Summary:
This document outlines important material characteristics that can influence the movement of moisture and thermal energy. While this document focuses on OSB and plywood variants, it applies to most construction products, so understanding these properties is fundamental to developing effective project specifications.

However, material data and modelling tools, such as WUFI, should be considered alongside good building design and construction practices. Their outputs depend on the quality of the inputs and interpretation. Always question assumptions, seek clarity, and assess the system as a whole. **Information does not automatically equate to understanding.**

OSB vs Plywood

The split into OSB and plywood happens once, at the top. Everything below is one shared spine - each row is a consideration both materials get evaluated against, with items coloured by who they actually belong to: OSB, plywood, or both.

> Conceptualised and compiled by **James Cornell** - a guidance tool, not a definitive guide. See **"How this was made"** below for the full authorship and sourcing note.

Substrate: OSB vs Plywood | Internal Lining Options

OSB · PLYWOOD · grey = applies to both · orange = OSB only · pink = plywood only

01 Type

OSB [1] [12]

- **OSB/1** — Dry, non-structural; Interior fit-out only — $
- **OSB/2** — Dry, load-bearing. — $
- **OSB/3** — Humid-capable, load-bearing; Default grade — $$
- **OSB/4** — Humid-capable, heavy duty; Higher density — $$$

PLYWOOD [2]

- **Bracing** — Racking/shear rated. — $$
- **Form** — Phenolic film face; Formwork — $$
- **Structural** — F-stress rated (F8–F27). [7] [8] — $$$
- **Birch-faced** — Dense multi-ply core; Joinery/CNC — $$$$
- **WBP** — Bond class, not a grade. — $$$$

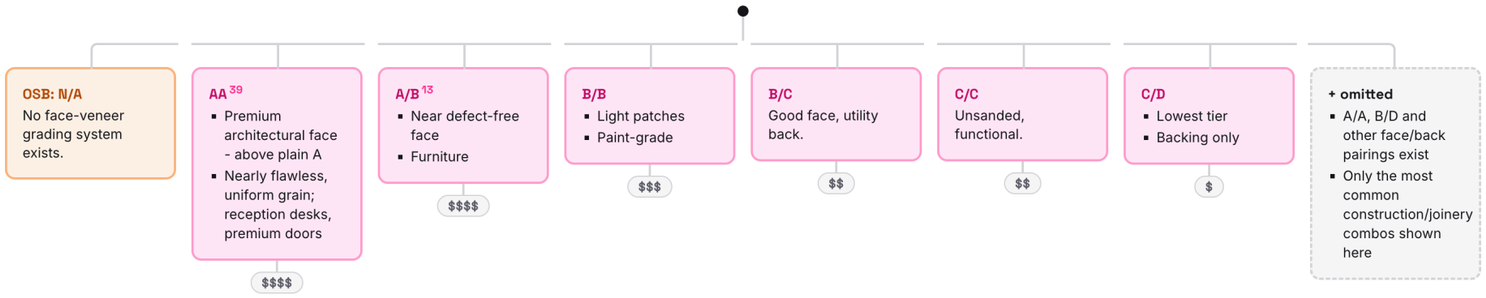
+ omitted
- Marine ply, hardwood/decorative ply, flexible/bendy ply and others also exist
- Only the most common construction-relevant types shown here for clarity

$ **Grey $ badges = relative cost tier, not sourced pricing.** Unlike the rest of this page, these are an indicative "nod" based on general market patterns (material grade, resin content, QA/finishing), not verified figures - actual pricing varies by supplier, region and volume.

02 Thickness

- **OSB 6–9mm** — Thin sheathing. — $
- **OSB 10–12mm** — Wall/roof standard. — $$
- **OSB 15–18mm** — Flooring standard. — $$$
- **OSB 22–25mm+** — Heavy / special order. — $$$$
- **Ply 3–7mm** — Thin / formwork liners; Also used for structural bracing — $
- **Ply 9–12mm** — General construction. — $$
- **Ply 15–18mm** — Structural flooring. — $$$
- **Ply 21–25mm** — Heavy structural. — $$$$

03 Grade - Face / Veneer

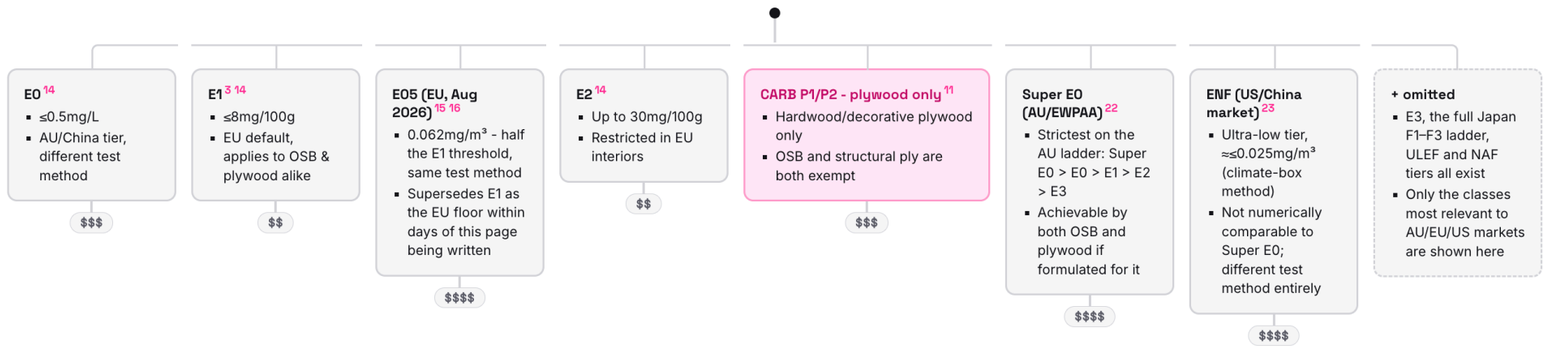


💡 **Grade = uniformity, not beauty.** Knots/streaks sold as "character" in visible use are the same features graded down here.

🔎 **A live example of why source appraisal matters, not just source counting.**

- This page's original face-grade source (Vinawood, ref13) never mentions AA at all - only A through D. A single source, however clear it reads, can simply be silent about a real tier that exists elsewhere in the market.
- The AA source itself (ref39) is a plywood vendor's own blog, not a neutral standards body - useful for the fact it reports, but it needs the same scrutiny as any other source, not automatic trust for filling the gap.
- Some sources on this page were selected because they held up well under checking. Others, including this pairing, are shown deliberately to demonstrate why checking is the point, not the exception.

04 Class - Emission



⚠ **CARB doesn't touch OSB at all.**

- US CARB/EPA formaldehyde rules exempt structural plywood and OSB entirely; they only regulate hardwood/decorative plywood.
- Where E1/E2 do apply to both: same letter ≠ same number, since EU, China and AU test methods and thresholds all differ.
- ENF and Super E0 are both marketed as "top tier" but come from separate systems - treat them as different scales, not interchangeable labels.

🌳 **None of these classes are measuring "formaldehyde vs none."**

- Formaldehyde occurs naturally in wood - untreated solid timber with no adhesive at all (beech, spruce, pine, birch) still measurably emits some, just from the wood itself. [14] [25]
- E0/E1/E2/CARB/ENF are measuring how much a manufacturing resin adds on top of that natural background, not whether the board contains formaldehyde in an absolute sense. [26]
- Useful for calibrating risk: "contains formaldehyde" alone isn't the meaningful fact - the manufactured addition above natural background level is.

⏰ **This row is a live example of why source dates matter.**

- "E1 is the EU default" was accurate for over 20 years and stops being the practical compliance floor on 6 August 2026, when E05 takes

over.

- A source from 2017 (or even early 2026) describing E1 as the EU standard isn't wrong for when it was written - it's just about to be superseded by a regulation that already existed but hadn't taken effect yet.
- Check the effective date of any compliance claim, not just its publication date.

🍾 **A separate toxicity pathway: import biosecurity fumigation, not manufacturing resin.**

- Methyl bromide is the default fumigant for imported timber products during Australia's Brown Marmorated Stink Bug season (1 Sept - 31 May) unless sulfuryl fluoride is specifically requested by the importer - DAFF's own review confirms MB is often the only option offered unless SF is asked for. [32]
- Sulfuryl fluoride is a genuinely available, requestable alternative - confirmed in practice by James Cornell's own import experience with wood fibre insulation over several years.
- Whether structural OSB/plywood panels specifically are commonly MB- or SF-treated on import isn't confirmed here - ask your supplier directly which fumigant was used, and request SF for future orders if toxicity is a priority. [33]

05 Density

↑ **Higher may assist** mass, strength, sound and overheating control - but as a structural substrate rather than a dedicated mass layer, the practical bearing on the whole assembly may be small. [38]

- Higher also means less insulating value per mm, so it's not a one-way gain.
- Worth checking: is this layer thick/dense enough for density to be a meaningfully significant variable here, or is another layer already doing that job?

06 Thermal Conductivity (λ)

↓ **Lower may reduce heat loss** - but whether that's meaningful here isn't automatic.

- Still worth considering: is this layer actually part of the thermal envelope, or just structure/sheathing behind a separate insulation layer?
- If it's the latter, this number may carry little to no real bearing on the wall's overall performance - measure it against the assembly, don't assume its significance.

07 Specific Heat Capacity

OSB - ≈1550–1700 J/kg·K
Notably higher than most wood panels at similar density.

Plywood - ≈1200–1600 J/kg·K
Varies with species and glueline ratio.

↑ **Higher may assist heat storage** - though as a substrate rather than a dedicated thermal-mass layer, the effect may be minor.

- Could smooth temperature swings if this layer is thick or dense enough to matter in context; if it does, the trade-off is slower response in fast-cycling heating systems.
- Worth checking: does this specific assembly actually rely on this layer for buffering, or is another material carrying that load? Measure before assuming significance.

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08 Thermal Diffusivity

OSB - ≈1.3×10⁻⁷ m²/s
Derived (λ ÷ ρc) from the density/conductivity/heat-capacity rows above.

Plywood - ≈1.9×10⁻⁷ m²/s

- Derived from mid-range values
- Species/density spread makes this a rough illustration, not a spec figure

↓ **Lower may mean slower temperature propagation** - a plausible contributor to short-term thermal stability, but its practical significance for a thin substrate layer isn't automatic.

- Worth asking: is this layer's thickness enough for diffusivity to be a meaningful variable, or negligible next to the dedicated insulation layer?
- These figures are derived from mid-range inputs, not measured directly - treat as illustrative, not a spec number.

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09 Volumetric Heat Capacity

OSB - ≈0.98 MJ/m³·K

- Derived (ρ × c)
- Heat stored per cubic metre, not per kg

Plywood - ≈0.81 MJ/m³·K
Derived from mid-range density and specific heat.

↑ **Higher may contribute more heat storage per unit volume** - a genuine metric, but whether it has a measurable effect on a wall's buffering depends on this layer's thickness and position.

- Combines density and specific heat rather than either alone, so it's a better indicator than reading those two rows separately.
- Still worth checking against the actual assembly rather than assumed as significant by default.

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10 Vapour Diffusion Resistance (μ) & Airtightness

OSB/3 - more vapour-open, less airtight

- μ≈30–50 (tabulated [4] - standard lookup value, not lab-tested for a specific board)
- Measured Sd (12mm) spans ~0.4–2.4m+ across products [19]
- Weakest tested air barrier (Hodoušek et al. 2015) [9]

OSB/4 - less vapour-open, more airtight

- Higher density/resin closes the pore structure
- Air permeation ~4× lower than OSB/3's weakest samples [5] [9]
- Guaranteed ≤0.12m³/(m²h) at ≥620kg/m³ (EGGER OSB/4 TOP) [10]

Plywood - μ ≈ 110–200 (tabulated)

⚠ Independent lab testing has reversed this ranking vs. OSB. [17]

⚠

- Same density/resin mechanism drives both properties in OSB.
- Grade number tells you the direction, not whether that direction is correct for your assembly.
- Match it to climate + vapour drive direction, not to the grade number.
- Sources disagree on resolution, not just numbers: some (Hodoušek, EGGER) grade-differentiate OSB/3 vs OSB/4; others (Building Science Corp's Info-312 [24]) lump "OSB" and "plywood" into one shared perm category regardless of type. Check which resolution a source actually offers before citing it as grade-specific.
- All of these figures also move with humidity: APA data shows plywood's vapour permeance rising roughly 10x between 50% and 90% RH [18] - a single "μ" number is a snapshot at one test condition, not a fixed property.

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11 Surface Emissivity (ε)

OSB - ≈0.93 (tabulated) [34]

- Typical of matte/organic building materials generally
- Only relevant if this surface faces an open or ventilated air gap

Plywood - ≈0.91 (tabulated) [34]

- Typical of matte/organic building materials generally
- Only relevant if this surface faces an open or ventilated air gap

⚠ **The base-material gap is small and likely insignificant on its own.**

- 0.91 vs 0.93 sits well inside the normal spread for matte organic building materials - wood, brick and plaster all cluster around 0.85-0.95.
- The real lever is coating, not substrate: a radiant-barrier facing or foil lamination can drop emissivity to 0.10-0.25, a genuinely large effect that swamps the OSB-vs-plywood difference entirely.

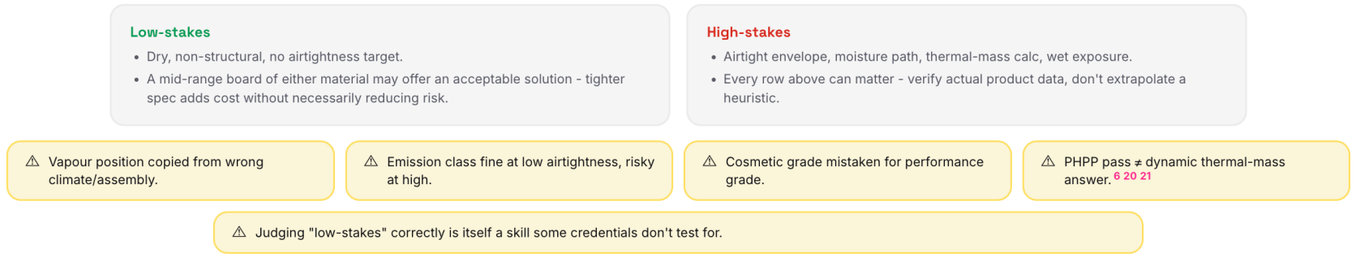
☀ **Why it matters at all: the same property cuts both ways, day and night.**

- Daytime/overheating: a sun-heated roof deck with high emissivity radiates that heat efficiently down into a ventilated cavity, raising ceiling heat flux. RIMA-International's IRCC research measured this at ~21.4 Btu/hr·ft² for standard OSB/plywood decking, cut by 65-72% with a low-e coating.
- Night-time/moisture: the same high-emissivity surface also radiates heat away efficiently, facing the cold night sky. Building Science Corporation's field research on Californian attics [35] found this can drop OSB roof-deck temperature below the surrounding air temperature - sometimes below its dew point - causing condensation on the underside of the sheathing even when the bulk attic air isn't especially humid.
- Net effect: efficient radiator by day (heat gain risk) is the same trait as efficient radiator by night (moisture risk). Neither is fixable by choosing OSB over plywood or vice versa, since both sit at nearly the same emissivity.

⚠ **Neither source above tested gap size or ventilation configuration - and it genuinely changes the answer.**

- Bigger isn't automatically better: a rain-screen cavity study [36] found enlarging the gap from 45mm to 110mm increased heat flow through the cavity by up to 1.5x, since a wider gap allows more convective air movement, not less heat transfer.
- The radiant-barrier benefit of low emissivity is strongest in an unventilated (still-air) gap; several manufacturer and research sources [37] note that once a gap becomes ventilated, a meaningfully different (usually reduced) value applies, because moving air can carry heat around the benefit rather than being blocked by it.
- Cross-ventilated / double-batten configurations specifically: no source found directly comparing this to single-cavity ventilation for OSB/plywood - flagging that gap rather than guessing.
- Broader research literature notes current building-code models generally don't have a robust method for ventilated-cavity thermal resistance the way they do for sealed gaps - this is a genuinely unsettled area, not just a simplification on this page.

12 Application Context



In Plain English

If you only read one part of this page, read this.

- **OSB and plywood aren't single products.** Each name covers a small family of genuinely different boards, and the label alone doesn't tell you which one you're getting.
- **Most jobs never need to resolve every row above.** For a job that's dry, non-structural, and has no airtightness target, a mid-range board of either material may offer an acceptable solution - but confirming a project genuinely fits that description is itself a judgement call, not a checkbox.
- **A qualification proves procedural skill, not systemic understanding.** Some Passive House-accredited practitioners can run PHPP and administer a blower-door test without having a deeper applied grasp of how materials interact across a whole assembly, much like knowing how to top up a car's screenwash or oil doesn't mean you can trace a coolant leak or strip down a clogged engine. The credential certifies specific procedures, not the underlying diagnosis.
- **Where it matters most, check the actual product, not the category.** Two boards sold under the same name can differ from each other more than OSB differs from plywood as categories - especially for airtightness, moisture paths, and thermal-mass calculations.
- **None of the properties in this document are "always better" or "worse", higher or lower.** Vapour resistance, density, thermal mass: each one only helps or hurts depending on where it sits in the build and what climate it's in.
- **A properly run PHPP is meant to ensure the building performs as planned.** Realising that outcome depends on a wide range of domains beyond the tool itself, from material selection to on-site execution, all coming together correctly - no tool captures everything on its own.

How this was made, and authorship

This material and layout was conceptualised by James Cornell for the purposes of disseminating complex information to help and educate. It is not an exact or direct representation and should be used as a guidance tool only, not as a definitive guide. Figures were checked against the sources listed below via live search rather than recalled from memory, but treat every value here as a starting point for verification against the primary standard, the product datasheet, or a qualified professional.

On authorship: the underlying facts, data and findings referenced throughout remain the property of their original sources, cited individually below. The specific selection, structure, analysis, commentary and communication of that information into this document is the original work of James Cornell.

Glossary

OSB
Oriented Strand Board.

WBP
Weather and Boil Proof - a bonding/glue class, not a structural or face grade.

Phenolic
Short for phenol-formaldehyde resin - a durable, waterproof synthetic resin. Used both as the bonding adhesive in WBP-rated ply/OSB and as a hard, glossy surface film on form ply for concrete formwork release.

Hydrolyse
To break a chemical bond by reacting with water, releasing the bond's components back apart. The mechanism behind UF resin's ongoing formaldehyde release - moisture slowly breaks the cured bond, freeing formaldehyde as it does.

UF / PF / pMDI
The three main wood-panel resin families. UF (urea-formaldehyde) is cheap but hydrolyses slowly, releasing formaldehyde over time - the main real-world off-gassing concern. PF (phenol-formaldehyde) and pMDI (polymeric methylene diphenyl diisocyanate) are chemically stable and don't hydrolyse - why structural OSB/plywood, typically PF or pMDI-bonded, is exempt from CARB/EPA formaldehyde rules.

FC sheet
Fibre cement sheet - an umbrella term (Villaboard, Blue board etc.) for Portland cement + sand + cellulose fibre panels, not a specific product.

MB / SF
Methyl bromide / sulfuryl fluoride - the two main fumigants approved for Australian import biosecurity treatment. MB is the default unless SF is specifically requested; SF avoids MB's ozone-depletion and acute toxicity profile.

BMSB
Brown Marmorated Stink Bug - the pest whose seasonal risk (1 Sept - 31 May) triggers mandatory offshore fumigation for many imported goods, including timber products, from target countries.

E05
New EU formaldehyde class under REACH Annex XVII Entry 77, effective 6 August 2026. 0.062mg/m³ - exactly half the E1 threshold, tested the same way (EN 717-1).

CARB
California Air Resources Board (US regulator).

ENF
At least three expansions in circulation: "Extremely No Formaldehyde" and "Emission No-Formaldehyde" both match the letters cleanly; "Extremely Low Formaldehyde" doesn't, but is widely used anyway. No primary regulatory source found confirming any of them - an ultra-low tier used mainly in US/China panel marketing. A small but genuine illustration of how far an unsourced term can travel before anyone checks it.

Super E0
The strictest tier on the Australian/Japanese emission ladder (via EWPAA).

EWPAA
Engineered Wood Products Association of Australasia.

ULEF
Ultra-Low-Emitting Formaldehyde, a CARB Phase 2 sub-tier.

NAF
No Added Formaldehyde.

JAS / JIS
Japan Agricultural Standard / Japan Industrial Standard.

PHPP
Passive House Planning Package - the Passive House compliance calculation software.

WUFI
German acronym for "Wärme Und Feuchte Instationär" (transient heat and moisture) - dynamic hygrothermal simulation software developed by the Fraunhofer Institute for Building Physics.

μ (Mu)
Water vapour diffusion resistance factor - how many times more resistant to vapour than the same thickness of still air.

Sd
Vapour-diffusion-equivalent air layer thickness, in metres - μ multiplied by material thickness.

λ (Lambda)
Thermal conductivity.

ε (Epsilon)
Surface emissivity - how efficiently a surface radiates heat compared to a perfect black body (1.0). Only relevant facing an open or ventilated air gap.

MJ
Megajoule (10^6 J). Capital M = mega; lowercase m would mean milli (10^{-3}) - a different unit entirely.

Tabulated
A standard reference value from a published lookup table (e.g. in a technical standard), used as a default design assumption - not a value independently lab-tested for a specific product.

Primary source
The original material itself - the actual peer-reviewed paper, the standard's own text, the regulator's own publication. The most trustworthy tier, since nothing has been summarised or reinterpreted along the way.

Secondary source
Something reporting on or summarising a primary source - a blog, vendor page, or news article. Can be a useful pointer, but carries the risk of the original being simplified, mixed up, or misrepresented in the retelling.

F8-F27
Structural stress grades for plywood under AS/NZS 2269. Higher number = higher bending/tension capacity; F27 is meaningfully stronger and stiffer than F8, not just a different category.

MGP
Machine Graded Pine - a separate Australian timber grading scale (MGP10, MGP12, MGP15) that rates stiffness (MOE), not bending strength. MGP10 and F7 are often used interchangeably but aren't technically identical.

MOE
Modulus of Elasticity - a measure of stiffness: how much a piece deflects under load without permanent damage. Different from bending strength (what F-grades primarily measure) - a stiff board and a strong board aren't necessarily the same board.

EN / ISO / AS/NZS / CEN
Standard-body prefixes: European Norm, International Organization for Standardization, Australian/New Zealand Standard, European Committee for Standardization.

EPA
US Environmental Protection Agency.

APA
The Engineered Wood Association, historically "American Plywood Association."

Sources

A note on these sources: whilst most have been selected, as far as is reasonably practicable, from scientific literature databases or directly from source (manufacturers, standards bodies, government agencies), some listed here may not be considered fully reputable on closer inspection. A full appraisal of any individual source is recommended before it is relied upon or cited elsewhere. In some cases here, care has been taken to find valid and reputable sources for a claim; in other cases, sources have been deliberately used to demonstrate why deep research and analysis is crucial - see the AA face-grade example in row 03 for a worked instance of this. **Recommendation:** for anything load-bearing to a real decision, seek out the **primary source** directly - the original peer-reviewed paper, the standard's actual text, the regulator's own publication - rather than relying on a **secondary source** (a blog, vendor page or summary reporting on that primary material, however well it reads). Search accredited, peer-reviewed research databases, or check with the relevant registered industry association or standards body, as a starting point for finding the primary source itself.

1. **EN 300:2006** - Oriented Strand Boards (OSB): Definitions, Classification and Specifications (CEN).
2. **EN 636:2012** - Plywood: Specifications (CEN).
3. **EN 13986:2004+A1:2015** - Wood-based panels for use in construction (CEN).
4. **EN 12524:2000 / EN ISO 10456:2007** - Hygrothermal properties, tabulated design values (CEN/ISO).
5. **EN 12114** - Air permeability of building components and building elements, laboratory test method (CEN).
6. **ISO 13786:2017** - Dynamic thermal characteristics, calculation methods (ISO).
7. **AS/NZS 2269:2012** - Plywood - Structural (Standards Australia).
8. Carroll Wholesale Timber - Grading Information for Timber in the Australian Construction Industry - source for F-grade direction and the MGP/MOE stiffness distinction.
9. Hodoušek, M. et al. (2015). Air Permeation Rate of Oriented Strand Boards (OSB/3 and OSB/4). BioResources 10(1), 1137–1148.
10. EGGER - OSB 4 TOP product datasheet.
11. APA – The Engineered Wood Association - Structural Plywood, OSB Exempt from Formaldehyde Ruling; US EPA - Formaldehyde Standards for Composite Wood Products Act FAQ.
12. European Panel Federation - Technical Information Sheet: OSB.
13. Vinawood - Plywood Grading Systems Explained.
14. ASBP - Formaldehyde in Wood-Based Panels - includes measured baseline emissions from untreated solid wood (beech, spruce, pine, birch etc., no adhesive involved), confirming formaldehyde occurs naturally in wood itself. Published 2017 - see E05 entries below for the regulatory landscape this predates.
15. **Commission Regulation (EU) 2023/1464**, amending REACH Annex XVII (Entry 77) - the legal basis for the new E05 formaldehyde limit (0.062mg/m³, EN 717-1 method), effective 6 August 2026, applying EU-wide to finished wood-based articles including OSB and plywood.
16. Measurlabs - Formaldehyde Testing according to EU Regulations - source for the E1-to-E05 threshold comparison and test method.
17. Sonderegger & Niemz (2009). Thermal conductivity and water vapour transmission of wood-based materials. Checked for a more current successor (2026) - none found; this remains the standard cited comparison in the literature 17 years on.
18. APA - Permeability - plywood's vapour permeance rises roughly 10x between 50% and 90% relative humidity, reinforcing how condition-dependent these figures are.

19 Korsnes et al., Passivhus Norden 2013 - Moisture Risk in Prefabricated Wooden Wall Elements.

20 Harvey & Szentesi-Nejur (2026). Decoupling between heat loss indicators and heating demand in a high-mass dwelling.

21 Passipedia (PHI) - PHPP: Validated and Proven in Practice.

23 Yalongwood - Plywood Formaldehyde Emissions: E0, E1, CARB P2, JAS F4 Star, ENF.

24 Building Science Corporation - Info-312: Vapor Permeance of Some Building Materials - a coarse 4-tier perm classification (impermeable / semi-impermeable / semi-permeable / permeable). Notably, it groups "OSB sheathing" and "plywood sheathing" into one shared category without differentiating grade or type - a coarser resolution than the grade-specific values used elsewhere on this page.

25 Understanding of Formaldehyde Emissions from Solid Wood: An Overview - BioResources - source for natural formaldehyde formation in unresinated wood via breakdown of cellulose, hemicellulose and lignin.

26 Solid Wood Products: Formaldehyde Emission from Solid Wood - study - source for the OSB/4 + PU-resin example where total board emission was statistically indistinguishable from natural wood background.

27 Formaldehyde Emission - ScienceDirect Topics overview - source for the UF/PF/pMDI resin-chemistry distinction underlying the CARB/EPA structural exemption.

28 California Air Resources Board - Consumer FAQ - source confirming off-gassing is highest immediately post-manufacture and decreases over time, distinct from the standardised E-class test condition.

29 Aussie Plasterboard - Villaboard Lining and Types of Plasterboard and Insulation - source for lining-board thickness and composition figures.

30 PPC Fibre Cement - Villaboard vs Blueboard - source for the internal-wet-area vs external-render application distinction.

31 **AS/NZS 2588:2018** - Gypsum Plasterboard (Standards Australia).

32 DAFF - Treatments for Timber and Timber Products and Quarantine and Pre-shipment Uses of Methyl Bromide, 2017-2020 - source for MB as default fumigant and the departmental specification barrier to SF uptake.

33 US EPA - Methyl Bromide (Bromomethane) Hazard Summary; ScienceDirect - Methyl Bromide overview - source for toxicity profile.

34 RIMA-International - Technical Bulletin #112: A Review of Interior Radiation Control Coating Research - source for OSB/plywood emissivity values and daytime radiant overheating mechanism.

35 Building Science Corporation - RR-1110: Hygrothermal Analysis of California Attics - source for night-sky radiative cooling and roof-deck condensation risk.

36 ScienceDirect - Experimental Investigation of Cavity Air Gap Depth for Enhanced Thermal Performance of Ventilated Rain-Screen Walls - source for gap-size vs heat flow findings.

37 ScienceDirect - Assessment of Reflective Insulation Systems in Wall Application in Hot-Arid Climates - source for ventilated vs unventilated gap performance.

38 Cornell, J., Life Panels - *Building Physics* and *Multifunctional Roles of Thermal Mass* technical guides (client-supplied reference material) - source for the density/conductivity/heat-capacity/diffusivity/volumetric-heat-capacity directionality convention used above.

39 TTPlywood - Hardwood Plywood Grades: AA, A, B, C Explained - a plywood vendor's own blog, not a neutral standards body, but the source that surfaced the AA tier missing from ref13. Kept deliberately as the row 03 worked example of why appraisal matters more than which source you happen to read first.