



Bonding Ceramic Tile, Stone or Brick Over Wood Floors TDS 152

I. STRUCTURAL FRAMING

A. Floor systems over which tile or stone will be installed shall conform to the International Residential Code (IRC) for residential applications, the International Building Code (IBC) for commercial applications, or 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 support wood subfloors under all distributed and concentrated live and dead loads, shall not exceed $1/480$ of the span where a ceramic tile or brick finish is adhered to an underlayment installed over a structural subfloor.

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 support wood subfloors under all distributed and 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 subfloor.

D. Joist spacing in conventional sawn lumber and engineered wood structural framing systems shall not exceed 16" (400 mm) o.c. However, actual joist spacing requirements are governed by the thickness and type of subfloor panel relative to joist or beam spacing (see II.B.). The Tile Council of North America (TCNA) and LATICRETE International provide options for wider joist spacing where applicable. Refer to the TCNA Handbook for Ceramic, Glass, and Stone Tile Installation and the LATICRETE® Architectural Guidebook (available at <https://laticrete.com/ag>) for additional information.

E. The actual weight of materials and construction assemblies, including concentrated dead loads of fixed service equipment, shall be used as prescribed by applicable building codes to estimate dead loads for structural design.

F. Minimum uniformly distributed live loads and concentrated live loads shall be provided as prescribed by applicable building codes.

G. Lateral and other bracing must be constructed as required by code and/or engineered wood manufacturer literature to achieve specified design deflection values.

II. SUB-FLOOR

A. Floor systems over which tile or stone will be installed shall conform to the International Residential Code (IRC), International Building Code (IBC), or applicable building codes. The deflection of structural subfloor panels spanning between framing members shall not exceed:

1. $1/360$ of the span where ceramic tile or brick is directly adhered;
2. $1/480$ of the span for spans up to 14 ft (4.3 m) and no greater than $7/32$ " (6 mm) for spans over 14 ft (4.3 m), where stone is directly adhered.

B. Thickness of plywood, oriented strand board (OSB), or composite (COM-PLY) subfloor panels:

1. $5/8$ " (16 mm) or $19/32$ " (15 mm) thick for 16" (400 mm) o.c. joist spacing;
2. $3/4$ " (19 mm) or $23/32$ " (18 mm) thick for up to 24" (600 mm) o.c. joist spacing;
3. For other subfloor materials (e.g., wood planks), minimum thickness shall comply with building codes and deflection must be verified by a qualified professional;
4. Panels with APA span ratings appropriate for joist spacing are acceptable.

C. All subfloor panels must be APA Exterior or Exposure 1 rated. Single-layer subfloors are not acceptable for direct adhesion of tile or stone without a properly installed underlayment.

D. Installation:

1. Panels installed with face grain perpendicular to supports;
2. Panels continuous over two or more spans;
3. End joints over framing members;
4. Tongue-and-groove or blocked edges;
5. Panels glued to supports and mechanically fastened;
6. Provide 1/8" (3 mm) gap at panel edges and abutments;
7. Fasten 6" (150 mm) o.c. at edges and 8" (200 mm) o.c. in field with appropriate fasteners or screws.

E. For thin-bed tile installations:

- Tiles <15" (375 mm): max variation 1/4" in 10' (6 mm in 3 m), and 1/16" in 12" (1.5 mm in 300 mm);
- Tiles ≥15" (375 mm): max variation 1/8" in 10' (3 mm in 3 m), and 1/16" in 24" (1.5 mm in 600 mm);
- Adjacent panel edges: max 1/32" (0.8 mm) difference.

If stricter tolerances are required (e.g. 1/8" in 10' [3mm in 3m]), they must be specified in project documents.

F. Above-ground installations are more susceptible to vibration. Proper materials should be selected accordingly.

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. Underlayment shall not be used as a structural panel to meet minimum deflection requirements of Section II.A.1 but may contribute to increased stiffness for Section II.A.2 requirements.

B. Acceptable underlayment panels include APA Exterior-rated plywood grades A-A, A-B, A-C, B-B, B-C, C-C, and C-C Plugged, as well as Structural I panels. Interior plywood is not acceptable. A 3/8" (10 mm) 7-ply birch plywood underlayment is acceptable over 16" (400 mm) o.c. joists only.

C. Minimum recommended thickness for plywood underlayment panels is 5/8" (16 mm) or 19/32" (15mm).

D. Mortar beds, cementitious backer units and fiber 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 126](#) and [TDS 208](#) 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 panels by at least one joist spacing from the ends of the sub-floor panels;
3. Offset from the floor joist below by 2" (50mm) so that underlayment end fasteners do not penetrate the joist;
4. Allow minimum 1/8" (3mm) between sub-floor panels and 1/4" (6mm) between panel and wall for expansion;
5. Glue underlayment to sub-floor with construction adhesive or below mentioned adhesive to increase stiffness;
6. Fasten 6" (150mm) o.c. along all edges and 8" (200mm) o.c. in both directions in panel field with 8d ring-shank, coated or hot-dip galvanized nails for 5/8" (15mm) and 3/4" (19mm) thick panels or screw the panels in place.

IV. INSTALLATION OF CERAMIC TILE, STONE & BRICK

A. Recommended Installation Materials:

1. 254 PLATINUM™;
2. 254 PLATINUM Plus;
3. 254R PLATINUM Rapid;
4. 125 TRI MAX®;
5. TRI-LITE™ ;
6. TRI-LITE™ Rapid ;
7. 4-XLT ;
8. 4-XLT Rapid;

9. LHT™ PLUS;
10. 317 Mortar; or, 272 Mortar and 333 Super Flexible Additive;
11. 253 Gold;
12. 252 Silver;
13. SURE SET™ LHT;
14. MULTIMAX™ LITE;
15. MULTIMAX 1;
16. LATAPOXY® 300 Adhesive;
17. LATAPOXY BIOGREEN™ 300 Adhesive;
18. STRATA_MAT™;
19. STRATA_MAT XT

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 is not a suitable subsurface for the installation of ceramic tile brick or stone in interior locations where plywood 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 panels (e.g. Advantech), luan, wafer board, particleboard, oriented strand board/OSB, or similar engineered or reconstructed wood panels 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 APA trademark as a performance rated structural-use panel, 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®, HYDRO BAN 1, HYDRO BAN Sheet Membrane or 9235 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.

NOTE: Given the numerous advances in technology and underlayment material types, please refer to the LATICRETE Architectural Guidebook (available at www.laticrete.com/ag) for complete installation instructions for applications over wood floors.

Technical Data Sheets are subject to change without notice. For latest revision, check our website at <https://laticrete.com>

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