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ACCEPTANCE CRITERIA FOR PRODUCT SPECIFIC WOOD SHAKE AND SHINGLE ROOF SYSTEMS

AC94
April 1994

Revised May 1995*
Previously Printed September 1993

PREFACE

Evaluation reports issued by the ICBO Evaluation Service, Inc. (ICBO ES), are based upon performance features of the *Uniform Building Code*™, ICBO *Uniform Mechanical Code*™ and related codes. Section 104.2.8 of the Uniform Building Code is the primary charging section upon which evaluation reports are issued. Section 104.2.8 reads as follows:

> The provisions of this code are not intended to prevent the use of any material, alternate design or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.
>
> The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of this code and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.
>
> The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

The attached acceptance criteria for the general code sections noted have been issued to provide all interested parties with guidelines on implementing performance features of the codes. The attached acceptance criteria were developed and adopted following public hearings conducted by the Evaluation Committee. These criteria may be revised from time to time as the need dictates.

ICBO ES may consider alternate criteria, provided the proponent submits valid data demonstrating that the alternate criteria are at least equivalent to the attached criteria and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a material, type or method of construction, or equipment, meets the attached acceptance criteria, or it can be demonstrated that valid alternate criteria are equivalent and otherwise meet the applicable performance requirements of the codes, if the material, product, system or equipment is such that either unusual care with its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use thereof, ICBO ES retains the right to refuse to issue or renew an evaluation report.

Published by the

International Conference of Building Officials

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*Editorially revised to reflect 1994 code references.

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PART I

1. INTRODUCTION

Scope: The purpose of these criteria is to establish requirements for ICBO Evaluation Service, Inc. (ICBO ES), recognition of a non-fire-rated product specific wood shake and shingle roofing system, third party quality control and grading based on the standards specified herein. These criteria supplement ICBO ES Rules of Procedure for issuance of evaluation reports on quality control agencies and/or evaluation reports. Proponents of these criteria must comply with each of the following in order to obtain an evaluation report or to maintain recognition of an existing report. Each mill covered by these criteria must be included in the evaluation report as an additional listee. Illustration of bundle labels must be included in the published evaluation report.

2. REFERENCE DOCUMENTS

2.1 ICBO ES Acceptance Criteria for Quality Control Manuals (AC10).

2.2 ICBO ES Acceptance Criteria for Special Roofing Systems (AC07).

3. 3. QUALITY CONTROL

3.1 Quality Control Manual:

The following information is necessary:

3.1.1 A Quality control procedural manual prepared in accordance with the Acceptance Criteria AC10. Quality control procedures required by the quality control agency of its member mills must be approved by ICBO ES.

3.1.2 Name, mailing address, telephone number, physical address or location of each mill.

3.1.3 In-house quality control requirements including name(s) of the in-house quality control inspector(s) at each mill.

3.1.4 Typical inspection forms used by the quality control agency during routine inspections. Typical inspection forms are included in Appendices A and B.

3.1.5 Facsimile copies of all pallet tags, release tags and bundle labels which must include installation instructions.

3.1.6 Production (in squares) for each type of product for each mill.

3.1.7 Detailed sampling plan to ensure that the quality control agency is grading a representative quantity of the mill production during routine audit.

3.2 Preinspection:

3.2.1 Prior to contracting with a prospective mill, the quality control agency must verify prior labeling and grading history of the mill.

3.2.2 Mills will be audited by the quality control agency prior to acceptance. The mills may be subject to joint audit by ICBO ES and the quality control agency.

3.3 Bundle Labels:

3.3.1 Label Information: Each bundle of No. 1 shakes and shingles including shakes and shingles for hip and ridge locations must be identified by a label printed on white base stock with predominantly blue ink with a distinctive yellow band across the top of the label. For No. 2 grade tapersawn shakes and shingles including tapersawn shakes and shingles for hip and ridge locations, the labels must be on white base stock with red ink with a distinctive yellow band across the top of the label. For No. 3 grade shingles, the labels must be on white base stock with black ink with a distinctive yellow band across the top of the label.

The following information must be on each bundle label:

3.3.1.1 Wood specie.

3.3.1.2 Product evaluation report number.

3.3.1.3 Installation requirements as detailed in Part III of these criteria.

3.3.1.4 Name, address and telephone number of the mill.

3.3.1.5 Name and evaluation report number of the quality control agency.

3.3.1.6 Product type and grade.

3.3.1.7 Product dimensions, including length and thickness.

3.3.1.8 Coverage and exposure information.

3.3.1.9 The wording, "See installation instructions on back."

3.3.2 Label Control:

3.3.2.1 Total control by the quality control agency of identification methods specified in the evaluation report is necessary.

3.3.2.2 The mills, at any given time, shall be provided labels for no more than 60 days of production for each product type.

3.3.2.3 Labels must be stored in a safe and secure place at the mill location, except for the quantity needed for daily production of each type of product.

3.3.2.4 Labels belonging to any other mill or agency other than the mill or agency of record respectively are not permitted at the mill site without specific prior approval.

3.4 Frequency of Inspection:

3.4.1 As a minimum, the quality control agency must conduct unannounced inspections at each mill once every working week.

3.4.2 Consideration of fewer inspections will require written concurrence by ICBO ES.

3.4.3 Field inspections of products manufactured by the mill may be substituted for a maximum of two required inspections per month at the production facility.

3.4.4 Copies of quality control agency inspection reports must be maintained on file at the mill location for a minimum of one year, and must be available at the mill location to the ICBO ES representative during any audit.

3.5 In-house Quality Control:

3.5.1 Mills are to maintain an in-house quality control program.

3.5.2 In-house quality control records must be maintained on file at the mill location for a minimum of one year.

3.6 Pallet Tags:

3.6.1 Each pallet must be identified by a serialized release tag substantially attached to the pallet. The release tag shall include the quality control agency name, the name of the mill, packing date, the date of release of the palletized material and signature or initials of the designated in-house quality control inspector.

3.6.2 Pallets cannot be shipped without a release tag.

3.6.3 The mill must maintain a release tag log which must contain the quantity of tags issued for each product type, and must be available at the mill location.

3.7 Noncomplying Products:

3.7.1 Noncomplying wood shake or shingle bundles must be segregated from complying shake and shingle bundles, and must bear a label clearly identifying them as noncomplying.

3.7.2 Each noncomplying bundle of shakes or shingles must be identified by a label printed on beige base stock with predominantly black ink.

3.7.3 Noncomplying labels may not reference the ICBO ES evaluation report number or the quality control agency evaluation report number. The wording, color and all other features or symbols upon the label may not suggest or infer complying material.

PART II

4. GRADING REQUIREMENTS FOR PRODUCT SPECIFIC WOOD SHAKES

4.1 Scope:

Wood shakes regulated under these criteria shall be of an approved durable wood and shall be graded No. 1 or No. 2 in accordance with these criteria at the time of manufacture, and their *use* shall be governed by the provisions of Chapter 15 of the Uniform Building Code and these criteria.

4.2 Definitions:

For the purposes of this section, certain words and phrases are defined as follows:

4.2.1 BEST FACE is that side of a shake which contains the least amount of defects as described within these criteria.

4.2.2 BREAKAGE is any check, separation of the wood, or damage caused after manufacture.

4.2.3 BUTT is the thick end of the shake.

4.2.4 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 upward from the butt of the shake.

4.2.5 CHECK is any separation of 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.

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

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

4.2.8 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.

4.2.9 EXPOSURE is the portion of a shake or shingle which, when applied, is exposed to the weather. See Table 2.

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

4.2.11 FEATHER TIP (SHIM) is a condition of manufacture found on the thin ends of some shakes where the saw came out of the piece prematurely, producing a thin, flimsy, feather-like tip that is uneven or has sawn off corners. It is not considered a defect when it appears on the tip edges providing the shake meets the parallel requirements in these criteria.

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

4.2.12.1 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 shake. It is a defect when it runs from one face of the shake to the other face within a longitudinal distance of 3 inches or less in that portion measured $7^1/_2$ or 10 inches from the butt on 18- or 24-inch shakes. The slope of the grain so defined shall not be any steeper at any other location on the piece.

4.2.12.2 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 or more in width in 12 inches of length measured from the butt.

4.2.12.3 EDGE GRAIN (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.

4.2.12.4 FLAT GRAIN is wood cut in a plane approximately tangential to the annual rings. A condition in which the rings form an angle of less than 45 degrees with the face of the shake. Only that portion of the shake which actually contains flat grain shall be included when measuring the flat grain content of a bundle of shakes.

4.2.12.5 TORN GRAIN (TORN FIBER) is a fuzzy or whiskered appearance on the face of the shake. Usually caused by a dull saw or grain deviations. It is not a defect when it occurs within the tip zone or on the reverse face of the shake.

4.2.13 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.

4.2.14 KILN CHECK (SEASONING CHECK) is any separation of the wood caused by drying or seasoning after manufacture and labeling.

4.2.15 KNOT is that portion of a branch or limb which has been surrounded by subsequent growth of wood of the tree. It is not considered a defect when it appears above the minimum length providing the knot does not protrude above the graded face more than one half the minimum butt thickness.

4.2.16 LINEAL INCHES is the total width of any given number of shakes when laid edge to edge. The calculation of total lineal inches of defects is determined by measurement of the total width of defective shakes and defective portions of shakes as described within these criteria.

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

4.2.18 REVERSE FACE refers to the entire reverse side of a shake which would be expected to be installed face down.

4.2.19 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. It is considered a defect when it exceeds the limitations as outlined by these criteria.

4.2.20 SHAKE TYPES. Shakes shall be one of the following types:

4.2.20.1 HAND SPLIT AND RESAWN shakes 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.

4.2.20.2 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.

4.2.20.3 STARTER-FINISH are either a hand split and resawn or tapersawn shake, and is normally used on roofs as a first course, last course or at valley intersection.

4.2.20.4 TAPERSAWN are tapered pieces sawn on both sides.

4.2.20.5 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.

4.2.21 SHIM. See feather tip.

4.2.22 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 Table 1.

4.2.23 TIP is the thinner end of the shake.

4.2.24 TIP ZONE refers to that area 22 inches or more from the butt in 24-inch shakes, 17 inches or more from the butt in 18-inch shakes and 14 inches or more from the butt in 15-inch shakes.

4.2.25 WARPAGE refers to facial curvature (bow) or twist or both. Warpage is measured from a level plane in the length of the shake. The shake is held firmly at the point of fastening with the butt and/or tip raised. The butt or tip may not exceed 1 inch from the level plane.

4.2.26 WAVES are the washboard-like irregularities on the face of a shake. It is not a defect when it occurs in the tip zone or on the reverse face of the shake.

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

4.3 Quality Standards:

4.3.1 General:

4.3.1.1 No. 1 Grade Shake shall be of sound and serviceable material, 100 percent clear and free of bark. Shakes shall be graded from the split face in the case of hand split and resawn shakes and from the best face in the case of taper-split and tapersawn shakes. One-eighth inch of sapwood is permitted on one edge within the exposure area of a shake. Additional sapwood is permitted from the exposure line to the tip in accordance with Section 4.3.5. Taper-split shakes shall be 100 percent edge grain. Tapersawn shakes and hand split and resawn shakes may include up to 20 percent of flat grain in the lineal inches of any bundle.

Warpage of hand split and resawn shakes shall not exceed 1 inch from a level plane. Excessive grain sweep on the face shall not be permitted. Knots, checks, crimps, waves and torn fiber are only permitted within the tip zone or on the reverse face. Wormholes are allowed only in the tip zone. Decay is not permitted.

4.3.1.2 No. 2 Grade Tapersawn Shake shall be of sound and serviceable material, graded from the best face. Flat grain is allowed and sapwood is restricted to 1 inch in width in the first 10 inches above the butt. Defects such as knots, wormholes, decay, checks, crimps, waves and torn fiber are not allowed in the first $7\frac{1}{2}$, 9 and 12 inches from the butt in the 15-, 18- and 24-inch lengths, respectively. Grain characteristics, other than cross grain, are not considered defects. Defects may be up to $1\frac{1}{2}$ inches in diameter, but aggregate defects must not exceed one half the width of the shakes. Excessive grain sweep on the face shall not be permitted.

4.3.2 Length:

4.3.2.1 No. 1 Grade Shake. Minimum lengths of 15-inch, 18-inch and 24-inch shake shall be 14, 17 and 22 inches, respectively, with a plus tolerance of 2 inches.

4.3.2.2 No. 2 Grade Tapersawn Shake. Minimum lengths of 15-inch, 18-inch and 24-inch shakes shall be 14, 16 and 22 inches, respectively, with a plus tolerance of 2 inches.

4.3.3 Thickness:

4.3.3.1 No. 1 Grade Shake. Shake thickness shall be determined by measurement of the butt within $\frac{1}{2}$ inch from each edge. A minus tolerance of $\frac{1}{16}$ inch less than the nominal thickness (see Table 1) is permitted on the remaining width of hand split and resawn shakes. No minus tolerance is permitted in $\frac{3}{8}$-inch hand split and resawn shakes. If corrugations or valleys exceed $\frac{1}{2}$ inch in depth, a minus tolerance of $\frac{1}{8}$ inch is permitted in the minimum specified thickness. The thickness at or below the maximum recommended exposure line shall be a minimum of one half of the butt thickness, except that $\frac{3}{8}$-inch shakes shall have a minimum thickness of $\frac{1}{4}$ inch at the exposure line. Tip thickness shall not exceed one half of the nominal specified butt thickness.

4.3.3.2 No. 1 and No. 2 Grade Tapersawn Shakes shall have one of two thickness at the butt, $\frac{5}{8}$ inch or $\frac{3}{4}$ inch with a minus tolerance of $\frac{1}{16}$ inch in 20 percent of lineal inches in a bundle.

4.3.4 Width:

4.3.4.1 No. 1 Grade Shake shall be of random widths. Hand split and resawn shakes shall have a minimum width of 4 inches and maximum width of 14 inches. Tapersawn shakes shall have a minimum width of $3\frac{1}{2}$ inches, however, hand split and resawn and tapersawn shakes less than 4 inches in width

shall not constitute more than 5 percent of the lineal inches of each bundle.

4.3.4.2 No. 2 Grade Tapersawn Shake shall have a minimum width of 3 inches and a maximum width of 14 inches. However, shakes less than 4 inches in width shall not constitute more than 10 percent of the lineal inches in each bundle.

4.3.5 Edges: Edges of hand split and resawn shakes shall be parallel within 1 inch. Edges of tapersawn shakes shall be parallel within $^5/_8$ inch. Feather tips, broken and/or checked corners and sapwood shall not be considered defects providing the defects are contained within a diagonally drawn line from the outside edge at the butt to a point 1 inch inward from the tip edge on hand split and resawn shakes and taper split shakes or $^5/_8$ inch for tapersawn shakes respectively. Sapwood is restricted to $^1/_8$ inch from butt to exposure line.

4.4 Packing:

General. Shakes shall be packed in straight courses in regular frames 18 or 20 inches wide.

4.5 Inspection:

Shakes shall be adjudged off-grade if the total lineal inches of on-grade shakes is less than the minimum inches per bundle required in Table 1.

4.6 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 4.5 shall also apply for reinspection.

5. GRADING REQUIREMENTS FOR PRODUCT SPECIFIC WOOD SHAKE HIP AND RIDGE UNITS

5.1 Introduction:

Shake hip and ridge units (two shakes joined together is a unit) are manufactured from material that meets the standards for No. 1 Grade hand split and resawn shakes, or No. 1 or No. 2 Grade tapersawn shakes that have one edge sawn on a bevel and fastened together to produce the cap for the hip or ridge of the roof.

5.2 Quality Standards:

5.2.1 General. No. 1 Grade shake hip and ridge units shall be produced from material that meets the standard for No. 1 Grade shakes; No. 2 Grade shake hip and ridge units shall be produced from material that meets the standard for No. 2 tapersawn shakes. Units shall be manufactured to 4:12 pitch or steeper.

5.2.2 Width: At the time of manufacture, the shake hip and ridge assembly width shall be 9 inches, measured on the underneath side of the assembly at the butt end for hand split and resawn shakes, and either 8 or 9 inches for tapersawn shakes. A minus tolerance of $^1/_8$ inch is allowed. Butt misalignment of assemblies in excess of $^1/_4$ inch is not permitted. The narrow component for 9-inch units shall have a minimum width of $4^1/_2$ inches at the butt end; and $3^1/_2$ inches for 8-inch units. For tapersawn ridge, top corners at the outer edge of the units shall be approximately 90 degrees to the face.

5.2.3 Fasteners: Shake hip and ridge units shall be joined with not less than two fasteners applied between 1 inch and 8 inches from the butt. Either staples or nails are acceptable. Fasteners shall be corrosion resistant, spaced approximately 4-inches apart.

5.3 Packing:

Shake hip and ridge units shall be packed 20 units per bundle with an equal number of right-hand and left-hand units (for alternate laps).

5.4 Inspection:

Each offgrade shake hip and ridge unit counts as 5 percent offgrade; more than two offgrade units per bundle shall preclude a passing grade.

5.5 Reinspection:

In case of reinspection, ten or more bundles selected at random shall constitute a fair sampling of the shipment. The criteria for inspection of shake hip and ridge units specified in Section 5.4 shall also apply for reinspection.

TABLE 1—PRODUCT SPECIFIC WOOD SHAKES SUMMARY OF TYPES, SIZES AND ON-GRADE LINEAL INCHES

SHAKE TYPE	NOMINAL SHAKE LENGTH, (inches)	GRADE	NOMINAL BUTT THICKNESS,[1,2] (inches)	MINIMUM ON-GRADE LINEAL INCHES PER BUNDLE[3]	CORRESPOND. APPROXIMATE COVERAGE PER BUNDLE, (sq. ft.)
Starter-Finish (Resawn)	15	1	$^1/_2$ or $^3/_4$	268	—
Resawn	18	1	$^3/_4$	268	15
		1	$^1/_2$	268	15
	24	1	$^3/_4$ or $^1/_2$	268	20
		1	$^3/_8$	268	10
Starter-Finish (Tapersawn)	15	1	$^3/_4$ or $^5/_8$	268	—
Tapersawn	18	1	$^3/_4$ or $^5/_8$	357	20
		2	$^3/_4$ or $^5/_8$	357	15
	24	1	$^3/_4$ or $^5/_8$	268	20
		2	$^3/_4$ or $^5/_8$	268	15
Taper-split	24	1	$^1/_2$	268	20

[1]See Section 4.3.3.

[2]For resawn shakes, the terms "medium" and "heavy" are sometimes used in reference to $^1/_2$- and $^3/_4$-inch shakes, respectively.

[3]Alternate methods of packing are permitted, provided per bundle coverage is achieved.

TABLE 2—PRODUCT SPECIFIC WOOD SHAKES MAXIMUM WEATHER EXPOSURE

SHAKE TYPE, GRADE AND LENGTH	4 INCHES IN 12 INCHES AND STEEPER
Wood Shakes	
No. 1 18-inch	$7^1/_2$
No. 1 24-inch	10
No. 1 24-inch by $^3/_8$-inch	5
No. 2 18-inch tapersawn	$5^1/_2$
No. 2 24-inch tapersawn	$7^1/_2$

6. GRADING REQUIREMENTS FOR PRODUCT SPECIFIC WOOD SHINGLES

6.1 Scope:

Wood shingles regulated under these criteria shall be of an approved durable wood and shall be graded No. 1, No. 2 or No. 3 in accordance with these criteria at the time of manufacture and their use shall be governed by the provisions of Chapter 15 of the Uniform Building Code and these criteria.

6.2 Definitions:

For the purpose of this section, certain words and phrases are defined as follows:

6.2.1 BEST FACE is that side of a shingle which contains the least amount of defects as described within these criteria.

6.2.2 BREAKAGE is any check, separation of the wood or damage caused after manufacturing.

6.2.3 BUTT is the thicker end of the shingle.

6.2.4 CHECK is any separation of the wood. It is considered a defect when it occurs anywhere within the minimum length on No. 1 grade and above three normal exposures from the butt on all No. 2 and No. 3 grade.

6.2.5 CLEAR LINE is an imaginary line across the width of a shingle which marks the Clear Zone. For 16-inch shingles, the clear line is at 16 inches, 10 inches and 6 inches from the butt for No. 1, No. 2 and No. 3 grades respectively. For 18-inch shingles, the clear line is at 18 inches, 11 inches and 6 inches from the butt for No. 1, No. 2 and No. 3 grades respectively. For 24-inch shingles the clear line is at 24 inches, 16 inches and 10 inches from the butt for No. 1, No. 2 and No. 3 grades respectively.

6.2.6 CLEAR ZONE is that portion of the shingle between the butt and the clear line, involving both the face and the reverse. Very limited manufacturing defects are allowed only on the reverse of the clear zone, per the grade descriptions of these criteria.

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

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

6.2.9 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.

6.2.10 EXPOSURE is that portion which, when applied, is exposed to the weather. See Table 4.

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

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

6.2.12.1 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 shingle. It is a defect when it runs from one face of the shingle to the other within a longitudinal distance of 3 inches or less in that portion measured 6 inches from the butt. The slope of the grain so defined shall not be any steeper at any other location on the piece.

6.2.12.2 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 or more in width in 12 inches of length.

6.2.12.3 EDGE GRAIN (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.

6.2.12.4 FLAT GRAIN is a condition in shingles where the growth rings are flat or horizontal as opposed to edge grain where the growth rings are on edge or vertical to the surface. Wood cut in a plane approximately tangential to the annual rings means a condition in which the rings form an angle of less than 45 degrees with the face of the piece.

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

6.2.14 HIP AND RIDGE 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 and No. 2 Grade shingles.

6.2.15 KILN CHECK (SEASONING CHECK) is any separation of wood caused by drying or seasoning after manufacture and labeling.

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

6.2.17 LINEAL INCHES is the total width of any given number of shingles when laid edge to edge. The calculation of total lineal inches of defects is determined by measurement of the total width of defective shingles and defective portions of shingles as described within these criteria.

6.2.18 PLY is one of a number of layers or thicknesses, when applied to the roof, of shingles at any point on the covered surface. This term is related to Exposure.

6.2.19 REVERSE FACE refers to the entire reverse side of a shingle which would be expected to be installed face down on the roof.

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

6.2.21 SHIM. See feather tips.

6.2.22 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. See Table 4.

6.2.23 TIP is the thinner end of the shingle.

6.2.24 TIP ZONE refers to that area 23 inches or more from the butt in 24-inch shingles, 17 inches or more from the butt in 18-inch shingles and 15 inches or more from the butt in 16-inch shingles.

6.2.25 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. It is considered a defect when it appears on the graded face of a shingle.

6.2.26 WAVES are washboard-like irregularities on the face of a shingle. It is not considered a defect when it occurs in the tip zone or on the reverse face.

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

6.3 Quality Standards:

6.3.1 General:

6.3.1.1 All grades shall be well manufactured and neatly packed; they shall comply with or exceed the specifications established herein for quality. All shingles shall be graded from their best face.

6.3.1.2 No. 1 Grade shall be vertical grain or edge grain, be clear of defects on the graded face and be 100 percent heartwood. Knots, knotholes, wormholes, decay, crimps, flat grain, cross grain and sapwood constitute natural characteristics that are not admissible. Defects in manufacturing, including shims and diagonal grain are not admissible. Manufacturing defects such as waves or torn fiber are permitted on the ungraded face;

feather tips and checks are likewise permitted providing neither occurs outside of the tip zone.

6.3.1.3 No. 2 Grade. Sapwood is restricted to 1 inch in width in the first 10 inches 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 in the first 10 inches, 11 inches and 16 inches from the butt in the 16-inch, 18-inch and 24-inch lengths, respectively. Manufacturing defects such as waves or torn fiber are permitted on the ungraded face. Checks are permitted above three recommended roof exposures from the butt. Defects may be up to 3 inches in diameter, but aggregate defects shall not exceed one half the width of the shingle.

6.3.1.4 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 from the butt for 16-inch and 18-inch lengths and 10 inches for 24-inch lengths, respectively. Defects may be up to 3 inches in diameter, but aggregate defects shall not exceed two-thirds the width of the shingle. Checks are permitted above three recommended roof exposures from the butt.

6.3.2 Length:

6.3.2.1 No. 1 Grade. The nominal lengths shall be 16 inches, 18 inches and 24 inches. The minimum lengths, including shims or feather tips for the 16-inch, 18-inch and 24-inch shingles, shall be 15 inches, 17 inches and 23 inches, respectively. A tolerance of 2 inches over the nominal length is allowed.

6.3.2.2 No. 2 Grade. The minimum lengths, including shims or feather tips for 16-inch, 18-inch and 24-inch shingles, shall be 15 inches, 16 inches and 20 inches, respectively. A tolerance of 2 inches over the nominal length is allowed.

6.3.2.3 No. 3 Grade. The minimum lengths, including shims or feather tips for 16-inch, 18-inch and 24-inch shingles, shall be 14 inches, 16 inches and 18 inches, respectively. A tolerance of 2 inches over the nominal length is allowed.

6.3.3 Width:

6.3.3.1 No. 1 Grade. Minimum width of 24-inch shingles shall be 4 inches. Minimum width of 16-inch and 18-inch shingles shall be 3 inches, however those less than 4 inches in width shall not constitute more than 10 percent of the running inches per bundle. Maximum width shall be 14 inches.

6.3.3.2 No. 2 Grade. Minimum width shall be 3 inches. Not more than 20 percent of the running inches in each bundle shall be less than 4 inches wide. Maximum width shall be 14 inches.

6.3.3.3 No. 3 Grade. Minimum width shall be 3 inches except it may be $2^1/_2$ inches for the 16-inch length. Not more than 30 percent of the running inches in each bundle shall be less than 4 inches wide. Maximum width shall be 14 inches.

6.3.4 Thickness: Shingles are measured for thickness at the butt ends. At the time of manufacture, each 16-inch shingle butt shall be nominally 0.40 inch or 5/2 (thickness of 5 butts measure nominally 2 inches), 18-inch shingles shall be nominally 0.45 inch or $5/2^1/_4$ (thickness of 5 butts measure nominally $2^1/_4$ inches) and 24-inch shingles shall be nominally 0.50 inch or 4/2 (thickness of 4 butts measure nominally 2 inches). Shingles shall be reasonably uniform in thickness, but a minus tolerance of 3 percent is allowable to compensate for variations in saw movement. A further 3 percent minus tolerance is permitted to compensate for shrinkage due to seasoning or kiln drying. See Table 3 for shingle butt thickness.

6.3.5 Edges: Edges shall be parallel for 16-inch, 18-inch and 24-inch length shingle within a tolerance of $^1/_4$ inch for No. 1 Grade and $^3/_8$ inch for No. 2 and No. 3 Grade.

6.4 Packing:

Shingles shall be packed in straight courses in regular frames 18 or 20 inches wide.

6.5 Inspection:

Shingles shall be adjudged offgrade if the total lineal inches of on-grade shingles is less than the minimum inches per bundle required in Table 4.

6.6 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 shingles specified in Section 6.5 shall also apply for reinspection.

7. GRADING REQUIREMENTS FOR PRODUCT SPECIFIC WOOD SHINGLE HIP AND RIDGE UNITS

7.1 Definition:

Shingle hip and ridge units (two shingles joined together is a unit) are manufactured from material that meets the standards for No. 1 or 2 Grade shingles that have one edge sawn on a bevel and fastened together to produce the cap for the hip or ridge of the roof.

7.2 Quality Standards:

7.2.1 General. No. 1 Grade shingle hip and ridge units shall be produced from material that meets the standard for No. 1 Grade shingles; No. 2 Grade shingle hip and ridge units shall be produced from material that meets the standard for No. 2 Grade shingles. Units shall be manufactured to a 4:12 pitch or steeper.

7.2.2 Width: At the time of manufacture, the shingle hip and ridge assembly width shall be 7 inches, measured over the top of the assembly at the butt end. A minus tolerance of $^1/_8$ inch is allowed. Butt misalignment of assemblies in excess of $^1/_8$ inch is not permitted. On the outer edge of the units, top corners shall be approximately 90 degrees to the face. The narrow component shall have a minimum width of $3^5/_{16}$ inches at the butt end.

7.2.3 Fasteners: Units shall be joined with not less than two fasteners applied between $^1/_2$ inch and $5^1/_2$ inches from the butt. Either staples or nails are acceptable. Fasteners shall be corrosion resistant, spaced approximately 3 inches apart.

7.3 Packing:

Sixteen-inch shingle hip and ridge units shall be packed 40 units per bundle, 18-inch shingle hip and ridge units shall be packed 36 units per bundle and 24-inch shingle hip and ridge units shall be packed 20 units per bundle, with each size having an equal number of right-hand and left-hand units (for alternating laps).

7.4 Inspection:

Each offgrade 16- and 18-inch shingle hip and ridge unit shall count for $2^1/_2$ percent offgrade; more than 4 offgrade units per bundle shall preclude a passing grade. Each offgrade 24-inch hip and ridge unit shall count for 5 percent offgrade; more than 2 offgrade units per bundle shall preclude a passing grade.

7.5 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 shingle hip and ridge units specified in Section 7.4 shall also apply for reinspection.

TABLE 3—PRODUCT SPECIFIC WOOD SHINGLES SUMMARY OF GRADES, SIZES AND EDGE PARALLELISM

SHINGLE LENGTH, (inches)	SHINGLE GRADE NUMBER	MINIMUM SHINGLE WIDTH,[1] (inches)	NOMINAL BUTT THICKNESS, (inches)	EDGE PARALLELISM, (inches)
16	1 2 3	3 3 $2^1/_2$	0.40 0.40 0.40	$^1/_4$ $^3/_8$ $^3/_8$
18	1 2 3	3 3 3	0.45 0.45 0.45	$^1/_4$ $^3/_8$ $^3/_8$
24	1 2 3	4 3 3	0.50 0.50 0.50	$^1/_4$ $^3/_8$ $^3/_8$

[1]The maximum lineal inches per bundle comprised of shingles each less than 4 inches wide shall be the following:
a. No. 1 - 10 percent;
b. No. 2 - 20 percent;
c. No. 3 - 30 percent;
Maximum shingle width for all lengths and grades shall be 14 inches.

TABLE 4—PRODUCT SPECIFIC WOOD SHINGLES—MAXIMUM WEATHER EXPOSURE AND ON-GRADE LINEAL INCHES REQUIRED

SHINGLE LENGTH, (inches)	SHINGLE GRADE NUMBER	MAXIMUM EXPOSED SHINGLE LENGTH ALLOWED, (inches)	MINIMUM ON-GRADE LINEAL INCHES PER BUNDLE[1]	CORRESPONDING APPROXIMATE COVERAGE PER BUNDLE, (sq. ft.)
Roof applications (minimum slope 4 in 12)				
16	1 2 3	5 4 $3^1/_2$	695 695 695	25.0 20.0 17.5
18	1 2 3	$5^1/_2$ $4^1/_2$ 4	635 635 635	25.0 20.4 18.0
24	1 2 3	$7^1/_2$ $6^1/_2$ $5^1/_2$	465 465 465	25.0 21.6 18.3

[1]Alternative methods of packing are permitted, provided adequate coverage per bundle is achieved.

PART III

8. INSTALLATION

8.1 Shakes:

The product specific wood shakes shall be installed in accordance with Table 15-B-2 of the Uniform Building Code, with the following **exceptions:**

8.1.1 Underlayment: Minimum one layer of nonperforated Type 15 felt lapped 2 inches horizontally and 4 inches vertically.

Alternate: For 24-inch shakes, Type 15 underlayment felt may be omitted when a 22-inch wide Type 30 interlayment felt is provided between each course.

8.1.2 Slope: Product specific wood shakes are limited to a minimum slope of 4 inches in 12 inches.

8.2 Shingles:

The product specific wood shingles shall be installed in accordance with Table 15-B-2 of the Uniform Building Code, with the following **exceptions:**

8.2.1 Underlayment: Minimum one layer of nonperforated Type 15 asphalt-saturated felt lapped 2 inches horizontally and 4 inches vertically.

8.2.2 Slope: Product specific wood shingles are limited to a minimum slope of 4 inches in 12 inches.

APPENDIX A

SHAKE INSPECTION REPORT

Mill Name _____

Mill Location _____

Date _____ Evaluation Report No. _____

No. of Bundles	Packer's Name or Number	SHAKE TYPE (See Below)	SHAKE SIZE Length and Thickness and Grade Number	Short Shakes	Short Shims or Feather Tips	Off Parallel	Narrow Shakes	Checks	Knots	Rot	Worm Holes	Sapwood	Excess Flat Grain	Curved Back	Diagonal grain	Thin Shakes	Thin Valleys	Cross Grain	Thin Edge	COVERAGE	Total Inches Off Grade	O.K. for Grade	On Grade Percentage

Inspector's Comments[1]

Manager

Inspector

SHAKE TYPE
R = Resawn
T = Taper-split
TS = Taper-sawn
SS = Straight Split
HR = Hip and Ridge
SF = Starter Finish

[1]Show if bundle is from yard iinventory
[2]If "NO" explain under Inspector's Comments
[3]Required only for mills with production less than 750 bundles per week

Noncomplying Material Labeled	YES	
	NO[2]	

Pallets Tagged	YES	
	NO[2]	

Pallets Dated	YES	
	NO[2]	
Pallets Released	YES	
	NO[2]	

No. of saws operating[3]	
Approximate squares produced since last inspection	

APPENDIX B

SHINGLE INSPECTION REPORT

Mill Name _____

Mill Location _____

Date _____ Evaluation Report No. _____

Machine No.	No. of Bundle	Packer's Name or Number	Width of Packing Frames Both Ends	Uniform Thickness (Yes or No)	Coverage	Grade Inspected	Length	Green or Dry	Thickness Butts	Thickness Tips	Short Shingles	Knots/Knot Holes	Worm Holes	Rot or Decay	Checks	Narrow Shingles	Off Parallel	Sapwood	Bark	Shims	Flat Grain	Cross Grain	Diagonal Grain	Thin Shingles	Thick Shingles	Crimps	Waves	Torn Fiber			Total Inches Off Grade	O.K. For Grade	On Grade Percentage

Inspector's Comments[1]

Manager

Inspector

[1]Show if bundle is from yard iinventory
[2]If "NO" explain under Inspector's Comments
[3]Required only for mills with production less than 750 bundles per week

Noncomplying Material Labeled	YES	
	NO[2]	

Pallets Tagged	YES	
	NO[2]	

Pallets Dated	YES	
	NO[2]	
Pallets Released	YES	
	NO[2]	

No. of saws operating[3]	
Approximate squares produced since last inspection	