



Globally Proven
Construction Solutions

Bonding Ceramic Tile, Stone or Brick Over Wood Floors

TDS-1152

I. STRUCTURAL FRAMING

- A. Floor systems over which tile, stone or brick will be installed shall be in conformance with the Building Code of Australia (BCA) for residential and commercial applications, or other applicable building codes.
- B. The deflection of engineered wood structural framing, including I-joists, open-web truss joists, composite laminated veneer lumber/ LVL, glue laminated timber/ glulam and other engineered wood beams or joists, that supports wood subfloors under all distributed or concentrated live and dead loads shall not exceed $L/480$ of the span where a ceramic tile or brick finish is adhered to an underlayment installed over a structural sub-floor.
- C. The deflection of engineered wood structural framing, including I-joists, open-web truss joists, composite laminated veneer lumber/ LVL, glue laminated timber/ glulam and other engineered wood beams or joists, that supports wood subfloors under all distributed or concentrated live and dead loads shall be determined by a qualified structural design professional where a stone finish is adhered to an underlayment installed over a structural sub-floor.
- D. Joist spacing in conventional sawn lumber and engineered wood structural framing systems shall not exceed 450mm c.c. However, the actual requirements for the spacing of joists are governed by the thickness and type of the subfloor sheet relative to the joist or beam spacing (see II.B.).
- E. The actual weight of materials and construction assemblies, including concentrated dead loads of fixed service and other equipment, shall be utilized as prescribed by state and local building codes to estimate dead loads for the purpose of structural design.
- F. The minimum uniformly distributed live load and minimum concentrated live loads, wherever such loads shall occur, shall be provided for as prescribed by state and local building codes.
- G. Lateral and other bracing must be constructed as prescribed by code and/or engineered wood manufacturers' literature to achieve specified design deflection values.

II. SUB-FLOOR

- A. Floor systems over which tile, brick or stone will be installed shall be in conformance with the BCA for residential applications and commercial applications, or other applicable building codes. Historically, the deflection of the structural sub-floor sheets spanning between structural framing components (beams and joists) is not to exceed:
 1. $L/360$ of the span where a ceramic tile or brick finish is directly adhered to the underlayment and sub-floor;
 2. $L/480$ of the span for spans up to 4.3m and no greater than 6mm for spans over 4.3m, where a stone finish is directly adhered to an underlayment and a structural sub-floor.
- B. Thickness of sub-floor sheets:
 1. For all structural sub-floor materials, such as plywood, structural grade particleboard, wood planks and the like, minimum thickness must be as prescribed by building codes and deflection must be verified by a qualified professional to comply with requirements in sections II.A.1. and II.A.2.;
 2. Sub-floor sheets shall be suitably trademarked and stamped with grade span ratings that are commensurate with joist spacing.
- C. All sub-floor sheets must have an Exterior exposure durability and used internally only. Single layer sub-floor sheets are not acceptable for direct adhesion of ceramic tile, stone or brick without a suitable, properly installed underlayment.
- D. Installation:
 1. Sub-floor sheets must be installed with the face grain or strength axis perpendicular to the support members to ensure proper strength and maximum stiffness;
 2. Sheet continuous over two or more spans;
 3. End joints must occur over framing members;
 4. Must be tongue and groove, or if not available, all edges must be blocked;
 5. Sub-floor sheets must be glued/adhered to the support members with construction adhesive to increase stiffness and fastened with specified mechanical fasteners;
 6. A 3mm space must be provided at time of sheet installation between the sheet edges and any hard abutment (e.g. perimeter walls, pipes, etc...);
 7. Fasten 150mm c.c. along all edges and 200mm c.c. in sheet field with 8d ring-shank, coated or hot-dip galvanized nails for 19mm thick sheets, or, screw the sheets in place.

- E. For thin-bed ceramic tile installations made directly to suitable plywood sheets, when a cementitious bonding material will be used, including medium bed mortar: maximum allowable variation in the tile substrate – for tiles with edges shorter than 375mm, maximum allowable variation is 5mm in 3m from the required plane, with no more than 1.5mm variation in 300mm when measured from the high points in the surface. For tiles with at least one edge 375mm in length, maximum allowable variation is 3mm in 3m from the required plane, with no more than 1.5mm variation in 600mm when measured from the high points in the surface. For modular substrate units, such as exterior glue plywood sheets or adjacent concrete masonry units, adjacent edges cannot exceed 0.8mm difference in height. Should the architect/designer require a more stringent finish tolerance e.g. 3mm in 3m, the subsurface specification must reflect that tolerance, or the tile specification must include a specific and separate requirement to bring the subsurface tolerance into compliance with the desired tolerance.

In addition to deflection considerations, above-ground installations are inherently more susceptible to vibration. Consult grout, mortar, and membrane manufacturer to determine appropriate installation materials for above-ground installations. A crack isolation and higher quality setting materials can increase the performance capabilities of above-ground applications. However, the upgraded materials cannot mitigate structural deficiencies including floors not meeting code requirements and/or over loading or other abuse of the installation in excess of design parameters.

III. UNDERLAYMENT

- A. The underlayment may not be used in whole or part as a structural sheet to achieve minimum deflection requirements of the sub-floor as specified in section II.A.1., but may be used as a structural sheet to provide increased stiffness to meet deflection requirements specified in II.A.2.
- B. Use AWP Exterior structural use, sub floor sheet grade designation; A bond CD Radiata. Do not use interior grade plywood.
- C. The minimum recommended thickness for plywood underlayment sheets is 19mm.
- D. Mortar beds, cementitious backer units and fibre cement underlayment, which are approved for direct adhesion of ceramic tile, stone and brick, are acceptable as exterior glue plywood underlayment substitutes - consult manufacturer for guidelines on installation and recommended adhesives (see LATICRETE TDS TDS1126 and TDS1208 for additional information on cementitious backer units).
- E. Installation:
1. Protect underlayment from damage or contamination by other trades;
 2. Stagger end joints of underlayment sheets by at least one joist spacing from the ends of the sub-floor sheets;
 3. Offset from the floor joist below by 50mm so that underlayment end fasteners do not penetrate the joist;
 4. Allow minimum 3mm between sub-floor sheets and 6mm between sheet and wall for expansion;
 5. Glue underlayment to sub-floor with construction adhesive or below mentioned adhesive to increase stiffness;
 6. Fasten 150mm c.c. along all edges and 200mm c.c. in both directions in sheet field with 8d ring-shank, coated or hot-dip galvanized nails for 15mm) and 19mm thick sheets or screw the sheets in place.

IV. INSTALLATION OF CERAMIC TILE, STONE & BRICK

- A. Recommended Installation Materials:
- LATICRETE® 254 PLATINUM ADHESIVE
 - LATICRETE 335 PREMIUM FLEXIBLE ADHESIVE;
 - LATICRETE 335 RAPID PREMIUM FLEXIBLE ADHESIVE;
 - LATICRETE 125 SOUND & CRACK ADHESIVE;
 - LATICRETE 315 MORTAR AND LATICRETE 101 RAPID LATEX ADMIX;
 - LATAPOXY® 300 ADHESIVE;
 - LATICRETE STRATA_MAT™

Consult relevant product data sheet before use to confirm suitability of adhesive to tile.

V. LIMITATIONS

- A. Engineered wood structural framing may be subject to increased in-service deflection due to moisture exposure and long span conditions.
- B. Plywood and structural grade particle board is not a suitable subsurface for the installation of ceramic tile brick or stone in interior locations where the sheet is exposed to excessive moisture or humidity, such as steam rooms, showers, pools, fountains, over damp basements, or for exterior installations.
- C. Fire-retardant, marine grade or preservative treated plywood, Masonite®, hardwood floors, strip wood floors, “yellow pitch pine” plywood, wood laminates, composite sheets (e.g. Advantech), luan, wafer board, particleboard, oriented strand board/OSB, or similar engineered or reconstructed wood sheets are not suitable substrates for the direct adhesive installation of ceramic tile, stone or brick. However, some of these materials, such as oriented strand board/OSB or fire retardant plywood, may be used as a structural sub-floor when 1) the material meets sub-floor deflection criteria listed in II.A.1. & II.A.2. of this specification, 2) are identified with an WPA trademark as a performance rated structural-use sheet, and 3) an underlayment suitable for direct adhesion of ceramic tile, stone or brick is provided over the sub-floor.
- D. For interior installations of ceramic tile, stone and brick in wet areas above occupied space, install HYDRO BAN® Waterproofing Membrane to prevent moisture penetration through floor construction to ceiling or occupied spaces below. Please note that this treatment is not designed for exterior roof decks.

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