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**Composite Wood Products
Airborne Toxic Control Measure (ATCM)**

Title 17, California Code of Regulations, Sections 93120-93120.12

Third Party Certification Guideline:
***Establishing a Correlation With an Acceptable Correlation
Coefficient (“r”, Value)***

Establishing a correlation with an acceptable “r” value. Some third party certifiers (TPC) find it challenging to establish proper correlations with five data pairs.

Section 93120.12, Appendix 2, subsection (g)(2) reads:

“Each plant’s quality control test results must be shown to correlate to primary or secondary method test results. The correlation must be based on a minimum sample size of five data pairs. If data shows variation from the previously used correlation, the manufacturer shall work with the certifier to evaluate the data to determine if a statistically significant change has occurred. If a change is noted, a new correlation curve will be established for the manufacturer by the certifier.”

Program Issue: Concerning the number of data pairs that must be used to develop a correlation (i.e., a minimum of five), it is possible that this number may not be sufficient for all Phase 2 compliant products because all of the measurements are near-zero, or below the analytic method of detection. Unless a broad enough range in measured formaldehyde emissions for both the primary/secondary and small-scale test methods can be achieved (i.e., when the five data pairs for a product are tightly clustered), the correlation that is developed for the product is likely to have a low “r” value. Guidance is needed with respect to the approaches that can be used to develop stronger correlations for products with clustered data.

Recommended CARB Guidance: In cases where data clustering occurs, it is recommended that a suitable correlation may be developed by:

- Collecting additional data to broaden the range in measured test data;
- Calculating a linear relationship using a point measured near the origin (such as a concentration measured in an empty chamber) and the average value of the clustered data points; or
- By establishing a small-scale test value threshold, in which the average small-scale test value for the data cluster is used as the Quality Control Limit (QCL) for the product.

For PB and MDF, TPCs are advised to develop a mill's correlation utilizing a minimum formaldehyde emission test result range of 0.05 ppm (e.g., 0.03 to 0.08 ppm). Whenever possible, the measured emission test result range should be achieved by using only the product for which the correlation applies – it is not recommended that products other than the CARB-certified product manufactured by the mill be used to develop a mill's correlation. It is further recommended that TPCs attempt to achieve a minimum acceptable “r” value for the correlation, in consideration of the values in the following table:

Minimum “r” values for Certified Mill Product Correlations ¹	
Degrees of Freedom (n-2) ²	“r” Value
3	0.878
4	0.811
5	0.754
6	0.707
7	0.666
8	0.632
9	0.602
10 or more	0.576

(¹) From: The British Standards Institution. 2000. Wood-based panels. Sampling, cutting and inspection. Quality control in the factory. BS EN 326-2. 36 pp.

(²) “n” = number of primary/secondary and small-scale test data pairs. Correlations based on five data pairs have 3-degrees of freedom and must achieve an “r” value of 0.878 or greater.

Alternately, TPCs may also consider fitting a line through a point near the origin, to develop a two-point correlation, using the average primary/secondary and small-scale test value of the clustered data points for the product as the second point. In this approach, the point near the origin may be a data pair representing the test value achieved when no sample is put in the primary/secondary and small-scale test chamber. The second data point would be the average primary/secondary and small-scale test result based on the paired data that has been collected (i.e., minimum of five). The slope of the line generated by this method would be used to determine the small-scale test result that represents the value equal to the Phase 2 emission standard using a primary/secondary method test.

A third option is to use a threshold approach in which the average small-scale test value, calculated as above from a data cluster, is used as the Quality Control Limit (QCL) for the product. This value would be a “do not exceed” limit for the product that provides a margin of safety relative to the maximum value in the data cluster.

For Phase 2 hardwood plywood (or other very low emitting products), TPCs may need to collect more than five data pairs to achieve a correlation with a minimum acceptable “r” value based on the above table or utilize the two-point correlation or threshold approach described above, given that the spread in test values of compliant products is likely to cluster in the 0.02 to 0.04 ppm range. In cases where the major portion of the small-scale test values for a product are “non-detectable” because the amount of

formaldehyde collected is below the method limit of detection, consideration should be given to using analytical methods with lower detection limits, so that fewer “zero” values are used to calculate the average test value of the data cluster. Lower limits of detection can be achieved by using reagents other than chromotropic acid (e.g., 3-methyl-2-benzothiazolone or acetyl acetone). Regarding the use of ASTM D 5014, additional information concerning 3-methyl-2-benzothiazolone can be found in Chan et al. (2001) in *The Analyst*, Volume 126, pages 720-723. Detection limits can also be lowered for some test methods by lowering background formaldehyde levels.