State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

**Supplement to the**
**Final Statement of Reasons for Rulemaking**

# ADOPTION OF THE AIRBORNE TOXIC CONTROL MEASURE TO REDUCE FORMALDEHYDE EMISSIONS FROM COMPOSITE WOOD PRODUCTS

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| Public Hearing Date: | April 26, 2007 |
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The ARB is submitting this supplement to the Final Statement of Reasons for insertion in Office of Administrative Law (OAL) File Number 2008-0307-03S.

## Incorporation by Reference

Fifteen documents are incorporated by reference in the airborne toxic control measure to reduce formaldehyde emissions from composite wood products. Section 93120.10 lists the fifteen documents which are incorporated by reference. Due to the length and volume of these documents, publishing them in the California Code of Regulations would be cumbersome, unduly expensive and otherwise impractical. All of these documents were made available upon request during the course of this rulemaking. These documents are also available from the Air Resources Board at 1001 I Street, Sacramento, California.

## Nonsubstantial Changes Made to the Final Regulation Order

ARB has made some minor nonsubstantial changes to the final regulation order for punctuation, grammar, accuracy, clarity, and proper authority and reference citations. The changes made do not materially alter any requirement, right responsibility, condition, prescription, or other regulatory element of any California Code of Regulations (CCR) provisions.

## Summary and Response

1) Comment [24-Landry-070423-CWIC]: "IV. Many Adhesive Systems are Untried and Theoretical at Best. The CARB staff has evaluated a variety of different niche technologies that have been used in limited applications and some more theoretical proposals that have been explored in laboratory or limited production settings. We commend the thoroughness of their inquiry, but we caution about assuming that these alternatives can meet the needs of the market, now or in the foreseeable future. The current product formulations have been proven over years of use and development. Their properties are well known; their

manufacturing characteristics are understood. A regulatory-imposed solution without adequate evaluation can be disastrous and examples abound -- MTBE in California, TRIS (imposed by the CPSC to reduce the flammability of children's sleepwear, not realizing it had serious health impacts), and, in the wood products industry, fire retardant plywood (imposed by many building codes not realizing that the retardant caused long term deterioration of the panels).

With the changes that CWIC has proposed to the Phase 2 levels, we believe that modified UF technology with various additives and production variations may be a solution for compliance. There will be substantial costs to reach these limits and much work will be needed to integrate the new materials and processes, but the industries believe that most facilities will be able to comply given enough time. However, there is no margin for error.

The following discussion comments on some of the alternative technologies that have been identified in Chapter 5 of the ISOR. CWIC does not believe any of these technologies are viable as a serious BACT option, either because of their current and anticipated cost, lack of availability or unproven nature."

Agency Response [24-Landry-070423-CWIC]: We disagree that all of the alternative technologies reviewed in Chapter V of the ISOR are not viable options for achieving BACT. As noted by the commenter, we evaluated a variety of commercial resin technologies that are currently being used to manufacture products with emission levels that would meet the Phase 1 or Phase 2 standards (e.g., European E1 and Japanese F✯✯✯✯ standards, respectively). For these resin technologies, products are already being made and sold to customers worldwide. Thus, we disagree with the comment that these resins are unproven. As also noted by the commenter, modified UF technologies will likely be used to manufacture products that comply with the Phase 1 and Phase 2 standards. The regulation establishes emission performance standards and does not dictate any particular resin technology, rather we believe that an array of resin technologies will be used to manufacture products that comply with the Phase 1 and Phase 2 standards, and modified UF resins will be among the options that manufacturers can choose from. Given that an array of resins will be available, we disagree that there will be issues with the lack of availability and cost. Columbia Forest Products, for example, is marketing their PureBond Technology. PureBond is a soy based resin system which is cost-neutral for the hardwood plywood industry.

2) Comment [24-Landry-070423-CWIC]: "A. Tannin Adhesives. There is an extensive discussion of tannin technologies in the staff report. However, the technology is largely theoretical and the raw materials would not be able to satisfy even a small part of the composite panel industry. Dr. Pizzi, one of the proponents of this technology, stated in a 1995 US Patent (US Patent 5407980) that only 150,000 pounds of tannins were then available. We do not believe that

the supply has meaningfully increased in the intervening period. Compare that to the 1.5 million tons of UF resins that are used in the United States or the 5 million tons of phenol formaldehyde (PF) adhesives that are available. The use of tannin resins for this industry is a totally impractical, if interesting, development."

Agency Response [24-Landry-070423-CWIC]: We believe that as chemical companies respond to the formaldehyde emission limits in the ATCM, other resin technologies will become more viable. Therefore, we disagree that the use of tannin resins for the manufacture of composite wood products is a totally impractical development. We believe that the use of tannins, as a substitute for petroleum-based resins, may be an option for some manufacturers if the cost of petroleum products rises from present levels and/or their availability declines. As noted previously, we believe that an array of resin technologies will be used to produce wood products that comply with the Phase 1 and Phase 2 standards, and tannin resins may be chosen for selected applications.

3) Comment [24-Landry-070423-CWIC]: "The staff report notes some of the technical problems regarding tannins. There is a suggestion that one of the problems, substantially increased press times, could be improved through the use of finely powdered silica. Silica cannot be used in the production process – it destroys sanders, saw blades and other production equipment. It could also present a whole range of health issues to employees and users of the products. The courts are jammed with claims of silicosis -- a disabling, nonreversible and sometimes fatal lung disease caused by overexposure to respirable crystalline silica."

   Agency Response [24-Landry-070423-CWIC]: We appreciate the comment concerning silica addition to tannin resins as described on page 96 of the ISOR. These workers tested the utility of finely powdered silica as an approach for improving particleboard press time. Other hardeners, such as hexamine, have been tested, which would not have the same kinds of effects to production equipment as silica powder (see text on Kim et al. (2003), also cited on page 96 of the ISOR). We believe that additives that are presently being tested in laboratories or used by manufacturers can potentially be used as additives for tannin resins to improve production time.

4) Comment [24-Landry-070423-CWIC]: "Tannin-based resins are considered in the report to be a "No Added Formaldehyde" resin system, but that term must be used with great care. Emissions from tannin-based composite panels are certainly low, but formaldehyde is critical to the adhesive process. The ISOR notes that tannin-based resins are prepared and cross-linked by formaldehyde, although the special nature of the tannin chemistry consumes all the formaldehyde. This sounds much like modern PF resins in which the cross

linking consumes virtually all of the formaldehyde or isocyanate (MDI) adhesives in which formaldehyde is a critical co-polymer in the creation of the resin. Regardless, formaldehyde is a critical component."

Agency Response [24-Landry-070423-CWIC]: We agree that the term "no-added formaldehyde" resin system should be used with care. In this case, if formaldehyde is added to a tannin resin and its use is part of the resin cross linking structure, it could not be designated as a "no-added formaldehyde" resin. However, it is likely that the tannin resin could meet the requirements for an ultra-low-emitting-formaldehyde resin (see section 93120.3 (d) of the ATCM).

5) Comment [24-Landry-070423-CWIC]: "B. Cashew Nut Oil Adhesives. Cashew nut oil is another biological approach that has been mentioned in scholarly journals – it is not a realistic candidate for BACT reliance. First, cashews are one of the more expensive items in the grocery store – they are not available in quantity. Cashew nut shell oil is described in the South African Department of Agriculture's website as follows: "Cashew shell oil extracted from the shells is caustic and causes burns on the skin. The mucous membranes of the mouth and throat are severely affected when it comes into contact with shell oil. The cashew nut shell extract is high in cardanol—a known endocrine disruptor." It is also in the same chemical family as the irritant in poison oak (or poison ivy). Furthermore, the ozonolysis process described at page 96 of the ISOR to create an adhesive is only feasible on a laboratory scale. Again, this is more theoretical than realistic for wide-scale use."

   Agency Response [24-Landry-070423-CWIC]: We disagree that cashew nut oil resin is not a realistic candidate for the BACT assessment. As noted on page 98 of the ISOR, this technology is in the early stages of development, and could possibly emerge as an option for manufacturing compliant products. As the extraction process for cashew nut shell liquid involves high-temperature processes, the complement of worker safety measures may need to be enhanced if cashew nut shell liquid is used as a component in composite wood product resins in the future. As noted in our response to Comment #1 of this Addendum, we believe that an array of resin technologies will be used to manufacture products that comply with the Phase 1 and Phase 2 standards, and cashew nut oil resin may be among the options that manufacturers can choose from.

6) Comment [24-Landry-070423-CWIC]: "C. Soy Based Adhesives. Columbia Forest Products, a wood product manufacturer with an exclusive license to use a proprietary soy adhesive formulation, has aggressively argued that regulatory limits should be imposed by ARB that would essentially mandate the use of its hardwood plywood product.[7] The reason is transparent – in spite of claims that its PureBond soy product is "cost competitive" and preferable, the market has

not warmed to the product.  Columbia is reported to have lost significant amounts of money on this product in 2006 and in the first two inventory cycles of 2007.

[[7] Although references have been made to trials on particleboard, very limited production has been seen in the market. Columbia Forest Products has announced the availability of a niche particleboard product produced in limited quantities at its only particleboard plant.  However, the reported cost substantially exceeded that of PF based particleboard, already a cost premium product, which has similar, negligible emissions.]

The 0.05 PPM emission level in Phase 2 BACT for Hardwood Plywood is essentially driven by the soy-based adhesive option. For purely competitive self-interest reasons, it is critical to Columbia that it obtains higher volumes of sales even before the onset of Phase 2.  At an ARB workshop in Sacramento, a representative of Hercules which owns the rights to the soy technology explained that it has an exclusive license for the product with Columbia.  In response to questioning, he also candidly admitted that the license terminates if certain volume benchmarks were not met at various times.

We submit that even if this product were appropriate for BACT analysis, and there are some questions about that, it is bad public policy to essentially impose monopoly power on a company that already has approximately 40% of the domestic production of hardwood plywood. Commercial disputes, product problems, pricing issues could all lead to an untenable situation in the industry."

Agency Response [24-Landry-070423-CWIC]: We disagree that the Phase 2 standard for hardwood plywood of 0.05 ppm is driven by the soy-based adhesive option.  As noted on page 63 of the ISOR, we specified three options as candidate resin systems for meeting BACT in hardwood plywood – UF with 15% melamine, PVA, and PVA-soy.  Soy resins, such as products made with PureBond by Columbia Forest Products, were not specifically considered in our determination of BACT.  At the public hearing on April 26, 2007, representatives from Columbia Forest Products offered to "sell their resin at a nominal cost above what they're paying now" to other UF resin manufacturers (see Comment #103 in Part C of the FSOR; oral testimony by Harry Demorest).

7) Comment [24-Landry-070423-CWIC]: "Columbia's shift to "formaldehyde free" PureBond hardwood plywood has been widely discussed and scrutinized by its customers and competitors, including a proceeding before the Better Business Bureau's National Advertising Division.  A decision from that body admonished Columbia to refrain from using the "formaldehyde free" terminology from its advertising and raised questions as to its claims of cost comparability.

There have been numerous reports of issues and problems.  First, the soy system is not a 'drop in' technology.  The resin is extremely viscous and difficult to handle.  It is reported that the Columbia Klamath Falls plant had to install new holding tanks, pumps, storage tanks and piping.  Many of the components had to be replaced with stainless steel because of the corrosiveness of the material. Pipes needed to be larger diameter. The cost is reported to have been near $1,000,000. Additional problems were experienced with the spreader which was replaced at the cost of approximately $150,000.”

Agency Response [24-Landry-070423-CWIC]: We appreciate the information, and understand that the industry has adopted the usage of “no-added formaldehyde” instead of “formaldehyde free” in consideration of biogenic formaldehyde emissions from wood. Columbia officials testified on April 26, 2007, that for the most recent generation of the PureBond resin technology, current day tooling costs would be lower than their costs from three years ago when they decided to switch to their soy-based resin. See also Comment #217 in Part C.

8) Comment [24-Landry-070423-CWIC]: “Other production and cost issues have been reported. Open time for the soy resin is approximately 10 minutes versus 50 minutes with UF, with attendant production challenges from pre-cure. Most importantly, throughput rates are about 15% slower.”

   Agency Response [24-Landry-070423-CWIC]: We appreciate the information. In testimony on April 26, 2007, Columbia stated that their plants were running on a cost-neutral basis to UF. See Comment #218 in Part C. The technical aspects of operational issues raised have been addressed, as witnessed by CARB staff during a site-visit to Klamath Falls to visit one of Columbia Forest Products’ hardwood plywood facilities.

9) Comment [24-Landry-070423-CWIC]: “Although Columbia claims that its product is "cost competitive," the cost of PureBond is reported to be approximately 2-3% higher than UF and spread rates are higher than with UF. Soy flour is approximately 80% more expensive than wheat flour. In a monopoly position, one would expect that end product prices would jump substantially.”

   Agency Response [24-Landry-070423-CWIC]: We appreciate the information. See Comment #218 in Part C of the FSOR concerning the cost of PureBond resin that is made with soy flour, and Comment #307 in Part C of the FSOR regarding the availability of soybeans to supply the adhesive market. See also Table VIII-16 on page 204 of the ISOR, where the projected increases in hardwood plywood panel costs are presented.

10) Comment [24-Landry-070423-CWIC]: “There have been reports of product problems and complaints with the new PureBond products. The soy resin is approximately 40% solids and 60% water – UF resins have just the reverse percentages. The additional water reacts with composite cores that are sensitive

to excessive moisture and can swell or decompose. This can cause an uneven substrate surface that can be seen on the face veneer. Delamination can also be a problem. Customers have also reported warping in the PureBond panels, such that they often will not lie flat on cabinetmaker's routing tables that have a negative pressure to ensure trueness. This can cause uneven depth in dados that result in out-of-square products. An industry should not be dependent on a sole source technology -- commercial relationships, pricing issues, varying availability, product quality -- all have the potential to become major problems. The soy product should compete for its customers the way other technologies do."

Agency Response [24-Landry-070423-CWIC]: We appreciate the information. Problems with delamination and warping are not unique to products made with PureBond; it is also known to occur in products made with UF resins typically used in the present-day. We believe that composite wood products made with soy resins are competing for customers the way that other technologies presently do.

11) Comment [24-Landry-070423-CWIC]: "Any of the issues cited above regarding soy adhesives should be sufficient to lead the Board to avoid a soy-based Phase 2 BACT decision for hardwood plywood. This is particularly compelling when one considers that the modest Phase 2 increases proposed by CWIC and the Hardwood Plywood and Veneer Association -- raising emission limits to 0.06 PPM for veneer core and 0.07 PPM for composite core – would encourage an array of competitive options for achieving compliance."

Agency Response [24-Landry-070423-CWIC]: We disagree that the Phase 2 standard for hardwood plywood was based on the use of BACT predicated on soy resins. In our assessment of PVA resins, we found that their use also yields formaldehyde emission levels similar to PureBond soy resins. See also the response to Comment #6 in this Addendum. We believe that the current state of resin technology allows for greater emission reductions than industry suggests (see also the response to Comment #141 in Part C).

12) Comment [24-Landry-070423-CWIC]: "What is absolutely clear at this time, however, is that the soy technology is completely incompatible with MDF and commercially unproven with particleboard. Even Columbia Forest Products is unable to produce commercial quantities of particleboard using the soy technology. CWIC's position is clear: when discussing the applicability of soy adhesives as BACT, one must be very careful to maintain a bright distinction between the technological feasibility of soy to hardwood plywood production and the feasibility to particleboard and MDF production.

As the ISOR notes resin applications and costs for plywood are completely different than for particleboard and MDF. In plywood resin often accounts for 5% of total panel cost as opposed to the other composite panels where resin costs are usually 30%. At these application rates, the soy based resins, even if they were found to be theoretically compatible, would command a process rate and a cost basis higher then PF resins with little additional benefit on lower emissions."

Agency Response [24-Landry-070423-CWIC]: We disagree. A representative from CalAg testified on April 26, 2007, that they planned to manufacture MDF using a soy resin (see pages 206-208 of the public hearing transcript). In comments submitted during the 45-day comment period, Columbia reported producing particleboard using soy resin at its mill in Canada (see Comment Letter #35 in Part C of the FSOR). Concerning product cost, Columbia has reported that their plants operate on a cost-neutral basis to UF (see also the response to Comment #9 in this Addendum).

13) Comment [24-Landry-070423-CWIC]: "D. Polyvinyl Acetate. Another no-added formaldehyde hardwood plywood adhesive, cross linked polyvinyl acetate (PVA), is currently available. However, it too should not be considered for a BACT determination. Its cost is in the range of 5-6 times that of UF resins. In addition, it cannot be used with certain species of face veneers due to "bleed through" or discoloration. This is particularly true with maple, but can be problem with other species as well.

If the Phase 2 limits were raised slightly, to the levels recommended by CWIC, it would create space for a range of options for compliance – soy based adhesives, PVA's if desired and UF systems with other additives. If the hardwood plywood veneer core and composite core limits were raised to 0.06 and 0.07 PPM, respectively, this would create a truly competitive, performance-based, extremely low emission standard that would accomplish the regulatory objectives of the state."

Agency Response [24-Landry-070423-CWIC]: We disagree that the use of PVA should not be considered in the BACT determination. Products are currently commercially available and made with PVA resins, which are sold to customers for some applications. While we recognize that the cost of PVA resin is higher than for UF, our estimates suggest that the increased cost of producing a hardwood plywood panel with PVA would be 10 to 30% higher than for UF (see Table VIII-16 on page 204 of the ISOR). We believe that resin technology allows for greater emission reductions than industry suggests (see also the response to Comment #141 in Part C).

14) Comment [24-Landry-070423-CWIC]: "E. MDI Adhesives. CARB staff correctly recognized MDI as an important 'no-added formaldehyde' adhesive system which has been used for a number of years in niche applications and it may be

used as an additive in some of the UF-based solutions. However, it should not be the BACT technology for a variety of reasons. First, it is extremely costly (as much as 480% higher than UF-based resins according to Appendix G of the ISOR). This disparity has the prospect of worsening. In the last year every wood products manufacturer using MDI has been put on allocation. This is ominous both as to availability and cost. There is simply not enough global MDI supply to meet the current worldwide demand. Last year's global consumption change in China for polyurethane has had a large and ongoing impact on pricing and availability in North America for MDI wood binders.

Second, MDI is an extraordinarily aggressive binder that can stick to presses and other equipment, significant retrofitting costs are required to use the adhesive. Third, MDI has to be handled very carefully because of its health effects. The uncured adhesive must be carefully isolated in the manufacturing process. Fourth, MDI can not be used in hardwood plywood production. It is expected that MDI based products will continue to occupy a niche position in the composite panel industry.

Emissions from MDI-bonded products are negligible and it is therefore appropriate that products using MDI adhesives be included in the 'no-added formaldehyde' list described in section 93120.3(b) of the rule."

<u>Agency Response [24-Landry-070423-CWIC]</u>: We disagree that MDI should not used in an assessment of BACT. Products made with MDI resins are currently being sold in the marketplace, and the price of products may likely decrease if the demand for MDI resins increase. As more experience is gained by manufacturers, we anticipate that reported problems with MDI use will be solved and equipment-related costs controlled. Procedures are already in place for the safe handling of MDI in the workplace. There are other options beside MDI resin for hardwood plywood, and its use remains as a potential low-emission option for particleboard and medium density fiberboard. As it is used today, MDI resins would qualify as a no-added formaldehyde resin in the ATCM.

15) <u>Comment [24-Landry-070423-CWIC]</u>: "F. Akzo 'Catcher' Adhesive. This is a new, proprietary product developed in Europe which to our knowledge has not been commercialized. While it may have potential in some applications, we submit that it is an inappropriate to rely on it as BACT. The Akzo Nobel literature references a 10.8 sec/mm press time (ISOR, page 76) as much as 50% slower than a well run continuous line in North America. Laboratory trials are a lot different than production reliability.

We urge CARB not to adopt provisions that are based on speculation and theory. The stakes are simply too high."

<u>Agency Response [24-Landry-070423-CWIC]</u>: We disagree. We met with

representatives from Akzo Nobel who informed us that the catcher system was being used commercially in European composite wood product manufacturing mills. As noted previously, we expect that an array of resin systems will be used to produce products that comply with the Phase 2 standards, and the catcher system is one option that manufacturers may opt to use. We recognize that with time, the use of the catcher system can be optimized for mills in the U.S.

16) Comment [24-Landry-070423-CWIC]: "V. There Will Be Significant Adverse Energy Impacts. This rule will have several important and negative environmental effects in terms of energy usage and attendant higher emissions of carbon dioxide of at least 75,000 metric tons annually. These impacts are driven by the fact that using lower emission adhesives will slow industry production processes by 20% at the proposed levels and could require substantially higher press temperatures. This is a very large unintended consequence of this regulation that has been completely overlooked by the staff report. Second, the ceiling limits proposed in the rule will lead to the increased use of phenol type adhesives which will cause methanol emissions to rise. The staff report does not properly account for either of these deleterious environmental impacts.

Industry Presses are powered by industrial boilers that consume between 10 and 25 million BTU per hour of operation (MMBTU/hr). The range is dependent on the age of the boiler and the fuel source. Additionally, 19 of the facilities in North America have oxidizers on their press vents to reduce factory emissions which consume, on average, nearly 8 MMBTU/hr. CWIC estimates that the CARB proposal will slow industry processes by 20% because the low emission adhesives will require longer press times, which will lead to proportionately greater energy use."

Agency Response [24-Landry-070423-CWIC]: We disagree that meeting the emission limits in the ATCM will significantly slow industry processes and lead to proportionately greater energy use. Therefore, we also disagree with the commenter's claim with respect to energy use. In our assessment, we learned that for resins like MDI, less energy would be utilized thereby creating a potential energy savings. Initially, processes may be slowed to some degree, until experience is gained in the use of hardeners and/or processes related to furnish preparation, etc. are optimized (see page 75 of the ISOR). The use of phenol resins is one of several resin options available to manufacturers, and it is premature to project whether its use will predominate in 2009-2012, given the array of potentially available resin technologies that manufacturers can choose from. Thus, we do not believe that there will be increase in methanol emissions from the use of phenol resins or in methanol use (see page 222 of the ISOR) to manufacture products that meet the Phase 2 standards.

17) Comment [24-Landry-070423-CWIC]: "The U.S. Department of Energy has set a conversion factor of 53 metric tons of carbon dioxide produced per billion BTU based on natural gas, the most efficient energy source for conversion purposes and a conservative factor for the estimate. CWIC estimates that 75% of production facilities in North America will have to meet the emission limits proposed by CARB. Together, these factors result in a median prediction of 75,000 metric tons/annually of increase in emissions. Attached as Appendix B are the spreadsheets which contain the details of these calculations.

The "cost" of carbon dioxide emissions can be readily tracked using the Chicago Carbon Exchange. California has set a goal of reducing carbon dioxide emissions by balancing any increased emissions. Using the current factors and recent pricing on the Chicago Exchange, we estimate this rule will increase the carbon deficit from between $300,000 to $400,000."

Agency Response [24-Landry-070423-CWIC]: We appreciate the information. However, the actual impact of the ATCM on carbon dioxide emissions will depend on the particular choice of resin system used by a manufacturer. For some resin systems which cure at lower press temperatures, less energy may be needed to manufacture a panel. See also the response to Comment #16 of this Addendum.

18) Comment [24-Landry-070423-CWIC]: "A. Appendix B Comments: 1. CARB does not now Fully Recognize that Emission Rates of Composite Wood Products ("CWPs") can be Influenced by Indoor Levels from Outdoor Ambient and non-CWP Formaldehyde Sources.

A concentration of 0.004 ppm (4 ppb) is indicated in the assumptions concerning decay for the 11$^{th}$ and last year of emissions for raw PB (Table 1), and the 20$^{th}$ and last year of emissions for one-side laminated PB (Table 3) in Appendix B. The 4 ppb level is mid-range between the 3 and 5 ppb outdoor ambient levels as reported by CARB to the California Legislature (CARB 2005). Because of vapor pressure gradients, emissions from CWP sources will diminish due to concentrations from certain other non-CWP sources. Indeed, CARB alludes to vapor pressure as a suppression-release formaldehyde mechanism (page 28 of the proposed ATCM). In the 6/20/06 Preliminary Risk Characterization Methodology and Estimates (CARB 2006) it is assumed that 75% of total formaldehyde emissions in a new conventional home originate from UF-based products and 25% from other sources. For older homes the contribution would be less for the original new home CWP sources. According to Kelly et al. (1999) there are a number of sources of formaldehyde unrelated to PB, MDF, and HWPW. Some of these other sources are episodic and obviously do not occur in all homes everyday. Nevertheless, with the large inventory of homes in California, a number of these homes each day would experience these releases, which in some cases, can be quite high. The contribution of CWP emissions towards formaldehyde levels is overstated."

Agency Response [24-Landry-070423-CWIC]: We disagree that the contribution of composite wood product emissions towards formaldehyde levels is overstated. The data in Table 1 in Appendix B of the ISOR depict the estimated formaldehyde emissions from the particleboard as it ages, and the net flux of formaldehyde from the panel is dependent on suppression-release exchanges that occur with all sources and sinks in the microenvironment. We estimated that 75% of total formaldehyde emissions in a new conventional home originate from UF-based composite wood products based on their reported emission rates (μg/m$^2$/hr) and estimated product usage. See Appendix F of the ISOR for a complete discussion of estimated formaldehyde emissions in a conventional home. Compared to other known sources, emission rates and the amounts of composite wood products used in a home are several orders of magnitude higher than for other sources. This percentage could be higher if we could assess emissions from furniture made with the specified composite wood products, which were not included in our analysis. In contrast to the commenter, we believe that 75% is a conservative estimate, given that furniture emissions were not included in the estimate.

19) Comment [24-Landry-070423-CWIC]: "2. There are no Long Term Decay Studies for Laminated Wood Products. CARB acknowledges that "staff was not able to find any long-term studies on emissions from laminated boards" (page 6, Appendix B) in respect to particleboard. There is also little or no information on the long term decay of MDF or HWPW. This has resulted in several highly speculative assumptions concerning one-side lamination and two-side lamination CWPs, as exemplified in the discussion on PB in pages 2-8 of Appendix B. While not addressed here, similar comments would also likely apply to MDF and HWPW:

A. CARB assumes that the duration of contribution of emissions of raw PB is 11 years based on an initial concentration of 0.18 ppm. Eleven years is very likely an overstatement of emission contribution of inside formaldehyde on ambient levels. The contribution of one-side laminated particleboard is assumed to be 20 years. This is based on the assumption that it takes 20 years for particleboard to off-gas formaldehyde and that "total emissions from laminated boards in 20 years are approximately the same as the total emissions from raw boards over an 11 year period." There is little or no data that would support this assumption. Even the process of lamination would likely drive off some of the free or loosely bound formaldehyde from the previously manufactured PB. Moreover, there is apparently no recognition by CARB for the long-term effectiveness of formaldehyde scavengers that may be contained in some CWPs.

B. The assumption for two-side PB lamination that an emission rate of about 20 μg/m$^2$/hr is constant for over 20 years is in conflict with reality. An emission rate of 20 µg/m$^2$/hr is associated with an indoor concentration of 0.014 ppm (Table 3 for one-side laminated particleboard). There seems to be little basis for this assumption as it is inconsistent with virtually all studies related to plotting formaldehyde concentration by home age when UF-bonded products are present in homes in these studies. Two-sided laminated PB could emit formaldehyde for a long period of time but the emissions would likely be severely limited because of the barrier effect."

Agency Response [24-Landry-070423-CWIC]: We acknowledge that there is very limited data on long-term formaldehyde emission rates for composite wood products. However, there are several fundamental assumptions that can be made to project long-term emissions based on published data – that free formaldehyde in a board will slowly diffuse to the surface and be emitted to air, and that the minimum emission rate of a composite wood product panel will approximate that of solid wood. With this in mind, we estimated lifetime formaldehyde emissions from the three products of concern, and consistent with decay rates in the literature estimated that it would take 11-years for uncoated boards to reach emission rates comparable to solid wood. Given that boards laminated on one-side had only half the effective emission surface area as uncoated boards, we reasoned that it would take about twice as long for the free formaldehyde in the board to be released to air. No other stakeholders expressed concern over this specific issue raised by the commenter. For boards laminated on two-sides, emissions would be restricted to edges. An emission rate of 20 µg/m$^2$/hr was chosen in consideration of edge emissions being up to three-times higher than surface emissions, and the amount of free-formaldehyde trapped in the board by the laminates.

20) Comment [24-Landry-070423-CWIC]: "3. Assumptions on Quantities of Laminated Boards Needs Further Review. The assumptions concerning the percentage of raw board and laminated boards for PB, MDF, and HWPW as shown on Table 7 (page 13) of Appendix B is not consistent with current end uses for CWPs. Particleboard flooring products in 2005 represented less than 5% of particleboard shipments (CPA 2006). This flooring material would be covered with vinyl or other finished flooring products most of which, except for carpets, would represent highly effective diffusion retarders. Most of the remaining PB (~ 95% of shipments) would be surface laminated or surface finished on one side or two by fabricators (kitchen cabinet and furniture manufacturers, etc). For MDF it is assumed that only 10% would be raw. This could still be high as almost all of this material would be finished on at least one side. Not only laminates but also overlays and many liquid applied finishes when cured will significantly reduce emissions from underlying UF-bonded wood products (CPA 2003).

For hardwood plywood it is assumed by CARB that all would be raw board. In the 2002 U. S. HWPW consumption figures listed in Table 6 (page 11), it is apparent that wall panels as well as industrial panels are included. In fact, virtually all hardwood plywood wall paneling, representing about 35% of U. S. production, is finished in the U.S., including both domestically produced and those produced with imported platforms. Over 50% of wall panel production is laminated one side with vinyl film, a highly effective formaldehyde diffusion retarder. Of the remaining industrial HWPW (about 65% of total consumption), about 10% is finished or laminated by hardwood plywood producers. Kitchen cabinet manufacturers and other fabricators finish almost all of the remaining industrial HWPW either on one side or two.

Agency Response [24-Landry-070423-CWIC]: We appreciate the information on the percentages of raw boards, one-side laminated, and two-side laminated currently being used for the three composite wood products subject to the ATCM. Our assumptions, as provided on page 10 of Appendix B of the ISOR, were based on information received at public workshops and in stakeholder meetings. The percentages may differ slightly from actual end uses, but provide a reasonable representation for estimating emission from the products subject to the ATCM. Also, an estimated emissions inventory already accounts for the lower surface emissions resulting from applying a laminate or covering to composite wood products (see Appendix B of the ISOR).

21) Comment [24-Landry-070423-CWIC]: “4. Adding Concentrations and Emission Rates of CWPs Used in the same Indoor Environment Fails to Recognize Interactions between Products. The estimate of California 2002 emissions relies on formula (9) on page 10 and assumes that emissions of PB, MDF and HWPW are added together. There is little merit in this assumption unless these materials exist in isolation from one another in different indoor environments. Two or more CWPs are found in most homes and other indoor spaces where they are used. A number of controlled chamber test studies have found that concentrations observed when testing PB and HWPW together is less, sometimes much less, than the addition of the concentrations when the same two products are tested alone (Singh et al. 1982, Godish and Kanter 1985, Newton et al. 1986, Godish and Rouch 1987). Although information is more limited, there is also data that indicates when PB, HWPW and MDF are tested together the concentration is less than adding the three concentrations when the three products are tested separately (Newton et al. 1986, Groah and Gramp 1988). The effect of UF-bonded wood product emission interactions has also been observed in a home study project sponsored by the Composite Panel Association and the U.S. Environmental Protection Agency (Koontz et al. 1996, Groah 2006).”

Agency Response [24-Landry-070423-CWIC]: We appreciate the information and recognize that interactions between products take place in indoor environments. As there is no benchmark basis for projecting the magnitude of emission interactions in a home, and that the full range of formaldehyde sources and sinks varies from home to home, we used an additive approach to estimate the maximum amount of emissions that would result from composite wood products compliant with HUD, Phase 1, and Phase 2 standards (see Appendix F in the ISOR). In light of the changes in formaldehyde source-sink relationships that occur over time as product emission rates decline, there would be greater uncertainty in the emission estimates if different emission interaction factors were applied for Phase 1 and Phase 2 products. In this regard, Godish and Rouch (1987) examined the effect of source contributions on formaldehyde levels under both whole-house and controlled laboratory conditions. The majority of their results clearly demonstrated that under whole-house conditions, formaldehyde levels from source combinations were either partially or completely additive.

22) Comment [24-Landry-070423-CWIC]: "5. The Consumption of Hardwood Plywood is Mis-stated for 2002. On Table 6 (page 11) California consumption of PB, MDF, and HWPW is determined by using the ratio of the California population (~ 12.3%) to that of the U. S. in determining California consumption from U. S. consumption. This is a straightforward method and CARB should be complimented on this approach. The 2002 U. S. consumption figures for PB and MDF look reasonable (CPA 2006); however the figures for HWPW appear to be too high. Over 85% of U. S. wall panel blanks are imported but are subsequent finished (liquid applied finishes, vinyl laminated, paper laminated, or printed) in the U.S. and thus there is a chance of double counting. For industrial hardwood plywood, imported platforms still qualify as plywood as they would be 3 or more ply. Likewise, there is a good chance of over counting in industrial plywood. HPVA records show about 2,180,000 $m^3$ for 2002 HWPW shipments (HPVA 2006A, HPVA 2006B). Assuming some imported stock not captured in U. S. production it would appear unlikely that U. S. consumption would exceed 2.8 to 2.9 million $m^3$ in 2002. The overstatement of HWPW consumption, however, is offset by the California consumption figures ($m^2$) in the last column of Table 6. All extensions in this column are incorrect, as apparently ¾" was assumed as the base thickness for HWPW, and not the ⅜" base thickness as indicated in footnote "b" to the table. Given the decline in the use of thin hardwood plywood wall paneling relative to hardwood plywood industrial panels in recent years, an average ½" base thickness is more appropriate for HWPW than the ⅜" thickness suggested by CARB."

Agency Response [24-Landry-070423-CWIC]: We appreciate the information concerning the overstatement of hardwood plywood consumption in California. We elected to use the consumption data from the Department of Agriculture after our requests at public workshops and stakeholder meetings failed to encourage responses of any kind. In addition, CARB staff received limited feedback from the hardwood plywood industry in response to our 2003 Product Survey. We made our estimates based on accepted practices in the literature, and agree that the numbers in Table 6 in Appendix B of the ISOR would be changed in light of the suggestions made by the commenter. In either case, formaldehyde emissions from hardwood plywood would still contribute in excess of 150 tons per day of formaldehyde emissions statewide, and would still be an important contributor to formaldehyde-related health risk.

23) Comment [24-Landry-070423-CWIC]: “6. Using a Statewide Outside Ambient Level is not Appropriate for the Contribution of Indoor Air to Outdoor Air in Many California Areas. As described earlier in these comments using 0.004 ppm (4 ppb) to represent the total indoor background level ignores the contribution of non-CWP formaldehyde sources and the effects that these sources have on emissions from PB, MDF, and HWPW. Indoor ambient background related to outside ambient formaldehyde levels appear to be associated with population density. For example, CARB reports a mean ambient concentration for Los Angeles of 7.5 $\mu g/m^3$ (6.1 ppb) with a range up to 17.2 $\mu g/m^3$ (14 ppb) on page 25 of the proposed ATCM. The higher formaldehyde ambient level in Los Angeles county as compared to other areas is no doubt due primarily to on-road mobile sources or automobile exhaust, characteristic of high density urban areas, as well as various "other mobile sources" that could also be related to high density urban areas. The high ambient range for Los Angeles is at the same 17.2 $\mu g/m^3$ (14 ppb) level estimated by CARB staff as the average current indoor formaldehyde level in California homes: Table VII-4 of the Preliminary Risk Characterization Methodology and Estimates (CARB 2006).”

On Table 13b, residential housing construction (units) by county for 1993 – 2002 is provided. Four of the 58 counties listed (Los Angeles, Riverside, San Diego, and Orange) make up 42% of the total of 2,710,902 housing units for the ten-year period. At least some, if not most, areas of these counties are probably accompanied by high automobile traffic patterns. The profile of urban, semi-urban, and rural areas in each county will likely affect the appropriate ambient levels for various counties or areas of counties. The location of formaldehyde sampling stations relative to urban or more rural areas can also be a factor in characterizing ambient concentrations. High outside ambient formaldehyde levels leading to higher indoor background levels not only has a bearing on the reduction of emission rates of indoor sources of formaldehyde by vapor pressure mechanisms but also to indoor exposures from non-CWP and CWP sources. It would appear that a more complete analysis of urban, semi-urban and rural interface as suggested above is more important, if not more so, than the three bulleted items on page 29 as examples of "information that could support improvements" in the emission methodology described in this appendix.

Agency Response [24-Landry-070423-CWIC]: We appreciate the information concerning the contributions from mobile sources in urban areas in outdoor air quality. As we have shown in Chapter VII of the ISOR (pages 155 to 159), our calculations of total daily formaldehyde exposure include estimates of exposure that occur indoors, in-vehicles, and outdoors for a typical member of the public.

We used an average outdoor concentration for estimating the outdoor exposure component instead of using values unique to urban, semi-urban, and rural interfaces. Using the approach proposed by the commenter would have lowered the total exposure values in Table VII-4 only slightly, given that people spend only a small portion of their day outdoors.

24) Comment [24-Landry-070423-CWIC]: "B. Appendix D Comments. 1. The ¼" UF particleboard as the last item in Table D-1 (product 1 in the Battelle study) appears to be an outlier: the typical conditions emission rate of 1580 µg HCHO/$m^2$-hr is 3 times that of the next highest "typical conditions" value for particleboard: ⅝" particleboard underlayment (product 2) at 508 µg HCHO/$m^2$-hr."

Agency Response [24-Landry-070423-CWIC]: The basis for the max(imum), mean, and min(imum) values in the Table are shown on page 5 of Appendix D. In Battelle (1996), two emission tests were performed on ¼" particleboard; both measurements were above 1,000 µg/$m^2$/hr.

25) Comment [24-Landry-070423-CWIC]: "2. On page 1, the 440 µg HCHO/$m^2$-hr emission rates for "PB and MDF: E 1333 = 0.30 ppm" is incorrect for MDF. The emission rate for MDF at the E 1333 designated 0.26 $m^2/m^3$ loading rate is 710 $m^2/m^3$ loading. Further, on page 1, the emission rate for MDF (2002 average E 1333 = 0.25 ppm) is actually 591 µg HCHO/$m^2$-hr, not the 367 µg HCHO/$m^2$-hr as shown."

Agency Response [24-Landry-070423-CWIC]: The estimated formaldehyde emission rate for 2002 average MDF (i.e., 367 µg/$m^2$/hr) is based on the assumption that there is a proportional relationship between a measured ASTM E 1333 value and a measured formaldehyde emission rate. It is not necessary to apply a loading rate correction, as the emission rate assumes that the same test procedures will be followed for each product.

26) Comment [24-Landry-070423-CWIC]: "3. On Table D-2 on page 3 under the "C. Resulting HCHO Emission Rate" the last column emission rate numbers for MDF should be 591 as the 2002 mean, 497 as the Phase 1 standard, and 260 for Phase 2."

Agency Response [24-Landry-070423-CWIC]: We disagree. See the response to Comment #25.

27) Comment [24-Landry-070423-CWIC]: "4. On page 5 under Particleboard (Battelle, 1996), the last bullet point in the text is reversed as related to the

various means. It should read as follows: Mean of highest 33% (µg /$m^2$-hr) = 293 (n= 7); mean of middle 33% (µg /$m^2$-hr) = 159 (n = 8); mean of lowest 33% (µg /$m^2$-hr) = 119 (n = 7)."

Agency Response [24-Landry-070423-CWIC]: We agree that the order of the text is reversed. This is an oversight that does not change the conclusions of Appendix D in the ISOR.

28) Comment [24-Landry-070423-CWIC]: "C. Appendix E Comments. 1. The 800 $ft^2$ "small" home and the 2000 $ft^2$ "large" home do not appear to be good selections to characterize California new homes. The average size of new one-family houses in the West region of the U.S. in 2005 was 2,434 $ft^2$ (U. S. Census Bureau, 2006). It is not expected that the size of homes in California would deviate much from the West region average. To characterize 2000 $ft^2$ as a large home when the average home is over 20% larger in the West region is not appropriate.

While homes as small as 800 $ft^2$ are constructed, it is likely that this size home represents a fairly small segment of new housing. Some apartments are larger than 800 $ft^2$. Single section manufactured homes often fulfill the need for smaller homes. The most common and economical unit is the single section 14 feet wide by as much as 80 feet long unit (mHousing.com 2007), a home that can offer about 1,100 $ft^2$ of living area."

Agency Response [24-Landry-070423-CWIC]: We appreciate the information about the new single-family home sizes in the West. We agree that the size of homes in California would not deviate much from the average home sizes in the West, and believe that the 2,000 $ft^2$ example provides a fair representation of an "average" size home in California. Our use of the phrase "large home" is in comparison to the 800 $ft^2$ home we used as an example of a "small home." Our reason for using the 800 $ft^2$ home as an example was affordability for low-income families in California who may live in small homes or apartments. If homes of this size are offered for sale in low-income communities, the potential environmental justice concerns would need to be examined in the staff report.

29) Comment [24-Landry-070423-CWIC]: "D. Appendix F Comments. 1. While larger new homes will likely contain greater quantities of UF-bonded cabinet and related materials than smaller homes, the increase in use is not proportional to the size and volume of the homes. This is amply illustrated by the 800 $ft^2$ small home and the 2000 $ft^2$ large home examples selected by CARB. In the small home the total loading rate of HWPW, PB and MDF is 0.52 $m^2/m^3$; in the large home the loading rate is 0.38 $m^2/m^3$. The average CARB projected concentrations for Phase 1 and Phase 2 for the small home are 182 µg/$m^3$ and

96 μg/m$^3$, respectively. For the large home the concentrations are 125 μg/m$^3$ for Phase 1 and 67 μg/m$^3$ for Phase 2.

The average size of California homes is not likely much different than the average size of homes in the West regional area as indicated in a U. S. Census Bureau table (2006). By using the two CARB selected sample homes, both of which are smaller than the 2,434 ft$^2$ average new one-family homes in the West region, the average loading rates of UF-bonded products and HCHO concentration in new California homes is exaggerated."

Agency Response [24-Landry-070423-CWIC]: We disagree. Homes of the sizes we used in our calculations are being built in California, and for both examples, maximum in-home concentrations are well above the acute and chronic reference exposure levels developed by OEHHA. While it follows that levels may be lower in larger homes, the scenarios we used are relevant for a significant portion of new home buyers in California.

30) Comment [24-Landry-070423-CWIC]: "2. Formaldehyde emissions for each of the 9 products in the CARB "small" home in Table F-1 are added together to obtain total maximum potential emissions for the home. The same procedure is used for the 10 products in the CARB "large" home. A number of studies have demonstrated that product concentrations, and thus formaldehyde emissions, cannot be added together. Home and space emissions are less than the addition of the individual sources because of interactions among formaldehyde sources. Two mechanisms have been suggested to explain this phenomenon: formaldehyde sinks and suppression due to vapor pressure gradients (Godish and Rouch 1987, and Groah 2006). Indeed a product that is a relatively weak source of formaldehyde can be a sink for emissions from a product with higher source strength.

A number of investigators have observed in dynamic chamber studies that the concentration of two or more UF-bonded wood products tested together is less than the addition of the concentrations when samples from the same product are tested in separate tests (Singh et al. 1982, Pickrell et al. 1982, Godish and Kanter 1985, Godish and Rouch 1987, Newton et al. 1986, Sundin 1987, and Groah and Gramp 1988). Adding HCHO emissions from products in Table F-1 (small home) and from products in Table F-2 (large home) will result in the total maximum potential emissions to be overstated."

Agency Response [24-Landry-070423-CWIC]: We disagree that the maximum potential emissions are overstated. We applied literature-based emission factors (see Appendix D of the ISOR) to the amounts of composite wood products that would be used in homes of the designated sizes using a commercially available estimation tool used by fabricators (Planit Solutions, Inc., 2004). We appreciate the information and recognize that interactions between products take place in indoor environments. However, as there is no benchmark methodology that can be used to address interactions, we used an additive approach to estimate the maximum potential emissions from the composite wood products in those homes. See also the response to Comment #21 of this Addendum.

31) Comment [24-Landry-070423-CWIC]: “3. In Section C (Change in Daily Time-weighted Average HCHO Concentration) on page 4, it is assumed that HCHO emissions from HWPW, PB, and MDF account for 75% of the measured concentrations in homes for both Phase 1 and Phase 2. Applying the 75% value (we do not concede that this is necessarily the correct percentage) to the 182 $\mu g/m^3$ total emission for Phase 1 in the small home yields 136.5 $\mu g/m^3$ attributed to wood panel products, and 45.5 $\mu g/m^3$ attributed to other sources. Without a concomitant decrease in other sources, not the subject of this CARB initiative, it is highly unlikely that 75% of the projected Phase 2 emissions could be attributed to HWPW, PB, and MDF. Indeed, if no changes were made in reducing emissions from non UF-bonded sources, including that contributed by the outside ambient concentration, the contribution of the three wood products in Phase 2 would be only about 53%: 96 $\mu g/m^3$ (Phase 2 projected contribution) - 45.5 $\mu g/m^3$ (other sources) = 50.5 $\mu g/m^3$ ÷ 96 $\mu g/m^3$ (x 100) = 52.6%. Applying the same logic in the large house example, the contribution of HWPW, PB and MDF could be as low as 53.4% (125 x 0.25 = 31.25; 67 - 31.5 = 35.75; 35.75 ÷ 67 = 0.534 x 100 = 53.4%). Thus, the percentage contribution to home concentrations from the three wood panel products has been overstated for Phase 2.”

Agency Response [24-Landry-070423-CWIC]: We disagree that the percentage contribution to home formaldehyde concentrations from the three wood panel products is overstated. The calculations on page 3 of Appendix F show how we calculated the maximum potential contribution from composite wood products alone. From these calculations, we determined percentage reductions in maximum potential concentrations in a home that we used to estimate decreases in indoor formaldehyde concentrations resulting from the use of Phase 1 and Phase 2 compliant wood products. We believe that 75% is a conservative estimate for total composite product-derived formaldehyde emissions in a home given their high formaldehyde emission rate and the amount of composite wood material in homes (see also the response to Comment #18 of this Addendum).

32) Comment [24-Landry-070423-CWIC]: “E. Appendix H Comments. 1. In Table H-1 on page 3 the information for HWPW is incorrect in two respects. The emission rate shown is 21 mg $m^{-2}$ $hr^{-1}$. This was derived by dividing L by N, rather than N by L. The formula appearing in ASTM E 1333 is referenced by CARB: ER = Cs x (N ÷ L) in making this calculation. The correct mathematical extension is 0.29 mg $m^{-2}$ $hr^{-1}$. The second error is more serious: while the test

loading rate for hardwood plywood industrial panels is correct at 0.425 $m^2/m^3$, the HUD Standard value is 0.3 ppm, not 0.2 ppm, as stated in a HUD letter of clarification, dated 1/31/85 (Nistler 1985). If the correct 0.3 ppm limit is used, the emission rate for industrial hardwood plywood would be 0.43 mg $m^{-2}$ $hr^{-1}$. Using the incorrect HUD level results in a significant understatement of the "% reduction from the 1985 HUD standard" for hardwood plywood. Thus, the burden to this segment of the industry to comply with the proposed Phase 1 and Phase 2 requirements is significantly understated. The % reduction in Table H-1 for HWPW for the 2002 mean is -70%, not -38%. For Phase 1, the correct reduction is -77%, not -53%. The Phase 2 reduction should be -86%, not -71%."

Agency Response [24-Landry-070423-CWIC]: We agree that the correct mathematical extension is 0.29 mg $m^{-2}$ $hr^{-1}$ instead of 0.21 mg $m^{-2}$ $hr^{-1}$. We used the value in the documentation for ASTM E 1333, and were not aware of the clarification letter by Nistler at the time the table was prepared. Irrespective of the relative discrepancies compared to the HUD standard, product emission rates that would be needed to comply with the Phase 1 and Phase 2 standards are being achieved today (see pages 101 to 103 of the ISOR). Although the percentage reductions required for Phase 1 and Phase 2 hardwood plywood appear to be more stringent than for particleboard and medium density fiberboard, the numerical value of the standards were all based on reductions from products commercially available in 2002, and projected advancements in resin systems for each of the three products.

33) Comment [24-Landry-070423-CWIC]: "2. On page 3, CARB reports that "the reported range of values for uncoated MDF was 0.210 to 0.385 mg HCHO $m^{-2}$ $hr^{-1}$, which may in part be due to the lower loading rate specified by ASTM in the E 1333 test protocol (0.26 $m^2$ $m^{-3}$) vs. the loading rate used in the Battelle study (0.46 $m^2$ $m^{-3}$)."

CARB is incorrect; the loading rate in the Battelle study for uncoated MDF was clearly 0.26 $m^2$ $m^{-3}$ (see product groups 4 and 6 in the Battelle study)."

Agency Response [24-Landry-070423-CWIC]: We acknowledge that an incorrect loading rate is cited on page 3 of Appendix H of the ISOR. The information in Appendix H was included in the ISOR for informational purposes, and does not affect the basis for the Phase 1 and Phase 2 standards for medium density fiberboard in the ATCM. Moreover, the information does not impact our estimates of formaldehyde emissions or exposure as reported in the ISOR.

34) Comment [24-Landry-070423-CWIC]: "3. It is important to make adjustments in concentrations of formaldehyde when comparisons are made from data derived using different test methods having different loading rates and performed under different conditions. While an attempt to make these adjustments is

commendable as shown on page 5, the outcome is highly questionable. This appears to be due, in part, to a shallow reading of the Groah et al. (1991) paper. The experiment described in this paper was a direct comparison of the WKI (EN 717-1) method with the ASTM E 1333 method. Matched samples were tested at the EN 717-1 loading rate and at the specified conditions set forth for that method. The other set of matched samples were tested using the ASTM procedure, which included loading rate, temperature, and relative humidity that was different from EN 717-1. The experiment had nothing to do with edge sealing in isolation. The results of that experiment indicated that at EN 717-1 conditions and loading, testing results were about 20% lower than when using ASTM conditions and when using chromotropic acid analysis in both procedures. Results were given in ppm. In assuming a test result of 0.10 ppm from EN 717-1, one would expect an approximate outcome of ~ 0.13 ppm when using ASTM E 1333."

Agency Response [24-Landry-070423-CWIC]: We appreciate the comment; the information in Appendix H was included in the ISOR for informational purposes and does not affect the basis for the Phase 1 and Phase 2 standards for medium density fiberboard in the ATCM. Moreover, the information does not impact our estimates of formaldehyde emissions or exposure as reported in the ISOR.

35) Comment [14.3-Julia-080215-CPA]: "CARB has . . . inserted . . . provisions for laminated products." "Although we believe that the concept is sound . . . there are four potential problems in the way in which the change has been implemented in Section 93120.7." "The definition of fabricator in Section 93120.1(12) already includes 'producers of laminated products.' The reference to both in the new section (93120.7(a)(2)) is superfluous and potentially confusing." "If lamination is being conducted by the same company that produced the platform, the literal language in Section 93120.7(a) would make the underlying production of the substrate exempt from third party certification. This is a huge loop hole." "Even if one were to favor the exemption from third party certification, the language as drafted is overly broad." "It should be clarified that Subsection 2 does not apply in situations in which the fabricator also manufactures the substrate."

Supplemental Agency Response [14.3-Julia-080215-CPA]: In the Agency Responses to comment # 50 in section D of the FSOR (comment # 50 is restated above), we stated that "we believe the definition of a fabricator is clear and that section 93120.7(a)(4) clarifies any possible confusion raised by the wording in section 93120.7(a)(2)." While we still believe this to be the case, we revised the wording of section 93120.7(a)(2) as a non-substantive change for clarifying purposes. Section 93120.7(a)(2) now reads: "Fabricators that produce laminated products, and do not manufacture composite wood products, do not need to comply with the manufacturer requirements regarding third party certification in section 93120.3(b)."