

# ENVIRONMENTAL CRITERIA FOR DETERMINATION OF FORMALDEHYDE EMISSIONS OF COMPOSITE WOOD PRODUCTS

## EC108

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## PREFACE

ICC-ES issues Environmental Criteria (ECs) to provide interested parties with information on the requirements for obtaining an ICC-ES Verification of Attributes Report (VAR). An ICC-ES VAR provides independent verification of a manufacturer's environmental claims and product attributes. ECs address the production stage of the report subject, beginning with raw material acquisition through final manufacturing and packaging, and may also include information on projections for installation, use, reuse, and end-of-life, where specifically stated therein. This EC is effective as of the date referenced above and may be amended from time to time.

All VARs must comply with the applicable EC in effect on the date of issuance or reissuance of the report. Any technical changes to the EC will be marked within the EC. A solid vertical line (|) shall be placed in the margin within the EC to indicate a change, addition, or deletion from the previous edition. A deletion indicator (➔) shall be placed in the margin where wording has been deleted.

ICC-ES may consider alternate approaches to those contained in this EC, provided the applicant submits valid data demonstrating that the alternate approach is at least equivalent to the requirements set forth in this EC, subject to approval by ICC-ES staff. Notwithstanding that a product, material, or type or method of construction meets the requirements set forth in this EC, or that it can be demonstrated that valid alternate ECs are equivalent to the requirements in this document, ICC-ES retains the right to refuse to issue or renew a VAR, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

This EC is limited to the scope statement in Section 1.2 and is not intended to construe a comprehensive environmental claim where considerations are given to other environmental trade-offs, impacts or full life cycle assessment.

*Environmental Criteria are developed for use solely by ICC-ES for purpose of issuing ICC-ES VARs.*

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# ENVIRONMENTAL CRITERIA FOR DETERMINATION OF FORMALDEHYDE EMISSIONS OF COMPOSITE WOOD PRODUCTS (EC108)

## 1.0 INTRODUCTION

**1.1 Purpose:** This document provides a procedure for determination of the level of *formaldehyde* emissions in *composite wood products*, for evaluation in an ICC-ES Sustainable Attributes Verification and Evaluation, Verification of Attributes Report (VAR).

**1.2 Scope:** Reports issued under this Environmental Criteria (EC) address raw material acquisition and production stages. Life cycle assessment considerations are outside the scope of this EC. Report users are responsible for determining compliance with applicable codes, standards and environmental regulations.

**1.3 Applicability:** *Formaldehyde* emissions of *composite wood products* shall be based on the criteria in the following:

**1.3.1** 2021 and 2018 IgCC Section 801.4.2.4 (2015 and 2012 IgCC Section 806.1)

**1.3.2** 2022 CALGreen Sections 4.504.5, 5.504.4.5, A4.504.1 and A5.504.4.5.1

**1.3.3** ICC 700-2020, ICC 700-2015 and ICC 700-2012 Section 901.4 and 901.5 (ICC 700-2008 Sections 901.4 and 901.10)

**1.3.4** ASHRAE Standard 189.1 Section 8.4.2.4

**1.3.5** LEED 2009 Credit IEQ4.4 (Note: The *formaldehyde* provisions are applicable to particleboard, medium-density fiberboard, plywood, wheatboard, strawboard, panel substrates and door cores only that are located inside the weatherproofing system of the building)

**1.3.6** LEED 2009 Homes Credit MR2.2 (Note: The *formaldehyde* provisions are applicable to particleboard, medium-density fiberboard, plywood, wheatboard, strawboard, panel substrates and door cores only.)

**1.3.7** LEED 2019 (v4) for Building Design and Construction EQ Credit: Low-Emitting Materials

**1.3.8** LEED 2018 (v4) for Building Operations and Maintenance MR Credit: Purchasing- Facility Maintenance and Renovation

**1.3.9** LEED 2019 (v4) for Homes Design and Construction EQ Credit: Low-Emitting Products

**1.3.10** LEED 2019 (v4) for Interior Design and Construction EQ Credit: Low-Emitting Materials

**Exception:** Wood products, which include engineered wood products, that are exempted from the definition of *composite wood products* (Section 1.5.1) are exempt from the *formaldehyde* emission requirements as noted in:

- CALGreen Sections 4.504.5 and 5.504.4.5
- ICC 700 Section 901.4(1)
- ASHRAE 189.1 Section 8.4.2.4.

### 1.4 Referenced Documents:

**1.4.1** ASTM E1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber, ASTM International.

**1.4.2** ASTM D5055-16, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists, ASTM International.

**1.4.3** ASTM D5456-18, Specification for Evaluation of Structural Composite Lumber Products, ASTM International.

**1.4.4** 2021, 2018, 2015 and 2012 *International Green Construction Code*™ (IgCC), International Code Council.

**1.4.5** 2021, 2018, 2015 and 2012 *International Building Code*® (IBC), International Code Council.

**1.4.6** 2022, 2019 and 2010 California Green Building Standards Code (CALGreen), California Building Standards Commission.

**1.4.7** 2020, 2015, 2012 and 2008 National Green Building Standard™ (ICC 700-20, -15, -12 and -08), National Association of Homebuilders.

**1.4.8** ANSI/ASHRAE/USGBC/IES Standard 189.1-2020, -2017, 2014 and -2009 – Standard for the Design of High-Performance Buildings (Except Low-Rise Residential Buildings), American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

**1.4.9** LEED® 2009 for New Construction and Major Renovations, U.S. Green Building Council, Inc.

**1.4.10** LEED® 2009 for Schools New Construction and Major Renovations, U.S. Green Building Council, Inc.

**1.4.11** LEED® 2009 for Core and Shell, U. S. Green Building Council, Inc.

**1.4.12** LEED® 2009 for Commercial Interiors, U.S. Green Building Council, Inc.

**1.4.13** LEED® 2019 (v4) for Building Design and Construction EQ Credit: Low-Emitting Material, Inc.

**1.4.14** LEED® 2018 (v4) for Building Operations and Maintenance MR Credit: Purchasing- Facility Maintenance and Renovation, Inc.

**1.4.15** LEED 2019 (v4) for Homes Design and Construction MR Credit: Environmentally Preferable Products

**1.4.16** LEED® 2019 (v4) for Homes Design and Construction v4EQ Credit: Low-Emitting Products, Inc.

**1.4.17** LEED 2019 (v4) for Interior Design and Construction EQ Credit: Low-Emitting Material, Inc.

**1.4.18** California Administrative Code Title 17 - Section 93120, *Airborne Toxic Control Measure to Reduce Formaldehyde Emissions*, California Code of Regulations - Department of Industrial Relations.

**1.4.19** Toxic Substances Control Act (15 U.S.C. 2601), Title VI – Formaldehyde Standards for Composite Wood Products.

**1.4.20** ANSI/AITC A 190.1-17, Structural Glued Laminated Timber, American Institute of Timber Construction.

**1.4.21** ANSI/APA PRG 320-2019, Standard for Performance-Rated Cross-Laminated Timber, The Engineered Wood Association.

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**1.4.22** AS/NZS 2269.0:2012, Australian/New Zealand Standard: Plywood-Structural, Standards New Zealand.

**1.4.23** BS EN 636:2012+A1:2015, Plywood-Specifications, The Engineered Wood Association.

**1.4.24** CSA O121-17, Douglas Fir Plywood, Canadian Standards Association.

**1.4.25** CSA O151-17, Canadian Softwood Plywood, Canadian Standards Association.

**1.4.26** CSA O153-13(R2017), Poplar Plywood, Canadian Standards Association.

**1.4.27** CS O325-16, Construction Sheathing, Canadian Standards Association.

**1.4.28** PS-1-19, Structural Plywood, U.S. Department of Commerce.

**1.4.29** PS-2-18, Performance Standard for Wood-based Structural-use Panels, U.S. Department of Commerce.

**1.4.30** PS-20-15, American Softwood Lumber Standard, U.S. Department of Commerce.

## 1.5 Terms and Definitions:

**1.5.1 Composite Wood Products:** Hardwood plywood, particleboard, and medium density fiberboard.

Composite wood products do not include the following:

Structural composite wood products made with moisture-resistant adhesives complying with ASTM D2559 or labeled as bond classification Exposure 1 or Exterior, having no surface treatments with added urea-formaldehyde resins or coatings, and certified according to one of the following industry standards in accordance with 2021 IgCC Section 801.4.2.4 (8.4.2.4):

1. Plywood: PS-1, PS-2, or AS/NZS 2269, BS EN 636, CSA O121, CSA O151, CSA O153, or CS O325
2. Oriented strand board: PS-2 or labeled as bond classification Exposure 1 or Exterior.
3. Structural composite lumber: ASTM D5456
4. Glued-laminated timber: ANSI A190.1
5. I-joist: ASTM D5055
6. Cross-laminated timber: PRG 320
7. Finger-jointed lumber: labeled "Heat Resistant Adhesive (HRA)" in accordance with DOC PS-20

**1.5.2 Engineered Wood Products:** Hardboard, wood structural panels (oriented strand board and plywood), structural composite lumber, glued laminated timber, and prefabricated wood I-joists complying with the applicable standards prescribed in Chapter 23 of the IBC; and finger-jointed lumber.

**1.5.3 Formaldehyde:** A colorless gas at room temperature that at elevated concentrations has a strong, pungent odor and can be irritating to the eyes, nose, and lungs (CAS No. 50-00-0).

## 2.0 REQUIRED DATA

**2.1 Product Description:** Information on the product to be evaluated. The information shall include the product name, style, part or model number, physical description, and

a production flowchart with respect to amount and type of *formaldehyde* content, as well as the overall manufacturing process. Additionally, all relevant specifications must be provided for the product, the components and/or constituents used to manufacture the product, and the components used with the product in the final assembly. Specifications must be consistent with the products as described in the submitted test reports and quality documentation. As an example, for mixed materials (wet and dry), the following must be provided:

- i. Specifications of incoming materials, or the date of the signed, controlled document that describes each constituent and its specification.
- ii. Mix ratios of the constituents, or the date of the signed, controlled document that describes the mix ratio.
- iii. Finished product specifications (for example, for wet products, specific gravity and viscosity; for formed products, weight, compressive strength, etc.).

When agreed to by ICC-ES, in lieu of providing the actual specifications, the applicant may identify the controlled document that describes the product specifications, provided the document is identified by a revision level and/or date.

When the product specifications are not provided to ICC-ES except through reference to a controlled document as described in the preceding paragraph, the controlled document describing the product specifications shall be made available to the inspection agency for their review and their verification, during the qualifying inspection described in Section 3.3, that the product specifications are consistent with the product described in the original qualifying data.

**2.2 Packaging and Identification:** A description of the packaging method and field identification of the product shall be submitted. Identification shall include the ICC-ES VAR number.

**2.3 Formaldehyde Emissions:** Reports shall be provided of testing in accordance with ASTM E1333 to determine the *formaldehyde* emission of the finished product and to demonstrate compliance with the requirements of California Administrative Code Title 17 - Section 93120, *Airborne Toxic Control Measure to Reduce Formaldehyde Emissions*, California Code of Regulations - Department of Industrial Relations. (Note: Data demonstrating compliance with Toxic Substances Control Act (15 U.S.C. 2601), Title VI - Formaldehyde Standards for Composite Wood Products, is an acceptable alternate compliance path.) The test report shall report the *formaldehyde* emissions, as well as specific information on the presence or absence of urea formaldehyde in the product.

**Exceptions:** The following are exceptions to the requirement for testing in accordance with ASTM E1333, provided the appropriate supporting data is submitted.

**2.3.1 Composite wood products** using phenol-based resins where test data or chemical analysis is submitted on the resins' emission performance.

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**2.3.2 Composite wood products** using isocyanurate-based resins where a chemical analysis is submitted to demonstrate that the chemistry of the resin does not contribute to *formaldehyde* emissions.

**2.3.3 Composite wood products** using no-added or ultra-low-emitting *formaldehyde* resins where the following data is submitted: (a) which product types will be manufactured using no-added or ultra-low-emitting formaldehyde-based resins; (b) the chemical formulation of the resins, including base resins, catalysts, scavenger additives or resins, and other additives as used in manufacturing; (c) evidence that the finished product is subject to third-party certification with regard to *formaldehyde* emissions; and (d) data on the emissions performance of the resins.

**2.3.4** To demonstrate compliance with the requirements of LEED 2009 for New Construction and Core and Shell, composite wood and agrifiber products are exempt from testing when an affidavit is submitted establishing that the adhesives used in the production of the product contain no added urea-formaldehyde resins.

### 3.0 QUALITY CONTROL

**3.1 Required Elements of the Quality System Documentation:** Quality system documentation shall be submitted that meets the following requirements:

**3.1.1** The documentation shall be signed and dated by an authorized representative of the manufacturer.

**3.1.2** The documentation shall clearly state the facility name of the manufacturing location, the street address and telephone number, and the name of the contact person at the facility.

**3.1.3** There shall be provisions for the quality system documentation to be reviewed at least annually. A record of revisions shall be maintained.

**3.1.4** The documentation shall indicate how the evaluated product is to be identified in the field. This information shall be consistent with the information in the "Identification" section of the VAR, and should include a copy of the product label or a description of what is included on the label. Product labeling shall include, at a minimum, the report holder's name, the VAR number (ICC-ES VAR-XXXX), and information required by the applicable environmental criteria.

**3.1.5** Based on the product labeling, the quality system shall provide a means to trace finished product back to the production and quality control records at the manufacturing facility.

**3.1.6** The documentation shall describe the manufacturing process.

**3.1.7** The documentation shall include provisions for the documenting of product changes, evaluation of product changes and notification to the appropriate parties.

**3.1.8 Incoming Materials:** The documentation shall include procedures regarding inspections or tests that are conducted on incoming materials, or other means used to determine that the materials meet specifications (for example, mill test reports, certificates of analysis, certificates of compliance, etc.). If incoming material requiring a certificate at the time of receipt does not carry a certificate,

then the documentation shall contain provisions for the material to be segregated until it has been appropriately tested or inspected, or the certificate is received.

**3.1.9 In-process Quality Control:** The documentation shall describe in-process quality control procedures, including how manufacturing processes are monitored to ensure that the product is consistently manufactured within the allowable tolerances.

**3.1.10 Final Inspection:** The documentation shall detail any final inspections and/or tests that are conducted before the product is labeled and shipped, to ensure that the finished product complies with specifications and applicable design values.

**3.1.11 Nonconforming Materials:** The documentation shall specify how nonconforming materials—incoming materials, materials in production, and finished materials—are segregated from production until a decision is made as to their disposition.

**3.1.12** When products are manufactured at multiple locations, the report applicant shall submit quality system documentation for each of the manufacturing sites.

**3.1.13** When the product is manufactured by a party other than the report holder, a form provided by ICC-ES to the applicant to cover this circumstance shall be submitted.

**3.2** The following declarations shall be provided to ICC-ES in a signed and dated affidavit from the report holder:

**3.2.1** The ICC-ES name, mark, or report number will only be used on products that are in compliance with the VAR and the quality system documentation.

**3.2.2** The report holder will promptly investigate and respond to ICC-ES when apprised by ICC-ES of complaints concerning product performance.

**3.2.3** The report holder agrees to permit ICC-ES representatives to examine, at distribution points and the manufacturing plant, any product labeled as being in conformance with the VAR.

**3.2.4** ICC-ES will be notified in writing if there is a significant change in the product, manufacturing procedures or quality system documentation from what was evaluated upon issuance of the VAR.

**3.3** Prior to issuance of a VAR, an initial on-site inspection of the manufacturing facility shall be conducted by an ICC-ES representative or a representative of an accredited inspection agency with the proper technical disciplines.

**3.4** At the time of renewal of a VAR, a third-party inspection of the manufacturing facility shall be conducted as a condition of renewal of the report. This inspection shall verify that no changes to the manufacturing process, raw materials or quality program as they relate to the *formaldehyde* content of the finished product have occurred.

### 4.0 VAR REQUIREMENTS

**4.1** The VAR shall identify the specific product, style or model and colors for which data was submitted.

**4.2** The VAR report shall state whether *formaldehyde* is present, the emission rate and the method used.

**4.3** Where the VAR subject is regulated by the scope of the International Building Code and/or International

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Residential Code but is the subject of a current ICC-ES evaluation report, the following statement shall be included:

“See ICC-ES evaluation report ESR-XXXX for compliance with IBC and/or IRC code requirements.”

**4.4** Where the VAR subject is regulated by the scope of the *International Building Code*<sup>®</sup> and/or *International*

*Residential Code*<sup>®</sup> but is not the subject of a current ICC-ES evaluation report, the following statement shall be included:

“Evaluation of the VAR subject for compliance with the requirements of the IBC and/or IRC is outside the scope of this evaluation report and evidence of compliance must be submitted by the permit applicant to the Authority Having Jurisdiction for approval.” ■