(s) shall include all of the following:
 - i) A description of the procedures or processes used to achieve the results from the most recent calendar or fiscal year, including how tools using reduction approaches a), b), or c) were excluded from the calculation, if applicable,
 - ii) The percentage of F-GHG emissions avoided,
 - iii) The calculation used to achieve 90% reduction; baseline emissions shall be calculated based on the most recent fab, industry average, or company records (e.g., gas purchase records) available prior to when the alternative gas, equipment, and/or process was employed (see Annex B for example equations).
 - 2) If excluding manufacturing tools and ancillary equipment from the calculation by using one or more reduction approaches a), b), or c), supplier shall demonstrate that all excluded tools and equipment are equipped as defined below, based on the reduction approach(es) used:
 - i) If abatement equipment is used to achieve this criterion, a statement certifying that the abatement equipment meets the following requirements:
 - For U.S. EPA Greenhouse Gas Reporting Rule, Subpart I, the abatement equipment has been installed, maintained, and operated in accordance with the site maintenance plan for abatement systems that is developed and maintained in records as specified in 98.97(d)(9).
 - For IPCC Tier 2a, 2b, or 3 methodology, the abatement equipment is any combination of electrically heated, fuelled-combustion, plasma, and/or catalytic devices that are specifically designed to abate F-GHGs and are used within the manufacturer's specified process window and in accordance with specified maintenance schedules. Also, the DREs of these abatement devices have been measured and confirmed under actual process conditions, using a technically sound protocol, which accounts for known measurement errors including, for example, CF₄ by-product formation during C₂F₆ abatement as well as the effect of dilution, the use of oxygen, or both, in combustion abatement systems.
 - ii) If gases with a GWP of 2300 or less are used toward the achievement of this criterion, the supplier letter(s) shall include the following information:
 - The percentage of the impacted manufacturing and ancillary operation tools that are using gases with a GWP of 2300 or less.
 - Demonstration that the GWP of the gas(es) is less than 2300 (e.g., in peer reviewed literature, IPCC assessment report).
 - Demonstration that when accounting for byproduct emissions and gas utilization rate, the total emissions on a CO₂e basis, from using a gas with a GWP of 2300 or less, are 90% less compared to total emissions (accounting for byproduct emissions and gas utilization rate) when using SF₆ for the same production. This may be demonstrated through, for example, measured and documented emission factors and by product formation factors.
 - iii) If supplier utilizes NF₃ remote plasma for CVD chamber clean toward the achievement of this criterion (in combination with other reduction methods), the supplier letter(s) shall include the following information:
 - The percentage of impacted CVD chamber cleaning process tools that are using NF₃ remote plasma clean. If not all chamber clean process tools are using NF₃

remote plasma clean, demonstration that all other chamber clean process tools are using another reduction method (i.e., have emission reduction technology installed or are using gases with a GWP of 2300 or less).

- Declaration that NF_3 remote plasma clean processes are being used in accordance with manufacturer specifications (e.g., flow rates). If deviations occur from specifications, the declaration should include an indication as to why.

Additional details:

F-GHGs are SF_6 , NF_3 , perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Examples of PFCs and HFCs include, but are not limited to, CF_4 , C_2F_6 , C_3F_8 , $\text{c-C}_4\text{F}_8$, $\text{C}_4\text{F}_8\text{O}$, CHF_3 , and CH_2F_2 .

Process Optimization is adjusting a process so as to improve a specified set of parameters (e.g., when flat panel display suppliers use less F-GHGs or use F-GHGs more efficiently in the manufacturing process).

Equations for emission reduction with abatement calculation and alternative gas calculation are provided in Annex B.

4.1.10.2 Optional—Reduce fluorinated greenhouse gas emissions from semiconductor production

Replace the text, table, and equations of 4.1.10.2 with the following:

Corporate criterion: Manufacturer shall meet the requirements of Part A for one point, and both Part A and Part B for two points total. The scope of Part A and Part B of this criterion shall include all 300 mm process semiconductor manufacturing facilities (fabs) that produce semiconductor components (e.g., CPUs, DRAM, accelerators) in products declared to conform to this standard for the manufacturer, from 75% of all the manufacturer's semiconductor component suppliers, by annual spend (fiscal or calendar) for those products. Supplier may include other semiconductor components; requirements may be met at the supplier level, fab level, or for the portion of the fab used in products declared to conform to this standard for the manufacturer.

Part A: The manufacturer shall demonstrate that both requirements a) and b) below are met by all impacted suppliers for each fab in scope.

- a) Develops a fluorinated greenhouse gas (F-GHG) emissions inventory using one of the following methods:
 - 1) The methods included in the US EPA Greenhouse Gas Reporting Rule, Subpart I
 - 2) The most recent IPCC Tier 2a, 2b, or 3 methodology. If using the IPCC 2006 Tier 2a or 2b methodology, multiply the IPCC 2006 Tier 2a or 2b emissions by a factor of 1.13⁸ to obtain adjusted IPCC 2006 Tier 2a or 2b emissions from etching and chamber cleaning processes:

For either 1) or 2), where a F-GHG is used in a process type or subtype for which it has no default emission factor in either the current IPCC guidance or in US EPA Greenhouse Gas Reporting Rule, Subpart I, the supplier may either:

- Assume that 100% of the F-GHG is emitted from the process type or subtype before accounting for abatement, or

⁸ The calibration factor is based on the following ratio: Emissions calculated based on the GHGRP default emission factors (EFs) for 300 mm fabs and the F-GHG consumption by the Semiconductor Industry Association's "sample set" of 300 mm fabs/Emissions calculated based on the Tier 2b IPCC default EFs and the F-GHG consumption by SIA's "sample set" of 300 mm fabs.

- Apply the utilization rate and by-product formation rates of the F-GHG that have been measured for the process using the latest version of the International SEMATECH Manufacturing Initiative (ISMI) Guideline for Environmental Characterization of Semiconductor Process Equipment.

The supplier shall calculate emissions in carbon-dioxide-equivalents (CO₂e) by applying the set of chemical-specific, 100-year global warming potentials (GWPs) from the IPCC Fourth Assessment Report (IPCC AR4), Table A-1 of Subpart A of 40 CFR Part 98, or the IPCC Fifth Assessment Report (IPCC AR5). For F-GHGs that do not have chemical-specific 100-year GWPs in either IPCC AR4 or IPCC AR5, the supplier shall apply the default GWP in Table A-1 of Subpart A of 40 CFR Part 98 for the F-GHG group of which the F-GHG is a member.

- b) Annually reports inventory results publicly, including (at a minimum) emissions of fluorinated GHGs used in the following:
 - 1) Plasma etching/wafer cleaning,
 - 2) Chamber cleaning processes,
 - 3) Heat transfer fluid use (e.g., those used for temperature control, device testing, cleaning substrate surfaces and other parts, soldering).

This inventory shall be compiled and reported once annually by the supplier.

Part B (additional 1 point): The manufacturer shall demonstrate that F-GHG emissions have been reduced across all fabs, (or portions of the fabs) in scope, by the applicable percentage in Table 5 from the uncontrolled baseline emissions calculated as per the Equation (3) and Equation (4). Fluorinated heat transfer fluids (F-HTFs) may be included in or excluded from the reduction assessment.

This percentage shall be calculated and demonstrated once annually and either publicly reported or reported to the manufacturer (see Table 5).

Table 5—Percent reduction in F-GHG emissions

	If F-HTF emissions are included in the reduction assessment	If F-HTF emissions are excluded in the reduction assessment
Percentage reduced	≥ 70%	≥ 75%

Overall equation: To calculate the percent of F-GHG reduced emissions for the 300 mm fabs, the supplier shall use the following Equations [(3) and (4)]:

$$\text{Percent of Total Reduced Emissions} = 100\% \times \left(1 - \left(\frac{\sum TE_{Fab}}{\sum BE_{Fab}} \right) \right) \quad (3)$$

where:

TE_{Fab} is the Total Emissions per fab in scope calculated using the methodologies in Part A (metric tons CO₂e). Fab data may or may not include F-HTFs, depending on reduction target selected from Table 5. If using Tier 2a, apportioning consumption between etch wafer clean and chamber clean is required for Equation (4).

BE_{Fab} is Baseline Emissions per fab calculated using the following equation, either including or excluding F-HTFs depending on option selected in Table 5 (metric tons CO₂e).

BE_{Fab} equation per fab:

$$BE_{Fab} = 1.15 \times ((C_{EW} \times WF_{EW}) + (C_{CC} \times WF_{CC})) \quad (4)$$

where:

1.15	is the factor to account for fluorinated heat transfer fluid emissions ⁹ (omit if excluding HTFs)
C_{EW}	is the total consumption of all F-GHGs by all etching and wafer cleaning processes within the fab (metric ton)
WF_{EW}	is the weighting factor for etching and wafer cleaning (CO ₂ e / metric ton) ¹⁰
WF_{EW}	is 5940 (if using AR4 GWPs for Part A)
WF_{EW}	is 5330 (if using AR5 GWPs for Part A)
C_{CC}	is the total consumption of all F-GHGs by all chamber cleaning processes within the fab (metric ton)
WF_{CC}	is the weighting factor for chamber cleaning (CO ₂ e / metric ton) ¹¹
WF_{CC}	is 8260 (if using AR4 GWPs for Part A)
WF_{CC}	is 7495 (if using AR5 GWPs for Part A)

Details for calculating C_{EW} and C_{CC} for each fab:

- To calculate the total consumption for all etching and wafer cleaning processes within the fab (C_{EW}), sum the masses of all fluorinated GHGs fed into etching and wafer cleaning processes in the fab during the year for which the F-GHG Inventory in Part A was prepared.
- To calculate the total consumption for all chamber cleaning processes within the fab (C_{CC}), sum the masses of all fluorinated GHGs fed into CVD chamber cleaning processes (in-situ plasma, remote plasma, and in-situ thermal) in the fab during the year for which the F-GHG Inventory in Part A was prepared.

If all the products declared by the manufacturer to conform to this standard do not contain a component covered by this criterion, the manufacturers shall declare “Not Applicable.” 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.

⁹ 1.15 = Factor to account for fluorinated heat transfer fluid emissions (omit if excluding HTFs).

¹⁰ The AR4 and AR5 coefficients for calculating baseline emissions from the etch/wafer clean process type are based on the following procedures:

- CF₄ is used as the baseline F-GHG.
- The subpart I emission and by-product formation factors for CF₄ used in etching processes in 300 mm fabs (see Table I-4 to subpart I of 40 CFR Part 98) are each multiplied by the corresponding AR4 or AR5 GWP for CF₄ and each by-product gas. The resulting products (GWPs × EFs) are then summed to derive the two coefficients. One coefficient is based on AR4 GWPs; the other is based on AR5 GWPs.

¹¹ The AR4 and AR5 coefficients for calculating baseline emissions from the chamber clean process type are based on the following procedures:

- C₂F₆ is used as the baseline F-GHG.
- The subpart I emission and by-product formation factors for C₂F₆ used in in-situ plasma clean in 200 mm fabs (see Table I-3 to subpart I of 40 CFR Part 98) are each multiplied by the corresponding AR4 or AR5 GWP for C₂F₆ and each by-product gas. The resulting products (GWPs × EFs) are then summed to derive the two coefficients. One coefficient is based on AR4 GWPs; the other is based on AR5 GWPs.

Applies to: All manufacturers with products that are declared to conform to this standard.

Verification requirements:

- a) Requirements for Part A:
 - 1) Declaration that manufacturer met the requirements of this criterion for 75% of suppliers of semiconductors in products declared to conform to this standard, by annual spend (fiscal or calendar).
 - 2) Supplier letter(s) or declaration with the following information:
 - i) Whether performance is demonstrated at the supplier-level, fab-level, or portion of the fab associated with the manufacturer.
 - ii) If any portion of the fab operations is excluded (i.e., performance is demonstrated for a portion of fab operations), the manufacturer shall provide information from the semiconductor supplier(s) that explains how the portions of the impacted fab(s) have been accounted for and included in the calculation in order to demonstrate conformance.
 - iii) Which methods were used to develop the F-GHG emissions inventory.
 - iv) Which of the GWPs allowed in Part A were used (IPCC AR4 or IPCC AR5).
 - v) Method used to estimate DREs of abatement equipment, if abatement is used (i.e., default or fab-specific).
 - 3) URL(s) where the inventory reporting is posted by the covered suppliers.
- b) Requirements for Part B:
 - 1) Supplier letter(s) or declaration including the following:
 - i) Demonstration of the equation used to calculate the percentage of F-GHG emissions reduced and whether F-HTFs were included or excluded from the reduction calculation (i.e., reference Equation (3): uncontrolled emissions used for etching/wafer cleaning and chamber cleaning, and emissions after implementation of reduction processes for etching/wafer cleaning and chamber cleaning.)
 - ii) The reduction approach(s) used to demonstrate conformance with this criterion.
 - iii) If abatement equipment is used to achieve this criterion, a statement certifying that the abatement equipment meets the following requirements:
 - For U.S. EPA Greenhouse Gas Reporting Rule, Subpart I, the abatement equipment has been installed, maintained, and operated in accordance with the site maintenance plan for abatement systems that is developed and maintained in records as specified in 98.97(d)(9).
 - For IPCC Tier 2a, 2b, or 3 methodology the abatement equipment is any combination of electrically heated, fuelled-combustion, plasma, and/or catalytic devices that are specifically designed to abate F-GHGs and are used within the manufacturer's specified process window and in accordance with specified maintenance schedules. Also, the DREs of these abatement devices have been measured and confirmed under actual process conditions, using a technically sound protocol, which accounts for known measurement errors including, for example, CF₄ by-product formation during C₂F₆ abatement as well as the effect of dilution, the use of oxygen or both in combustion abatement systems.
 - iv) If performance is demonstrated for a portion of fab operations, a supplier declaration that all portions of the fab(s) in scope were included.

- 2) Demonstration that the total percent of F-GHG reduced emissions for each supplier included in scope was either reported to the manufacturer or reported publicly [e.g., supplier letter(s), URL(s)].

Additional details: Examples of reduction methods for F-GHG emissions are provided in Annex C.

4.2 Materials selection

4.2.1 Post-consumer recycled plastic content

4.2.1.1 Required—Minimum post-consumer recycled plastic, ITE-derived post-consumer recycled plastic or bio-based plastic content

Replace the text of 4.2.1.1 with the following:

Product criterion: Product shall contain, on average, a minimum of 2% of any combination of post-consumer recycled plastic, ITE-derived post-consumer recycled plastic, or bio-based plastic, measured as a percentage of total amount of plastic (by weight) in the product.

The following may be excluded from the calculation of percentage:

- a) Printed circuit boards, labels, cables, connectors, electronic components, optical components, ESD components, EMI components, adhesives, and coatings
- b) For ruggedized devices
 - External enclosure and
 - Specialized parts, such as swivels and hinges
- c) External components sold with the product

If an allowable exclusion is used, the plastic content of the component or part must be excluded from both the numerator and the denominator of the calculation of percentage.

This criterion is “Not Applicable” if the product contains a total combined weight of plastic < 100 g after exclusions are removed.

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.

Applies to: All covered products.

Verification requirements:

- a) Supplier letter(s) stating percentage of applicable content(s) in plastic(s) supplied to manufacturer or to manufacturer’s part supplier.
- b) Documentation of calculation, including plastic part name(s) or other part identifiers and the total weight of their plastic content, as well as the weight of plastic content that is post-consumer, ITE-derived post-consumer, or bio-based.
- c) If excluding parts, list of excluded parts and reason for exclusion.