

WSRCA TECHNICAL BULLETIN No.2020-LSII-1ED.



**Roof Wood Sheathing
Susceptibility to Moisture**

Fall 2020



WESTERN STATES
ROOFING CONTRACTORS ASSOCIATION

TECHNICAL BULLETIN No. 2020-LSII-1ed
Roof Wood Sheathing Susceptibility to Moisture

To: WSRCA Contractor Members

Fall 2020

From: WSRCA Low-Slope & Steep-Slope Committees

I. INTRODUCTION

Ideally, installation of roofing should occur over a dry substrate, during dry weather and with no rain in the forecast. However, depending on the size and complexity of the project, construction schedules, and inclement weather, roof systems, in many instances, are not installed when substrates are dry. We acknowledge that many issues are not under the control of the roofing contractor. It needs to be made clear to the General Contractor that their role is to turn over a roof substrate that is suitable to accept a roofing system, and this suitability includes providing wood sheathing at an acceptable moisture content which may require providing temporary protection until the roofing subcontractor commences their work.

When the roof deck is plywood or OSB sheathing, the roofing contractor must take additional precautions prior to installing the roofing system. They must ensure that the roof deck has reached an acceptable moisture content and consider that the roof system, to be installed, will prevent moisture damage and deterioration of the roof sheathing. These precautions include understanding the type of sheathing installed (plywood versus OSB), testing the wood sheathing to ensure it is dry before proceeding with roof system installation, protecting the roof sheathing from bulk water, before and during construction, and water build-up from condensation after construction is complete. This technical bulletin addresses concerns and best practices to help ensure that a roof system is installed over an acceptability dry wood sheathing substrate.

II. WOOD STRUCTURAL SHEATHING TYPES

The type of roof deck sheathing used is generally not a decision made by the roofing contractor. However, knowing the type of sheathing used can alert the roofing contractor so they can at least advise the General Contractor as to their construction schedule concerns early to avoid, as much as possible, inclement weather, or provide a level of temporary protection. Roof deck sheathing is typically specified to be structural panels and is either manufactured as plywood or OSB (oriented strand board). The building codes and APA (the Engineered Wood Association) treat these two materials as the same in terms of performance. However, there are differences between plywood and OSB that can affect their resistance to moisture and decay. Both are made from sapwood (the younger and outermost layer of the wood of a tree) that is considered moderately decay resistant. Both incorporate adhesives that are moisture resistant. However, the way the panels are manufactured does affect their decay resistance.

OSB is made with shredded thin wood strands that are cross-oriented, combined with adhesive and wax, and then heat/pressure treated into panels. OSB is manufactured mostly from southern yellow pine, aspen, and poplar. OSB has wood strands with exposed end grains making it more susceptible to moisture absorption than plywood.

Plywood is made from thin layer sheets peeled from the wood by rotating it along its horizontal axis. These sheets are then cross layered, (alternating layers perpendicular to each other), glued, and heat and pressure treated to form the panel. The alternating cross-layering allows even swelling and faster drying when exposed to moisture. Most plywood originating from the western United States is typically made

from Douglas Fir. Due to the face grain of the veneers, plywood absorbs less moisture (as opposed to end grains of OSB strands), and it is therefore slightly more decay resistant as compared to OSB.

The structural panels that have the APA trademark are further classified by the moisture resistance of the glue used in their fabrication. Panels are either classified as “Exposure 1” or “Exterior.” Exposure 1 panels “are intended to resist the effects of moisture due to construction delays or other conditions of similar severity”, i.e. short-term wetting. Exterior classified panels “have bonds capable of withstanding repeated wetting and redrying or long-term exposure to weather or other conditions of similar severity”, i.e. long-term exposure. This classification pertains to structural integrity of the panel but not to biological resistance such as mold and fungal decay. If either panel type remains wet for prolonged periods, they may begin to decay.

Construction delays on a project can vary and the roofing contractor should consider not only the length of delays, but when delays occur and the climate where project is located. Climates with high seasonal precipitation or high relative humidity can result in long-term moisture conditions and potential for wood deterioration from decay if the sheathing is not allowed to dry before installing the roof system. If there is the possibility that the roof sheathing will be exposed to repeated wetting (e.g. during an El Nino season), structural panels with the “Exterior” bond classification should be used. It is even more important to protect the substrate with a temporary weather covering.

III. TEMPORARY PROTECTION DURING CONSTRUCTION

Typically, the general conditions of the contract or Division 1 part of a project manual require the General Contractor to provide temporary protection of the structure (including the roof) to protect underlying conditions and work in progress. It is imperative the roof sheathing be covered as soon as possible and protected from moisture derived from inclement weather or from surface condensation (or frost in colder climates).

The roofing contractor may not have control over the schedule and the period between when the roof deck framing is completed and commencement of the roofing system installation. Knowing who is responsible for the protection and the type of protection needed is important during the bidding phase so the construction team can price the means and methods for that protection. Without appropriate temporary protection, the roofing contractor’s effort to ensure a dry substrate, and their liability, if it is not dry, increases. The following language can be used by the roofing subcontractor to put the General Contractor on notice if the roof sheathing that they have turned over is not at an acceptable moisture content or if there is entrapped moisture or construction issues in the structure under the sheathing.

“Roofing contractors’ commencement of roof installation indicates only that roofing contractor has visually inspected the top surface of the roof deck for visible defects. Roofing contractor shall not be liable for the structural sufficiency, quality of construction, undulations, or moisture content of the roof deck”¹

¹ Prepared by Cotney Construction Law, LLP. – Note that this language does not constitute, is not intended, and should not be relied upon as legal advice.

IV. OTHER MOISTURE SOURCES

Interior moisture from high occupancy (i.e. assembly spaces) or special use building (i.e. natatoriums) may allow for the possibility of moisture laden air condensing or creating a high relative humidity at the roof deck level after completion. Poor interior ventilation in addition to limited roof top insulation can also lead to moisture concerns at the roof deck level. In addition, there may be a long-term concern due to white “reflective” single ply roof system installed directly over plywood decks (without insulation and an interior vapor retarder) as it may lead to elevated relative humidity or even condensation at the roof sheathing layer. The accumulation of moisture or high relative humidity can lead to plywood or OSB deterioration even if they were installed at an acceptable moisture content.

White single ply roofs have high reflectivity and emissivity and low transmission, so they do not provide a heat reservoir to dry wood deck substrates into the evening and nighttime hours. Technical Bulletins No.-- -- and No. ---- go to greater lengths in discussing the cause of moisture accumulation and methods to avoid the occurrence, respectively. In summary a minimal amount of insulation compliant with ASHRAE requirements over the wood sheathing will provide a good level of protection. In some instances (typically for special use buildings), a vapor retarder may be required in conjunction with the insulation. The best approach to address any long-term moisture accumulation concerns is to perform a computer model analysis that considers the HVAC design and yearly weather data to determine the insulation need (and thickness) and if a vapor retarder is required.

V. MOISTURE ASSESMENT PRIOR TO ROOF MEMBRANE INSTALLATION

Prior to roof system installation the moisture content of structural wood sheathing should be measured, to confirm the sheathing is within the acceptable industry standard limits (18% for plywood and 16% for OSB). Pinless and pin-type wood moisture meters can be used. However, the user should be aware that typical wood moisture meters are calibrated for a single species of wood and require species correction if the wood species measured differs from the meter manufacturer’s default wood species. Best practice is to allow the plywood and OSB to reach a 14% moisture content. This provides a factor of safety, allowing for anomalies in the sheathing moisture content and some possible installation issues based on the structure type and use.

The glue adhesives and varying wood species used in the manufacturer of OSB creates further inaccuracies with the meter reading results. Therefore, a relative scale for wood moisture content should be established by testing a dry control sample of the OSB against the in-place sheathing and to use the relative scale setting built into the moisture meter (scale range is typically zero to 100). The OSB control sample must be from the same OSB used on the project (for consistency) and kept dry during this quality control process. At a minimum, the moisture content readings should be taken throughout the roof surface at both panel edges and field portion of the board.

VI. CONCLUSIONS

It is paramount that roofing systems be installed when plywood or OSB deck substrates are at an acceptable moisture content. To meet this acceptable moisture content in many climate zones the General Contractor will have to provide temporary weather protection until the roofing subcontractor commences their work. The maximum acceptable moisture content is 18% for plywood or 16% for OSB. Depending on the roof assembly, (inclusive of insulation and vapor retarder, if provided) further analysis through a computer model may be needed to confirm that there is not the possibility of long-term elevated humidity or

condensation on the roof deck. To provide a factor of safety and to help alleviate some long-term installation issues, best practice is to enclose roof decks (OSB and plywood) at moisture levels equal to or less than 14%.

Determining an acceptable moisture content for a plywood roof deck is easily performed with a conventional calibrated moisture meter, set to the correct scale. However, for OSB, conventional moisture meters do not have scales for measuring the moisture content for a multi-species wood material. The only non-destructive method to measure moisture content in OSB is to have a dry control sample of the same material in the roof deck, use that to calibrate the moisture meter, and to use the relative scale setting of the moisture meter.

LEGAL DISCLAIMER

All rights reserved. All content (text, trademarks, illustrations, reports, photos, logos, graphics, files, designs, arrangements, etc.) in this Technical Opinion ("Opinion") is the intellectual property of Western States Roofing Contractors Association (WSRCA) and is protected by the applicable protective laws governing intellectual property. The Opinion is intended for the exclusive use by its members as a feature of their membership. This document is intended to be used for educational purposes only, and no one should act or rely solely on any information contained in this Opinion as it is not a substitute for the advice of an attorney or construction engineer with specific project knowledge. Neither WSRCA nor any of its, contractors, subcontractors, or any of their employees, directors, officers, agents, or assigns make any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use (or the results of such use) of any information or process disclosed in the Opinion. Reference herein to any general or specific commercial product, process or service does not necessarily constitute or imply its endorsement or recommendation by WSRCA. References are provided as citations and aids to help identify and locate other resources that may be of interest, and are not intended to state or imply that WSRCA sponsors, is affiliated or associated with, or is legally responsible for the content reflected in those resources. WSRCA has no control over those resources and the inclusion of any references does not necessarily imply the recommendation or endorsement of same.