# CERAMIC TILE OVER WOOD STRUCTURAL PANEL FLOORS

Wood structural panels have been used successfully under ceramic tile for decades. Due to the brittle nature of the tile, however, it is important to make certain that the floor system is as stiff as practically possible.

TCA, in cooperation with APA, tested wood floor systems with joists spaced 24 inches o.c. Two of these assemblies utilized oriented strand board (OSB). These systems (Table 1) have been tested by TCA, in accordance with ASTM C 627 and received a service classification of Residential or Light Commercial.

The Tile Council of North America's (TCA) *2003-2004 Handbook for Ceramic Tile Installation* lists 16 floor systems that utilize plywood (Table 2) or, in the case of assembly F155-03, OSB. Seven of these systems, F142-03, F143-03, F149-03, F147-03, F150-03, F152-03 and RH130-03 have two-layer all-plywood substrates. Many systems call for joists at 16 inches o.c., but one permits joists spaced at 19.2 inches o.c. and five permit joists spaced at 24 inches o.c. Two systems are designed for floor-embedded electric heating systems.

All floor systems are for interior, dry-use only. Plywood and OSB panels must be dried to equilibrium prior to application of underlayment and prior to application of tiles. Avoid driving T&G joints tight. Offset panel underlayment edges at least two inches from subfloor edges. Offset underlayment ends from subfloor panel ends by one or more panel spans, plus 2 inches. All layers of panels should be installed with strength axis perpendicular to supports. Install APA Underlayment panels with corrosion-resistant fasteners. Avoid driving underlayment fasteners into joists. For all TCA-listed floor systems, consult TCA *Handbook for Ceramic Tile Installation* and *American National Standard Specifications for the Installation of Ceramic Tile*, ANSI A108, 118 and 136 for specific installation details.

**TABLE 1. ASTM C 627-TESTED ASSEMBLIES—NOT LISTED BY TCA**

| TCA No. | Service Classification[1, 2] | Joist Spacing (in. o.c.) | Tile Adhesive | Underlayment Layer | Subfloor Layer | Other |
|---|---|---|---|---|---|---|
| Unlisted | Light Commercial | 24 | Multi-purpose thin-set mortar | Tested and passed with no underlayment layer: Minimum ¼" plywood APA Underlayment layer recommended | 1-1/8"APA Rated Sturd-I-Floor 48 oc T&G Exposure 1 Plywood | — |
| Unlisted | Residential | 24 | Multi-purpose thin-set mortar | 19/32"APA Rated Sturd-I-Floor 20 oc T&G Exposure 1 OSB | 23/32"APA Rated Sturd-I-Floor 24 oc T&G Exposure 1 OSB | Trowel-applied waterproof membrane over underlayment |

## TABLE 2. ASTM C 627-TESTED ASSEMBLIES LISTED IN TCA HANDBOOK FOR CERAMIC TILE INSTALLATION

| TCA No. | Service Classification[1, 2] | Max. Joist Spacing (in. o.c.) | Tile Adhesive | Underlayment Layer | Subfloor Layer | Comment |
|---|---|---|---|---|---|---|
| F141 | Light Commercial | 16 | Portland cement paste, dry-set mortar or latex-portland cement mortar | Mortar bed (1-1/4" minimum) | 19/32" Exposure 1 plywood | Cleavage membrane |
| F142 | Residential | 16 | Organic | 19/32" Exposure 1 plywood | 19/32" Exposure 1 plywood | — |
| F143 | Light Commercial or (with special tile), Heavy | 16 | Epoxy | 19/32" Exposure 1 plywood | 19/32" Exposure 1 plywood | 15/32" plywood underlayment layer gives "Residential" performance |
| F144 | Residential or Light Commercial | 16 | Dry-set mortar or latex-portland cement mortar | Cementitious backer units or fiber cement underlayment | 23/32" Exposure 1 plywood | 19/32" plywood subfloor gives "Residential" performance |
| F145 | Light Commercial | 16 | Portland cement paste, dry-set mortar or latex-portland cement mortar | 3/4" Minimum mortar bed | 23/32" Exposure 1 plywood | Cleavage membrane + metal lath |
| F146 | Light Commercial | 16 | Dry-set mortar or latex-portland cement mortar | Coated glass-mat backer board | 19/32" Exposure 1 plywood | 2"x 2" or larger tile only |
| F147 | Residential | 24[3] | Latex-portland cement mortar or dry-set mortar | 3/8" Exposure 1 plywood plus uncoupling system | 23/32" Exposure 1 T&G plywood | 4"x 4" or larger tile only |
| F148 | Residential | 19.2 | Dry-set mortar | Uncoupling system | 23/32" Exposure 1 T&G plywood | — |
| F149 | Residential | 24 | Latex-portland cement mortar | 19/32" Exposure 1 plywood | 23/32" Exposure 1 T&G plywood | — |
| F150 | Residential or Light Commercial | 16 | Latex-portland cement mortar | 19/32" Exposure 1 plywood | 19/32" Exposure 1 plywood | 15/32" plywood underlayment layer gives "Residential" performance |
| F151 | Light Commercial | 24 | Latex-portland cement mortar | Coated glass mat backer board | 7/8" Exposure 1 T&G plywood | 8"x 8" or larger tile only |
| F152 | Residential | 24 | Latex-portland cement mortar | 3/8" Exposure 1 plywood | 23/32" Exposure 1 T&G plywood | 4"x 4" or larger tile only |
| F155 | Residential[4] | 24 | Latex-portland cement mortar | 19/32" Exposure 1 plywood | 23/32" Exposure 1 T&G OSB or plywood | OSB subfloor OK |
| F170 | Residential | 16 | Latex-portland cement mortar | Fiber-reinforced gypsum panel | 19/32" Exposure 1 plywood | — |
| RH130 | Residential or Light Commercial | 16 | Latex-portland cement mortar | Light Commercial-19/32" Exposure 1 plywood | 19/32" Exposure 1 plywood | 15/32" plywood underlayment layer gives "Residential" performance |
| RH135 | Residential or Light Commercial | 16 | Dry-set mortar or latex-portland cement mortar | Cementitious backer unit | 23/32" Exposure 1 plywood | 19/32" plywood subfloor gives "Residential" performance |

[1] Order of increasing serviceability: Residential, Light Commercial, Moderate and Heavy
[2] As typically performed, the ASTM C 627 Robinson-Type Floor Tester delivers three, simultaneous dynamic, 300-pound concentrated wheel loads to the surface of test assembly. The number of cycles the system withstands without failure determines its Service Classification. One criterion used to determine failure is a maximum deflection of L/360 during this test.
[3] 1-1/2 inch net support width permitted with 8x8 inches or larger tile—otherwise 2-1/4 inches minimum flange width.
[4] This assembly passed the ASTM C 627 test with a "Light Commercial" rating with both a plywood and an OSB subfloor.

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