

CSSB - 97

Grading and Packing Rules
for
Western Red Cedar* Shakes and Western Red Cedar* Shingles
of the
Cedar Shake and Shingle Bureau



**Cedar Shake &
Shingle Bureau**

www.cedarbureau.org

*Also applies to Alaskan Yellow Cedar

Copyright 1997 – 2001 Cedar Shake & Shingle Bureau.
All Rights Reserved.

SHAKES

SECTION 15.301--SCOPE

Wood shakes regulated under this part shall be of an approved durable wood and shall be manufactured and graded No.1 shakes or No.1 or 2 taper-sawn shakes in accordance with this standard, and their use shall be governed by the provisions of Chapter 15 of this code.

SECTION 15.302--DEFINITIONS

15.302.1 General. For the purposes of this part, certain words and phrases are defined as follows:

BEST FACE is the side of a shake or shingle which is graded and contains the least amount of defects as described within this Standard.

BREAKAGE is damage caused after manufacture and subsequent to packing

BUNDLE is a unit or package comprising sufficient material of the same grade and length to cover a specified area at recommended exposures.

BUTT is the thicker end of the shake.

BUTT CHECK (SUN CHECK) is a condition caused by heat or excessively dry temperature and usually occurs while the raw material is in block form. It is considered a defect when it extends more than 3/8-inch (9mm) upward from the butt of the shake.

CHECK is any separation of the wood. A check that causes an obvious, readily identifiable section that is easily separated during the grading process shall not be considered defective unless the separated sections are less than the minimum required width.

CLEAR LINE is an imaginary line across the width of a shake which marks the "clear zone.

CLEAR ZONE is that portion of the shake between the butt and the "clear line," involving both the face and the reverse.

COURSE is a horizontal layer forming one of a series of layers on a roof or wall or in the packed bundle.

CRIMPS is a breaking down or collapse of wood cells during drying, characterized by a caved-in or corrugated appearance.

DECAY (ROT) is the decomposition of wood substance caused by action of wood-destroying fungi, resulting in softening, loss of strength and weight and change of texture and color.

EDGE is the long side of a shake.

EXPOSURE is the portion which, when applied, is exposed to the weather.

EXPOSURE LINE is an imaginary line drawn across the shake at the same distance above the butt that is equal to the weather exposure.

FEATHER TIP or shim is a condition of manufacture found on the thin ends (tip) of some shakes where the saw came out of the piece prematurely, producing a thin, flimsy, feather-like tip that is uneven or has corners sawn off.

GRAIN is the direction, size, arrangement, appearance or quality of the fibers in wood. To have a specific meaning, the term must be qualified:

Cross Grain is a condition that should not be confused with the terms “flat grain” or “edge grain,” and that might better be termed “cross fiber,” since it is a deviation of the wood fibers from the true parallel of the face of the taper-sawn shake. It is a defect when it runs from one face of the taper-sawn shake to the other within a longitudinal distance of 3 inches (75mm) or less in that portion measured 5 1/2 (140mm) 7 1/2 inches (190mm) and 10 inches (255mm) from the butt on 15-inch (380mm), 18-inch (455mm) and 24-inch (610mm) shakes. There is to be no excessive cross grain in the remainder of the shake.

Diagonal Grain is a condition where the grain of the wood does not run parallel to the edges of the shake. It is considered a defect when the grain diverges or slants 2 inches (50mm) or more in width in 12 inches (305mm) of length measured from the butt.

Edge Grain or Vertical Grain is wood cut in a plane approximately at right angles to the annual rings. A condition in which the rings form an angle of 45 degrees or more with the face of the piece.

Flat Grain is wood cut in a plane approximately tangential to the annual rings and means a condition in which the rings form an angle of less than 45 degrees with the face of the piece.

Mixed grain is the condition in which edge and flat-grain are present in the same piece of wood.

Torn Grain (Torn Fiber) is a fuzzy or whiskered appearance in the face of the shake. Usually caused by a dull saw or grain deviations.

HEARTWOOD (HEART) is the inner layer of a woody stem wholly composed of nonliving cells and usually differentiated from the outer enveloping layer (sapwood) by its darker color.

KNOT is that portion of a branch or limb which has been surrounded by subsequent growth of wood of the tree.

KNOT DIAMETER shall be measured by average facial dimensions.

LINEAL INCHES is the total width of any given number of shakes when laid edge to edge.

PLY is the minimum number of thicknesses, when applied, of shakes or at any point on the covered surface. This term is relative to exposure.

REVERSE FACE refers to the entire reverse side of a shake or shingle, which would be expected to be installed down.

SAPWOOD is wood containing some living cells and forming the initial wood layer beneath the bark of the log. Sapwood may be lighter in color than heartwood.

SHIM. See “feather tip.”

SQUARE PACK is a unit providing sufficient shakes for the coverage of a given area when the shakes are laid at the required exposure to the weather. (See Tables 15-3-A and 15-3-B.)

TIP is the thinner end of the shake.

TIP ZONE refers to that area 22 (560mm) or more inches from the butt in 24-inch (610mm) shakes, 17 (430mm) or more inches from the butt in 18-inch (455mm) shakes and 14 (355mm) or more inches from the butt in 15-inch (380mm) shakes.

WARPAGE refers to facial curvature (bow), or twist, or both. Warpage is measured from a level plane, with the shake convex to the highest point at the butt. The shake is held firmly inches down from the tip 4-inches (102mm).

WAVES are the washboard-like irregularities on the face of a shake.

WORMHOLE is a hole or passage burrowed by a worm or insect.

15.302.2 Shake Types. Shake types shall be one of the following types:

1. **Handsplit-and-resawn** have split faces and sawn backs, and are produced by running split wood blanks or boards of proper thickness diagonally through a bandsaw to produce two tapered shakes from each blank.

2. **Straight-split** are manufactured by splitting from only one end of a block of wood, producing shakes which are the same thickness throughout.

3. **Taper-sawn** are tapered pieces sawn both sides.

4. **Taper-split** are split both sides. A natural taper, from butt to tip, is achieved by reversing the block, end for end, with each split.

SECTION 15.303--QUALITY STANDARDS

15.303.1 No. 1 Grade Shake. Shakes shall be 100 percent clear, graded from the split face in the case of handsplit-and-resawn shakes and from the best face in the case of taper-split, taper-sawn and straight-split shakes.

Shakes shall be 100 percent heartwood, free of bark and sapwood, except that up to 1/8 inch (3mm) of sapwood is permitted on one edge from the butt to the maximum recommended exposure line on the graded face. Additional sapwood shall be permitted above the exposure line providing the sapwood is contained within a diagonally drawn line from the outside edge at the butt to a point 1 inch (25mm) inward from the tip edge on handsplit and resawn shakes and 5/8 inch on tapersawn shakes.

Taper-split shakes and straight-split shakes shall be 100 percent edge-grain. Handsplit-and-resawn shakes and taper-sawn shakes may average up to 20 percent of flat-grain in the lineal inches (mm) of any bundle.

Curvature in the sawed face of handsplit-and-resawn shakes shall not exceed 1 inch (25mm) from a level plane in the length of the shake. Excessive grain sweep on the face shall not be permitted. Knots, wormholes, decay, checks, crimps, waves and torn fiber are not permitted.

15.303.2 No. 2 Grade-Taper-Sawn Shakes. No. 2 grade taper-sawn shakes shall be of sound and serviceable material, graded from the best face. Flat grain is allowed in the No. 2; sapwood is restricted to 1 inch (25mm) in width in the first 10 inches (255mm) above the butt. Defects such as knots, wormholes, decay, crimps, cross grain, waves or torn fiber are not allowed in the first 7 1/2 inches, 9 inches and 12 inches (190mm, 230mm, and 305mm) from the butt in the 15-inch, 18-inch and 24-inch (380mm, 455mm and 610mm) lengths, respectively, of the No. 2 grade taper-sawn shakes. In the same product, grain characteristics, other than excessive cross grain, are not considered defects; defects may be up to 1 1/2 (38mm) inches in diameter, but aggregate defects must not exceed one half the width of the shakes.

15.303.3 Standard grade shakes. Shakes shall be handsplit-and resawn taper-sawn. Shakes shall be edge grain or flat grain or any combination of edge and flat grain. Shakes shall be graded from the split or best face. Grain characteristics other than excessive cross grain are not considered defects. Curvature shall not exceed 1 inch (25mm) from a level plane in the length of the shake.

SECTION 15.304--SIZE

15.304.1 Length.

15.304.1.1 No 1 grade shakes. Nominal shake lengths shall be 15 inches, 18 inches or 24 inches (380mm, 455mm or 610mm), with a minus tolerance of 1 inch (25mm) and a plus tolerance of 2 inches (50mm) for 18-inch (455mm) shakes . A variation, including shims or feather tips, of 1 inch (25mm) from these nominal lengths of 18-inch (455mm) shakes shall be permitted in any bundle. A variation of 2 inches (50mm) below the nominal length shall be permitted in 24-inch (610mm) shakes and may contain, but is not limited to, shims or feather tips within the specified variation and shall have a plus tolerance of 3-inches (75mm). See Table 15-3-A. The 15-inch (380mm) starter-finish course grade shall permit a tolerance of 1 inch (25mm) over and under the nominal 15-inch (380mm) length.

15.304.1.2 No. 2 Taper-Sawn Grade Shakes.. For No. 2 grade taper-sawn shakes, minimum lengths of 15-inch, 18-inch and 24-inch (380mm, 455mm and 610mm) shakes shall be 14, 16 and 22 inches (355, 405 and 560mm), respectively.

15.304.1.3 Standard Grade Shakes. For Standard Grade shakes the minimum length of 18-inch (455mm) and 24-inch (610mm) shakes shall be 17-inches (430mm) and 22-inches (560mm) respectively.

15.304.2 Thickness.

15.304.2.1 No. 1 grade shakes. Shake thickness shall be determined by measurement of the butt within 1/2 inch (13mm) from each edge. If corrugations or valleys exceed 1/2 inch (13mm) in depth, a minus tolerance of 1/8 inch (3mm) is permitted in the minimum specified thickness. (Providing the required minimum shake thickness is maintained within 1/2-inch (13mm) of each edge at the butt, a minus tolerance of 1/16-inch (1.5mm) less than the nominal thickness shall be permitted on the remaining width of the shake.) No minus tolerance shall be permitted. The thickness at the exposure line shall be a minimum of one half the butt thickness, except that 3/8-inch (9mm) shakes shall have a minimum thickness of 1/4 inch (6mm) at the exposure line.

15.304.2.2 No. 1 and No. 2 grade taper-sawn shakes. No 1 and No. 2 grade taper-sawn shakes shall have one of two thicknesses at the butt, 5/8 inch (16mm) or 3/4 inch (19mm) with a minus tolerance of 1/16 inch (1.5mm) in 10 percent of a bundle.

15.304.2.3 Standard grade shakes. Standard Grade shakes shall have one thickness. Eighteen inch (455mm) and 24-inch (610mm) shakes shall have a minimum butt thickness of 3/4-inch (19mm).

Thickness at the exposure line shall be a minimum of one-half (1/2) the minimum specified butt thickness.

15.304.3 Width.

15.304.3.1 No. 1 grade shake. Shakes shall be of random widths, none narrower than 4 inches (100mm). Minimum width for taper-sawn shakes shall be 3 1/2 inches (90mm). Taper-sawn shakes less than 4-inches (100mm) in width shall not constitute more than five percent (5%) of the running inches (mm) of each bundle.

15.304.3.2 No. 2 grade taper-sawn shake. No. 2 grade taper-sawn shakes shall have a minimum width of 3 inches (75mm). Taper-sawn shakes less than 4 inches (100mm) in width shall not constitute more than 10 percent of the running inches of each bundle. Edges shall be parallel within 1/2 inch (13mm).

15.304.3.3 Standard Grade Shakes. Standard Grade shakes shall be of random widths, no narrower than 4 inches (100mm); and none wider than 8 inches (200mm).

15.304.4 Edges. Edges of shakes shall be parallel within 1 inch (25mm). Edges of taper-sawn shakes shall be parallel within 5/8 inch (16mm).

SECTION 15.305-PACKING

15.305.1 General. Shakes shall be packed in straight courses in regular frames 18 to 20 inches (457mm to 508mm) wide. See Tables 15-3-A and 15-3-B.

15.305.2 Identification. Each bundle of wood shakes graded under this standard shall bear the label of an approved inspection bureau or agency. The label shall be white base stock printed with predominately blue ink and shall clearly indicate No. 1 grade. For No. 2 grade taper-sawn shakes, the label shall be white base stock printed with predominately red ink and shall clearly indicate the No. 2 grade. For standard grade shakes, the label shall be white base stock printed with predominately brown ink and shall clearly indicate standard grade.

SECTION 15.306--INSPECTION

Shakes packed in a five-bundle square shall be off grade if the total lineal inches of on-grade shakes is less than 268 inches (6807mm) per bundle.

SECTION 15.307--REINSPECTION

In case of reinspection, 10 or more bundles selected at random shall constitute a fair sampling of the shipment. The criteria for inspection of shakes specified in **Section 15.306** shall also apply for reinspection.

PART II--Grading Rules for Shake Hip and Ridge

SECTION 15.308--DEFINITION

Shake hip and ridge are two shakes that have one edge, each sawn on a bevel and fastened together to produce the cap for the hip or ridge of the roof.

SECTION 15.309--QUALITY STANDARDS

No. 1 hip and ridge units shall be produced from material that meets the standard for No. 1 shakes; No. 2 units shall be produced from material that meets the standard for No. 2 taper-sawn shakes. Lower grade material is not permitted.

SECTION 15.310--SIZE

At the time of manufacture, the shake hip and ridge assembly width shall be 9 inches (230mm), measured on the underneath side of the assembly at the butt end. A minus tolerance of 1/8 inch (3mm) is allowed. Butt misalignment of assemblies in excess of 1/4 inch (6mm) is not permitted. The narrow component shall have a minimum width of 4 1/2 inches (115mm) at the butt end. For taper-sawn ridge, top corners at the outer edge of the units shall not be more than a 90-degree angle.

SECTION 15.311--PACKING

Individual shake hip and ridge units are made up of one wide and one narrow component. They shall be packed 20 units per bundle with an equal number of right-hand and left-hand units (for alternating laps). Units shall be manufactured to a 4 units vertical in 12 units horizontal (33.3% slope) pitch or steeper. Units shall be joined with not less than two fasteners applied between 1 inch and 8 inches (25mm and 200mm) from the butt. Either staples or nails are acceptable. Fasteners shall be corrosion resistant, spaced approximately 4 inches (100mm) apart.

SECTION 15.312--INSPECTION

Each off-grade unit counts as 5 percent of the grade; more than two off-grade units per bundle shall preclude a passing grade.

SHINGLES

SECTION 15.401--SCOPE

This standard provides a minimum specification for sawn wood shingles of No. 1 grade, No. 2 grade and No. 3 grade. It covers length, width, thickness, and grain characteristics for these requirements, plus definitions and specifications.

SECTION 15.402--DEFINITIONS

For the purpose of this standard, the following terms shall be construed as herein specified.

BEST FACE is the side of a shingle which is graded and contains the least amount of defects.

BREAKAGE is damage caused after manufacture and subsequent to packing.

BUNDLE is a unit or package comprising sufficient material of the same grade and length to cover a specified area at recommended exposures.

BUTT is the thicker end of the shingle.

BUTT CHECK (SUN CHECK) is a condition caused by heat or excessively dry temperature and usually occurs while the raw material is in block form. It is considered a defect when it extends more than 3/8-inch (9mm) upward from the butt of the shingle.

CHECK is any separation of the wood.

CLEAR LINE is an imaginary line across the width of a shingle which marks the "clear zone."

CLEAR ZONE is that portion of the shingle between the butt and the "clear line," involving both the face and the reverse.

COURSE is a horizontal layer forming one of a series of layers on a roof or wall or in the packed bundle.

CRIMPS are a breaking down or collapse of wood cells during drying, characterized by a caved-in or corrugated appearance.

DECAY (ROT) is the decomposition of wood substance caused by action of wood-destroying fungi, resulting in softening, loss of strength and weight and change of texture and color.

EDGE is the long side of a shingle.

EXPOSURE is the portion which, when applied, is exposed to the weather.

EXPOSURE LINE is an imaginary line drawn across the shake or shingle at the same distance above the butt that is equal to the weather exposure.

FEATHER TIPS (or shims) is a condition of manufacture found on the thin ends (tip) of some shingles where the saw came out of the piece prematurely, producing a thin, flimsy, feather like tip that is uneven or has corners sawn off.

GRAIN is the direction, size, arrangement, appearance or quality of the fibers in wood. To have a specific meaning, the term must be qualified:

Cross Grain is a condition that should not be confused with the terms "flat" or "edge" grain, and that might better be termed "cross fiber," since it is a deviation of the wood fibers from the true parallel of the face of the shingle. It is a defect when it runs from one face of the shingle to the other

within a longitudinal distance of 3 inches (75mm) or less in that portion measured 6 inches (150mm) from the butt. Excessive cross grain must not be present in the remainder of the shingle.

Diagonal Grain is a condition where the grain of the wood does not run parallel to the edges of the shingle. It is considered a defect when the grain diverges or slants 2 inches (50mm) or more in width in 12 inches (305mm) of length.

Edge Grain or Vertical Grain is wood cut in a plane approximately at right angles to the annual rings. A condition in which the rings form an angle of 45 degrees or more with the face of the piece

Flat Grain is a condition in shingles or lumber where the growth rings are flat or horizontal, as opposed to edge-grained or quartered material where the growth rings are on edge, or vertical to the surface. Wood cut in a plane approximately tangential to the annual rings and means a condition in which the rings form an angle of less than 45 degrees with the face of the piece.

FEATHER TIPS (or shims) is a condition of manufacture found on the thin ends (tip) of some shingles where the saw came out of the piece prematurely, producing a thin, flimsy, feather like tip that is uneven or has corners sawn off.

HEARTWOOD (HEART) is the inner layer of a woody stem wholly composed of nonliving cells and usually differentiated from the outer enveloping layer (sapwood) by its darker color.

KNOT is that portion of a branch or limb which has been surrounded by subsequent growth of wood of the tree.

KNOT DIAMETER shall be measured by average facial dimensions.

LINEAL INCHES are the total width of any given number of shingles when laid edge to edge.

PLY is the minimum number of thicknesses, when applied, of shingles at any point on the covered surface. This term is related to exposure.

REVERSE FACE refers to the entire reverse side of a shake or shingle, which would be expected to be installed down.

SAPWOOD is wood containing some living cells and forming the initial wood layer beneath the bark of the log. Sapwood may be lighter in color than heartwood.

SHIM See "feather tips."

SQUARE PACK is a unit providing sufficient shingles for the coverage of a given area when the shingles are laid at the specified exposure to the weather in Tables 15-C and 23-L of this code.

TIP is the thinner end of the shingle.

TIP ZONE refers to that area 23 inches (585mm) or more inches from the butt in 24-inch (610mm) shingles, 17 (430mm) or more inches from the butt in 18-inch (455mm) shingles and 15 inches (380mm) or more inches from the butt in 16-inch (405mm) shingles.

TORN FIBER (TORN GRAIN) is a fuzzy or whiskered appearance on the face of the shingle usually caused by a dull saw or grain deviations.

WAVES are the washboard-like irregularities on the face of a shingle.

WORMHOLE is a hole or passage burrowed by a worm or insect.

SECTION 15.403--GRADING AND LABELING

Each bundle of No. 1 grade, No. 2 grade and No. 3 grade wood shingles graded under this standard shall bear the label of an approved inspection bureau or agency. For No. 1 grade, the label shall be of white base stock printed with predominantly blue ink and shall clearly indicate the No. 1 grade. For No. 2 grade, the label shall be of white base stock printed with predominantly red ink and shall clearly indicate the No. 2 grade. For No. 3 grade, the label shall be of white base stock printed with predominantly black ink and shall clearly indicate the No. 3 grade.

All grades shall be well manufactured and neatly packed; they shall comply with or exceed the specifications herein established for quality. All shingles shall be graded from their best face. Wormholes, decay and crimps are not allowed on either face of No. 1 shingles and below the clear line to the butts on either face of No. 2 and No. 3 grade shingles.

15.403.2 Characteristics.

15.403.2.1 General. Shingles characteristics shall be in accordance with the provisions of this section:

15.403.2.2 No. 1 grade. No. 1 grade shall be vertical grain or edge grain, be clear of defects on the graded face and be 100 percent heartwood. Knots, knot holes, wormholes, decay and crimps are not allowed on either face. Flat grain, cross grain and sapwood constitute natural characteristics that are not admissible. Defects in manufacturing, including shims, excessive feather tips, diagonal grain, and cross grain are likewise not admissible. Manufacturing defects such as checks, waves or torn fiber are permitted on the ungraded face.

15.403.2.3 No. 2 Grade. In No. 2 grade, sapwood is restricted to 1 inch (25mm) in width in the first 10 inches (255mm) above the butt. Grain characteristics, other than cross grain, are not considered defects. Defects such as knots, knotholes, wormholes, decay and crimps are not allowed on either face in the first 10 inches, 11 inches and 16 inches (255mm, 280mm and 405mm) from the butt in the 16-inch, 18-inch and 24-inch (405mm, 455mm and 610mm) lengths, respectively. Manufacturing defects such as checks, waves or torn fiber are permitted on the ungraded face. Defects may be up to 3 inches (75mm) in diameter, but aggregate defects shall not exceed one half the width of the shingle.

15.403.2.4 No. 3 Grade. In No. 3 grade, sapwood is permitted. Other grain deviations are not considered defects. Other defects, as listed above for No. 2 grade, are not allowed in the first 6 inches (150mm) from the butt for 16-inch (405mm) and 18-inch (455mm) lengths and 10 inches (255mm) for 24-inch (610mm) lengths. Defects may be up to 3 inches (75mm) in diameter, but aggregate defects shall not exceed two-thirds the width of the shingle.

SECTION 15.404--LENGTH, WIDTH, THICKNESS

15.404.1 Length.

15.404.1.1 No. 1 Grade. Shingles are usually manufactured in 16-inch, 18-inch and 24-inch (405mm, 455mm and 610mm) lengths. A minus tolerance 1-inch (25mm) below the nominal length is allowed..

15.404.1.2 No. 2 Grade. For No. 2 grade the minimum lengths, including shims or feather tips for 16-inch, 18-inch and 24-inch (405mm, 455mm and 610mm) shingles, shall be 15 inches (380mm), 16 inches (405mm) and 20 inches (510mm), respectively.

15.404.1.3 No. 3 Grade. For No. 3 grade the minimum lengths, including shims or feather tips for 16-inch, 18-inch and 24-inch (405mm, 455mm and 610mm) shingles, shall be 14 inches (355mm), 16 inches (405mm) and 18 inches (455mm), respectively.

15.404.2 Width

15.404.2.1 No. 1 Grade. Minimum width up to but not including 24-inch lengths (610mm), shall be 3 inches (75mm). Minimum width for shingles 24 inches (610mm) and longer shall be 4 inches (100mm). In 16-inch and 18-inch (405mm and 455mm) shingles those less than 4 inches (100mm) in width; shall not constitute more than 10 percent of the running inches per bundle. Shingles shall be uniform in width; that is, with parallel sides. Edges shall be parallel within a tolerance of 1/4 inch (6mm) on 16-inch (405mm) and 18-inch (455mm) shingles and 3/8-inch (9mm) on 24-inch (455mm) shingles.

15.404.2.2 No. 2 Grade. Minimum width shall be 3 inches (75mm). Not more than 20 percent of the running inches (mm) in each bundle shall be less than 4 inches (100mm) wide. Edges shall be parallel within a tolerance 3/8-inch (9mm) in the 16-inch, 18-inch and 24-inch (405mm, 455mm and 610mm) lengths.

15.404.2.3 No. 3 Grade. Minimum width shall be 3 inches (75mm) except it may be 2 1/2 inches (65mm) for the 16-inch (405mm) length. Not more than 30 percent of the running inches in each bundle shall be less than 4 inches (100mm) wide. Edges shall be parallel within a tolerance of 3/8 inch (9mm).

15.404.3 Thickness. Shingles are measured for thickness at the butt ends and designated according to the number of pieces necessary to constitute a specific unit of thickness. At the time of manufacture, 16-inch (405mm) shingles shall be “nominally” $5/2$ [the thickness of five butts will be 2 inches (50mm)], 18 inches (455mm) shall be nominally $5/2 \ 1/4$ [five butts measure $2 \ 1/4$ inches (55mm)] and 24 inches (610mm) shall be nominally $4/2$ [four butts measure 2 inches (50mm)]. Shingles shall be uniform in thickness, with a plus or minus tolerance of three percent(3%) shall be permitted to compensate for variations in saw movement. -A further plus or minus tolerance of 3 percent is allowable to compensate for the difference in shrinkage due to seasoning or kiln drying. This tolerance is based on the total thickness of the bundle.

SECTION 15.405-INSPECTION

Shingles packed as a 4 bundle square shall be off grade if the total lineal inches (mm) of on grade shingles is less than 695 inches (17 653mm) 635 inches (16 129mm) and 465 inches (11 811mm) per bundle for 16-inch (405mm), 18-inch (455mm) and 24-inch (610mm) shingles respectively.

SECTION 15.406-REINSPECTION

In case of reinspection, 10 or more bundles selected at random shall constitute a fair sampling of the shipment. The 4 percent tolerance for defective shingles specified in **Section 15.405** shall also apply for reinspection.

Part II - Grading Rules for Shingle Hip and Ridge

SECTION 15.407-DEFINITION

Hip and Ridge Shingles are two shingles that have one edge of each sawn on a bevel and fastened together to produce the cap for the hip or ridge of the roof. Hip and ridge units are manufactured from No. 1 or No. 2 grade shingles.

SECTION 15.408- QUALITY STANDARDS

No. 1 hip and ridge units shall be produced from material that meets the standard for No. 1 shingles; No. 2 hip and ridge units shall be produced from material that meets the standard for No. 2 shingles. Lower-grade material is not permitted.

SECTION 15.409--SIZE

At the time of manufacture, the shingle hip and ridge assembly width shall be 7 inches (180mm), measured over the top of the assembly at the butt end. A minus tolerance of 1/8 inch (3mm) is allowed. Butt misalignment of assemblies in excess of 1/8 inch (3mm) is not permitted. On the outer edge of the units, top corners shall not be more than 90-degree angle. The narrow component shall have a minimum width of $3 \ 5/16$ (85mm) inches at the butt end.

SECTION 15.410--PACKING

Individual shingle and ridge units are made up of one wide and one narrow component. Sixteen-inch (405mm) shingles shall be packed 40 units per bundle; 18-inch (455mm) shingles shall be packed 36 units per bundle, with an equal number of right-hand and left-hand units (for alternating laps). Units shall be manufactured to a 4 units vertical to 12 units horizontal (33.3%) pitch or steeper. Units shall be joined with not less than two fasteners applied between 1/2 inch and 5 1/2 inches (13mm and 140mm) from the butt. Either staples or nails are acceptable. Fasteners shall be corrosion resistant, spaced approximately 3 inches (75mm) apart.

SECTION 15.411--INSPECTION

Each off-grade unit shall count for 2 1/2 percent of the grade; more than four off-grade units per bundle shall preclude a passing grade.