

MATERIALS AND CONSTRUCTION METHODS FOR EXTERIOR WILDFIRE EXPOSURE

DECKING ALTERNATE METHOD A SFM STANDARD 12-7A-4A

12-7A-4A.1 Application. The minimum design, construction and performance standards set forth herein for unloaded decks are those deemed necessary to establish conformance to the provisions of these regulations. Materials and assemblies that meet the performance criteria of this standard are acceptable for use as defined in the California Building Standards Code.

12-7A-4A.2 Scope. This standard evaluates the performance of decks (or other horizontal ancillary structures in close proximity to primary structures) when exposed to direct flames and brands. The under-deck flame exposure test is intended to determine the heat release rate (HRR) and degradation modes of deck or other horizontal boards when exposed to a burner flame simulating combustibles beneath a deck. The burning brand exposure test is intended to determine the degradation modes of deck or other horizontal boards when exposed to a burning brand on the upper surface.

12-7A-4A.3 Referenced document.

1. ASTM E 108. Standard Test Methods for Fire Tests of Roof Coverings.
2. California Building Code, Chapter 7A.

12-7A-4A.4 Definitions.

1. **Deck boards.** Horizontal members that constitute the exposed surface of the ancillary structure.
2. **Heat release rate.** The net rate of energy release as measured by oxygen depletion calorimetry.

12-7A-4A.5 Test assembly.

1. **Size.** The overall size of the test deck shall be nominally 24 x 24 inches (610 x 610 mm) unless width variation of deck boards requires an increase in overall deck width (i.e., the direction of joists) in order to meet the overall dimensions. The length of individual deck boards shall be 24 inches (610 mm).
2. **Joists.** The deck is supported by two nominal 2 x 6 Douglas-fir joists running perpendicular to the deck boards, and constructed with a 16-inch (406 mm) center-to-center spacing. A comparable species that may be more commonly used for structural framing of decks in a given region can be substituted for Douglas-fir.
3. **Deck board spacing and fastening.** Edge-to-edge spacing and method of attachment shall conform to the manufacturer's installation recommendations. The front deck board shall be flush with the ends of the joists, and the rear deck board shall overhang the end of the joists by 1 inch (25 mm).
 - 3.1. In the absence of recommended installation guidance, the edge-to-edge spacing shall be $\frac{3}{16}$ inch (5 mm) with boards mechanically attached to the joists using deck screws.
 - 3.2. If nominal 6-inch-wide deck boards are used, a total of five boards shall be used for each deck. Changing the board width could change the number of deck boards.

12-7A-4A.6 Materials.

1. **Cross-sectional dimension.** All deck board materials are to have cross-sectional dimensions equivalent to use in service.
2. **Description.** The material under test should be described as completely as possible (unit weight, thickness, width, and general information regarding composition).
3. **Condition of test material.** Prior to testing, all materials (deck boards and joist material) shall be conditioned to a constant weight or for a minimum of 30 days at 73 ± 4 °F (23 ± 2 °C) and 50 ± 5 percent relative humidity, whichever occurs first. Constant weight shall be defined as occurring when the change in test material weight is less than or equal to 2 percent in a 24-hour period.

Note: The moisture content of joists shall be between 8- and 10-percent moisture content.

12-7A-4A.7 Under-deck flame test.

12-7A-4A.7.1 Equipment.

1. **Burner.** A 12- x 12-inch (300 x 300 mm) diffusion burner shall be used. Natural gas, methane or propane shall be supplied to the burner through a metered control system. The gas supply to the burner shall produce a net heat output of 80 ± 4 kW throughout the flame exposure. Burner output can be determined from HRR or calculated from the gas flow rate, temperature, and pressure.
2. **Oxygen depletion calorimeter.** The equipment shall include a hood, associated ducting, and instrumentation to provide HRR data by oxygen depletion calorimetry.

12-7A-4A.7.2 Test system preparation. See 12-7A-4 Figure No. 1.

1. **Deck support assembly.** Assembly that holds the test deck over the burner.
2. **Baffle panels and joist support.** Horizontal metal plates to support the deck joists along their full length, and also to confine burner flames to the underside of the deck boards located between the support joists.
3. **Back wall.** Ceramic fiber board or another noncombustible panel product for the back wall material. Total height of the back wall is 8 feet (2.4 m).
4. **Ledger board.** A 4-foot-long (1.2 m) simulated 2 x 6 ledger board shall be constructed of layers of ceramic fiber board (or other noncombustible panel product) and attached to the wall at a height slightly below the overhang of the rear deck board of the test deck.

12-7A-4A.7.3 Conduct of tests.

1. **Airflow.** The test is conducted under conditions of ambient airflow.

2. **Number of tests.** Conduct the test on three replicate assemblies.
3. **Burner output verification.** Without a deck in the apparatus, set the output of the burner to 80 ± 4 kW. Conduct a verification run of 3 minutes to ensure the heat release rate, and then turn off the burner.
4. **Measurement of heat release rate.** HRR is measured during the tests with a properly calibrated oxygen depletion calorimeter. Since HRR is typically a post-test analysis, this criterion for Acceptance may be determined at the end of the test.
5. **Burner positioning.** Center the burner directly under the middle deck board, midway between the joists. The distance from the top of the burner to the bottom of the deck boards shall be 27 inches (690 mm).
6. **Moisture content.** Measure the moisture content of the wooden members of the assembly using a moisture meter (ASTM D 4444).
7. **Procedure.**
 - 7.1. **Ignition.** Ignite the burner, controlling for a constant 80 ± 4 kW output.
 - 7.2. **Flame exposure.** Continue the exposure for a 3-minute period. Extinguish the burner.
 - 7.3. **Continued combustion.** Continue observation for an additional 40 minutes or until all combustion has ceased. The test shall be terminated immediately if flaming combustion accelerates uncontrollably (runaway combustion) or structural failure of any deck board occurs.
8. **Observations.** Note physical changes of the deck boards during the test, including structural failure of any deck board, location of flaming and glowing ignition, and loss of material (i.e., flaming drops of particles falling from the deck). It is desirable to capture the entire test with a video recorder to allow review of the details of performance.

12-7A-4A.7.4 Report. The report shall include a description of the deck board material and the time of any degradation (effective net peak heat release rate) during the test.

12-7A-4A.7.5 Conditions of acceptance. Should one of the three replicates fail to meet the Condition of Acceptance, three additional tests may be run. All of the additional tests must meet the Condition of Acceptance with an effective peak heat release rate of less than or equal to 25 kW/ft^2 (269 kW/m^2).