LEED v4 MR credit Building Disclosure and Optimization - Material Ingredients Option 3 Implementation Guidance

Developed by the Supply Chain Optimization Working Group

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CONTENTS

1 Summary

This guidance proposes building on programs that many companies already have in place, specifically environmental management systems (EMS) such as ISO 14001 and health and safety management systems such as OHSAS 18000, to meet and document compliance with Option 3. To comply with this option, the building product manufacturer (BPM), and any company that supplies it with ingredients or components that are significant health hazards, must have a robust program for continual improvement in environmental management and health & safety management.

The minimum requirements for meeting Option 3 are listed in summary form here, and in more detail in Section 2. There are additional options for recognizing enhanced achievement beyond these minimum requirements; these are described in Section 3.

Step 1: Guiding Principles. The building product manufacturer publishes a publicly available set of guiding principles for the optimization of ingredients and products in their supply chain with an emphasis on human and environmental health. The principles include, at a minimum, the following:

a. a commitment toward continual improvement within their supply chain;
b. a commitment toward greater communication and transfer of information within their supply chain and with their industry partners; and
c. a commitment to applying the principles of green chemistry and principles of green engineering.

Step 2: Inventory. The building product manufacturer identifies the ingredients or constituents within all components and/or products purchased to a minimum of the 99% level by mass.

Step 3: Hazard Screen. The building product manufacturer screens all those ingredients against a specific set of criteria from the Globally Harmonized System (GHS) for Chemicals.

Step 4: Environmental & Health Program. The building product manufacturer ensures that its own handling of all hazard-flagged ingredients is covered by its environmental and health & safety management systems. (To ensure conformance with the credit language specific minimum requirements for those systems are detailed in Section 2.)

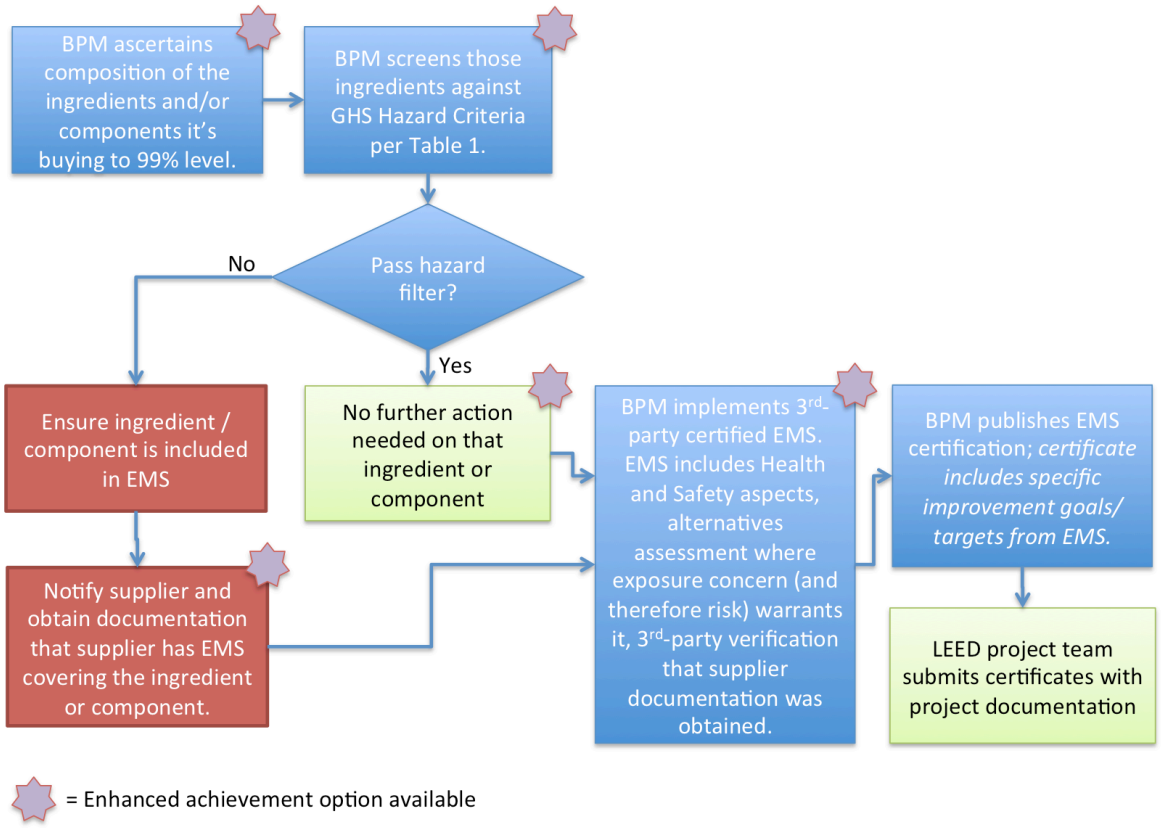
Step 5: Supplier Engagement. The building product manufacturer notifies its suppliers of any hazard-flagged ingredients, and obtains documentation from those suppliers that they have environmental and health & safety management systems in place covering those ingredients. Supplier systems can be either self-declared or third-party verified.

Step 6: Verification. The building product manufacturer obtains third-party verification of its environmental and health & safety management systems. This would typically be done as an extension of pre-existing auditing processes, and must confirm that the steps listed here are completed, including a review of documentation from the suppliers about their programs. If there are no hazard-flagged ingredients, then the fact that the Hazard Screen was completed is the only specific element required beyond basic conformance with the environmental and health & safety practices described in Section 2.4 parts 1-3.

Step 7: Customer Communication. The building product manufacturer provides a certificate verifying its Option 3-conforming program to anyone seeking to specify or purchase its product for a LEED project. The certificate must include a brief summary of the manufacturer's continual improvement goals and objectives specific to that product or product line.

Step 8: LEED Project Submission. The LEED project team submits product manufacturer's certification with its LEED application as evidence that the products or materials purchased contribute to the 25% by cost threshold for Options 2 & 3 in the credit.

Figure 1. Summary of hazard screen process flow in Option 3



2 Further Explanation: Supply Chain Optimization

This guidance proposes building on programs that many companies already have in place, specifically environmental management systems such as ISO 14001 and health and safety management systems such as OHSAS 18000, to meet and document compliance with Option 3. Specific industry programs that are consistent with ISO 14001:2004 include:

- RC14001:2013 Responsible Care
- ChemStewards Integrated Management System-2011

2.1 Step 1: Guiding Principles

The building product manufacturer publishes a publicly available set of guiding principles for the optimization of ingredients and products in their supply chain with an emphasis on human and environmental health. The principles include, at a minimum, the following:

a. a commitment toward continual improvement within their supply chain;

b. a commitment toward greater communication and transfer of information within their supply chain and with their industry partners; and
c. a commitment to applying the principles of green chemistry and principles of green engineering

These principles should be endorsed by top management and referenced in documentation relating to Option 3 conformance.

2.2 Step 2: Inventory

The manufacturer of permanently installed building products determines the composition of the ingredients and components it's buying to at least the 99% level by mass; no more than 1% of the contents can remain undetermined. If a supplier chooses to withhold the chemical identity of materials defined as trade secret or intellectual property, they may instead communicate the functional role, percent by mass and GHS hazard classification of each ingredient via Safety Data Sheet and/or supplier's documentation on company letterhead, signed by a company official. In the case of mixtures, each ingredient in the mixture must be documented. The manufacturer will typically obtain this information from its first-tier suppliers, although if those suppliers provide manufactured components it may be necessary to reach further back into the supply chain to obtain content information to the 99% level.

2.3 Step 3: Hazard Screen

All documented ingredients representing at least 99% by mass of the final product shall be screened for human health and environmental hazard characteristics according to the most current available criteria of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). For each product, any ingredient that is flagged against the hazard criteria identified in Table 1 shall be included in the building product manufacturer's environmental and health & safety management systems (section 2.4) and supplier engagement (section 2.5).

If an ingredient has a data gap, it is considered to not pass the initial hazard screen. A "data gap" for this purpose is a hazard and endpoint combination for which exposure is possible but data/information are not available to assess the hazard. If the 99% of ingredients to be screened includes recycled content, the building product manufacturer shall document its best management practices to characterize the sources of pre- and post-consumer recycled material and reduce or eliminate hazards associated with these materials.

Table 1. GHS Hazard Criteria by Endpoint for Option 3 Screening

Endpoint	Minimum Requirements Hazard Criteria	Enhanced Achievement Hazard Criteria
Carcinogenicity (C)	Category 1 (1A, 1B)	Category 2
Mutagenicity & Genotoxicity (M)	Category 1 (1A, 1B)	Category 2
Reproductive Toxicity (R)	Category 1 (1A, 1B)	Category 2
Acute Mammalian Toxicity (AT) (oral, dermal, and inhalation routes)	Category 1,2,3	-
Systemic Toxicity & Organ Effects (ST-single exposure)	Category 1	-
Skin Irritation (IrS)	Category 1 (1A, 1B, 1C)	Category 2

Endpoint	Minimum Requirements Hazard Criteria	Enhanced Achievement Hazard Criteria
Eye Irritation (IrE)	Category 1 or 2A	-
Aspiration Hazard	Category 1	-
Systemic Toxicity & Organ Effects* Repeated Exposure sub-endpoint (ST-repeat)	Category 1	Category 2
Skin Sensitization (SnS)	Category 1A	-
Respiratory Sensitization (SnR)	Category 1A	-
Acute hazards to the aquatic environment	Category 1 or 2 (note 1a)	-
Chronic hazards to the aquatic environment	Category 1 or 2 (note 1b)	-

Notes to Table 1:

Note 1: For the purposes of this option, USGBC has mapped the GHS Hazard Categorizations to low, moderate, high, and very high. Persistence and bioaccumulation characteristics are factored into the aquatic environment hazards endpoints. As an alternative, if GHS categorizations for the aquatic endpoints are not available and specific empirical science is also not available, then the online PBT Profiler can be used to determine if the substance falls within the associated GHS categories:

Note 1a: If the fish chronic value (ChV) in the PBT Profiler (or more appropriate metric, as approved by the auditor) is less than 10 mg/L the substance is screened as having a Category 1 or 2 Acute Hazard GHS classification.

Note 1b: If the fish chronic value (ChV) in the PBT Profiler is less than 0.1 mg/L the substance is screened as having a Category 1 or 2 Chronic Hazard GHS classification.

Note 2: In general, this table establishes GHS Category criteria for each endpoint so that chemicals with only "low" or "moderate" hazard classifications for each endpoint pass the rapid hazard screening criteria. The exception is skin irritation, where chemicals characterized as GHS Category 2 (defined as "skin irritation, reversible adverse effects in dermal tissue") will pass through the screen at the base level of achievement.

Note 3: For Enhanced Achievement in the Rapid Hazard Screen, in addition to the Base Level of Achievement, the inclusion of GHS Category 2 for the Carcinogenicity, Mutagenicity, and Reproductive Toxicity ("CMR"), and Systemic Toxicity & Organ Effects Repeated Exposure sub-endpoint (ST-repeat) *endpoints allows only chemicals with a "low" hazard condition to pass through the screen. Under GHS language, GHS Category 2 chemicals in one or more CMR endpoints show evidence of having the specific hazard characteristic to be "suspected" of being carcinogenic, etc. This is in contrast to chemicals that are GHS Category 1A or 1B for one or more of the CMR endpoints, which indicate higher hazard evidence that the chemical is a "known" or "presumed" carcinogen, etc.*

Similarly, the Enhanced Achievement Criteria adds GHS Category 2 for Skin Irritation as a trigger for further action in addition to CMR endpoints. To receive Enhanced Achievement Credit via the Rapid Hazard Screen, only chemicals showing evidence of moderate or low hazard for Skin Irritation (GHS Category 3) will pass the Enhanced Achievement Rapid Hazard Screening Criteria.

2.4 Step 4: Environmental and Health & Safety Management Systems

Building Product Manufacturers shall have programs for environmental and health & safety management that includes all the essential elements listed below and covers the facility where the building products in question are manufactured. This step describes an environmental management system as the

framework, with health and safety criteria added, but the systems can be combined differently as long as they contain the same elements.

Essential elements of a environmental management system include:

1. Publicly available policy statement signed by top management that describes the company's commitment and what the EMS is intended to achieve.
2. Written Plan for continual improvement based on a list of existing and potential environmental aspects and impacts. The plan must include:
    a. Targets and goals addressing all significant environmental aspects on list.
    b. Monitoring and measurement of key elements in the operation that have relevant impacts.
    c. Documented activities implementing the plan.
    d. Internal evaluation, corrective action and audits of conformance to plan.
    e. Communication to top management about results of audits.

For the purposes of documenting conformance with Option 3, the building product manufacturer's environmental and health & safety management systems, either separately or combined into one, must meet all of these requirements:

3. The management system policy and plan shall include chemical safety & health as objectives with specific targets and goals in the plan. As a general framework, the plan should seek to, on a continual improvement basis,
    a. eliminate the use of hazardous ingredients,
    b. minimize the use of hazardous ingredients where elimination is not possible,
    c. transition to more effective control measures where hazardous ingredients remain, and
    d. manage those remaining hazardous ingredients responsibly with a goal of zero exposure and discharge to humans and the environment.
4. The management system shall require identification of at least 99% by mass of the ingredients in building product(s) made at the facility covered by the management system, and collection of information from suppliers about associated hazards of chemical ingredients, including all relevant endpoints listed in Table 1. Safety data sheets can meet this information requirement if they include all the endpoints relevant to the ingredient. The management system shall also require screening of ingredients using GHS criteria (see Sections 2.2 and 2.3, above).
5. The building product manufacturer shall share hazardous characteristics for each ingredient that fails the hazard screen with customers to inform their appropriate handling, installation, and management of the product, and with suppliers as an input to their management system prioritization.
6. The management system shall have a continual improvement plan to evaluate and eliminate or reduce chemical hazards and exposure to the ingredients in the final building products as well as chemical hazards and exposures during the manufacturing processes.
    a. For optimization purposes established frameworks that contain steps for the comparative or alternatives assessment that meet the intent of this requirement are listed below, but others can also be used as long as they are known as acceptable equivalents. Frameworks that factor in broader environmental impacts such as climate change and resource extraction impacts are encouraged but not required.
        i. National Academy of Sciences (National Research Council) Alternatives Assessment Framework
        ii. BizNGO Chemical Alternatives Assessment Protocol
        iii. Interstate Chemicals Clearinghouse Alternatives Assessment Guide

2.5 Step 5: Supplier Engagement

The building product manufacturer notifies its immediate (first-tier) suppliers of any chemical ingredient or component flagged in the hazard screen. Suppliers of those ingredients or components must have systems for environmental and health & safety management as described in Section 2.4, items 1–3.

The supplier provides documentation of its management system(s) to the building product manufacturer. This documentation can be third party verification or a self-declaration stating that processes are place for the ingredients and/or components supplied. Any self-declaration must be accompanied by supporting documentation, which must be reviewed as part of the third-party verification of the building product manufacturer's environmental and health & safety management systems.

2.6 Step 6: Verification

The building product manufacturer obtains third-party verification of its environmental and health & safety management systems. This would typically be completed as an extension of pre-existing auditing processes, confirming that the steps listed above are completed, including a review of documentation from the suppliers about their corresponding programs. Audits to be repeated at least every three years.

If no ingredients are Hazard-flagged, then the fact that the Hazard Screen was completed is the only specific element required beyond basic conformance with the environmental and health & safety practices described in Section 2.4 parts 1-3. Procedures for building product manufacturer's assessment of ingredient hazards must be disclosed to the auditor.

2.7 Step 7: Customer Communication

The building product manufacturer provides a certificate verifying its Option 3-conforming program to anyone seeking to specify or purchase its product for a LEED project. The certificate must include a brief summary of the manufacturer's continual improvement goals and objectives specific to that product or product line.

2.8 Step 8: LEED Project Submission

Project teams specify and install products that have verified processes in place for assessing and improving the health impact of the product along the supply chain. The team must obtain third party-verification that the building product manufacturer has processes in place for the specific product, as defined in Section 2.6 above. The LEED project team submits that certification with its LEED application as evidence that the products or materials purchased contribute to the 25% by cost threshold for Options 2 & 3 in the credit.

3 Enhanced Achievement Options

In addition to the minimum requirements described in Section 2, building product manufacturers have the option of pursuing more advanced supply chain optimization measures, which can help their products contribute more value towards earning the LEED point, as described in Section 4, Calculations.

3.1 Additional ingredient inventory

Instead of identifying ingredients to the 99% level, the building product manufacturers identifies and includes in the screening (and, if appropriate, additional requirements) all ingredients to the 99.9% level (1,000 ppm).

3.2 Additional hazard screening

Use GHS Category 2 criteria for hazard screening for carcinogens, mutagens, reproductive toxicants, skin irritants, and Systemic Toxicity & Organ Effects Repeated Exposure sub-endpoint (ST-repeat) for

determining which ingredients are subject to management, reporting, and optimization (the basic requirement stops at GHS Category 1 for these endpoints). See Table 1.

3.3 Supplier documentation for all ingredients

To address hazardous substances that do not persist into ingredients comprising the end product, the building product manufacturer shall require either self-declared or third-party validated environmental management and health & safety management systems as described in the requirements in Section 4 for ALL ingredients up to the 99% threshold, not just those that fail the initial Hazard Screen. If the building product manufacturer is also seeking extra credit in the Supply Chain Depth factor, this would also apply to all ingredients at the additional tier or tiers.

3.4 Green Chemistry Optimization

The building product manufacturer takes actions to design and improve chemical ingredients within their supply chain. To demonstrate compliance, building product manufacturer must:

- Take at least one supply chain ingredient that triggered a Hazard Criteria in Table 1 and conduct a comparative assessment on that ingredient.
- Based on the comparative hazard assessment, the building product manufacturer must substitute or eliminate (e.g. product design change or process change) that ingredient.
- Where substitution occurs, manufacturer shall take action based on that alternatives assessment such that the hazard is no longer flagged at the Enhanced Achievement hazard Criteria level (table 1) in place of the original ingredient.
- After substitution or elimination, safety and stewardship information about the chemical ingredient is publicly available for all points along the supply chain.

Ingredients that are substituted must have been incorporated within 3 years of the alternative assessment date, and the ingredient being replaced must have been present in the product manufacturing processes no more than 6 years prior to the alternatives assessment and a subject of said alternatives assessment (e.g., the alternatives assessment was intended for the ingredient).

3.5 Enterprise-wide application of the EMS

The building product manufacturer has met the Option 3 minimum requirements for the entire business unit or company.

3.6 Extension of supplier engagement to Tier 2

All Tier 2 suppliers have documented environmental and health & safety management systems as described for Tier 1 suppliers. Building product manufacturer must procure third party verification or self-declaration with documentation that all first and second tier suppliers have those systems in place for the material they are supplying.

3.7 Extension of supplier engagement to source

All suppliers in the supply chain of the product have documented processes in place as described for Tier 1 suppliers. Building product manufacturer must procure third party verification or self-declaration with documentation that all suppliers have processes in place for the material they are supplying.

4 Calculations

Products that meet the requirements of Option 3, as outlined below, contribute toward earning LEED credit at 100% of the product cost. To encourage actions beyond those minimum requirements, additional credit can be earned in a number of ways.

Equation 1.

$$\text{\% of materials cost} = \frac{\{\text{product cost}_1\ (\text{criterion val. factor})(\text{supply chain depth factor})(\text{location val. factor})\} + \{\text{product cost}_2\ (\text{criterion val. factor})(\text{supply chain depth factor})(\text{location val. factor})\} + \ldots}{\text{Cost of all permanently installed products}} \text{X100}$$

Criteria valuation factor = multiplier assigned to number of enhanced achievement measures

- 100% value (by cost) where the minimum requirements are met.
- 150% value (by cost) where the minimum requirements plus:
    a. Inventory and screening performed to 99.9% level (section 3.1)
    OR
    b. Use GHS Category 2 criteria for hazard screening for carcinogens, mutagens, reproductive toxicants, and skin irritants for determining which ingredients are subject to management, reporting, and optimization (the basic requirement stops at GHS Category 1 for these endpoints). See Table 1. (section 3.2)
    OR
    c. The building product manufacturer shall require either self-declared or third-party validated environmental management and health & safety management systems as described in the requirements in Section 4 for ALL ingredients up to the 99% threshold, not just those that fail the initial hazard screen. If the building product manufacturer is also seeking extra credit in the Supply Chain Depth factor, this would also apply to all ingredients at the additional tier or tiers. (section 3.3)
    d. The building product manufacturer shall document substitution or elimination of at least one ingredient that was flagged in the hazard screening process. Where substitution occurs, manufacturer shall take action based on that alternatives assessment such that the hazard is no longer flagged at the Enhanced Achievement hazard Criteria level (table 1) in place of the original ingredient. (section 3.4)
- 200% value (by cost) where the minimum requirements are met plus any two of the four above options.

Supply chain depth factor = multiplier assigned to level of supply chain engagement

- 100% value (by cost) where the minimum requirements are met.
- 150% value (by cost) where the minimum requirements plus one of these two:
    a. The building product manufacturer has met the Option 3 minimum requirements for the entire business unit or company. (section 3.5)
    OR
    b. All tier 2 suppliers have documented processes in place as described for tier 1 suppliers. This multiplier is not available to products with only tier 1 suppliers in their supply chain. (section 3.6)
- 200% value (by cost) where the minimum requirements plus:
    All suppliers in the supply chain of the product have documented processes in place as described for tier 1 suppliers. This multiplier is not available to products with only tier 1 and tier 2 suppliers in their supply chain. (section 3.7)

5 Definitions

Building product manufacturer: Any company making an article for incorporation into the project that would arrive at the job site.

Business unit: A logical segment of a company that represents a specific operational function or production of a product type. Also called department, division, or a functional area.

Component: Uniquely identifiable input, part, element, piece, assembly or subassembly, system or subsystem, that (1) is required to complete or finish an activity, item, or job, (2) performs a distinctive and necessary function in the operation of a system, or (3) is intended to be included as a part of a finished, packaged, and labeled product. Components are usually removable in one piece and are considered indivisible for a particular purpose or use. Commonly, items of very small or insignificant cost are not considered components.

Facility: one or more buildings or locations, or part of a building, that it is clearly delineated in the EMS and includes all process associated with the relevant building product (in the case of a Building Product Manufacturer) or ingredient or component (in the case of a supplier to the building product manufacturer).

First-tier supplier: Any company providing components or ingredients directly to a building product manufacturer.

Green chemistry: The design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances (Anastas, P. T. and Warner, J. C. Green Chemistry: Theory and Practice. Oxford University Press: New York, 1998, p. 30).

Green engineering: The development and commercialization of industrial processes that are economically feasible and reduce the risk to human health and the environment (Anastas, P.T., and Zimmerman, J.B., "Design through the Twelve Principles of Green Engineering", Env. Sci. Tech. 2003, 37(5), 94A-101A).

Ingredient: A substance or single constituent used to make a compound, mixture, or finished product. Ingredients can be active (help directly in achieving a performance objective(s)) or inert (facilitate acceptance, application, stability, handling or marketing of the product, or delivery of the active ingredients).

Optimization: Developing a product or process with the highest achievable combination of functional performance, cost, and positive social, environmental, and health impacts by maximizing desired factors and minimizing undesired ones. For the purposes of LEED's Material Ingredients credit "optimization" implies giving human and environmental health higher priority among the multiple factors than is typically the case.

Upstream supplier: Any company or business unit providing ingredients to another supplier in the supply chain that ultimately leads to the building product manufacturer.

6 Referenced Standards

ChemStewards Integrated Management System
http://www.socma.com/chemStewards/?subsec=478

GHS: Globally Harmonized System. A Guide to the Globally Harmonized System of Classification and Labelling, also known as the 'Purple Book"; most current version
https://www.osha.gov/dsg/hazcom/ghs.html

ISO 14001:2004 Environmental Management Systems
http://www.iso.org/iso/home/standards/management-standards/iso14000.htm or most current version

OHSAS 18001:2007
http://www.ohsas-18001-occupational-health-and-safety.com or most current version

Responsible Care RC-14001 program
http://responsiblecare.americanchemistry.com/

7 Credit Language Cross Reference Table

Credit Language	Steps	EMS (TBD by pilot) ISO 14001:2004
Use building products for at least 25%, by cost, of the total value of permanently installed products in the project that:	2.6 Step 6: Verification and 2.8 Step 8: LEED Product Submission	
Are sourced from product manufacturers who engage in validated and robust safety, health, hazard, and risk programs which at a minimum document at least 99% (by weight) of the ingredients used to make the building product or building material, and	2.1 Step 1: Guiding Principles and 2.2 Step 2: Inventory and 2.4 Step 4: Environment and Health & Safety Program	Covers EMS. Health and safety needs to be added. Section 4.3.1 covers environmental impacts of products and might cover chemicals if included in the organization's EMS. Section 4.3.2 requires that applicable legal requirements are addressed when developing the EMS
Are sourced from product manufacturers with independent third party verification of their supply chain that at a minimum verifies:	2.6 Step 6: Verification	ISO extends the EMS to the organization's contract (toll) manufacturers and other performing tasks on behalf of the organization (Sec 4.4.2)
Processes are in place to communicate and transparently prioritize chemical ingredients along the supply chain according to available hazard, exposure and use information to identify those that require more detailed evaluation	2.2 Step 2: Inventory and 2.3 Step 3: Hazard Screen	If identified as a significant environmental aspect, could be part of operational control procedure per 4.4.6 Organizations handling chemicals could include human health and safety considerations in its definition of environmental aspects and impacts in Section 4.3.1
Processes are in place to identify, document, and communicate information on health, safety and environmental characteristics of	2.4 Step 4: Environment and Health & Safety Program and 2.5 Step 5: Supplier Engagement	

Credit Language	Steps	EMS (TBD by pilot) ISO 14001:2004
chemical ingredients		
Processes are in place to implement measures to manage the health, safety and environmental hazard and risk of chemical ingredients	2.4 Step 4: Environment and Health & Safety Program	Section 4.4.6 Operational Control asks for the organization to identify operations with significant environmental aspects. Section 4.5 and its subsections specifically address monitoring and measurement. While the specific language is on regular monitoring and measuring significant environmental impact, organization can monitory safety/health as well if there is an impact to humans.
Processes are in place to optimize health, safety and environmental impacts when designing and improving chemical ingredients	2.3 Step 3: Hazard Screen and 2.4 Step 4: Environment and Health & Safety Program	Section 4.3.1 (Environmental Aspects) asks organizations to implement procedures to identify the environmental aspects of activities, products, and services within the scope of the organization's EMS, which includes new and modified products. Section 4.5.3 Nonconformity deals with correcting and mitigating environmental impacts; Health and safety impacts could be included in EMS plan depending on how organization defines environmental impacts.
Processes are in place to communicate, receive and evaluate chemical ingredient safety and stewardship information along the supply chain	2.5 Step 5: Supplier Engagement and 2.7 Step 7: Customer Communication	Environmental but not necessarily H&S; Section 4.4.5 covers document control and management; Section 4.4.3 covers procedures for the receipt of documents and internal communication of environmental aspects and management. Section 4.4.2 covers competence and training on environmental aspects and actual or potential impacts

Credit Language	Steps	EMS (TBD by pilot) ISO 14001:2004
		associated with their work. This could cover health and safety depending on how the organization defines environmental impacts.
Safety and stewardship information about the chemical ingredients is publicly available from all points along the supply chain	2.7 Step 7: Customer Communication	