

Asphalt Shingle Product and Test Standards

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Asphalt shingles continue to be the most popular choice for residential roof coverings in North America. There are many reasons for their continued dominance in the market, including their ability to provide excellent performance under a wide range of climate conditions. Most homeowners and building owners would be surprised to learn of the myriad laboratory tests and requirements against which shingles are evaluated. This bulletin will summarize the common asphalt shingle product standards and test methods that consumers are most likely to see listed in manufacturers' literature or on product packaging. Note – the summaries below provide a very brief overview and are not intended to characterize all aspects/requirements of the various standards and test methods.

PRODUCT STANDARDS

The building codes include product specification standards with which asphalt shingles are required to comply. The following product standards are frequently followed in North America.

ASTM D3462 – *Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules*. The specification includes prescriptive mass requirements for the shingles and many individual shingle components, along with tests to assess shingle physical properties such as pliability, tearing resistance, and nail pull-through resistance.

CSA A123.5 – *Asphalt shingles made from glass felt and surfaced with mineral granules*. Similar in many respects to the ASTM D3462 standard, this Canadian product standard includes requirements for many product properties such as minimum weight (mass), pliability, granule embedment, and resistance to tearing.

ASTM D3018 – *Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules*. Unlike the ASTM D3462 and CSA A123.5 standards, this document does not contain any mass references, and its provisions are limited to specifying a maximum volatile

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matter, requiring that the shingles not stick together in the package, and incorporating ASTM fire and wind resistance tests (E108 and D3161, respectively).

ICC Evaluation Service AC438 – Acceptance Criteria for Alternative Asphalt Roofing Shingles.

While the product standards above have existed for decades and are the most common ones referenced by shingle manufacturers, this standard (developed by ICC Evaluation Service) provides alternative acceptance criteria for demonstrating compliance with ICC building codes. This standard contains some of the requirements found in ASTM D3462, as well as additional tests to assess shingle physical properties, which some feel may predict product performance after installation.

TEST METHODS

Asphalt shingle roofing systems offer high resistance to extreme conditions of fire, wind, and impact. Testing demonstrates the performance of these products. Nationally recognized standards organizations, such as UL Standards & Engagement (formerly Underwriters Laboratories) and ASTM International, develop consensus standards used to evaluate the performance of asphalt shingles.

Fire Resistance

The building codes adopted by local jurisdictions establish minimum requirements for resistance to external fires for all roofing systems. The standard test methods that follow are used to evaluate various aspects of fire resistance.

ASTM E108, UL790, CAN/ULC-S107 – Standard Test Methods for Fire Tests of Roof

Coverings. As the title describes, these standards outline test methods designed to assess a roof assembly's resistance to fire from external sources. It should be noted that the tests do not address fire sources from within the structure. There are three "Classes" of compliance (A, B, and C), with Class A reflecting the highest level of a roof assembly's fire resistance.

Wind Resistance

High wind events are common in many areas of North America, and the building codes establish minimum wind resistance requirements for products installed on the exterior of the building

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envelope, including asphalt shingles. The standard test methods described below examine the resistance of asphalt shingles to wind.

ASTM D7158 – *Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)*. ASTM D7158 evaluates the combined aspects of a shingle's adhesive bond and the shingle's inherent design/rigidity to determine its overall uplift resistance. The laboratory measured values can be directly compared to code prescribed three-second gust design wind speeds. As with other methods, "Classes" are assigned to various levels of the results, and in this test, Class H represents the highest (best) wind resistance level.

ASTM D3161 – *Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method)*. This method is the original method used to assess an asphalt shingle's response to "wind" in a test facility. A deck of shingles is prepared and conditioned to provide an opportunity for the factory-applied adhesive to adhere the shingles together. Fan-induced "wind" is applied to the deck, and the highest wind speed achieved without any shingle portion lifting yields the shingle's classification. Although design wind speed requirements established by building codes are based on three-second gusts, the fan-induced test is conducted for two hours. As with other methods, "Classes" are assigned to various levels of the results, and in this test, Class F is the highest (best) rating.

TAS 100 – *Testing Application Standard (TAS) Standard Test Method for Wind and Wind-Driven Rain Resistance of Discontinuous Roof Systems*. This test assesses a roof covering material's ability to shed water from simulated "rain" driven by wind, as well as the shingle system's wind resistance. The wind is generated by fans. The test method is contained within the High Velocity Hurricane Zone provisions of the Florida Building Code and may be used to determine a roof covering's suitability for installation in regions subject to hurricanes. Passing criteria includes a requirement that water cannot be driven around the roof system to the roof deck.

Impact Resistance

Although not required by the building codes, the ability to resist damage from impacts is of interest to many homeowners and building owners. The following test methods are used for this purpose.

UL 2218 – *Impact Resistance of Prepared Roof Covering Materials*. This standard provides a laboratory test method to qualitatively evaluate a roof covering's response when subjected to impact. The test uses steel balls of various diameters dropped from heights ranging from 12 to 20 feet onto a deck of shingles. The impact locations are examined, and the product is rated into one of four "Classes," with Class 4 representing the highest (best) level of impact resistance. The results of impact resistance testing may help homeowners obtain a reduction in home insurance costs in some areas and from some insurers.

FM 4473 – *Specification Test Standard for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls*. This standard test also addresses the impact resistance aspect of roofing materials but uses ice balls of various diameters launched from a pneumatic device rather than dropping steel balls as is done in the UL method. Roofing materials are classified in one of four "Classes," with Class 4 the highest (best) level of impact resistance.

OTHER STANDARDS

Two additional standards which may be encountered are described in the following sections.

ANSI/CRRC S100 – The Cool Roof Rating Council (CRRC) administers a program to rate asphalt shingles which have been independently tested for their solar reflectance and thermal emittance, from which a solar reflective index (SRI) is calculated. Some jurisdictions may establish solar reflectance, thermal emittance, or SRI requirements for roof coverings.

CSA A123.51 – *Asphalt shingle application on roof slopes 1:6 and steeper*. Neither a product standard nor a test method standard, CSA standard A123.51 is a unique industry standard that prescribes general guidelines for shingle installations and is occasionally cited in a

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manufacturer's literature. The standard covers such topics as typical underlayment installation, fastener use, and slope guidelines. The standard does not purport to address all building code requirements, and portions of the standard may not apply to laminated shingles.

Aside from the most common industry standards listed above, manufacturers might also refer to other specialized product/test standards, regional/state building code references, or insurance organization approved assemblies. When manufacturers reference compliance with the standards above, they may optionally include reference to a "date" (year) suffix to identify the version of a standard with which the product complies.

It should be noted that all these product standards and test methods apply to shingles "as manufactured" and are not intended to evaluate shingles after storage or installation. Laboratory tests are performed under controlled conditions. These tests bring valuable insight to wind, rain, fire, impact, or sun exposure, but do not fully replicate real-world conditions.

Lastly, regardless of a shingle manufacturer's research and quality control efforts to ensure compliance with all product and test standards, optimum shingle performance on the roof is equally dependent upon proper installation according to the manufacturer's installation instructions. When shingles are tested for compliance with various test standards, they are installed on the test deck according to the manufacturer's installation requirements. For example, in the fire resistance test, the shingles are installed on the test deck "according to the manufacturer's installation instructions," including those related to underlayment. Therefore, if the shingles are not installed on the roof consistently with those requirements, the installed roof system's fire resistance may be unknown. Since shingle installation procedures vary between different shingle manufacturers and different shingle designs, contractors should ensure they always follow the correct requirements for the specific shingle being installed.

NOTE: Organizations referenced:

- ASTM = ASTM International
- CSA = CSA Group

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- UL = UL Standards and Engagement (formerly Underwriters Laboratories)
- ULC = UL Standards and Engagement Canada
- FM = FM Approvals

WARNING: Because it is dangerous to walk, climb or work on a roof, ARMA recommends that only trained professionals engage in such activity. If you choose to do so, exercise extreme care, comply with all government safety regulations, and follow all safety work practices, precautions and procedures, including but not limited to manufacturer's instructions, labels, and warnings.

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