

Interlaboratory Testing Comparison (ILC) of Third-Party Certifier (TPC) Laboratories

Measuring Formaldehyde Emissions from
Composite Wood Products

2025

June 2026

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Summary

In the fall of 2025, California Air Resources Board (CARB) staff organized an interlaboratory testing comparison (ILC) of third-party certifier (TPC) laboratories.

The ILC assessed laboratory proficiency at measuring formaldehyde emissions from particleboard (PB) according to the secondary compliance test method (secondary method) defined in the *Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products* (herein referred to as the Composite Wood ATCM).¹

Proficiency was assessed using two statistical measures:

- *Z-score*, which compares laboratory results to the consensus mean of all test results, and
- *Precision*, which evaluates measurement repeatability.

Laboratory proficiency was considered satisfactory if the following criteria were met:

- Z-score between -2.0 and +2.0.
- Precision $\leq$ 0.02 parts per million (ppm).

Based on the criteria outlined above, all laboratories demonstrated satisfactory results.

¹ *ATCM to Reduce Formaldehyde Emissions from Composite Wood Products*, title 17, California Code of Regulations, sections 93120-93120.12

I. Introduction and Regulatory Requirements

The Composite Wood ATCM requires third-party certifier (TPC)² laboratories to participate in an ILC with laboratories using a compliance test method³ for the same composite wood products the first year the laboratory is used by a TPC and every two years thereafter.⁴

Additionally, the U.S. EPA TSCA Title VI⁵ regulation, *Formaldehyde Standards for Composite Wood Products*⁶, requires TPC laboratories to participate in the CARB ILC, when offered, or an U.S. EPA recognized proficiency assessment, if available.⁷

This is the 8th CARB-organized ILC. CARB previously organized ILCs in 2009, 2011/2012, 2013, 2014/2015, 2016, 2018/2019, and 2023. Due to the pandemic, CARB did not organize an ILC between 2020 and 2022. In 2023 and 2025, the Composite Panel Association (CPA, TPC-01) assisted CARB with the ILC by purchasing, preparing, and shipping the test material to each participant.

II. Purpose

The purpose of the ILC is to:

- Evaluate laboratory proficiency at measuring formaldehyde emissions from composite wood products according to the regulatory compliance test method(s). Proficiency is evaluated using the statistical measures *Z-score* and *precision*, and
- Identify measurement issues and potential sources of error.

ILCs are also useful for monitoring laboratory performance over time. Laboratories can use the information from an ILC to improve and/or maintain internal operating procedures, instruments, and the analytical skills of laboratory staff.

² [CARB-Approved Third-Party Certifiers Executive Orders / California Air Resources Board](#)

³ The compliance test methods are defined in section 93120.9(a) of the Composite Wood ATCM.

⁴ Composite Wood ATCM, Appendix 3 of section 93120.12 subdivision (b)(1)(F)

⁵ United States Environmental Protection Agency (U.S. EPA) Toxic Substances Control Act (TSCA) Title VI

⁶ [eCFR :: 40 CFR Part 770 -- Formaldehyde Standards for Composite Wood Products](#)

⁷ [eCFR :: 40 CFR Part 770 Subpart B -- EPA TSCA Title VI Third-Party Certification Program](#)

III. Participants

Thirty-nine laboratories participated in the ILC. Participants are listed in Appendix A and include:

- 35 CARB and U.S. EPA TPC laboratories (all CARB-approved TPC laboratories participated in the ILC),
- 1 prospective TPC laboratory,
- 2 former TPC laboratories, and
- 1 laboratory that is not associated with the TPC program.

IV. Study Design

Timeframe

The ILC was announced via email in May 2025. In September 2025, CARB sent participants the ILC test protocol and the data submittal form. CPA shipped the test material to participants in October 2025, and participants completed testing and submitted results to CARB between November 2025 and February 2026.

Test Protocol

The Composite Wood ATCM includes two compliance test methods:

- the primary method, a large chamber method, defined as ASTM E 1333 (ASTM, 2022. Designation E 1333), and
- the secondary method, a small chamber test method, defined as ASTM D 6007 (ASTM, 2022. Designation D 6007) with additional conditions specified in the ATCM and listed below.

The test protocol, which can be found in Appendix B, directed laboratories to measure formaldehyde emissions from the test material according to the secondary method. Laboratories were directed to:

- Use the testing conditions and loading rates specified in ASTM D 6007 (ASTM, 2022. Designation D 6007),
- Condition the test material according to the period used to establish equivalence between the small chamber and a large chamber,
- Test nine specimens, representing evenly distributed portions of an entire panel, in groups of three specimens, resulting in three test results, and
- Average the three test results to represent one test result for the panel.

The test protocol also instructed participants to:

- condition the test material within three weeks of receipt and test within one week of conditioning to avoid potential decay in formaldehyde emissions,
- collect a duplicate air sample (i.e., a repeated measurement of the same test material) for one of the three small-chamber tests, and
- report results to CARB on the data submittal form, Data submittal form ILC 2025.xlsx.

All CARB-approved TPC laboratories were encouraged to participate, whether equivalence testing had been completed or not, to fulfill the regulatory requirement to participate in an ILC. CARB understands that some TPC laboratories use a large chamber for certification testing and have not established equivalence between their small and large chambers. Laboratories that had not conducted equivalence testing were instructed to use a 7-day conditioning period, consistent with the conditioning period for large chambers.

Test Material

Each laboratory received nine pieces of test material, 5/8-inch (in) particleboard (PB), cut from evenly distributed portions across a single 4-foot (ft) x 8-ft panel. Each piece of test material measured approximately 18-in x 18-in.

Laboratories were responsible for cutting each piece of test material to dimensions appropriate for their small chamber and consistent with the flow-to-area (Q/A) ratio specified in ASTM D 6007 (ASTM, 2022. Designation D 6007).

Preparation and Shipping

CPA sourced, ordered, prepared, and shipped the test material to participants. Prior to shipping, the test material was cut, labeled, wrapped in thin plastic wrap, and placed in a shipping box. A cover sheet with instructions and contact information was included in the shipping box.

V. Statistical Evaluation of the Results

Data Analysis

CARB staff reviewed each data submittal form for completeness and consistency, removing special characters from numeric fields and reformatting dates where needed. Additionally, test results were rounded to the nearest 0.01 ppm per ASTM D 6007 (ASTM, 2022. Designation D 6007).

The Tidyverse package (Wickham et al., 2019) in the statistical computing software, R (R Core Team, 2025), was used for data analysis and visualization.

Assigned Values

Assigned values are widely used for the purposes of calculating statistical scores (Thompson et al., 2006). They are derived directly from data sets and may serve as a reference for comparison. In this ILC, two assigned values were used: *consensus mean* and *acceptable standard deviation*.

Consensus Mean ($\bar{X}$): The consensus mean is the arithmetic mean of all laboratory test results. The consensus mean was rounded to the nearest 0.01 ppm per ASTM D 6007 (ASTM, 2022. Designation D 6007).

Acceptable Standard Deviation (σ): CARB assigned an acceptable standard deviation at 0.01 ppm. This value is based on the published precision of the large and small chamber methods (ASTM, 2022. Designation D 6007 and Designation E 1333) for products that emit as low as 0.06 ppm. Additionally, CARB re-analyzed ILC data collected between 2009 and 2023 and found that the robust standard deviation⁸ of test results for products that emit in the range of 0.02 ppm to 0.06 ppm is also 0.01 ppm.

Proficiency Assessment: Z-score

Z-score measures how many standard deviations a test result is from the consensus mean.

Z-score is interpreted based on the standard normal distribution ("bell curve"). Under this model, 95 percent of calculated Z-scores will fall within 2.0 standard deviations of the consensus mean. Z-scores in this range are commonly designated as acceptable or satisfactory (Thompson et al., 2006).

The Z-score for each laboratory was calculated according to the following equation:

$$Z_i = \frac{\bar{x}_i - \bar{X}}{\sigma}$$

where:

Z_i = Z-score for laboratory "i".

$\bar{x}_i$ = test result for laboratory "i", in ppm, expressed as the mean of three test results.

⁸ Robust standard deviation is calculated according to Thompson et al., 2006 by excluding test results outside of $\pm 50\%$ of the ILC median.

$\bar{X}$ = consensus mean of all test results, in ppm.

σ = acceptable standard deviation, 0.01 ppm.

Laboratory proficiency was evaluated according to the following criteria:

- $|Z| \leq 2.0$ Satisfactory
- $|Z| > 2.0$ Follow-up Evaluation Required

Proficiency Assessment: Precision

Precision compares the formaldehyde concentrations of duplicate air samples (i.e., repeated measurements of the same test material) to assess the reliability of the measurement method.

Precision is calculated according to the following equation:

$$precision_{i,j} = |x_{i,j} - d_{i,j}|$$

where:

$precision_{i,j}$ = difference between duplicate air samples "j", in ppm, for laboratory "i".

$x_{i,j}$ = test result "j", in ppm, for laboratory "i".

$d_{i,j}$ = test result of duplicate air sample "j", in ppm, for laboratory "i".

j = between 1 and 3 for duplicate samples collected during the 3 small-chamber tests.

Laboratories were considered for follow-up evaluation if the difference between duplicate air samples was more than 0.02 ppm. ASTM E 1333 (ASTM, 2022. Designation E 1333) instructs that formaldehyde concentrations from simultaneous duplicate air samples should not vary by more than 0.02 ppm. Since the ASTM D 6007 test method produces comparable results to ASTM E 1333, duplicate air samples collected according to ASTM D 6007 should similarly not vary by more than 0.02 ppm. This value is also consistent with the previous CARB ILCs, which considered laboratories for follow-up evaluation if duplicate air samples differed by more than 0.02 ppm.

Duplicate air samples that differ by more than 0.02 ppm indicate imprecision in sample collection and/or analysis, data reporting errors, or other issues.

VI. Results

Table 1 provides a summary of test results ($\bar{x}$), as well as the consensus mean ($\bar{X}$), acceptable standard deviation (σ), range in Z-scores (Z), and measurement *precision*.

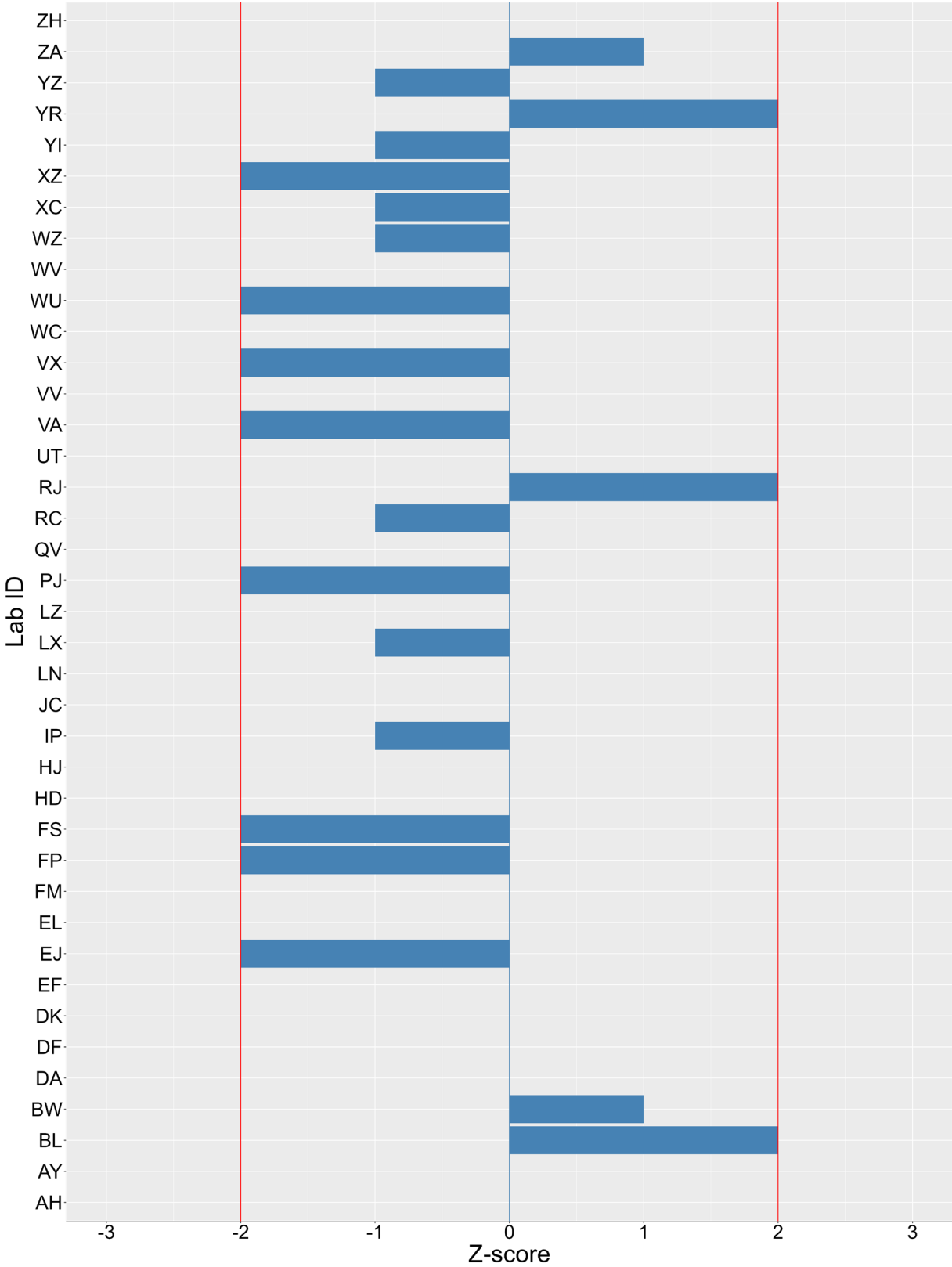
Table 1. Summary of Results

Parameter	Summary Statistic
Number of test results ($\bar{x}$)	39
Concentration range of test results ($\bar{x}$)	0.04 – 0.08 ppm
Consensus Mean ($\bar{X}$)	0.06 ppm
Acceptable Standard Deviation (σ)	0.01 ppm
Range in Z-scores (Z)	$-2.0 \leq Z \leq 2.0$
Number of duplicate air samples ¹	93
Measurement repeatability (<i>precision</i>)	≤ 0.02 ppm

¹ Although laboratories were instructed to collect 1 duplicate sample during 1 of 3 small-chamber tests, 27 laboratories collected 3 duplicate air samples.

Figure 1 shows the Z-score (Z) for each laboratory by Lab ID code. Additionally, Appendix C contains laboratory test results ($\bar{x}$), Z-scores (Z), and *precision* by Lab ID code. All test results and follow-up evaluations are confidential, and Lab ID is known only to CARB staff and the respective laboratory.

Figure 1. Laboratory Z-score (Z)



VII. Discussion

The ILC results showed minimal variability among the participating laboratories. Test results were narrowly distributed with an actual standard deviation of 0.01 ppm. All participants showed proficiency at measuring formaldehyde emissions from particleboard (PB) according to the secondary method. All laboratories received a Z-score between ± 2.0 and duplicate air samples were within 0.02 ppm.

The Z-scores are distributed and can be interpreted as follows:

- 19 laboratories received a Z-score of 0. These laboratory test results are equal to the consensus mean.
- 7 laboratories received a Z-score of -1.0. These laboratory test results are 0.01 ppm less than the consensus mean.
- 2 laboratories received a Z-score of 1.0. These laboratory test results are 0.01 ppm greater than the consensus mean.
- 8 laboratories received a Z-score of -2.0. These laboratory test results are 0.02 ppm less than the consensus mean, and
- 3 laboratories received a Z-score of 2.0. These laboratory test results are 0.02 ppm greater than the consensus mean.

CARB staff will follow up with laboratories where there are questions about the data submittal form. All follow-up is done to improve or verify understanding of the testing procedures.

VIII. References

American Society for Testing and Materials (ASTM), 2022. Designation E 1333 - Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber. ASTM, West Conshohocken, PA.

ASTM, 2022. Designation D 6007 - Standard Test Method for Determining Formaldehyde Concentrations in Air from wood Products Using a Small Scale Chamber. ASTM, West Conshohocken, PA.

R Core Team, 2025. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.

Thompson, M., Ellison, S. L. R., & Wood, R., 2006. The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories. *Pure Appl. Chem.*, 78(1), 145-196. doi: 10.1351/pac200678010145. Available at <https://old.iupac.org/publications/pac/2006/pdf/7801x0145.pdf>.

Wickham H, Averick M, Bryan J, Chang W, McGowan LD, François R, Golemund G, Hayes A, Henry L, Hester J, Kuhn M, Pedersen TL, Miller E, Bache SM, Müller K, Ooms J, Robinson D, Seidel DP, Spinu V, Takahashi K, Vaughan D, Wilke C, Woo K, Yutani H (2019). "Welcome to the tidyverse." *Journal of Open Source Software*, 4(43), 1686. doi:10.21105/joss.01686 <https://doi.org/10.21105/joss.01686>

APPENDIX A - Participants

Company Name	Laboratory Type TPC, TPC Contract Laboratory (CL), or Other	TPC # or TPC # Associated With	Country
Composite Panel Association (CPA)	TPC	1	USA
Benchmark International, LLC	TPC	2	USA
PFS TECO	TPC	3	USA
Fraunhofer Institute for Wood Research WKI	TPC	4	Germany
PT. Mutuagung Lestari Tbk	TPC	6	Indonesia
Xuzhou MUTU Inspection and Testing Co., Ltd.	CL	6	China
Capital Testing and Certification Services	TPC	8	USA
Beijing Products Quality Supervision and Inspection Institute (National Center for Quality Inspection and Testing of Furniture & Indoor Environment)	CL	9	China
Zhongbei International Testing Technology Co., Ltd.	CL	9	China
Entwicklungs- und Prüflabor Holztechnologie GmbH	TPC	10	Germany
Research Institutes of Sweden (RISE)	TPC	13	Sweden
SGS Hong Kong	TPC	14	China
AIDIMME. Instituto Tecnológico Metalmecánico, Mueble, Madera, Embalaje y Afines	TPC	15	Spain

Company Name	Laboratory Type TPC, TPC Contract Laboratory (CL), or Other	TPC # or TPC # Associated With	Country
CATAS spa	TPC	16	Italy
FCBA	TPC	17	France
MPA Eberswalde Materialprüfanstalt Brandenburg GmbH	TPC	18	Germany
Łukasiewicz Research Network - Poznan Institute of Technology	TPC	19	Poland
Výzkumný a vývojový ústav dřevařský, Praha, s. p.	TPC	23	Czech Republic
LA.P.I. Laboratorio Prevenzione Incendi SpA	TPC	24	ITALY
WOOD.BE	TPC	29	Belgium
Intertek Testing Services Zhejiang Ltd.	CL	31	China
Intertek Testing Service Ltd., Shenzhen	TPC	33	China
COSMOB S.p.A.	TPC	36	Italy
Forest Research Institute Malaysia	CL	37	Malaysia
Sustainable Stewardship Private Limited	CL	37	India
Ośrodek Badawczo-Rozwojowy Przemysłu Płyt Drewnopochodnych	TPC	39	Poland
Shanghai Hongjun Science & Technology Co., Ltd	CL	43, 44	China
Viet Nam ICTT International Testing Company Limited	future CL	43, 44	VietNam
SGS Vietnam LTD	TPC	45	VietNam

Company Name	Laboratory Type TPC, TPC Contract Laboratory (CL), or Other	TPC # or TPC # Associated With	Country
TÜV Rheinland (China), Limited	CL	46	China
SGS-CSTC Standards Technical Services Co., Ltd. SH CCL	CL	47, 14	China
SGS-CSTC Standards Technical Services Co. Ltd Guangzhou Branch	CL	47	China
GRG Metrology & Test Group Co., Ltd.	CL	48	China
Guangzhou Quality Supervision and Testing Institute (GQT)	CL	48	China
CHINA FORESTRY INSPECTION AND TESTING (CHONGQING) CO., LTD	CL	49	China
SJT INCORPORATED COMPANY	CL	50	China
Berkeley Analytical Associates, LLC	former CL	NA	USA
Hexion	former CL	NA	USA
Intertek Testing Services NA	Other	NA	USA

APPENDIX B - Protocol for Inter-laboratory Comparison of Composite Wood Product Third-Party Certifiers and Subcontract Laboratories

The following protocol was sent to participants on October 25, 2025:

2025 Interlaboratory Comparison (2025 ILC)

Test Protocol

- 1. Summary:** The California Air Resources Board (CARB) interlaboratory comparison (ILC) of formaldehyde emissions from composite wood products is scheduled for October 2025.

The 2025 ILC will assess the ability of participating laboratories to measure formaldehyde emissions from particleboard (PB) according to the secondary compliance test method (secondary method) defined in the *Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products* (herein referred to as the Composite Wood ATCM)⁹.

For CARB and U.S. EPA TSCA Title VI¹⁰ third-party certifier (TPC) laboratories, participating in this ILC fulfills the CARB and U.S. EPA regulatory requirements to:

- participate in an interlaboratory comparison during the first year the laboratory is used by a third-party certifier, followed by participation in interlaboratory comparisons every two years¹¹, and
- participate in the CARB ILC when offered or an EPA-recognized proficiency or interlaboratory program, if available.¹²

- 2. Test Material:** The test material is 5/8-inch (in) particleboard (PB).

Participants will receive 9 pieces of PB cut from evenly distributed portions across a single 4-foot (ft) x 8-ft panel. Each piece will measure approximately 18-in x 18-in and will be labeled with an alphanumeric code. For example, for panel #10,

⁹ [Composite Wood ATCM](#)

¹⁰ United States Environmental Protection Agency (U.S. EPA) Toxic Substances Control Act (TSCA) Title VI

¹¹ Composite Wood ATCM, Appendix 3 of section 93120.12 subdivision (b)(1)(F)

¹² [eCFR :: 40 CFR Part 770 Subpart B -- EPA TSCA Title VI Third-Party Certification Program](#)

3 pieces will be labeled as 10a, 3 pieces will be labeled as 10b, and 3 pieces will be labeled as 10c.

- 3. Shipping and Handling:** The test material will be wrapped in plastic wrap, placed in a box with a cover sheet explaining the contents, and shipped to participating laboratories.
- 4. Fee:** The Composite Panel Association (CPA, TPC-1) purchased, prepared, and shipped the test material. As previously communicated, the fee for participation covers the cost of the test material (\$600 USD) and shipping and handling (\$100 USD). CPA will send an invoice to each participant via email. To ensure receipt of the invoice, please add June Sloper, jsloper@cpamail.org, to your email contacts. Participation in the ILC will be voided due to lack of payment.
- 5. Schedule:** The schedule for the 2025 ILC is outlined in Table 1. The test material will be shipped to participating laboratories in September 2025. Testing should be completed within a month of receiving the test material.

Table 1: 2025 ILC Schedule*

Task	Responsible Party	Timeline
Prepare test material	CPA	September 2025
Ship test material to participating laboratories	CPA	September 2025
Send invoices	CPA	October 2025
Test material conditioning	Participating laboratories	October 2025
Formaldehyde emissions testing		October 2025
Report results to CARB		November 2025
Data analysis	CARB	December 2025
CPA receives payment in full	Participating laboratories	December 31, 2025
Release of results	CARB	January/February 2026
Follow-up	CARB	As needed

*If the above dates change, participants will be notified via email.

6. Test Method: Formaldehyde emissions will be measured according to the secondary method, which is defined in section 93102.9 of the Composite Wood ATCM.

The secondary method uses the testing conditions and loading rates specified in ASTM D 6007, Standard Test Method for Determining Formaldehyde Concentrations in Air from Wood Products Using a Small-Scale Chamber¹³, with additional conditions specified in section 93102.9(a)(2)(A) of the Composite Wood ATCM.

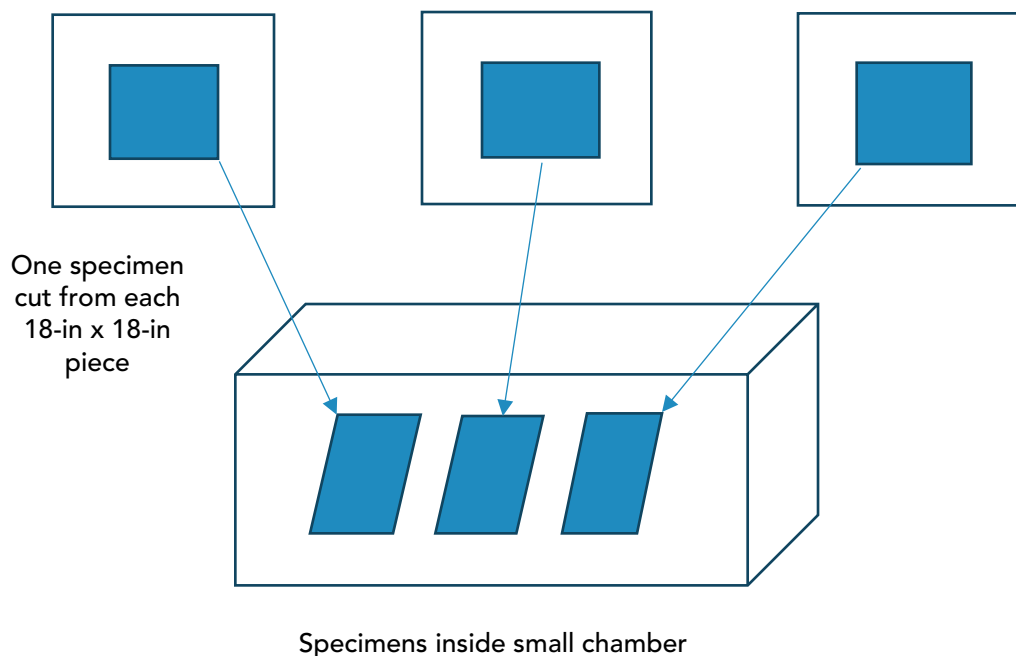
Store, condition, and test the material according to the following guidance:

- Immediately upon receipt of the test material, store the wrapped test material in a room with controlled temperature and relative humidity. The test material must remain wrapped in plastic until sample conditioning is initiated. Do not store the test material in a freezer or in a hot warehouse, because these conditions could change the emission characteristics.
- *Complete conditioning within 3 weeks of receiving the test material.* For TPC laboratories that have conducted equivalence testing, condition the test material according to the period used to establish equivalence between the small chamber and a large chamber. For laboratories that have not conducted equivalence testing, condition the test material for 7 days.
- Cut each piece of PB to the dimensions that are appropriate for the volume of the small chamber and are consistent with the flow-to-area (Q/A) ratio specified in ASTM D 6007. Cut one specimen from each of the nine pieces, resulting in nine specimens.
- *Test the specimens within 1 week of conditioning.* Conduct 3 small-chamber tests, testing the 9 specimens in groups of 3 (as shown in Figure 1). Testing can be conducted in 3 small chambers or sequentially using the same small chamber.

The specimens should be positioned in the test chamber to allow the face and back of the test material to emit inside the chamber. Laboratories should follow their normal procedures for taping or sealing of edges of specimens.

¹³ *D6007 Standard Test Method for Determining Formaldehyde Concentrations in Air from Wood Products Using a Small-Scale Chamber*

Figure 1: Specimen Configuration



- Collect a duplicate air sample during 1 of the 3 small chamber tests. The duplicate air sample can be collected simultaneously or sequentially (i.e., two consecutive 30-minute sampling periods).
- Document the test conditions, requirements of ASTM D 6007, and test results in the data submittal form, "*Data Submittal Form ILC 2025.xlsx*".
- Do not discard the test specimens after testing. Immediately after testing, wrap the test specimens in plastic wrap and store them in an environmentally controlled room until the ILC has concluded. CARB may request that a laboratory re-test or ship the test specimens to another testing location.

7. Data Submittal: Document the test conditions, requirements of ASTM D 6007, and test results in the attached Excel data submittal form, "*Data Submittal Form ILC 2025.xlsx*".

Submit the completed data submittal form to Archita.Sharma@arb.ca.gov by the end of November 2025.

8. Results: CARB staff will evaluate the formaldehyde emission testing proficiency of each laboratory using two statistical measures, Z-score¹⁴ and precision. Z-score

¹⁴ Z-scores are based on a fitness-for-purpose criterion, which is in accordance with the International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories ([IUPAC](#)

compares a laboratory's test result to the consensus mean of all test results using a fitness-for-purpose standard deviation, and precision evaluates a laboratory's measurement repeatability by calculating the difference between duplicate air samples.

A laboratory's testing proficiency will be considered satisfactory if:

- Z-score is between -2.0 and +2.0, and
- precision is ≤ 0.02 parts per million (ppm).

If the Z-score is outside of the ± 2.0 range, or precision is greater than 0.02 ppm, TPC laboratories may be required to conduct follow-up testing and/or be required to evaluate their testing practices to improve proficiency.

CARB will report on the results after CPA receives payment from all participants. In the report, participants will be assigned an anonymous identifier known only to CARB and the participant.

9. Contact Information: For questions about this ILC, please contact *Hilary Minor* at hilary.minor@arb.ca.gov or the composite wood team at compwood@arb.ca.gov.

10. Participating Laboratories:

- CARB and U.S. EPA TPC laboratories
- Laboratories not associated with the TPC program, including former and future TPC laboratories

11. Attachments

Data Submittal Form ILC 2025.xlsx

Technical Report, Thompson, M., Ellison, S.L.R. and Wood, R., 2006, and The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories, Pure Appl. Chem., 78[1], 145-196).

Data Submittal Form for ILC 2025.xlsx

Please complete the 'Data Submittal Form' tab according to the following instructions:

1	Do not include text or special characters in numerical fields, i.e., test results. For example, where background HCHO is less than the limit of quantification (LOQ), the LOQ should be reported. Do not include the "<" character in your response.
2	Please format all data in the specified units (where unit is specified). Dates should be reported as dd/mm/yyyy.
3	Use a decimal point (.) as a decimal separator in numerical answers.
4	Only 1 duplicate test sample is required.
5	Do not alter the format of the "Data Submittal Form" tab.
6	Submit this completed spreadsheet to archita.sharma@arb.ca.gov . A PDF version of this spreadsheet will not be accepted.

It is important that all participants follow these instructions so that the data is formatted consistently.

For questions, please contact Hilary Minor at hilary.minor@arb.ca.gov or the team at compwood@arb.ca.gov.

Parameter	Definition	Unit
Laboratory Information		
TPC/Laboratory name	Name of Third-Party Certifier (TPC) or laboratory	
TPC number or TPC number associated with	TPC number or the TPC number(s) that laboratory is associated with (if applicable)	
Address	Laboratory mailing address	
Contact name	Laboratory contact	
Email address	Email address of laboratory contact	
Date of data submittal form	Date form completed	dd/mm/yyyy
Has equivalence testing been conducted? (yes/no)	Has laboratory conducted equivalence testing for their small chamber(s)? Yes or no	
Date of most recent equivalence testing	Date most-recent equivalence testing completed (if applicable)	dd/mm/yyyy
Date test material received	Date test material received at laboratory	dd/mm/yyyy
Conditioning Information		
Conditioning background HCHO	Background formaldehyde (HCHO) concentration inside conditioning area (chamber or room)	ppm (parts per million)
Date conditioning started	Date conditioning started	
Conditioning time	Conditioning duration in hours	h (hours)
Minimum temperature	Minimum temperature inside conditioning area (chamber or room)	°C
Maximum temperature	Maximum temperature inside conditioning area (chamber or room)	°C
Minimum relative humidity	Minimum relative humidity inside conditioning area (chamber or room)	%
Maximum relative humidity	Maximum relative humidity inside conditioning area (chamber or room)	%
Comments	Provide additional information related to conditioning	
Secondary Method Results - Tests 1 - 3		
Test date	Date material tested	dd/mm/yyyy
Small-chamber volume	Volume of small chamber	L (liters)
Sample labels	Labels on test material; 3 labels per test	
Specimen length	Length of tested specimen	cm (centimeters)
Specimen width	Width of tested specimen	cm
Total specimen area	Total exposed (face + back) area in meters squared (m ²) of three specimens in a small chamber test	m ² (meters squared)
Testing background HCHO	Background formaldehyde (HCHO) concentration in empty small chamber	ppm
Minimum temperature	Minimum temperature inside small chamber during	°C
Maximum temperature	Maximum temperature inside small chamber during testing	°C
Minimum relative humidity	Minimum relative humidity inside small chamber during testing	%
Maximum relative humidity	Maximum relative humidity inside small chamber during testing	%
Air sampling rate	Air sampling rate	L/min (liters/minute)
Air sampling time	Air sampling time	minutes
Flow-to-area (Q/A) ratio	The ratio of air flow through the chamber (Q) to specimen surface area (A); see ASTM D6007	m ³ /h air per m ² test area
Analytical method	Analytical method used to determine the quantity of formaldehyde in an air sample	
Test result	Secondary method test result rounded to the nearest 0.01 ppm	ppm
Duplicate result	Duplicate test result rounded to the nearest 0.01 ppm; only 1 duplicate test sample is required	ppm
Was background HCHO subtracted? (yes/no)	Was background formaldehyde subtracted from the test result? Yes or no	
Comments	Provide additional test information or information about any event that might affect the results	
Average of three small chamber tests		
	Average of three small chamber test results rounded to the nearest 0.01 ppm	ppm

Parameter	Value	Unit
Laboratory Information		
TPC/Laboratory name		
TPC number or TPC number associated with		
Address		
Contact name		
Email address		
Date of data submittal form		dd/mm/yyyy
Has equivalence testing been conducted? (yes/no)		
Date of most recent equivalence testing		dd/mm/yyyy
Date test material received		dd/mm/yyyy
Conditioning Information		
Conditioning background HCHO		ppm
Date conditioning started		
Conditioning time		h
Minimum temperature		°C
Maximum temperature		°C
Minimum relative humidity		%
Maximum relative humidity		%
Comments		
Secondary Method Results - Test 1		
Test date		dd/mm/yyyy
Small-chamber volume		L
Sample labels		
Specimen length		cm
Specimen width		cm
Total specimen area		m ²
Testing background HCHO		ppm
Minimum temperature		°C
Maximum temperature		°C
Minimum relative humidity		%
Maximum relative humidity		%
Air sampling rate		L/min
Air sampling time		minutes
Flow-to-area (Q/A) ratio		m ³ /h air per m ² test area
Analytical method		
Test result		ppm
Duplicate result		ppm
Was background HCHO subtracted? (yes/no)		
Comments		
Secondary Method Results - Test 2		
Test date		dd/mm/yyyy
Small-chamber volume		L
Sample labels		
Specimen length		cm
Specimen width		cm
Total specimen area		m ²
Testing background HCHO		ppm
Minimum temperature		°C
Maximum temperature		°C
Minimum relative humidity		%
Maximum relative humidity		%
Air sampling rate		L/min

Air sampling time		minutes
Flow-to-area (Q/A) ratio		m ³ /h air per m ² test area
Analytical method		
Test result		ppm
Duplicate result		ppm
Was background HCHO subtracted? (yes/no)		
Comments		
Secondary Method Results - Test 3		
Test date		dd/mm/yyyy
Small-chamber volume		L
Sample labels		
Specimen length		cm
Specimen width		cm
Total specimen area		m ²
Testing background HCHO		ppm
Minimum temperature		°C
Maximum temperature		°C
Minimum relative humidity		%
Maximum relative humidity		%
Air sampling rate		L/min
Air sampling time		minutes
Flow-to-area (Q/A) ratio		m ³ /h air per m ² test area
Analytical method		
Test result		ppm
Duplicate result		ppm
Was background HCHO subtracted? (yes/no)		
Comments		
Average of 3 small chamber tests		ppm

APPENDIX C - Results

Lab ID	Mean Result ($\bar{x}$) (ppm) ¹	Z-score (Z)	Number of duplicate air samples	Laboratory precision (precision) ²
AH	0.06	0	1	0
AY	0.06	0	1	0
BL	0.08	2	3	0
BW	0.07	1	1	0.01
DA	0.06	0	3	0
DF	0.06	0	3	0
DK	0.06	0	3	0.01
EF	0.06	0	3	0
EJ	0.04	-2	1	0
EL	0.06	0	3	0.01
FM	0.06	0	1	0
FP	0.04	-2	1	0
FS	0.04	-2	3	0
HD	0.06	0	3	0.01
HJ	0.06	0	3	0
IP	0.05	-1	1	0
JC	0.06	0	3	0

Lab ID	Mean Result ($\bar{x}$) (ppm) ¹	Z-score (Z)	Number of duplicate air samples	Laboratory precision (precision) ²
LN	0.06	0	3	0
LX	0.05	-1	1	0
LZ	0.06	0	1	0
PJ	0.04	-2	3	0.01
QV	0.06	0	3	0
RC	0.05	-1	3	0.01
RJ	0.08	2	3	0
UT	0.06	0	3	0.01
VA	0.04	-2	3	0
VV	0.06	0	3	0
VX	0.04	-2	1	0
WC	0.06	0	3	0.01
WU	0.04	-2	3	0.01
WV	0.06	0	3	0
WZ	0.05	-1	3	0
XC	0.05	-1	1	0
XZ	0.04	-2	3	0.01
YI	0.05	-1	3	0.02
YR	0.08	2	3	0

Lab ID	Mean Result ($\bar{x}$) (ppm) ¹	Z-score (Z)	Number of duplicate air samples	Laboratory precision (precision) ²
YZ	0.05	-1	3	0
ZA	0.07	1	3	0.01
ZH	0.06	0	1	0.01

¹ The three small-chamber test results were averaged and rounded to the nearest 0.01 ppm per ASTM D 6007 (ASTM, 2022. Designation D 6007).

² Laboratory precision is the maximum calculated precision for laboratories that collected more than one duplicate air sample.