



## SPECIAL CONDITION: Metal Alloys

Version: SCMetalAlloy/2020-08-06

### KEY REQUIREMENTS

#### Effective Date

This policy becomes effective when it is implemented in the HPD Builder. That “Effective Date” will be published here when it is available: \_\_\_\_\_.

#### Definitions

Metal alloy: A metal alloy is a material made by combining metals and/or other elements. The alloying process modifies the properties of the material, usually providing increased strength, malleability, or resistance to corrosion.

Individual alloying elements: Individual substances that are combined to form a metal alloy, e.g. zinc, copper, manganese, lead, etc.

#### Summary of Policy

Use of this policy allows a manufacturer to report metal alloy content in a tandem process:

1. Metal alloys in a product or part can be reported directly on a Product HPD or Supplier HPD (the latter for a part).
2. The HPD reporting the metal alloy should refer to a separate Supplier HPD to provide detailed metal alloy composition data, and hazard screening data for individual alloying elements.

Manufacturers may also choose to omit this tandem reporting process, and report the full metal alloy composition data and hazard screening data on the Product HPD or Supplier HPD.

Effective with this policy, use of CAS RNs referring to metal alloys, e.g. 12597-68-1: Stainless Steel, is disallowed in all cases on HPDs.

See “Explanation of Policy,” below, for details.

#### Scope

This Special Condition addresses only the bare, uncoated, untreated metal alloys used in a product or part. Metal coatings and treatments on those products or parts are considered distinct content and are to be inventoried separately in the HPD.



## Required for All HPDs with Metal Alloys

All Product HPDs and Supplier HPDs reporting metal alloy content are required to comply with this policy to be considered complete, published HPDs. HPDs not following this policy that are published after the effective date, must be removed from publication and revised.

## Compliance with Policy

There are two options for compliance.

### Option 1. Metal Alloy Option

***This option is available to any Product HPDs and Supplier HPDs reporting metal alloys as content. Detailing this option is the main purpose of this Special Condition policy. This option is for an HPD whose main purpose is to report on the elemental contents of a metal alloy.***

To report metal alloy content and associated potential hazards, follow the reporting guidelines detailed in this document (under “Explanation of Policy” and “Instructions” below).

### Option 2. Alloying Element Option

***This option is available for Product HPDs or Supplier HPDs to report on the elemental composition of a metal alloy. This is the required option for Supplier HPDs being referenced in HPDs that use Option 1.***

Under this option, manufacturers are treating the individual alloying elements as the ingredients in their finished product, and should report those ingredients with their specific CAS RN, e.g. 7429-90-5: Aluminum, 7440-66-6: Zinc, 7440-50-8: Copper, etc. Follow the typical HPD Open Standard instructions and provide inventory and hazard screening information for all intentionally added substances and residuals/impurities, i.e., the individual alloying elements, above the chosen reporting threshold. The inventory should be complete, thorough, and verifiable; for this purpose, reference to UNS or CEN classification systems (see below) are required in the Substance Notes. *There is no further guidance on this option in this policy.*

## BACKGROUND: WHY THIS IS A SPECIAL CONDITION

As part of the development of Special Conditions in the HPD Open Standard, HPDC’s Technical Committee must determine that there are compelling grounds for allowing for a Special Condition. There are several contributing factors that demonstrate the need for this Special Condition policy. Together, these factors point to an alternative method for providing transparency on metal alloys. This Special Condition policy is more accurate from the perspective of manufacturers, and more useful for HPD users, than the standard HPD reporting content inventory method for the materials and substances covered by this Special Condition.

### 1. Accuracy of content inventory

This policy meets the need to provide a reporting structure that recognizes that the metal alloy has different characteristics from its constituents, while being transparent about alloying elements.



When individual alloying elements are combined into a metal alloy under high heat, the resulting alloy has significantly different characteristics than the individual alloying elements on their own. These include different characteristics: physical characteristics, e.g., electrical conductivity; mechanical, e.g., tensile strength; casting, e.g., yield; and fabrication properties, e.g., capacity for being hot formed. Referring directly to the metal alloy as the content on an HPD can make it clear to HPD users that the alloy itself is considered the content in the building product, and not the individual alloying elements. At the same time, HPD users have an interest in seeing the elemental composition of metal alloys, as well as their hazards and any relevant flags for restricted lists, etc. For all these reasons, use of the various HPD reporting tools (Product HPD and Supplier HPD) in a specified, tandem method, is prescribed by this policy to improve the “signal to noise ratio” for HPD users, and to provide full transparency.

## **2. Accuracy of hazard assessment: The metal alloy has different characteristics from its constituents**

Metal alloys have different intrinsic characteristics (see above) than the metals encapsulated therein. This is due in part to the impact of the alloying process on microstructural features including grain size, inclusions, impurities, second phases, porosity, and segregation, which in turn influences physical properties and surface phenomena.

Similarly, alloys are generally expected to have different hazards than their alloying elements. These differences are driven by the following factors:

- the elemental composition of the alloy as a metal mixture;
- the speciation of metals contained within the alloy;
- and the solubility of, or release of metal ions from, the surface of the alloy.

Solubility is especially important, since this determines the bioaccessibility/bioavailability of the alloy. As discussed in the U.N. GHS Annex 9.7 on Classification of metals and metal compounds:

“Generally speaking, the rate at which a substance dissolves is not considered relevant to the determination of its intrinsic toxicity. However, for metals . . . the difficulties in achieving dissolution . . . is so severe that . . . solubilization and transformation become indistinguishable.”

Hazard assessment of metals is unique, in that it evaluates data typically associated with exposure, i.e., information on solubility, bioaccessibility, and bioavailability, in combination with toxicological data to characterize the intrinsic toxicity of metallic substances. This approach recognizes that the metal ion is the toxic moiety responsible for effects observed *in vivo*, and the metal ion’s oxidation state and biological interaction determine the toxicity.

Studies on the bioaccessibility of alloys, in particular, demonstrate the significance of their unique qualities. Hillwalker and Anderson (2014)<sup>1</sup>, for example, evaluated the bioaccessibility of sixteen elements in six alloys and concluded:

- “The large variability of bioaccessibility indicates the relevancy of assessing alloys as toxicologically distinct relative to individual metals.”
- “These results illustrate and support that alloy grades have unique chemical reactivity that is not adequately explained by their individual metal compositions.”
- “These results support testing alloy grades as unique from their metal components to avoid over- or under-estimating their health risk to humans.”

This background supports the use of a different hazard screening method on the HPD for metal alloys.

Note that full assessment of exposure and human health risks is well beyond the scope of this policy. This policy focuses on inherent hazards of metals. As discussed herein, this is complicated in itself. At this time the policy does not add exposure and risk to considerations for reporting in the HPD Open Standard.

### **3. Availability of an industry-specific inventory and classification system**

A significant contributor to the development of this policy is the availability of industry-specific classification and inventory systems that are broadly adopted within the metal alloys supply chain, and that support transparency.

The typical CAS RN numbering system used in the HPD often fails to provide detailed content inventory information when used for metal alloys. CAS RNs are often available for metal alloys, but they typically lack specificity. For example, #12597-68-1 is the main CAS RN used on HPDs for Stainless Steel. This CAS RN encompasses all of the hundreds of varieties of stainless steel without differentiation for content differences across different stainless steel alloys.

An alternative numbering system, the Unified Numbering System (UNS), is widely accepted in North America as a system designating alloy composition. UNS is managed jointly by the ASTM International and SAE International. UNS codes consist of a prefix letter and five digits designating a material composition. For example, a prefix of S indicates stainless steel alloys (UNS S13800 and UNS S20153, for example), and C indicates copper, brass, or bronze alloys. A UNS code provides a transparent and detailed content inventory of a metal alloy.

There are other alloy numbering systems, including CEN, used in Europe. These systems define alloy composition similar to UNS, and some trade associations<sup>2</sup> provide tools to align different systems.

<sup>1</sup> <https://www.sciencedirect.com/science/article/pii/S0269749113005265?via%3Dihub>

<sup>2</sup>See <https://www.kupferinstitut.de/en/tools/copperkey.html>, for example.



## EXPLANATION OF POLICY

### **Special Condition: Product HPD or Supplier HPD reports metal alloy, refers to a separate Supplier HPD for detail**

A manufacturer completing a Product HPD or Supplier HPD shall provide in the content inventory information about the specific metal alloy used in the product, using UNS or CEN classification systems.

In place of any additional content inventory or hazard screening information, a statement is provided indicating to the HPD user that the characteristics, including hazards, of the alloy are different from those of the individual alloying elements. The manufacturer also provides a link to a separate Supplier HPD that provides full inventory and hazard screening information of the alloy following typical HPD instructions. That Supplier HPD must refer to the requirements under Option 2 above (see “Key Requirements”) to report individual alloying elements per the CAS RN of those elements, and not using CAS RNs for metal alloys.

### **Third-Party Verification to Support “Authoritative” Metal Alloy HPDs**

The same metal alloys are used by many product manufacturers. Rather than each manufacturer repeating the same work to report a metal alloy, this policy is intended to support the production and use of “authoritative” Supplier HPDs for alloys. For example, a single authoritative Supplier HPD could be produced for Stainless Steel UNS S13800, and referenced by any manufacturer using that alloy.

HPDC encourages trade associations representing metal alloy manufacturers to create these authoritative Supplier HPDs, though any manufacturer or group of manufacturers can do so. HPDC strongly encourages [third-party verification](#) of these Supplier HPDs by checking the Supplier HPD against UNS (or similar) composition information. To be referenced by an HPD that seeks to be third-party verified, the Supplier HPD must also be third-party verified.

### **Role of Trade Associations**

To avoid redundant creation of metal alloy Supplier HPDs, HPDC encourages trade associations to step forward and offer these authoritative Supplier HPDs, or for manufacturers to collaborate to do so. (Please contact [support@hpd-collaborative.org](mailto:support@hpd-collaborative.org) for help on initiating this process.) HPDC can collaborate with trade associations who offer API access to their metal alloy formulations to automate the production of Supplier HPDs.

### **Note on Further Development of Metal Alloys Hazard Screening Methodology**

In time, HPDC anticipates that this policy will refer to a rigorous and widely available hazard assessment methodology for metal alloys in place of the typical hazard assessment process used by the HPD for individual substances. However, after reviewing the field, HPDC has not



found a methodology that is widely available and transparent enough for HPDC to require under this policy<sup>3</sup>.

A key obstacle to this is lack of regulatory driver. In most jurisdictions implementing the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), and under the Classification, Labelling, and Packaging (CLP) regulation in Europe, alloys are considered articles, not substances, so classifications are not required.

HPDC will continue to review developing methodologies as they become available and adopted, and may update this policy in the future to require their use.

HPDC also considered reporting of other data points in this policy that might provide useful context on possible hazards of alloys. A key data point in assessing hazards of metals is bioaccessibility/bioavailability. However, a metal with low bioaccessibility could also be highly toxic and receive a significant hazard classification. Therefore reporting on this data point without additional information may be misleading. Again, a full assessment methodology is needed.

#### **Note on GreenScreen Scores**

When in using this policy an alloy is reported as content in a Product HPD or Supplier HPD, the GreenScreen Benchmark or List Translator scores of the constituent alloying elements will also be considered GreenScreen scores of the product or ingredient as a whole. In other words, the GreenScreen scores of the alloy's constituents are a subset of the GreenScreen scores for the whole product or part being reported. These scores are not reported in full detail (although see the next paragraph for an exception) on the Product HPD or Supplier HPD, but neither are they combined or overwritten in any way. "See notes" shall be entered in place of the GreenScreen score. This policy is consistent with GreenScreen for Safer Chemicals v1.4, Section III: Assessing Products<sup>4</sup>.

For this reason these scores should be considered as part of the product for any relevant product-level calculations. An example of this are the required calculations for LEED v4/4.1, Material Ingredients credit Option 2. The score of an alloying constituent should also be considered for "Contents highest concern GreenScreen score" in Section 1 of the HPD.

This policy supports the highlighting of substances with GreenScreen Benchmark-1 (BM-1) and List Translator-1 (LT-1) scores as part of the Product HPD or Supplier HPD on which the alloy is being reported. This occurs in addition to the Supplier HPD providing a full listing of alloying

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<sup>3</sup> See MeClas (<http://www.meclas.eu>) and Cradle to Cradle (<http://www.c2ccertified.org>) for example methodologies.

<sup>4</sup> GreenScreen v1.4: <https://www.greenscreenchemicals.org/learn/guidance-and-method-documents-downloads>.



elements and all GreenScreen scores and potential hazards. The reporting of substances with these scores appears in a note on the alloy, “GreenScreen BM-1 and LT-1 alloying elements.”

### **Powdered Form of Metals**

Several common alloying elements have GreenScreen Benchmark-1 or LT-1 scores as the result of hazards specific to a powdered form of the alloying element. Powders are produced via highly specialized industrial processes, are not used to make alloys, nor are they generated from metal alloys under normal use and handling. In future versions of this Special Condition, HPDC may add a variation on the policy above (see “Note on GreenScreen Scores”) for these elements.

### **Note on Additional Listings**

The HPD Open Standard (version 2.3 onward) includes Section 2.2.2.11: Additional Listings, which is specified in further detail in [Best Practices for Additional Listings](#).

Additional Listings are non-hazard listings that are complementary to the hazard listings displayed on a HPD. Of particular relevance to metal alloys, Additional Listings include restricted lists that reference some common alloying elements.

With respect to alloying elements, this Special Condition will follow the policy of the organization responsible for the listing. For example, the Cradle to Cradle (C2C) Banned List references Mercury and flags it when it is used in an alloy. When Mercury (or another element falling under this policy) is included in an alloy, the C2C Banned List will be listed under Additional Listings for the alloy, as well as for that alloying element on the Supplier HPD. (See the mockup below, under Instructions, for how this would appear in a Product HPD.) A Listings Notes field will also appear to explain why the listing(s) appear for the alloy.

### **Harmonization**

This Special Condition has been harmonized with the following:

- Cradle to Cradle Certified: Specific alloy number is used to determine elemental composition. However, risks associated with the composition are considered in the C2C Material Health Methodology. Alloying elements on the C2C Banned List for Technical Nutrients are flagged under HPD’s Additional Listings policy.
- Declare: Declare allows a disclosing organization to use either the CAS RN for the metal (if available), an alloy number (without any preference to a numbering system) or the elemental composition. Declare does not give one reporting methodology preference over another. In this policy, both methodologies are supported.
- BIFMA level: Per BIFMA e3\_2019: “Chemical substances of metal alloys can be based on generic composition defined by appropriate standards organizations.”
- Prop 65: Prop 65 itself does not contain language specific to the reporting of alloys and/or their elemental make-up. However, the California Office of Environmental Health Hazard Assessment (OEHHA) has provided relevant rulings. For instance, Nickel is listed



on Prop 65. However in a [2004 ruling](#), OEHHA noted, “nickel alloys are distinct from nickel compounds, and are not included in the Proposition 65 listing of *nickel compounds*.”

## INSTRUCTIONS

Special Conditions instructions for specific data fields follow; ***if there are no Special Conditions instructions for a data field, the requirements of the HPD Open Standard should be followed.*** If the HPD Open Standard and Special Conditions instructions are followed, the HPD will not be barred from qualifying for the LEED v4/4.1 Material Disclosure and Optimization, Material Ingredients credit.

\*Data field auto-fills if using HPD Online Builder

HPD Data Field	Special Condition Requirements
<b>SECTION 1: SUMMARY</b>	
Content in Descending Order of Quantity*	<ul style="list-style-type: none"> <li>• Metal alloy content is listed by the alloy name and classification, e.g. “Stainless Steel UNS S13800,” as instructed in Section 2.</li> </ul>
Characterized Screened Identified*	<ul style="list-style-type: none"> <li>• “Yes” should be checked if all Standard requirements are met.</li> </ul>
Inventory and Screening Notes*	<ul style="list-style-type: none"> <li>• Include the following notes:               <ul style="list-style-type: none"> <li>○ “Special Conditions applied: [MetalAlloy].”</li> </ul> </li> </ul>
<b>SECTION 2: CONTENT IN DESCENDING ORDER OF QUANTITY</b>	
<b>Materials</b> – instructions apply only to Nested Materials Inventory format	
Material Name (top level in Nested inventory)	Name the Material in which the alloy is the content. For example, enter “Aluminum Extrusion.” Within this Material, nest the specific aluminum alloy that was used (see below for this procedure), along with any additional ingredients such as coatings that are part of that Material (using the typical HPD instructions). If the alloy is the only content in this Nested Material, simply follow the procedure below to list the alloy content.



<p>Residuals and Impurities Notes</p>	<p>Instructions are applicable if marking “Yes” for considering residuals and impurities for this Material or Product.</p> <ul style="list-style-type: none"> <li>• Enter “Defined by UNS” if you are reporting a material with a UNS designation, or “Defined by CEN,” etc., depending on the classification system you are using.</li> <li>• If you have a Certificate of Analysis from the Supplier, enter a functional URL to that certificate, e.g., a link posted on your website.</li> </ul>												
<p><b>Content</b> – instructions apply to both Nested Materials and Basic Inventory formats. Enter the alloy content as a Material, not a Substance, using the following data fields. These fields are customized to this Special Condition guidance. Fields unique to this Special Condition are marked below with a double asterisk**. This mockup shows a typical result of the following instructions:</p> <p><b>Aluminum Alloy UNS A93105</b> <span style="float: right;">ID: <b>UNS A93105</b></span></p> <table border="0" style="width: 100%;"> <tr> <td>HAZARD DATA SOURCE: <b>Pharos Chemical and Material Library</b></td> <td>HAZARD SCREENING DATE: <b>2019-08-08</b></td> </tr> <tr> <td>%: <b>10.0000–12.0000</b> GREENSCREEN: <b>See notes</b> RC: <b>None</b></td> <td>NANO: <b>No</b>      ROLE: <b>Structure component</b></td> </tr> <tr> <td>HAZARD TYPE</td> <td>AGENCY AND LIST TITLES</td> </tr> <tr> <td style="text-align: center;">Not required under this Special Condition</td> <td>WARNINGS</td> </tr> <tr> <td>ADDITIONAL LISTINGS</td> <td>AGENCY AND LIST TITLES</td> </tr> <tr> <td>RESTRICTED LIST</td> <td>Cradle to Cradle Products Innovation Institute (C2CPII) Cradle to Cradle Certified v3.1 Banned List – Technical Nutrients</td> </tr> </table> <p>METAL ALLOY HPD: See alloy HPD for alloying element content inventory, GreenScreen scores, and hazards: [<a href="#">link to HPD in HPD Public Repository</a>]</p> <p>METAL ALLOY NOTES: In compliance with HPDC Special Conditions Policy for Metal Alloys, the listed alloy is considered the ingredient in this product, and is reported without information regarding its alloying elements. Metal alloys have different intrinsic characteristics, including health and environmental hazards, than their alloying elements. For reference, an alloy HPD with alloying element content inventory, their GreenScreen scores, and hazards is available at the link above.</p> <p>GREENSCREEN BM-1 &amp; LT-1 ALLOYING ELEMENTS: Chromium VI (LT-1)</p> <p>LISTINGS NOTES: The C2C Banned List is included above due to presence of the following alloying element(s): Chromium VI.</p> <p>MATERIAL NOTES:</p>		HAZARD DATA SOURCE: <b>Pharos Chemical and Material Library</b>	HAZARD SCREENING DATE: <b>2019-08-08</b>	%: <b>10.0000–12.0000</b> GREENSCREEN: <b>See notes</b> RC: <b>None</b>	NANO: <b>No</b> ROLE: <b>Structure component</b>	HAZARD TYPE	AGENCY AND LIST TITLES	Not required under this Special Condition	WARNINGS	ADDITIONAL LISTINGS	AGENCY AND LIST TITLES	RESTRICTED LIST	Cradle to Cradle Products Innovation Institute (C2CPII) Cradle to Cradle Certified v3.1 Banned List – Technical Nutrients
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ADDITIONAL LISTINGS	AGENCY AND LIST TITLES												
RESTRICTED LIST	Cradle to Cradle Products Innovation Institute (C2CPII) Cradle to Cradle Certified v3.1 Banned List – Technical Nutrients												
<p>Material Name</p>	<p>Enter a name for the metal alloy. This should include the generic alloy type, e.g. “Aluminum Alloy,” as well as the code, e.g. “UNS A02010,” even if this is redundant with Identifier. For example, use “Aluminum Alloy UNS A02010,” not simply “Aluminum Alloy.”</p>												
<p>ID (Identifier):</p>	<p>Enter a specific identifier, including the system in which the identifier appears. Either a UNS or EN identifier is required. For example:</p> <ul style="list-style-type: none"> <li>• UNS S13800</li> <li>• EN CC754S</li> </ul> <p>Note: As discussed earlier in this document, the UNS system is jointly published by SAE and ASTM. While ASTM product standards may reference UNS numbers, ASTM codes are not appropriate entries here.</p>												



Hazard Data Source*	Enter source of hazard screening data for the content in the Supplier HPD for the alloy, e.g., Pharos Chemical and Materials Library
GreenScreen*	Enter "See notes"
Material Role	Select an appropriate role, such as Hardware Component, or Structure Component.
Hazards and Agency(ies) with Warnings*	Enter "Not required under this Special Condition."
Metal Alloy HPD**	Enter a URL linking directly to a complete, published Supplier HPD that provides a full content inventory and hazard screen of the metal alloy. See the "Background" section of this document for more information on this HPD. This Supplier HPD must list all individual alloying elements by CAS RN, and avoid CAS RNs for metal alloys.
Metal Alloy Notes**	Enter the following statement:  In compliance with HPDC Special Conditions Policy for Metal Alloys, the listed alloy is considered the ingredient in this product, and is reported without information regarding its alloying elements. Metal alloys have different intrinsic characteristics, including health and environmental hazards, than their alloying elements. An alloy HPD with alloying element content inventory, their GreenScreen scores, and hazards is available at the link above.
GreenScreen BM-1 & LT-1 Alloying Elements**	Enter any alloying elements or residuals included in the referenced Supplier HPD that have GreenScreen scores of either BM-1 or LT-1. Enter the score in parentheses.
Listings Notes**	If Additional Listings appear for the alloy, enter an explanation of why, i.e., which alloying element(s) are prompting the listing. For example, "The C2C Banned List is included above due to presence of the following alloying element(s): Chromium VI."
Material Notes	There are no specific requirements for this field under this Special Condition. Enter any optional or required notes per the requirements of the HPD Open Standard, section 2.2.3.12 Material Notes.



<b>SECTION 3: CERTIFICATIONS AND COMPLIANCE</b>
No changes to requirements for Special Conditions
<b>SECTION 4: ACCESSORIES</b>
No changes to requirements for Special Conditions
<b>SECTION 5: GENERAL NOTES</b>
No changes to requirements for Special Conditions
<b>SECTION 6: REFERENCES</b>
No changes to requirements for Special Conditions