Forest Service Handbook
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Forest Service Handbook 2409.11 – National Forest Log Scaling Handbook
Chapter 30 - Log Defects and Deductions

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Approved by: Gregory Smith, For Joel Holtrop, Deputy Chief

Date approved: April 20, 2006

Responsible Staff:

Last Change: Amendment No. 7

Superseded Document(s): Entire Handbook, Title Page thru 247

Digest: Following is an explanation of the changes throughout the directive by section.

10: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

13: Clarifies in paragraph 1 that the standard unit for saw timber scaling will be in cubic foot log scale, although board foot log scale is used under certain circumstances.

17.12: Changes the caption in exhibit 02 to clarify direction to allow full trim in the length measurement and record in 2 foot multiples.

17.18: Adds new direction and an exhibit for length measurements on forked logs.

17.2: Clarifies scalers will notify the contracting officer when improper trim allowance is detected.

17.3: Adds direction on how to record logs that are further reduced to the lower 2 foot multiple, but the diameter increases to the next diameter class, the increased diameter will be recorded as the proper scaling diameter.

17.33: Adds a list of butt characteristics to assist in identifying butt cut logs.

20: Corrects minor typographical and technical errors throughout the chapter. There are no changes to the substantive direction in this chapter.

30: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

33: Establishes defect types and new deduction procedures for: Burls, Foreign Material, Pecky Rot, Pistol Butt Defect, Pitch Pockets, and Spiral Grain.

Slope of Grain, and Twist have been included in the Spiral Grain definition.

Barber Chair and Pull, Stump or Sliver has been included in the Breaks and Splits definition.

Bark Seam has been included in the Pitch Seam, Heart Check, Frost Crack definition.

Adds new direction and exhibits for crook defect deduction process.

Combines Knots, large and Knots, clusters into a single new defect type, Knots. Establishes new knot size limits and knot deduction guide.

Adds definition of massed pitch and clarification of when a deduction in necessary.

Adds clarification of scaling cylinder position when deducting for sweep.

Reformats and renumbers entire section to conform to FSH 2409.11a - Cubic Scaling Handbook, chapter 20.

40: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

44: Changes caption from Stump Scaling to Timber Trespass. Provides direction for measurements to be performed by certified scalers and cruisers and requires coordination with Law Enforcement staff prior to beginning field work.

44.1: Changes caption from Timber Trespass to Stump Scaling.

44.2: Changes caption from Scaling when Stump and other Direct Evidence is lacking to Stump Cruising.

44.3: Established this code and recodes direction formerly at section 44.2 to this section.

51: Changes caption to selection of scaling locations. Changes responsibility for selection of scaling locations from District Ranger to Contracting Officer. Also removes direction on selecting truck-scaling locations.

52: Removes requirement for Forest Supervisor to develop additional safety specifications for scaling.

53: Removes the direction which discusses the need for the purchaser to keep government logs separate from private logs up to the point of scaling and for the use of distinctive marking between various sales.

54.1: Changes the direction for team scaling from "discouraged" to "must not be used." Also removes direction Regional Forester to authorize team scaling in limited situations. Changes the responsibility for taking corrective action when scalers to not perform to standard from District Ranger to Contacting Officer.

54.2: Removes direction on the benefits of mill visits and specific direction concerning various items to be observed while conducting a mill visit.

55.2 - 55.4: Removes obsolete direction, which referenced out of date equipment, processes and procedures.

55.5: Revises and recodes to section 55.2. Changes the responsibility for completing the Scaler Information Form from the Forest Service Representative to the Contracting Officer.

55.61: Removes section on standard scaling forms.

55.62: Recodes to section 553.

55.63: Recodes to section 55.4. Removes significant amount of instruction, including exhibit's 01 and 02, on how to fill in scaling sheets. Stresses the use of field data recorders to record scaling information.

55.64 - 55.65: Removes obsolete direction from handbook.

56.1: Removes obsolete from handbook.

56.21: Removes obsolete direction from handbook.

56.22: Recodes to section 56.1.

56.3: Removes obsolete direction from handbook.

60: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

64: Increases situations where Regional Foresters may deviate from established check scale standards.

65: Revises to require minimum check scale record and summary information. Removes out-dated policy, procedures, and forms.

70: Reformats chapter.

71: Updates CFR reference.

80: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

82: Deletes previous documentation which was incomplete and adds reference to National Forest Cubic Scaling Handbook (FSH 2409.11a) for handbook direction.

85: Adds a cross reference on sample scaling to Forest Service Handbook 2409.11a, National Forest Cubic Scaling Handbook, chapter 50.

85.5: Recodes to section 86.1.

85.6: Recodes to section 86.2.

87.42: Establishes new direction for Fiber Scaling.

Appendix: Renames exhibits from "Table" to "Appendix." Removes Table 1A, Table VIII, Table IX - Exhibit A, Table XIV. Adds Appendix 15 - Factors for Computing Scribner decimal C Volumes and Appendix 16 - Scribner Decimal C Recorded Length and Segment Lengths.

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31 - General

A scaling defect is any unsound material or abnormal shape in a log that reduces its net volume. Defects are grouped in two common classes:

1. Natural Defects. Natural defects are those which exist in the log before the tree is felled. These may include all kinds of interior rot, rotten knots fire scars, catfaces, massed pitch, pitch rings and shake, pitch seams and checks, lightning scars, sweep, crook, massed grubworm holes, crotch, sap rot, weather checks (snags and windfalls), knot clusters, burls, and some types of large knots.

2. Logging Defects. Logging defects are those generally occurring after the tree is felled. They include mechanical defects, such as breakage, brooming, tractor damage, and loading damage. They also include other defects caused by poor logging practices, such as sap rot, weather checks, and damage caused by borers after trees have been cut.

Forest Service scaling considers deductions for all defects, natural and mechanical. All logs shall be scaled as presented, unless otherwise instructed by the Contracting Officer. The Contracting Officer must make the decision concerning permissive deductions for defects caused by the purchaser allowing logs to remain in the woods.

Some defects in logs are caused by abnormal delay in scaling due to the fault of the purchaser. Deductions made for sap rot, weather checks, or other defect resulting from abnormal delay in scaling are chargeable at contract rates. Therefore, these deductions must be separately identified.

32 - Defect Types and Applicable Deduction Methods

Following is a tabulation of common types of defect and the defect-deduction method most applicable to each type. The types of defect and applicable procedures are discussed in section 33. Deduction methods are described in chapter 20.

32 - Exhibit 01
Tabulations of Defect

		Deduction Method			
Defect	Defect Symbol	Diameter	Length	Pie-cut	Squared-defect
Barber chair	BK		x	x	x
Bark seam	PS			x	x
Break, straight	BK		x	x	x
Break, other	BK		x		
Burl	BL		x	x	
Catface, shallow	CF	X			
Catface, deep	CF			x	
Check, heart	CH				x
Check, weather	WC	X			
Crack, frost	FC			x	x
Crook	CR		x		
Crotch	Y		x		x
Fire scar	FS		x	x	
Knots, large	K	X	x	x	x
Knot cluster	KC		x	x	
Knots, rotten	RK			x	x
Lightning scar	LS	X	x	x	x
Multiple defects	MD		x	x	x
Pitch, massed	MP		x	x	x
Pitch seam	PS				x
Pitch spangle, small	SF				x
Pitch spangle, large	SP		x		
Pull, stump or sliver	BK				x
Ring, pitch or shake	PR or SH	X			x
Ring, pitch or shake multiple	PR or SH		x		
Rot, conk	C		x	x	x
Rot, heart	R		x		x
Rot, sap	S	X			
Rot, stump	R		x		x
Stain[1]					
Sweep	SW		x	x	
Wormholes, massed large	WH	X	x	x	x

[1]Stain is not a defect by itself. If stain is accompanied by rot, refer to the appropriate rot. The common rots and fungi found in sawlogs are described in table IX in the appendix chapter.

33 - Defect Types and Deduction Procedures

Descriptions of common defect types, with applicable deduction procedures, follow in alphabetical order. The Scribner Decimal C rule is used in examples. The same general scaling practices apply to the International rule.

33.1 - Rots

33.1a - Rot, Conk

Sometimes this rot is called red ring or honeycomb rot. In eastern species, it is known as red rot. (Should not be confused with red rot of ponderosa pine-Polyporus anceps - see table IX, appendix chapter.) In incipient stages it is commonly referred to as "firm red heart." This defect varies in color from purple and light red in early stages to dark brown in mature stages. In the early stages the wood is only stained and requires no deduction. In later stages, the wood breaks down to form a honeycomb appearance. Patches of white substance called "white pocket" appear. These white pockets indicate that the wood is broken down and that a deduction is required.

Deductions for conk rot are particularly difficult. Any one of several methods may apply. Effects of the fungus appear to vary with species, soil, altitude, and climatic conditions. Mill visits and experience are essential for a scaler to interpret what conk indicators mean in the timber he is scaling. Record guides applicable to timber from specific areas.

Generally, the point of deepest penetration of conk rot is where a fruiting body or conk enters the log. Here the rot most commonly takes the shape of a crescent. Occasionally, it may be in the form of one or more full rings. These may roughly parallel growth rings.

When conk stain or conk rot shows in log ends, look with care for conks on the log. Use a spud to dig into swollen spots, punk knots, and black limbs. Size of conks is sometimes helpful in determining the extent of rot in some species. Recognize where conks have broken away from logs by punky, yellowish-brown material in the holes where the conks were attached.

Make deductions for white pocket (conk) using the squared-defect method if the defect occurs as a spot in one end. If 1/4 to 1/2 of one end is defective, make a pie-cut deduction of the scaling cylinder affected for the estimated length.

A good plan while on a mill visit is to make a rough chart guide such as that shown in exhibit A, appendix chapter, for conk rot deductions. Use such a chart only for areas and species where it is proved to be applicable by repeated mill visits. Note the average length of rot spread from the last visible indicator.

WARNING: The effects of conk rot are variable. Widespread or uniform use of one chart without essential local modifications and repeated checks could- result in erroneous scaling.

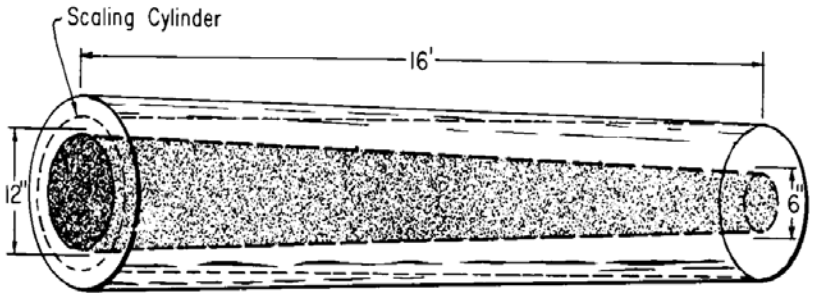
33.1b - Rot, Heart

Sometimes called center, circular, dry, or red, this rot is found in logs cut from any position in trees. In color it ranges from light brown in early stages to reddish brown in its advanced stage. Fruiting bodies are usually missing by the time the log is ready to scale. This decay is characterized as brittle, dry, crumbly, sometimes with cubical patches and usually with white felt like layers between the patches.

Use the full estimated length of heart rot because it does not taper like stump rot. Make deductions by the squared-defect method for most heart rot.

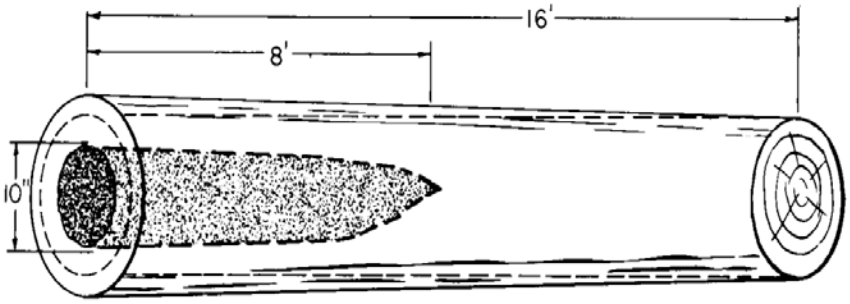
Example 1: Exhibit 01 illustrates a 16-foot log with a heart rot extending full length through the log. The defect including allowance for waste measures 12 by 12 inches on one end, 6 by 6 inches on the other. Average of these end dimensions is 9 by 9 inches. Using the squared-defect method (ch. 20, sec. 22.5), deduct as follows: 9 x 9 = 81 to the next 10 = 90 (9 Decimal).

33.1b - Exhibit 01
Example 1 - Heart Rot Both Ends - Squared-defect Method



Example 2: Exhibit 02 illustrates a 16-foot log with heart rot extending 8 feet into the log. The defect including waste allowance measures 10 by 10 inches on the end showing. The squared-defect method gives 10 x 10 = 100 to the next 10 = 110 (11 Decimal). Take 1/2 of 11 or a 6 deduction for this log.

33.1b - Exhibit 02
Example 2 - Heart Rot One End Only - Squared-defect Method



Use the length-deduction method where the diameter of heart rot equals or approaches the diameter of the scaling cylinder (sec. 24). Any regional variance from the instructions above should be based on a local guide developed during mill visits. Refer to Rot, Conk, and exhibit A, appendix chapter.

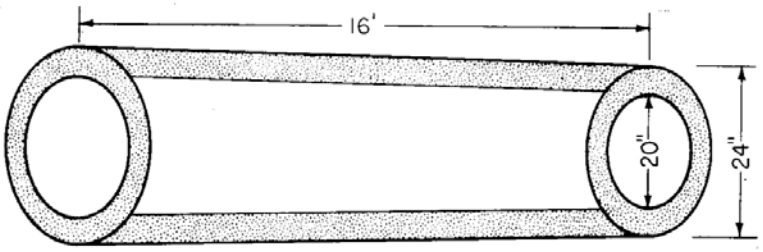
33.1c - Rot, Sap

1. Sapwood on logs cut from dead trees, either snags or windfalls, often is in advanced stages of decay. If rotten sap extends over both the length and circumference of the log and the sapwood is still in place, the gross or outside diameter will be measured directly and the average diameter determined just as for green logs. When the rotten sapwood has sloughed away, the gross or outside diameter will be determined by measuring the sound wood within the sapwood and adding thereto the estimated thickness of the rotten sapwood.

To obtain net scale, determine the average diameter of the sound cylinder inside the rotten sapwood (or surface checks) and treat it as a special scaling cylinder, considering any other defects that may be present. The difference between the gross scale of the outer scaling diameter and the net scale of the inner scaling diameter will be the deduction if no other defects are present.

Example: Exhibit 01 illustrates a 16-foot log, 24 inches in diameter at the small end, has a gross scale of 40. If the average thickness of rotten sapwood is 2 inches, the net scale of the log will be that of a 16-foot log 20 inches in diameter, or 28.

33.1c - Exhibit 01
Example 1 - Sap Rot - Diameter-deduction Method

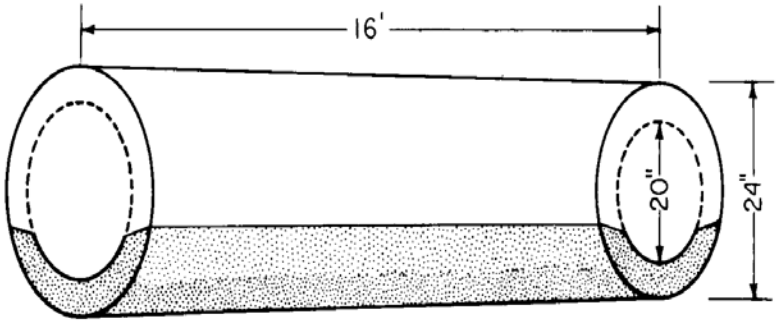


2. When portions of the length or circumference of the sap are sound, the full log diameter including sap will be the scaling diameter and the defect deduction will be treated as follows:

Example: Exhibit 02 illustrates a 16-foot log, 24 inches in diameter at the small end, has a gross scale of 40. If the rotten sapwood is confined to the side which was lying on the ground and averaged 2 inches rotten sapwood for 1/3 the circumference for the full length of the log the net scale of the log would be 36, derived as:

33.1c - Exhibit 02
Example 2 - Sap Rot on One Side - Diameter-deduction Method

$$40 - \left(\frac{40 - 28}{3}\right) = 36$$



3. Examine logs with dead sapwood carefully. Rot may extend into the heart in the form of pockets. In fire-killed or down timber these pockets may be on one side only. This material should be looked over with care. Use the Hallin hammer or other type of spud to help determine the extent of rot. Deductions for these associated rots should usually be determined by the pie-cut method. See ch. 20, sec. 23.

4. Occasionally the top end of a sap-rotted log shows a deep rot penetration for a short length only. Make a length deduction for this portion and a diameter deduction for the remainder.

5. Check merchantability specifications of the timber sale contract (ch. 10, sec. 16). Some contracts may state that logs with the sapwood decayed will be scaled inside the sapwood. In such cases the sapwood, like the bark, in disregarded in scaling. Gross scale in such a case refers to the heartwood only. Other contracts may provide for scaling such logs "gross," in which case the gross scale is the only recorded volume.

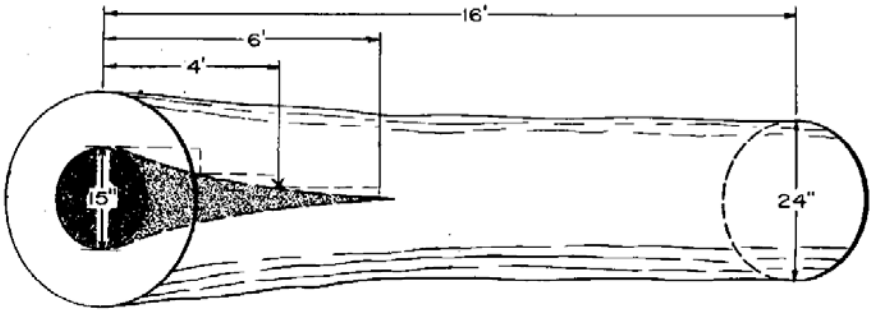
33.1d - Rot, Stump

Often called butt or ground rot, it is found only in the butt portion of trees as the name implies. Color varies from light brown to dark reddish brown. Swelling on the outside of a log may be an indication of defect length but not always so. Where swellings do indicate rot, decay seldom extends far beyond such swelling. The rot may be either blunt or conical. Splits on the side of a log, sometimes due to weakness caused by rot, aid in estimating decay length. Mill visits are the best way to find out whether the local stump rot is generally blunt or conical. It may be desirable to develop a local chart guide of the type shown by exhibit A in appendix chapter.

The length of penetration of stump rot seldom exceeds 16 feet and most commonly runs 2 to 8 feet. If mill visits show that the rot is generally blunt at the end, the amount of defect will be determined in the same manner as heart rot. If the rot is conical in shape, the amount of standard-length lumber which will be recovered along the taper of the rot must be considered. Use the squared-defect method unless the size of the defect is so large as to approach the diameter of the scaling cylinder and a length cut is indicated.

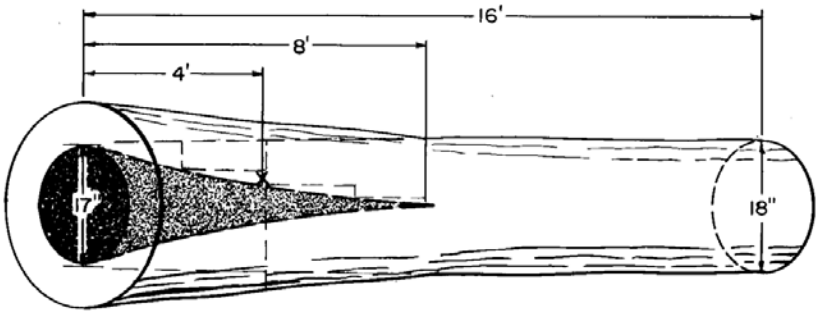
Example 1: Exhibit 01 illustrates a 16-foot, 24-inch log with stump rot averaging 14 inches in diameter. Visible swelling in the log indicates total length is 6 feet. Because of the cone shape of stump rot, all of the 6-foot portion is not lost. At the point where the rot penetrates deepest, the log will not produce longer than 10-foot lumber, but along the sides of the rot cone within the scaling cylinder, it should produce 12- and possibly some 14-foot lumber. Average the defect length. In this example use 4 feet as the average length. The squared-defect method (code 22.4) gives 15 x 15 = 225 + 10 raised to the next 10 = 240 (24 Decimal), the deduction if the defect extended 16 feet. The average length, however, is 4 feet, 1 the length of the log, or a deduction of 6.

33.1d - Exhibit 01
Example 1- Stump Rot - Squared-defect Method



Example 2: Exhibit 02 illustrates a 16-foot, 18-inch log with stump rot averaging 16 inches in diameter. The size of this defect is so large as to approach the diameter of the scaling cylinder and calls for a length deduction. In the type of stump rot illustrated, a 4-foot-length cut should equal the loss from rot. The difference in scale between a log 12 feet in length and 18 inches in diameter and one 16 feet is 5, the proper deduction for this log.

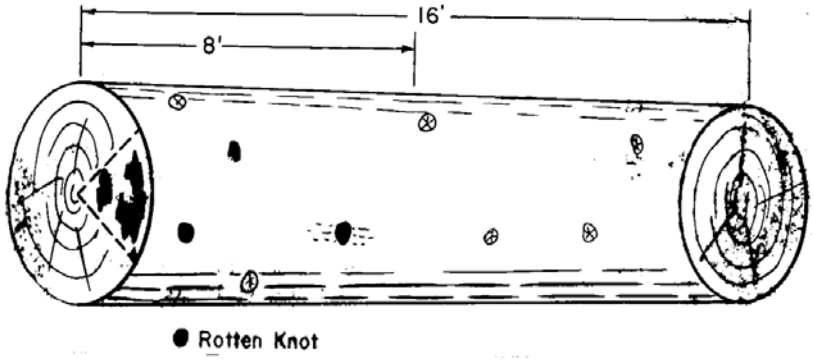
33.1d - Exhibit 02
Example 2 - Stump Rot - Length-deduction Method



33.1e - Knots, Rotten

In some species and areas, rotten knots indicate interior rot. Rot may follow the knot into the log, and then spread out one or both ways. The length of this spread varies with species, age, and locality. When rot shows on one or both ends, make deductions using the pie cut method for the length affected. Logs with rotten knots and no end indications are a challenge to any scaler. Visit local mills to establish a pattern for making deductions for this defect.

33.1e - Exhibit 01
Rot in Log End Caused by Rotten Knots—Pie-cut Method



33.1f - Pecky Rot

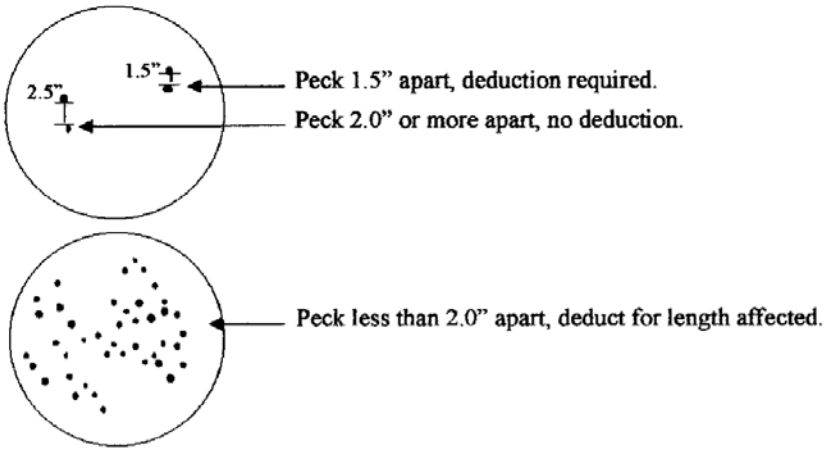
Pecky rot does not taper the same as other defects. The following rules apply to pecky rot in lieu of averaging defect dimensions (Squared Area Methods, sec. 22.31).

1. Arrangement of Pecky Rot.

Consider all pecky rot that is less than 2.0" apart as defect. Minimum recordable volume for any single pecky rot defect is 10 board feet, or 1 Dec C. A 1.0" x 2.0" peck extended through a 16' log will yield 1 Dec C defect. (Including 1" for waste; $\frac{2"x3"x16'}{15}$ = 6 BF, or 1 Dec C).

The following exhibit is an example of an arrangement of deductible pecky rot:

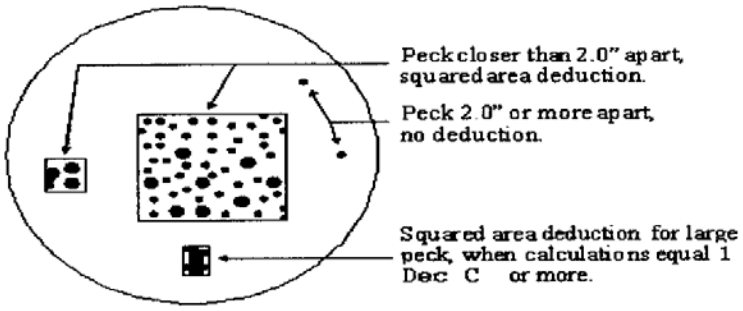
33.1f - Exhibit 01
Pecky Rot Arrangements



2. Defect Deduction Methods

The following exhibit is an example of Squared Area Method:

33.1f - Exhibit 02
Pecky Rot Squared Area Method

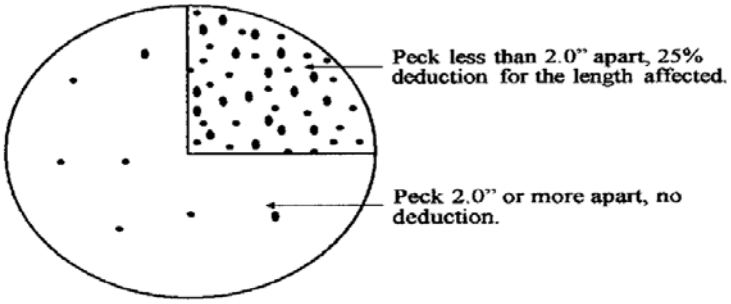


First, calculate largest squared area; taking each subsequent squared area at right angles.

When edges of squares result in squared areas closer than 2.0", use the give and take method to obtain squared area dimensions for the entire area affected by pecky rot.

Percent Deduction Method:

33.1f - Exhibit 03
Pecky Rot Percent Deduction Method



3. Extent of Pecky Rot

In the absence of other indicators, use the following rules to determine extent of pecky rot.

Single Segment Logs

(1) When only one end contains pecky rot, calculate and extend the actual dimensions, including waste, of any deductible peck through one-half of the segment length in even, two foot multiple

For example:

33.1f - Exhibit 04
Figures a & b – Pecky Rot One End, Single Segment Log

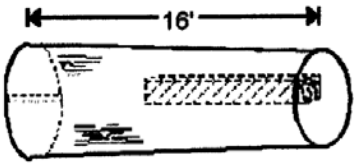


Figure a:
Butt Log
Extended defect dimensions (10" x 10") through one-half of segment (8').

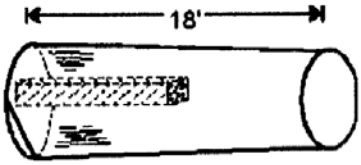


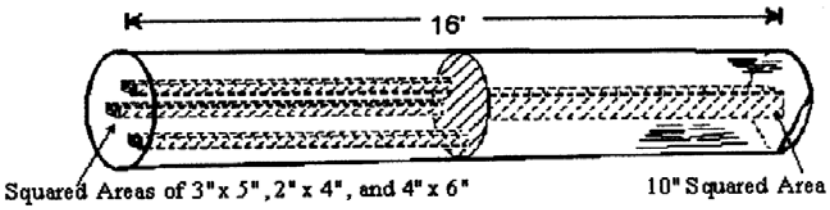
Figure b:
Second Cut
Extended defect dimensions (10" x 10") through one-half of segment (9') in even, two foot multiples, rounding whole.

(2) When both ends contain pecky rot and the defect on each end can be contained using one squared area dimension, calculate the average squared dimension and extend through the segment length.

(3) When both ends contain pecky rot and the defect dimensions on one or both ends result in two or more squared areas, extend each defect through one-half of the segment length.

For example:

33.1f - Exhibit 05
Pecky Rot Both Ends, Multiple Squared Areas,
Single Segment Log



Extend defect dimensions, including waste, through half segment length (8').

Extend defect dimensions the segment through one-half the one- the segment length (8').

Two Segment Second Cut Logs

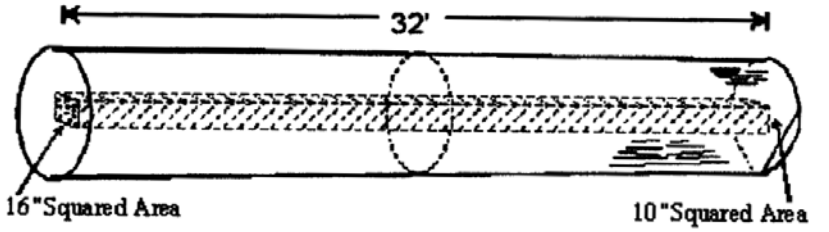
(1) When only the small end is affected by deductible peck, calculate and extend the actual dimensions, including waste, through the small end segment only.

(2) When only the large end is affected by deductible peck, calculate and extend the actual dimensions, including waste, through the large end segment only.

(3) When both ends contain pecky rot and the defect on each end can be contained using one squared area dimension, calculate the average squared dimension including waste, and extend through the length of each segment.

For example:

33.1f - Exhibit 06
Pecky Rot Both Ends, One Squared Area,
Two Segment Second Cut Log

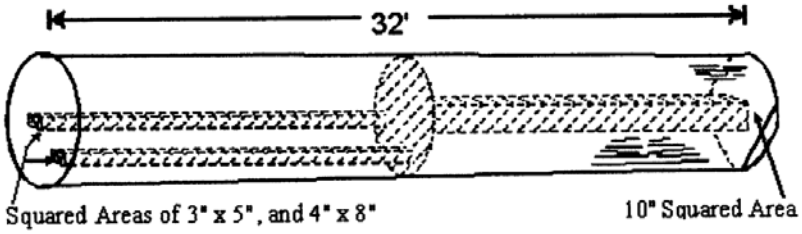


Extend averaged dimensions (17" x 17" on large end and 11" x 11" on small end, for an average of 14" at the mid - point)

(4) When both ends contain pecky rot and defect dimensions on one or both ends result in two or more squared areas, extend each defect through the length of the segment.

For example:

33.1f - Exhibit 07
Pecky Rot Both Ends, Multiple Squared Areas,
Two Segment Second Cut Log



(5) Exception:

When in the scaler's judgment the pecky rot is clearing up or when the individual pecks are small and not expected to extend through the segment length, extend actual dimensions through one-half segment only.

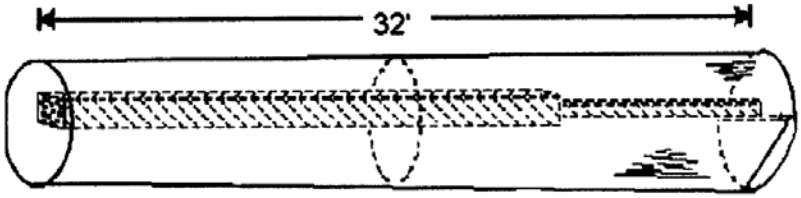
c. Two Segment Butt Logs

(1) Merchantable Butt Logs

(a) When both ends are affected by deductible peck, calculate and extend the actual dimensions including waste, of the small end deductible peck through the length of the small end segment and one-half the length of the butt (large) end segment. Extend the actual dimensions including waste of any deductible peck on the butt through the remaining one-half length of the butt (large) end segment.

For example:

33.1f - Exhibit 08
Pecky Rot Both Ends, Merchantable Two Segment Butt Log



Extend actual dimensions (10" x 10" on small end), plus waste, through the length of the small end segment (16'), and one-half the length of the butt (large) end segment (8'). Extend actual dimensions (4" x 5" on the butt end) plus waste, through on-half the length of the butt (large) end segment.

(b) When only the butt (large) end segment is affected by deductible peck, calculate and extend actual dimensions of any deductible peck through the length of the butt (large) end segment only.

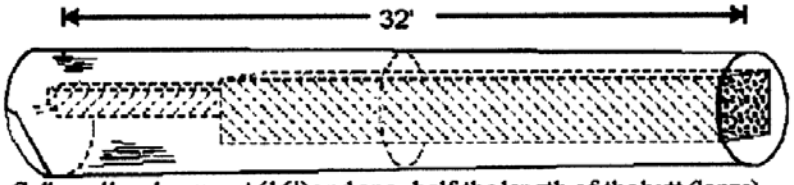
(2) Cull Segments, Butt Logs

(a) When the small end is affected by deductible peck, covering an area large enough to result in less than the contract minimum net scale recovery, cull the small end segment and one-half the length of the butt (large) end segment. Extend the actual dimensions, including waste, of any deductible peck showing on the butt through the remaining length (one-half) of the butt (large) end segment. To determine if the butt (large) end

segment is cull, compute the volume for each defect [include culled one-half butt (large) end segment], and then add them together. If the combined defect results in a net volume in the butt segment that is less than the contract minimum net scale recovery, cull the butt (large) end segment.

For example:

33.1f - Exhibit 09
Pecky Rot Both Ends (Cull Small End Segment),
Two Segment Butt Log

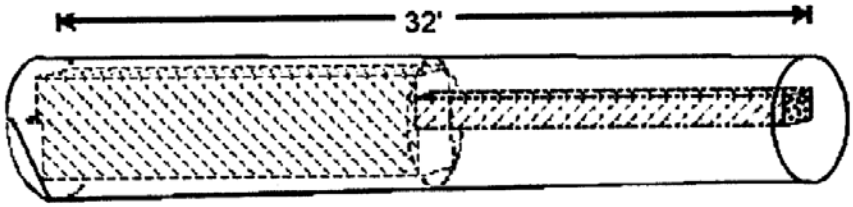


Cull small end segment (16') and one-half the length of the butt (large) end segment (8'). Extend actual dimensions (10" x 10" on butt end, plus waste), through the remaining length of the butt (large) end segment (8').

(b) When the large end segment is affected by deductible peck covering an area large enough to result in less than the contract minimum net scale recovery, cull the large end segment. Extend the actual dimensions, plus waste, of any deductible peck showing on the small end through the length of the segment.

For example:

33.1f - Exhibit 10
Pecky Rot Both Ends (cull large end segment),
Two Segment Butt Log



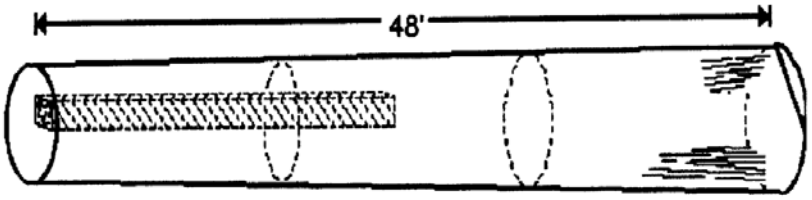
Cull butt (large) end segment (16'). Extend actual dimensions (10" x 10" on small end), plus waste, through small end segment (16').

d. Three Segment Second Cut Logs

(1) When only the small end is affected by deductible peck, calculate and extend the actual dimensions, plus waste, of any deductible peck through the length of the small end segment and one-half the length of the middle segment.

For example:

33.1f - Exhibit 11
Pecky Rot Small End Only,
Three Segment Second Cut Log



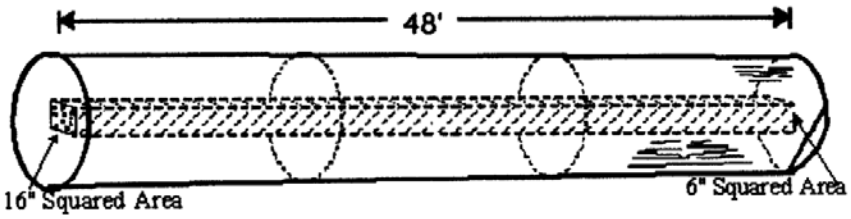
Extend actual dimensions (10"x 10" on small end), including waste, through the small end segment (16'), and one-half of middle segment (8').

(2) When only the large end is affected by deductible peck, calculate and extend the actual dimensions, plus waste, of any deductible peck through the length of the large end segment and one-half the length of the middle segment.

(3) When both ends are affected by deductible peck and the defect on each end can be contained using one squared area dimension, calculate the average squared dimension for each segment and extend through the length of each segment.

For example:

33.1f - Exhibit 12
Pecky Rot Both Ends, One Squared Area,
Three Segment Second Cut Log



Average squared dimension for each segment and extend through the length of each segment.

(4) When both ends are affected by deductible peck and the defect on one or both ends results in two or more squared areas, calculate and extend the actual dimensions of each deductible squared area through the length of each end segment and one-half the length of the middle segment.

(5) Exception:

When in the scaler's judgment the pecky rot is clearing up or when the individual pecks are small and not expected to extend through the segment length, extend actual dimensions through one-half segment only.

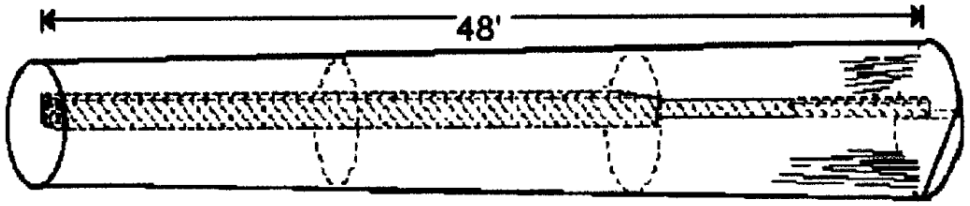
e. Three Segment Butt Logs

(1) Merchantable Butt Logs

(a) When both ends are affected by deductible peck, calculate and extend the actual dimensions, including waste, of any deductible peck on the small end through the length of the small end and middle segments. Extend the actual dimensions of any deductible peck on the butt through the remaining length of the butt (large) end segment.

For example:

33.1f - Exhibit 13
Pecky Rot Both Ends, Merchantable Three Segment Butt Log



Extend actual dimensions (10" x 10" on small end, plus waste) through the length of the small end segment (16') and middle segment (16'). Extend actual dimensions (4" x 5" on the butt end, plus waste) through the length of the butt (large) end segment (16').

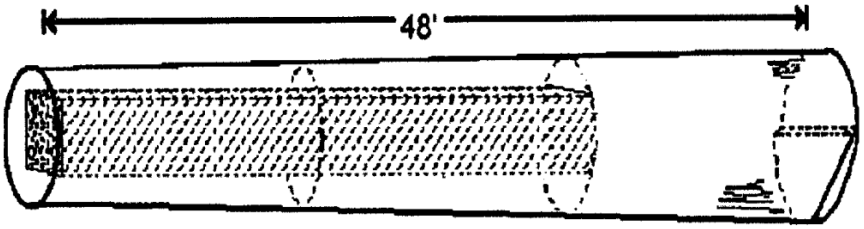
(b) When only the butt (large) end is affected by deductible peck, calculate and extend the actual dimensions, plus waste, of any deductible peck through the butt (large) end segment only.

(2) Cull Segments, Butt Logs

(a) When the small end is affected by deductible peck, covering an area large enough to result in less than the contract minimum net scale recovery, cull the small end segment and the middle segment.

For example:

33.1f - Exhibit 14
Pecky Rot Small End Only,
Three Segment Butt Log With Cull



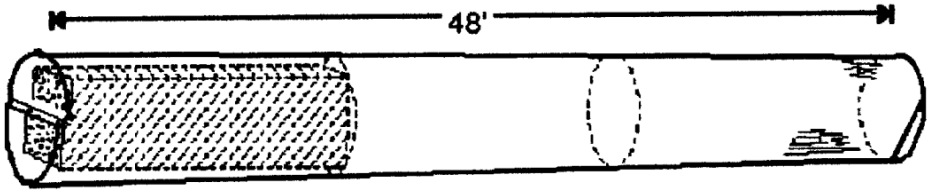
Cull small end segment (16'), middle segment (16'0).

Extend any other defects showing on the butt (large) end through the remaining length of the butt (large) end segment.

(b) When the butt (large) end is affected by deductible peck, covering an area large enough to result in less than the contract minimum net scale recovery, cull the large end segment only.

For example:

33.1f - Exhibit 15
Pecky Rot Large End Only,
Three Segment Butt Log With Cull

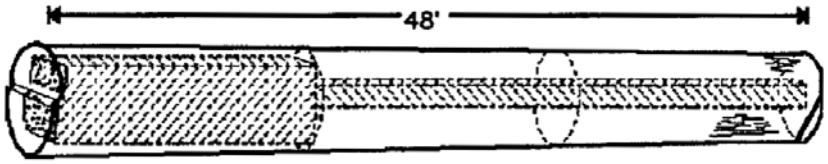


Cull butt (large) end segment (16').

(c) When both ends are affected by deductible peck, and the butt end has deductible peck covering an area large enough to result in less than the contract minimum net scale recovery, cull the large end segment only. Calculate and extend the actual dimnsions, plus waste, of any deductible peck on the small end through the length of the small end and middle segments.

For example:

33.1f - Exhibit 16
Pecky Rot Both Ends, Three Segment Butt Log With Cull



Cull butt (large) end segment (16'). Extend actual dimensions (10" x 10" on small end), plus waste, through the length of the small end segment (16') and the middle segment (16').

33.2 - Voids

33.2a - Catface

Scars or wounds, often caused by falling objects scraping against a tree, are generally called catfaces. When shallow in depth and removable with the slab, they need no deduction. When they penetrate deeper into the log, use the pie-cut method.

For catfaces similar to sap rot, determine how much of the surface of the scaling cylinder is affected and apply a diameter cut.

Exhibit 01 illustrates a 16-foot log with a deep and partially grown-over catface. The defect is 10 feet long and is confined to a quarter section of the log. The diameter at the small end of the log is 17 inches. The gross scale of a 10-foot log, 17 inches in diameter, is 120 or 12 Decimal. The deduction for defect would be 1/4 of 12 or 3 Decimal.

33.2a - Exhibit 01
Catface - Pie-cut Method

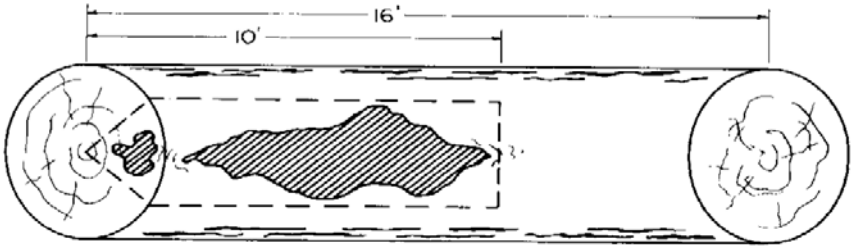
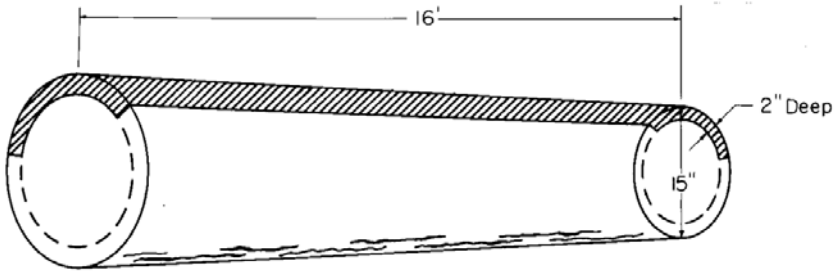


Exhibit 02 illustrates a 16-foot log with a catface extending the entire length. The catface is 2 inches deep and covers 1/3 the circumference. The small diameter of the log is 15 inches and the gross scale 140 or 14. The defect is determined by subtracting the scale of an 11-inch log (diameter of core) from the gross scale and dividing by 3. Example: (14-7) ÷ 3 = 2.

33.2a - Exhibit 02
Catface - Diameter-deduction Method



Watch for massed pitch, wormholes, and rot in conjunction with catface. If ants are present, they are usually an indication of a deep dry rot somewhere within the log.

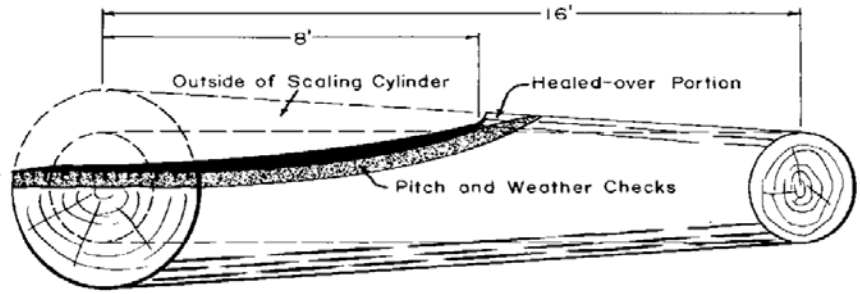
33.2b - Fire Scar

Fire scars are usually found only in butt logs, but occasionally extend into the second 16-foot log. In some species this defect may be accompanied by massed black or red pitch; sometimes by weather checks and wormholes or rot. Part of the scar at the top end may be healed over; consider possible defect here in measuring its length within the scaling cylinder. Mill visits will show how fire scars affect recovery of lumber from local species, timber of different ages, and scars of different ages. Fire scars may also be called catfaces. (See catface.)

Exhibit 01 illustrates a 16-foot log with fire scar extending 8 feet from the butt. Fire scars of this type always have a part of the defect outside the scaling cylinder (not deductible) and therefore appear more serious than they are actually.

Use a combination of pie cut and length of defect. First, estimate what part of the end of the scaling cylinder is affected, then what length is lost by defect. In the illustration half of the cross section of the scaling cylinder might be affected for 8 feet in length. Deduct 1/2 of the 8 feet or 4 feet in length. Net scale is that of a log 12 feet long.

33.2b - Exhibit 01
Fire Scar in Butt Log - Combination
Pie and Length of Defect Method



33.2c - Lightning Scar

The spiral effect of lightning scars, sometimes with shatter, massed pitch, wormholes, and weather checks, presents a difficult scaling problem. The degree of spiral and volume loss varies. Give consideration to short-length lumber the log will produce.

The following alternate method may be used for the more difficult problems:

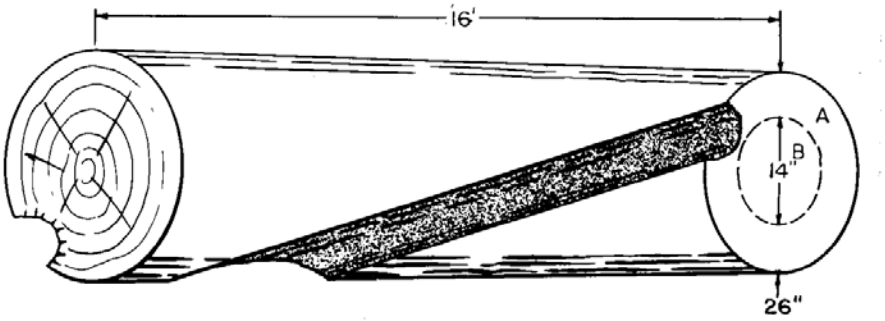
1. Determine degree of spiral over the entire log (as 1/4, 1/3, 1/2, 2/3). Consider recovery of short-length lumber and taper.

2. Obtain gross scale of the log.

3. Measure depth of scar. Include massed pitch and other defects if present.

4. Double the scar depth (for both sides, sec. A) and sub-tract from log diameter. This result is diameter of section B.

33.2c - Exhibit 01
Lightning-scar Deduction



5. Obtain volume of section B and subtract from gross volume of the log for the gross deduction if the entire collar, section A, were lost.

6. Judge how much of this collar is lost. If the spiral went 1/3 the way around the log, only 1/3 would be affected in some way. Short-length-lumber recovery might also reduce the amount lost.

7. Subtract net deduction from gross scale for net scale. Exhibit 12 illustrates a 16-foot by 26-inch log with lightning scar spiral of 1/3 and 6 inches in depth. When the above formula is applied to these figures, the results are:

a. Gross log scale of 16-foot by 26-inch log = 50

b. Depth of scar doubled = 6 plus 6 inches = 12

c. Diameter of unaffected section B = 26 minus 12 inches or 14

d. Volume of section B = (16 feet by 14 inches) = 11

e. Gross deduction = 50 minus 11 = 39

f. Scar affects 1/3 of this "collar" 1/3 of 39 = 13

g. If short-length-lumber recovery and taper allowance in that 1/3 is about 25 percent, reduce the amount of loss 25 percent or about 3.

    13 minus 3 = 10

h. Net log scale = 50 minus 10 (Decimal) = 40

Some logs have shallow scars on all sides that are deep enough to cause some loss in the scaling cylinder. Treat this defect the same as sap rot by making a diameter deduction.

Use the pie cut method when lightning scars are deep and affect one face.

33.3 - Breaks and Splits

Breaks and splits are mechanical defects which require special consideration. Modern-day logging, much of it in steep country, will generally result in some damage to the logs when felled, bucked, transported, and handled by various mechanical devices. In many instances this damage may result in a considerable loss of sound timber. Refer to codes 17.5 and 42 if abnormal amounts occur. Broken-end logs (shatter breaks) caused by falling, split or slabbed ends caused by poor bucking or falling, and slivers (stump pull) pulled from logs in falling are the most common types.

Breakage may occur regardless of what precautions are taken; or may result from improper bedding, felling trees across stumps, logs, rocks, or ridges. Accurate determination of the extent of lengthwise shattering is often difficult as it may be hidden by bark. Remove enough bark to insure inclusion of the entire defect in the deduction.

Buckers should usually leave some breakage in a log to avoid waste.

Lengths of broken-end logs are determined as follows:

1. Where the broken end is wholly or partly bucked, measure the log from saw cut to saw cut and make any required deduction (ex. 01, figure a).

2. When only one end is bucked, determine the most applicable scaling length and make the required deduction (ex. 01, figure b).

3. When neither end is bucked, determine the applicable scaling length and make any required deduction for defect (ex. 01, figure c).

4. When applicable scaling length is determined and the length due to breakage is less than the minimum length stated in the contract, the log is considered unmerchantable due to size. It shall be considered as substandard. Refer to section 55.63 for recording.

33.3 - Exhibit 01
Broken End Partly Bucked
Figure a

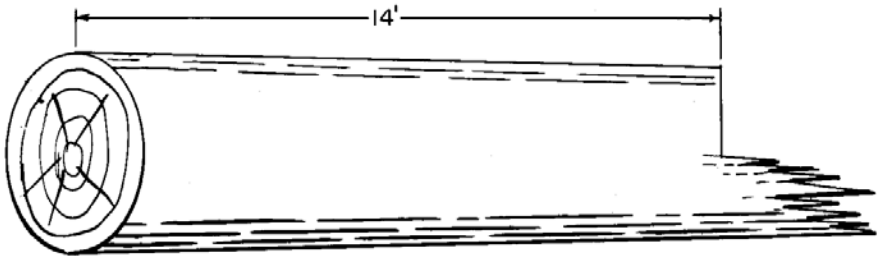


Figure b

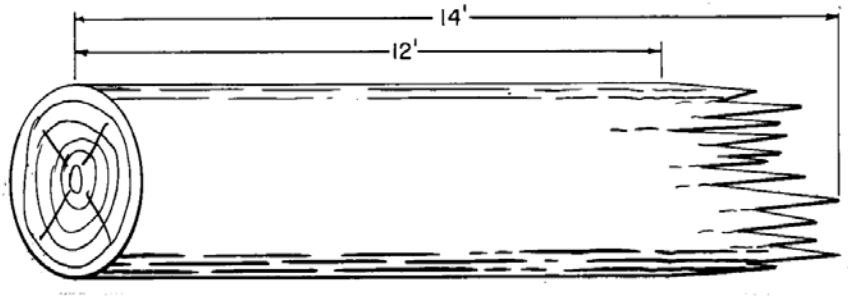
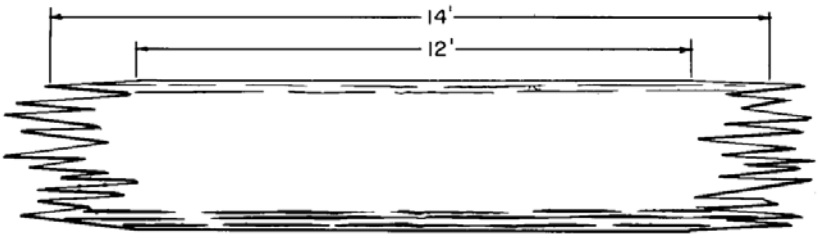


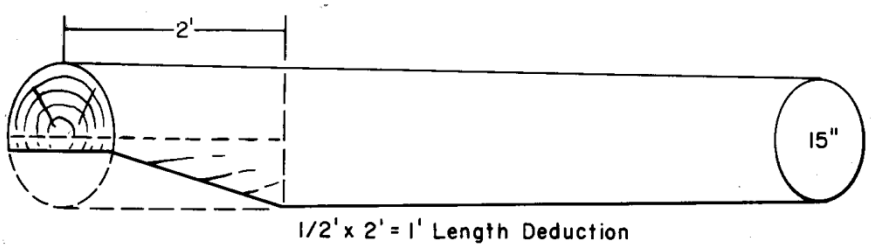
Figure c



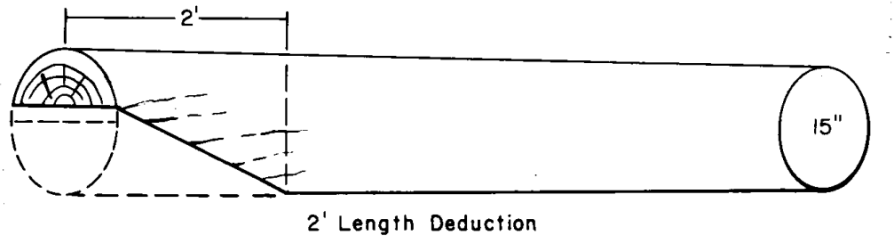
The following deduction procedure should be used to simplify and standardize treatment of broken-end logs:

1. Logs under 16 inches. If a quarter to a half of the end section within the scaling cylinder is gone, deduct half the length affected (Exhibit 02 - figure a). If more than half the end section is gone, consider the entire end lost and deduct for the full length affected (33.3, ex. 02 - fig. b).

33.3 - Exhibit 02
End Break - Small Log Deduction When Half or Less of Log End is Broken
Figure a

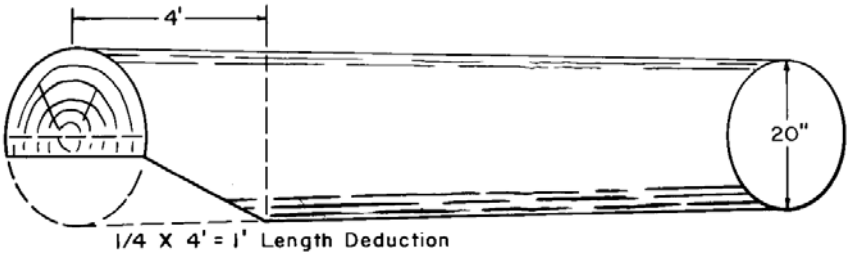


End Break — Small Long Deduction When Over Half of Log End is Broken
Figure b

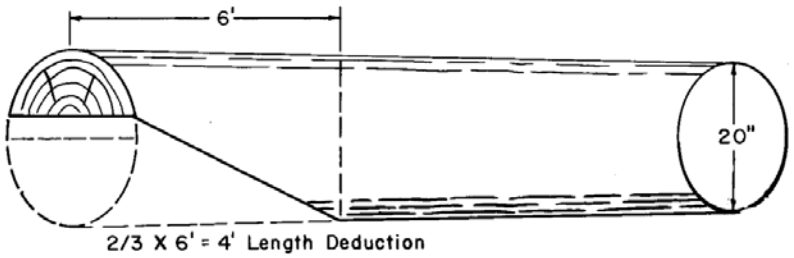


2. Logs 16 inches and over. When any portion of the end section is broken, use a combination of pie-cut and length deduction. See Ex. 03, Fig. a - c.

33.3 - Exhibit 03
End Break - Large Log Deduction When Half or Less of Log End is Broken
Figure a

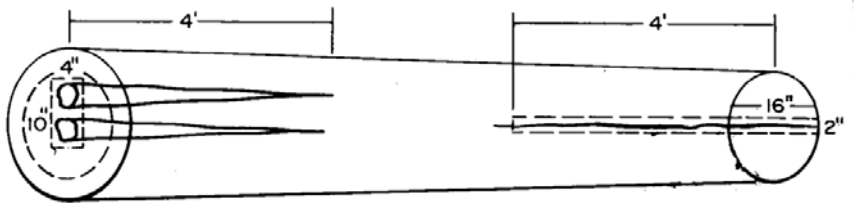


33.3 - Exhibit 03-Continued
End Break - Large Log Deduction When Over Half of Log End is Broken
Figure b



Falling and bucking breaks are generally avoidable, but may be caused by rot, by heavy leaning trees on steep slopes, or by some factor not readily apparent to the scaler. Deductions for these defects are generally made by the squared-defect method. Refer to chapter 40, sec. 41.2 for scaling of chunks and slabs.

Left, Stump Pull - Squared-defect Method Right, Bucker Break (straight) - Squared-defect Method
Figure c



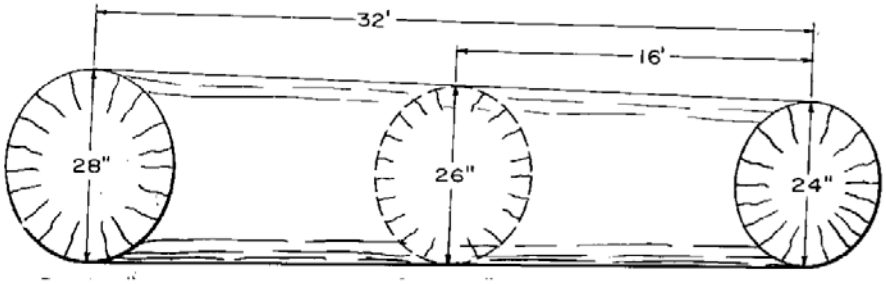
33.4 - Checks

33.4a - Check, Weather

Also known as wind and sun checks. They occur (1) in logs left in the woods or cold decks for an extended period before scaling and (2) in dead trees (snags). Make no deductions for logs that weather check when left in the woods (by the option of the purchaser) or in cold decks. However, make deductions for such logs if the purchaser was not responsible for the condition of the logs as in sales of right-of-way logs already piled, or logs resold to a new purchaser. Instructions to scalers should cover proper procedures when this condition occurs.

Exhibit 01 illustrates a 32-foot log cut from a live tree. End dimensions are 24 and 28 inches, respectively. Weather checks occurred after the tree was felled and bucked in a right-of-way clearing. Such checks usually are about twice the depth at the ends of a log than elsewhere. If these weather checks are deductible (that is, not due to delay in removal by the purchaser), deduct as follows:

33.4a - Exhibit 01
Weather Checks - Diameter-deduction Method



1. Top segment.

    a. Measure the small end diameter of the 32-foot log (24 inches in the illustration).

    b. Measure one-half of the depth of the checks on the small end (3 inches) and multiply by 2 for both sides of the segment (6 inches); this is the gross diameter deduction.

    c. Reduce the diameter of the segment (24 inches) by 6 inches to obtain a net diameter of 18 inches. The net scale then is that of a 16-foot log 18 inches in diameter, 210 board feet or 21.

2. Butt segment. In the top segment the gross diameter deduction was 6 inches or a net scale of a log 6 inches less than the diameter at the small end. Do the same thing with the butt segment, but use the midpoint diameter of the long log.

    a. Find the midpoint diameter by use of the taper in the long log. In the illustration the taper is 4 inches from butt to top. Thus the midpoint diameter is 26 inches.

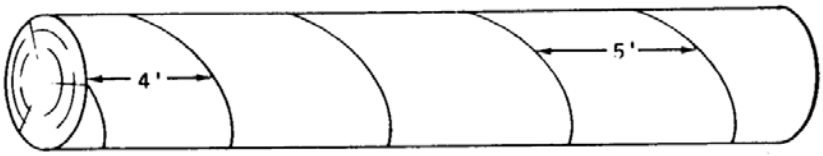
    b. Reduce the segment diameter by 6 inches for a net diameter of 20 inches. The net scale then is that of a 16-foot log 20 inches in diameter, 280 board feet or 28.

Where only a fraction of the log surface or end is affected and the checks are deep, use the pie cut method, as shown in figure 14. Where (1) only a fraction of the log surface or end is affected and (2) the checks are confined to the outer surface and are deductible use a percentage or fraction of a diameter deducted for the length affected (fig. 24).

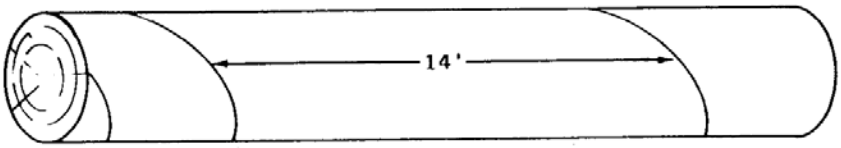
Weather checks found in logs cut from dead trees often are different from those described previously. These checks usually occur before a tree is felled. The depths of the checks in the sides of logs and at midpoint are about as deep as those in the ends. However, because of moisture retained in butts of standing trees, checks in the large end of a butt log may not be as deep as those in the top.

Weather checks often penetrate deep into the center of dead logs. If spiral grained, the log may be cull for sawtimber. However, if the log is straight grained, or the spiral is not severe, consider the possibility of cutting merchantable length lumber between the checks. By mill visits, determine the seriousness of weather checks. The statements above are guides to help in making deductions. To be merchantable, the log must meet net percent of gross stated in the contract. Exhibit 02, figures a and b, illustrate the recovery of merchantable length lumber from spiral-checked logs.

33.4a - Exhibit 02
Log is Cull because 6' Lumber Cannot be Recovered Between Checks
Figure a



Log is Merchantable Because of Recoverable Lumber Between Checks
Figure b



33.4b - Pitch Seam, Heart Check, Frost Cracks

1. Heart check is an opening or separation across the log heart at right angles to the annual rings. When filled with pitch, it is called a pitch seam. Frost cracks are similar to heart checks, except that they are usually visible in the bark and extend from the outside of the log to the heart. Often these defects run farther lengthwise than do pitch rings. Normally make deductions for seams, checks, and frost cracks by the squared-defect method.

A word of caution in measuring the width of this type of defect; Search for "breakouts" or branches from the main check or seam. These are sometimes difficult to see, especially when log ends are wet. The minimum width of a check is 1 inch. This results in a width of 2 inches for squared defect calculations when the inch is added for waste.

33.4b - Exhibit 01
Heart Check - Squared-defect Method

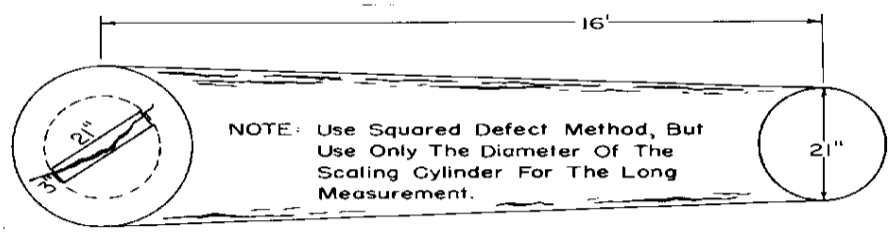
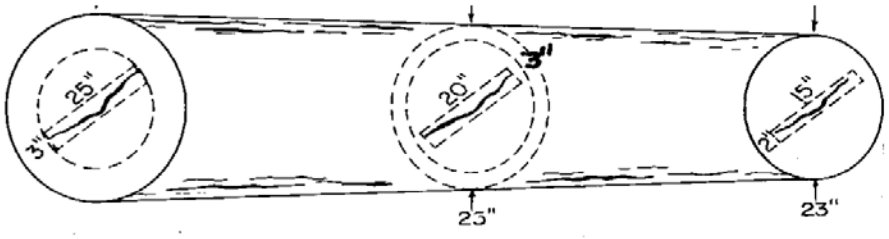


Exhibit 01 illustrates a 16-foot butt log with a heart check in the large end. Top diameter of the log is 21 inches. The actual height of the check is 23 inches, but do not add an inch for waste to this dimension. Use 21 inches (the diameter of the scaling cylinder) for the height and 3 inches for the width. The width measurement includes the 1 inch allowed for waste. The estimated depth of penetration in the log is 8 feet. The squared-defect method (sec. 22.4) then gives 3 by 21 = 63 or a deduction of 7 for a 16-foot length. One-half of this gives 4 (Decimal), the deduction for 8 feet of penetration.

2. When the check shows on both ends and apparently extends straight through the log without twisting, deduct as for heart rot: For 16- to 20-foot logs, average the end defect dimensions. For logs shorter than 16 feet, use the large end dimensions unless the Regional Forester prescribes otherwise. For logs longer than 20 feet, follow the deduction rules described under section 22.5. This includes the use of the alternative method explained under section 22.5, item 3c.

33.4b - Exhibit 02
Heart Check in 32-foot Log - Squared-defect Method

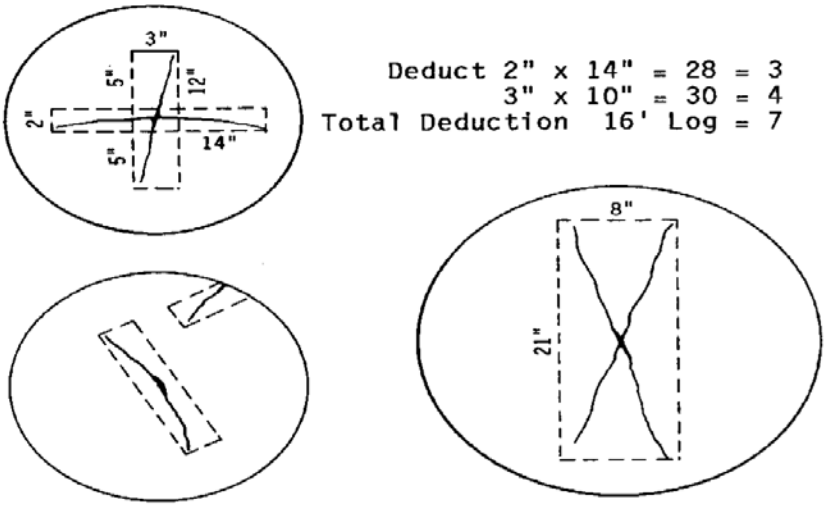


This exhibit illustrates a 32-foot butt log with heart check showing on both ends and in the same position. Small diameter of the 32-foot log is 23 inches, and midpoint diameter 25 inches. End dimensions of the defect in the 32-foot log are 2 by 15 inches and 3 by 25 inches, respectively,

including waste. When dimensions of 15 and 25 inches are averaged the midpoint dimension is 20 inches.

Use 3 inches for the estimated width at the midpoint. For the butt segment, average 3 by 20 inches and 3 by 25 inches; result, 3 by 23 inches. For the top segment, average 2 by 15 inches and 3 by 20 inches; result, 3 by 18 inches. The squared-defect method (code 22.5) then gives the following deductions: Butt segment, 3 x 23 = 69 or 70 or 7. Top segment: 3 x 18 = 54 or 60 board feet (6 Decimal).

33.4b - Exhibit 03
Method for Making Deductions for Cross-checking

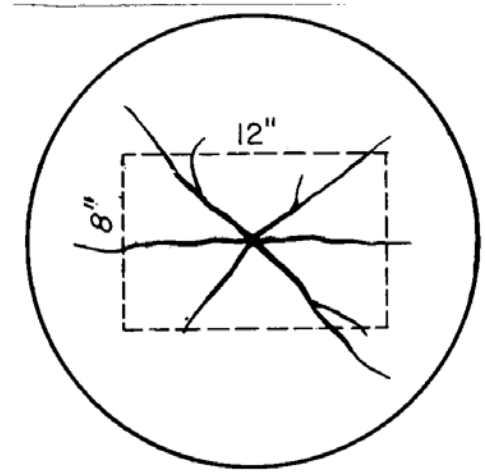


3. Deductions for two cross-checks are made as explained in item 2 preceding. In measuring height of the second check, do not include the width of the first check measured. Diagram separate checks at right angles. The "give and take" procedure explained in item 4 may also be used in determining the deduction for two cross-checks. Use the "give and take" procedure when diagramming at right angles creates a loss of recoverable material in the squared defect area of the checks.

4. Deductions for more than two, cross-checks (called multiple checks or spangle) are usually made using the squared-defect method unless the defect is large and results in a length-deduction. Some recovery might show between the ends of the check. Use the "give and take" procedures when squaring out this type of defect.

In exhibit 04 below, note that some recovery appears between the square (the "give" area). This is offset by the loss in the check ends outside the square (the "take" area).

33.4b - Exhibit 04
Multiple Checks and Pitch Spangles - Squared-defect Method

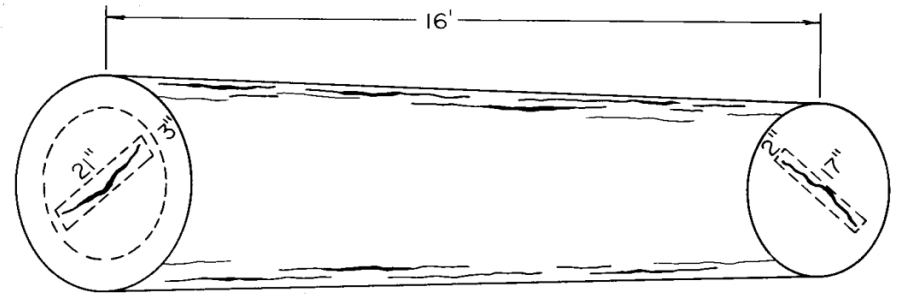


5. Heart checks and pitch seams showing on both ends of a log at different angles indicate twist. Obviously the loss here is greater than when the check is straight. The twist causes the production of short-length lumber, some of it less than 6 feet. Consider the amount of twist when deducting for this defect. If the twist is 45°, use 1.5 times the deduction for a straight check. If the twist is 90°, double the deduction for a straight check.

On one log end, place a small stick in the bark parallel to the check. This helps determine if any twist is present when you are at the other end.

This exhibit illustrates a 16-foot log with a 2- by 20-inch heart check showing on the butt end. The same check at the top end is 1 by 16 inches, but shows a 90∞ twist. After adding 1 inch for waste and averaging the defects (3 by 21 and 2 by 17), the squared-defect method (code 22.5) gives 3 x 19=57, or a deduction of 6 for a 16-foot log with a straight check. Adjusting for the 90∞ twist, the actual deduction for the log will be 6 x 2 or 12.

33.4b - Exhibit 05
Heart Check With 90° Twist - Squared-defect Method



The next exhibit illustrates a 32-foot log with a heart check showing on both ends. End measurements of the defect are 3 by 21 inches and 2 by 12 inches, including waste. The check on the top end indicates a 90∞ twist from that showing on the butt end. By using the squared-defect method (sec. 22.5), the defect is computed as follows:

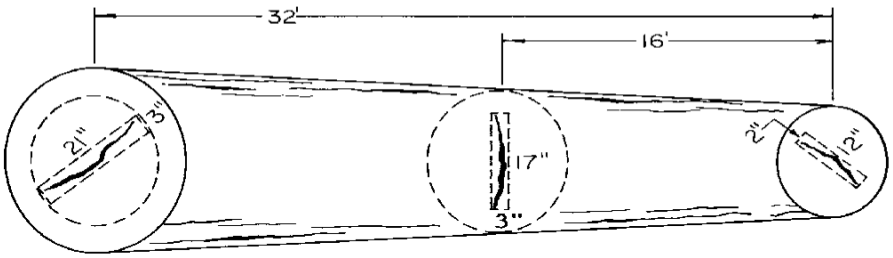
Average end defects (3 by 21 and 2 by 12 inches) to obtain dimensions of defect in the center of the log (3 by 17 inches).

Determine defect for each scaling length by averaging end defects and adjusting for twist (45 degrees in each segment).

3 by 21 and 3 by 17 average 3 by 19 inches.

Use 3 x 19 = 57 or a deduction of 6 for the 16-foot length for the butt segment if the check was straight.

33.4b - Exhibit 06
Heart Check With 90° Twist in 32-foot Log; 45° Twist in 16-foot Log — Squared-defect Method



Adjusting for the twist, the actual deduction for the butt segment will be 6 x 1.5, or 9.

3 by 17 and 2 by 12 average 3 by 15 inches.

Use 3 x 15 = 45 or a deduction of 5 for the 16-foot length of the top segment if the check was straight. Adjusting for the twist, the deduction for the top segment will be 5 x 1.5 or 8. The total defect deduction for the 32-foot log is 17.

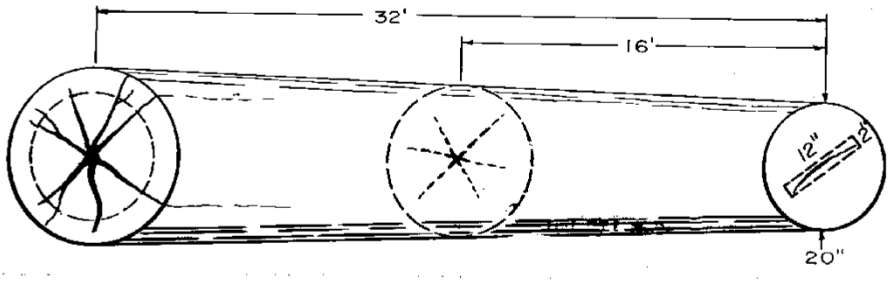
6. When logs are exposed to the sun and wind for an extended period, weather or seasoning checks often occur in the ends. The scaler must learn to detect this type because he makes no deduction for them (see Checks, Weather). Such checks often increase in length due to weather. Use a thin wire or knife blade on doubtful checks to determine the type. Look for sawdust in checks. Sometimes this is an indication of a natural heart check.

7. For multiple frost cracks, see Pitch Spangle.

33.4c - Pitch Spangle

When more than two pitch seams occur in the large ends of butt logs, the defect is called a pitch spangle. Douglas-fir and western larch are species commonly affected. Breakouts from the seams often occur. Sometimes pitch rings occur in connection with pitch seams. Defect of this type causes heavy loss in lumber manufacture. Sometimes a part of the defect extends into the second log.

33.4c - Exhibit 01
Pitch Spangle Deductions in 32-foot Log; Butt Segment - Length-deduction Method Top Segment - Length-deduction Method for Large End; Squared-defect Method for Small End



Make length-cut deductions for pitch spangles in the butt 16-foot log when the size of the spangle approaches the scaling diameter. For other logs, use the squared-defect method, as you would for multiple checks.

This exhibit illustrates a 32-foot, 20-inch log with pitch spangle. The entire scaling cylinder is affected because the seams extend beyond its edges. Some defect shows on the small end of the 32-foot log indicating the defect is greater at the 16-foot point and not as great as in the butt end. In the illustration the butt 16-foot segment is highly defective, more than 50 percent.

If the contract merchantability clause specifies 50 percent, this log is cull. If 33 1/3 percent, this log may be marginally merchantable.

If mill visits indicate that pitch spangle cuts out this way, treat the top 16-foot log as follows: Judge the large end defect as 50 percent of the scaling cylinder and the length of penetration as 8 feet. Deduct half of the 8 feet affected or 4 feet for the large end. For the small end, apply the squared-defect method and use 8 feet for the length. Compute the deduction for each, add, and then compute the net scale of the log.

Refer to examples included under Pitch Seam, Heart Check, Frost Cracks for alternate procedures for determining the volume of a top log.

33.5 - Pitch Ring, Shake Ring

33.5a - Rings, Pitch and Shake

1. Ring shake defect is the separation of one or more annual rings sufficient to cause a volume loss in manufacture. This separation is known as a pitch ring when it becomes filled with pitch, often a characteristics of species like Douglas-fir and larch.

2. Shake ring defects follow the annual rings. Sometimes they stop where knots start, for knots tend to hold the annual rings together. On some logs the length of pitch rings is shown by a narrow scar or pitchy seam running lengthwise in the bark. A scaler must look closely at log ends to locate rings and determine their size and shape. He should bear in mind that a ring that opens wide may have deep penetration into the log and that numerous rings may penetrate deeper than one or two rings. Make no deductions for rings outside the scaling cylinder, but rings in the large end of logs that enter the scaling cylinder will need defect deductions. It is important for the scaler to make sawmill visits to develop judgment in making ring shake deductions.

3. The need for considering the number of rings, ring location, ring class, ring taper, and the scale of any solid core often makes pitch and shake rings a complex scaling problem.

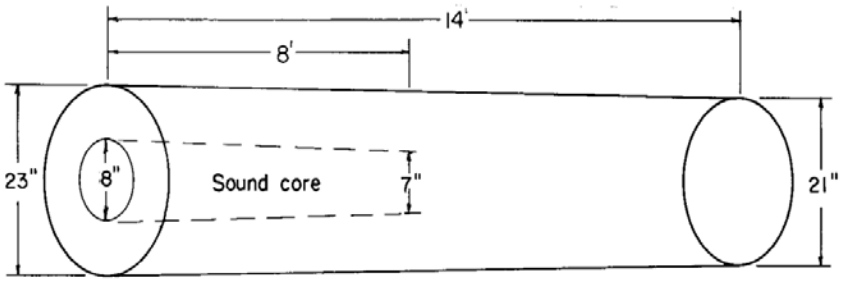
4. The basic procedure for scaling pitch and shake rings is to square the defect and replace a sound core. Rings are measured and averaged for size in the same manner as log diameters (sec. 173).

This rule in formula is:

Logs to 14 feet inclusive: $(\text{large ring} + 1)^2$ - (core ring scale)

Logs 16 to 20 feet inclusive: $(\text{average ring} + 1)^2$ - (core ring scale)

33.5a - Exhibit 01
Shake Ring in Large End



Example 1: A 14-foot log 21 inches in diameter has an 8-inch shake ring showing in the large end. The defect extends an estimated 8 feet.

Using the shortcut procedure (sec. 22.4), deduct as follows:

9 x 9 = 81 to the next higher 10 = 90 board feet

90 x 8/16 = 45 to the nearest 10 = 50 board feet

Replace 7-inch core (allow 1-inch taper), 8 feet long

Deduction = 50 - 10 or 40 board feet (4 Decimal)

(This is easy to compute with the Coconino scale stick.)

Example 2: A 16-foot log has a 6-inch shake ring showing at the small end and an 8-inch shake ring showing at the large end. Adding 1 inch for waste and averaging the defect (sec. 22.5):

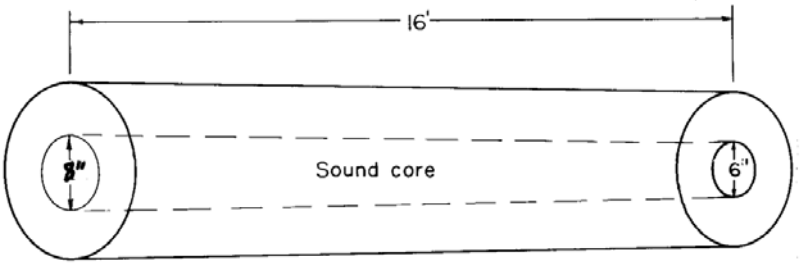
8 x 8 = 64 to the next higher 10 = 70 board feet

Replaced 6-inch log = 20 board feet

Deduction = 70 - 20 or 50 board feet (5 Decimal)

(This is easy to compute with the Coconino scale stick.)

33.5a - Exhibit 02
Shake Ring in Both Ends



5. Following are instructions for varying the above procedure in accordance with the circumstances encountered.

   a. For one-quarter rings, use the squared-defect method as for checks and do not consider core.

   b. For a half ring, take half the deduction for a full ring for the length affected.

   c. For a three-quarter ring, take three-quarters of the deduction for a full ring for the length affected.

   d. When 2 full rings are not more than 2.5 inches apart, measure diameter of the outside ring. Add 1 inch. Apply squared-defect method for gross deduction. Reduce this by the scale of a log with a diameter of the inner ring.

   e. When 2 full rings are over 2.5 inches apart, measure diameters of both rings. Compute separately as per preceding examples and add deductions together.

Example 3: A 16-foot log has 6-inch and 16-inch shake rings showing at the small end and 8-inch and 18-inch rings showing at the large end. Adding 1 inch for waste and averaging the defect:

18 x 18 = 324 + (sec. 22.2) to the next higher 10 =

330 + 20 (For 17" to 21" squares) = 350

Replaced 16-inch log = 160

Deduction for large ring = 350 - 160 or 190 (19 Decimal)

8 x 8 = 64 to the next higher 10 = 70

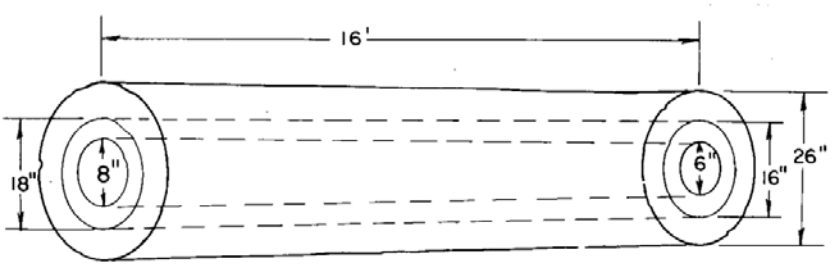
Replaced 6-inch log = 20

Deduction for small ring 70 - 20 or 50 (5 Decimal)

Total deduction 240 board feet or 24

(This is easy to compute with the Coconino scale stick.)

33.5a - Exhibit 03
Two Full Rings Over 2.5 Inches Apart

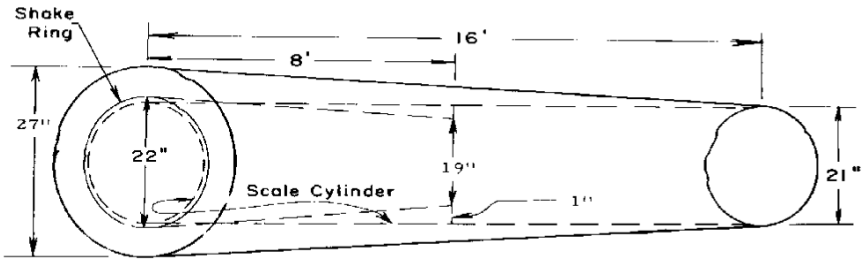


f. When multiple rings occur with no recovery between them, square the overall defect and allow for the scale of any inside log surrounded by the rings.

g. For a full or partial ring 2.5 inches or less from the outside at the top end, a perimeter ring, deduct by the diameter deduction method for the portion of the circumference and length affected.

Example 4: A 16-foot log 21 inches in diameter has a 22-inch shake ring showing in the large end. The defect extends an estimated 8 feet to where the estimated ring diameter is 19 inches. It is thus a perimeter ring at this point and a diameter reduction is used. An 8-foot log 21 inches in diameter scales 150 board feet; an 8-foot log 19 inches in diameter scales 120 board feet. The deduction is 30 board feet or 3.

33.5a - Exhibit 04
Perimeter Deduction in Stump Cut



h. Make a length deduction if deductions by the squared-defect method exceed the log scale of the part affected.

i. Do not replace the core in determining the defect when the core is too small (normally less than 6 inches) to yield standard-sized lumber.

6. The scaler must remember to follow instructions for application of the squared-defect method (sec. 22.3) in determining which measurements to use. They should also be aware that ring defects follow annual rings and taper, and remember to treat each core as a new scaling cylinder.

7. A Pitch and Shake Ring Deduction Table for 16-, 18-, and 20-foot logs with rings showing on both ends (table VI in the appendix chapter) can be used instead of making the several calculations normally required. The table is for use in scaling with the Scribner Decimal C rule and provides for taper up to 8 inches.

8. Breakouts from a shake ring sometimes occur. These numerous short radial seams usually are found in a "collar" on the outside of the ring. Obtain the average length of the seams. If 2.5 inches or less (the collar thickness) follow the deduction rule as explained in the preceding item 5. If seams are over 2.5 inches long, determine how much of the collar is affected-a third, half, or all-and use the multiple-ring rule as explained in item 5.

9. Sometimes pockets occur in annual rings. In some softwood species they are called pitch pockets.

In some hardwood species they are referred to as gum pockets. Usually there is a separation present but the pockets are too short to cause a volume loss. Make no deduction for these pockets unless they are long enough to square out for a deduction of 10 board feet or are so numerous as to cause an actual loss in lumber recovery.

10. In white fir and hemlock a combination of ring and radial shake is common in some areas. The combination often requires a length deduction. Frost cracks, splits, or seams on the outside of the log often indicate the extent or condition.

33.5b - Pitch, Massed

Massed Pitch is defined as an accumulation of solid pitch. Often massed pitch occurs in connection with fire scars and may extend beyond the scar at the top end. The concentration of pitch must be sufficient enough to cause an actual loss of merchantable lumber before any deduction is made. No deduction is made for wood lightly saturated with pitch because such material can be utilized in certain grades of lumber.

33.5c - Pitch Pockets

Defined as small, scattered crescent shaped areas of pitch (usually 1 or 2 inches in length) that are occasionally present in some species of logs. This condition is rare, but when it does occur, it is usually found in the butt logs of pine species.

No deduction is made for this condition because scattered pitch pockets rarely if ever result in a volume loss of merchantable lumber. Certain grades of lumber allow for the presence of pitch. A deduction may be made if an extreme concentration of pitch pockets is enough to cause an actual loss of merchantable lumber.

33.6 - Crook, Pistol Butt and Sweep

33.6a - Crook and Pistol Butt

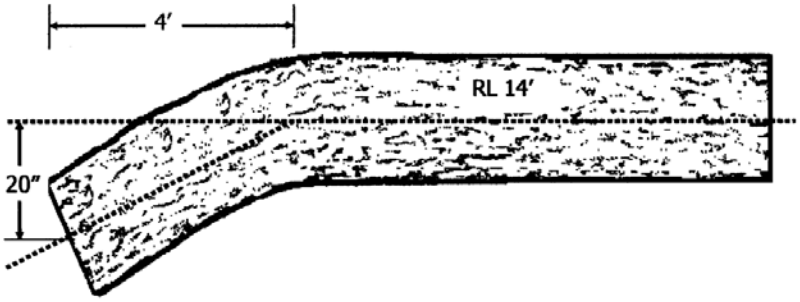
When a log has an abrupt curve or bend, the defect is called crook. When crook is present in the butt end of the log, the defect is called pistol butt defect. Deductions are made for void, cross grain and any portion that will not produce 6-foot lumber recovery on either side of the crook.

One type of crook is found in logs from upper portions of trees. Snow or falling trees that break off tops of other trees can cause this defect. Before a new leader starts, rot and black massed pitch may enter the wound. The new leader may die, leaving a large sucker-type dead knot. Breakage may occur at this point due to weakness caused by cross grain.

Cross grain material is defined as grain deviation that exceeds 3 inches per foot from straight. Measure grain deviation by projecting a straight line down the center of the segment starting from the longest straight portion. Measure the distance between the projected straight line and the centerline of the crook portion for the length affected. If the deviation exceeds 3 inches per foot it is considered cross grain and the entire length affected by crook is deducted using a length deduction.

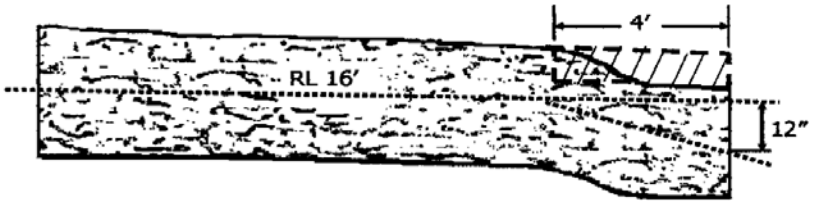
If cross grain material is not present, determine the percent loss for void and include the portion of the log that will not produce standard length lumber in the manufacturing process for the deduction.

33.6a - Exhibit 01
Crook - Length Deduction for Cross Grain



In this exhibit, 4 feet of length is affected by crook. Grain deviation measures 20 inches in 4 feet, or 5 inches in 1 foot, which exceeds 3 inches per foot. Due to cross grain, the length deduction is the full 4 feet.

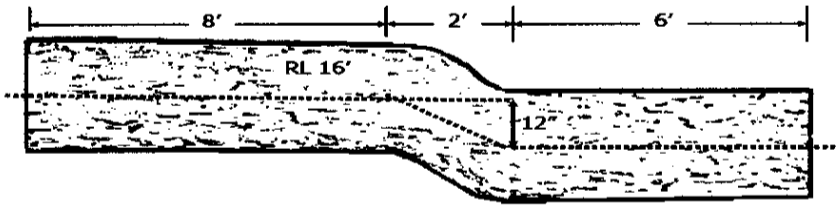
33.6a - Exhibit 02
Crook - Length Deduction for Void



In this exhibit, 4 feet of length is affected by crook. Grain deviation measures 12 inches in 4 feet, or 3 inches in 1 foot, which does not exceed the allowable deviation. Void and loss due to manufacturing process affects 25% of 4 feet. Length deduction of 25% of 4 feet is taken for void.

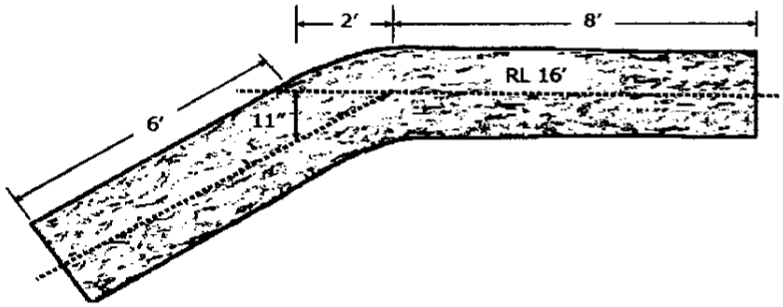
If grain deviation had exceeded 3 inches per foot, it would be considered cross grain and a length deduction of 4 feet would be taken for the crook.

33.6a - Exhibit 03
Crook - Length Deduction for Cross Grain



In this exhibit, 2 feet of length is affected by crook. Grain deviation for the affected 2 feet measures 12 inches, or 6 inches in 1 foot, which exceeds 3 inches per foot. A 6-foot portion and an 8-foot portion remain on either side of the crook and are parallel to, or on the same plane, as each other. The length deduction is the full 2-foot portion containing cross grain. If the remaining portions on either side of the defect would not produce 6-foot lumber recovery or were not parallel and on the same plane, the deduction would include those portions.

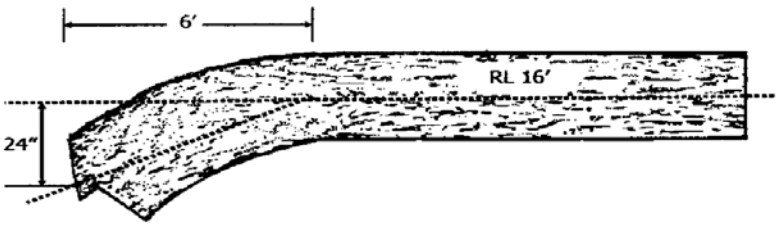
33.6a - Exhibit 04
Crook - Length Deduction for Cross Grain and Portion Not on the Same Plane



In this exhibit, 2 feet of length is affected by crook. Grain deviation for the affected 2 feet measures 11 inches, or 5.5 inches in 1 foot, which exceeds 3 inches per foot. A 6-foot portion and an 8-foot portion remain on either side of the crook but since they are not parallel to, or not on the same plane as each other, the defect deduction includes the 6-foot portion. The length deduction is 8 feet; 2 feet for cross grain and 6 feet for the portion not on the same plane.

Trees growing on steep slopes and/or in locations of heavy snowfall are susceptible to pistol butt defect. This condition often results in cross grain material in the affected area.

33.6a - Exhibit 05
Crook - Pistol Butt Defect



In this exhibit, pistol butt defect affects 6 feet of the butt end of this log. Grain deviation measures 24 inches in 6 feet, or 4 inches in 1 foot, which exceeds the allowable 3 inches per foot. The length deduction for pistol butt defect in this example is the entire 6 feet.

33.6b - Sweep

Sweep compared with crook is less abrupt and more continuous. Sweep is often long enough to affect more than one segment. Varying the bucking lengths of logs will often reduce the loss due to sweep. If logs presented for scaling indicate poor bucking practices the scaler will report this to the Contracting Officer. Scalers will deduct for sweep in logs by scaling as presented unless otherwise instructed (sec. 17.5).

Make deductions for sweep as follows:

1. Position the scaling cylinder in the log segment to maximize volume recovery. The scaling cylinder may extend from either end of the log segment or may be positioned in the center portion.

2. Measure the length of the log affected by sweep.

3. Deduct the fraction of this length lost in sawing, considering standard length lumber recovery.

4. Make a length deduction accordingly.

33.6b - Exhibit 01
Sweep

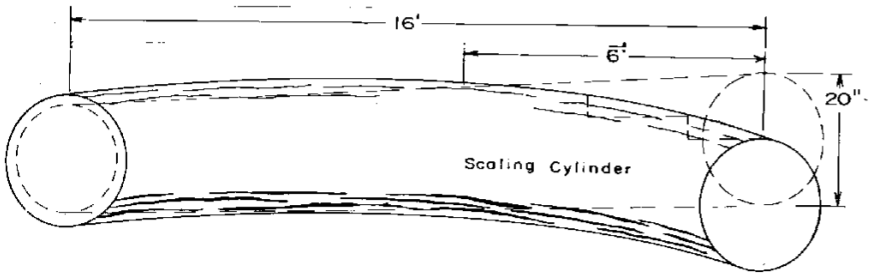
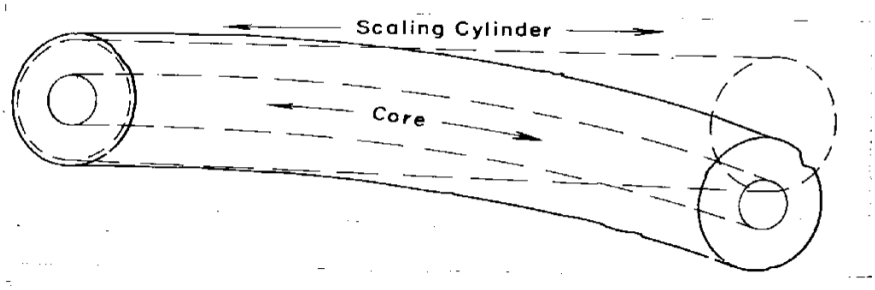


Exhibit 01 illustrates a 16-foot, 20-inch log with sweep affecting 6 feet of the scaling cylinder. It is estimated that one-third of the affected area will be lost in sawing. In this case a 2-foot-length deduction is made.

Sweep in combination with an interior defect such as rot or shake is likely to cause a cull log.

33.6b - Exhibit 02
Sweep in Combination With Shake



33.7 - Knots

Knots are normally a grade defect and are not considered a scaling defect until the knots are oversized where they enter the scaling cylinder, and their numbers and location cause a volume loss in the manufactured product. An extremely knotty log does not automatically create the need for a defect deduction.

Live knots begin to taper immediately under the log surface, whereas dead knots begin to taper at a point where the limb actually died. Volume loss associated with oversize knots occurs in the growth ring area of the knot. Logs with larger knots may produce grain distortion in and around the collarwood area causing additional volume loss due to cross grain material. A volume loss may also occur when oversize knots occur in knot whorls, knot clusters or bunch knots.

Knot clusters may consist of a group of small limbs developed from adventitious buds. It does not affect the volume of lumber produced and is not treated as a defect.

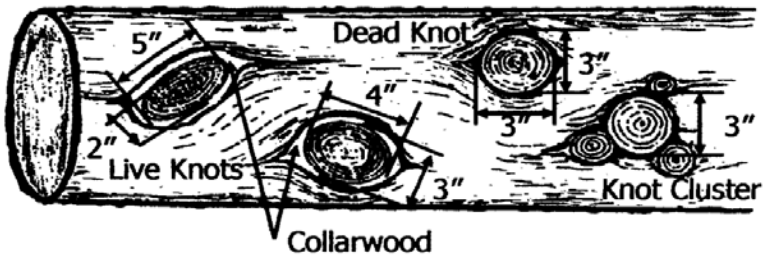
Live and dead knots are considered oversize when they exceed the maximum knot size limit for the diameter ranges shown below. Maximum knot sizes are based on the small end diameter, or scaling cylinder size, of the affected log or segment.

KNOT SIZE LIMIT

Small End Diameter	Max. Live	Max. Dead
5" to 10"	2"	1"
11" to 20"	3"	2"
21" & up	4"	3"

Knots are measured at the surface of the log and size is determined by averaging the narrow and wide measurements of the hardened area of the knot showing growth rings, excluding the collarwood surrounding the knot, as shown in Exhibit 11.

33.7 - Exhibit 02
Determining Knot Size



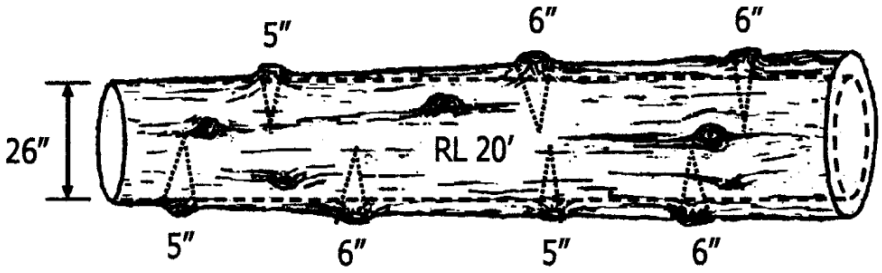
Make deductions for oversize knots using the Knot Deduction Guide when the entire scaling cylinder is affected with oversize knots. Consider knot location, log taper, percent of circumference and length affected and adjust the deduction outlined in the Deduction Guide to reflect only the loss within the scaling cylinder due to oversize knots. A few scattered oversize knots on a log does not create a volume loss. These deductions for oversize knots are not applicable to Ponderosa Pine, Sugar Pine, and hardwoods.

KNOT DEDUCTION GUIDE

Small End Diameter	*Diameter Deduction
5" to 15"	1"
16" to 25"	2"
26" to 35"	3"
36" to 45"	4"
46" & up	Scaler's judgment

* Reduce the defect volume if entire scaling cylinder or length is not affected.

33.7 - Exhibit 02
Mostly Live Oversize Knots



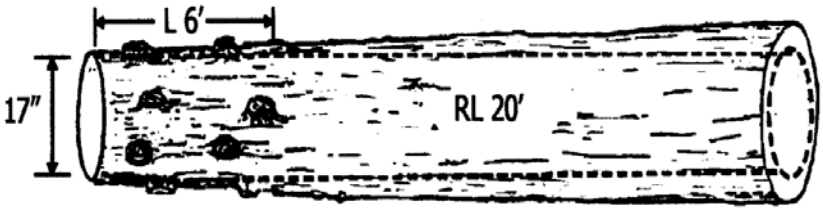
Given:

Recorded log length = 20 feet
Small end diameter = 26 inches
Live knot size limit = 4 inches.
Live knots, 5 to 6 inches in size, are affecting the entire surface of the log.

Using the Knot Deduction Guide, a 3-inch diameter deduction is indicated. Log taper is considered and it is determined that the knots would be 5 inches where they enter the scaling cylinder so no adjustment is made to the deduction.

When oversize knots do not affect the entire surface and/or length of the log, the amount of defect deduction will be reduced to represent only that portion of the log that is affected with oversize knots.

33.7 - Exhibit 03
Mostly Dead Oversize Knots



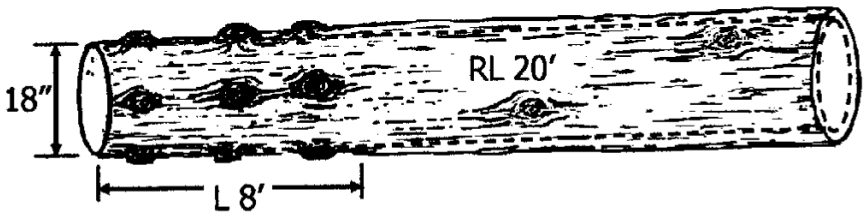
Given:

Recorded log length = 20 feet
Small end diameter = 17 inches
Dead knot size limit = 2"
Mostly dead oversize knots affect two faces, 50%, for 6 feet.

Using the Knot Deduction Guide, a 2-inch diameter deduction is indicated. Adjust the deduction to 1" for 6 feet for the percent and length affected.

Deductions will be made for oversize knots in knot whorls and knot clusters when oversize knots show on one or more faces of the log. Use the Knot Deduction Guide when making the deduction. Reduce the defect deduction for the actual length and faces affected.

33.7 - Exhibit 04
Live Oversize Knots in Knot Whorls



Given:

Recorded log length = 20 feet
Small end diameter = 18 inches
Live knot size limit = 3"
Live oversize knots in whorls affecting 8 feet.

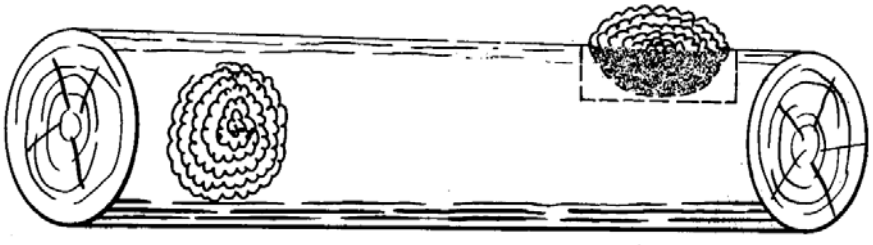
Using the Knot Deduction Guide, a 2-inch diameter deduction is indicated. Adjust the deduction to 2" for 8 feet for the length affected.

33.8 - Other Defects

33.8a - Burls

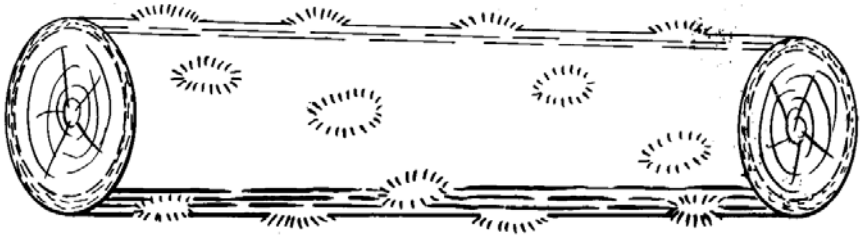
1. Burls are dome-shaped growths of various sizes found on tree trunks. At times they penetrate into logs as far as their height above the log surface. When burls cover about 1/4 the circumference of a log, make a length deduction to cover the volume loss in the affected portion (one-fourth the length of the burl within the scaling cylinder). Usually 1 foot per major burl is sufficient. If the burls are so close together as to prevent the manufacture of merchantable length lumber between them, apply the pie-cut method for the portion of the length affected.

33.8a - Exhibit 01
Burls - Combination Pie-cut and Length-deduction Method



2. Numerous small burls or pitch scabs may contain massed pitch and pitch rings which occur beneath these burls and may cause a loss in the outer portions of logs. A diameter deduction for this defect equal to the depth and portion affected as for sap rot may be equitable but should be checked, and not applied automatically (Exhibit 02 - Figure a). The figure shows areas of defect only. Deductions should include all loss of standard-length lumber.

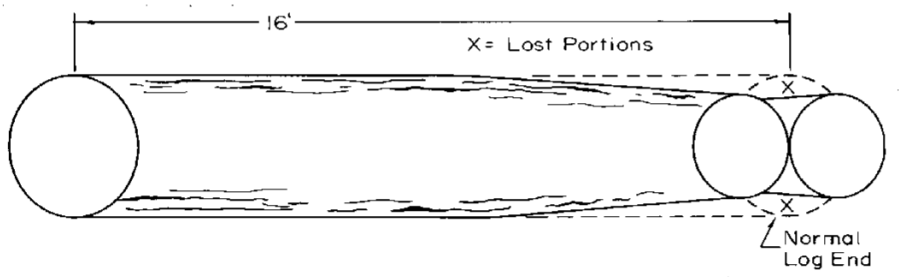
33.8a - Exhibit 02
Numerous Small Burls or Pitch Scabs -
Diameter-deduction Method



33.8b - Crotch

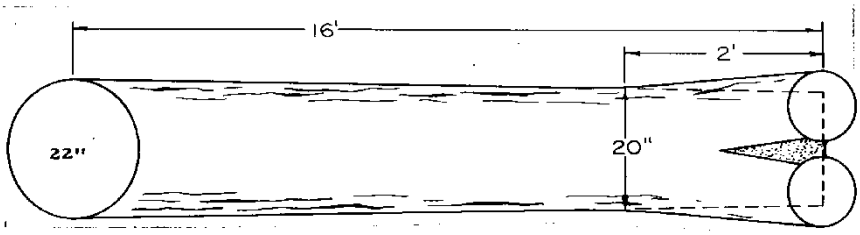
A crotch is the point in a tree where it forks into two or more leaders or stems. Proper bucking can eliminate much of the defect. Usually the loss occurs from a bark seam, split, or cross grain in the end of such logs. Loss may occur from flat sides often characteristics of a crotch condition. A deduction of 1 or 2 feet in length is often made for this type of defect, but the actual deduction depends on observation of loss during mill visits.

33.8b - Exhibit 01
Crotch Log With Characteristic Flat Sides



It may be sufficient merely to square out the bark seam. Amount of deduction depends on the point of bucking. See chapter 10, sec. 17.32 for method of measuring diameters of crotched logs.

33.8b - Exhibit 02
Crotch Log



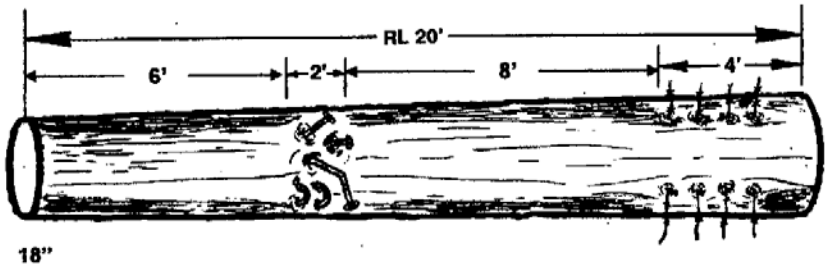
33.8c - Foreign Material

Logs that contain foreign material such as insulators, spikes, nails, staples, wire, rocks, etc., that may create a safety hazard or may damage saw mill equipment when being manufactured, shall be treated as follows:

1. The Scaler should identify the log as a safety hazard by marking the log or by using another identifying method. Inform purchaser, equipment operator or other appropriate person so the log can be set aside.

2. If the foreign material can be readily removed, remove the material or have it removed. If the foreign material cannot be readily removed, make a length deduction in even two foot multiples to eliminate the entire length affected. Since foreign material must be physically bucked out, the remaining portion of the log must meet contract minimum log length after deductions or the log is cull. If the extent of the material in the log cannot be determined, the log may be culled.

33.8c - Exhibit 01
Foreign Material Defect



Foreign material is found in two locations on this 20-foot log. Nails are located approximately 6 feet from the small end. A deduction of 8 feet is necessary to eliminate the length affected by the foreign material and the portion of the log that is less than the contract minimum log length, which in this example, is 8 feet. The large end has wire embedded in the log 4 feet from

the end. A deduction of 4 feet will eliminate the length affected. Eight feet remains between the defected areas. Total deduction for the log is 12 feet.

33.8d - Multiple Defects

More than two types of defect may occur in ends and sides of logs. To apply one or more deduction methods to each defect is often difficult and time consuming, and may result in erroneous deductions. The best method is usually to combine a pie cut with the length of defect on such logs. In some cases, the squared-defect method may be applicable.

33.8d - Exhibit 01
Multiple Defects - Combination Pie-cut and Length of Defect Method

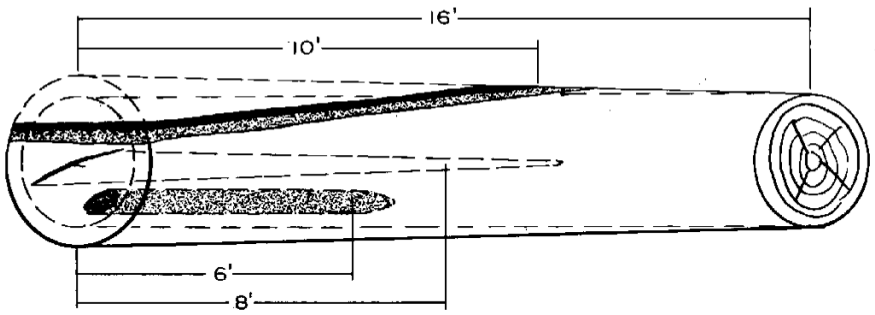


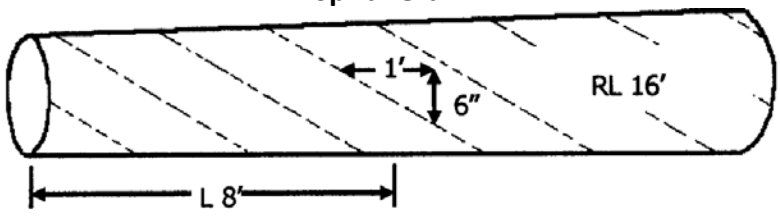
Exhibit 01 illustrates a 16-foot, 24-inch butt log with multiple defects in the large end. First estimate what fraction of the scaling cylinder is affected. About two-thirds of the tree is affected to some extent. Next, estimate the average length of the defects.

Example: Fire scar 10 feet, rot 6 feet, heart check 8 feet, making an average of 8 feet. The deduction then is 2/3 of 8 feet, or a 6-foot-length deduction.

33.8e - Spiral Grain

Any grain distortion that exceeds 3" per foot, or 1" in 4", will require a deduction. Measure spiral grain midway through the affected area. A 1" diameter deduction shall be taken for each inch by which the slope of grain exceeds 3" per foot.

33.8e - Exhibit 01
Spiral Grain



Spiral grain affects the entire log. Grain distortion measures 6" in 1-foot, which results in a diameter deduction of 3 inches.

33.8f - Stain

Stain normally affects quality of lumber recovery rather than quantity. Generally stains are blue or brown. No deduction is made when the stain is firm and light in color, but deduction is made when stain is associated with actual rot and there is a breakdown of the wood. When to make a deduction for stain in some species is difficult to know. Examine dark stain for rot, weather checks, or wormholes. Brown spots are generally an indication of actual rot. See Rot, Sap. Earlier stages of actual breakdown of wood can be determined frequently by driving the corner of a sharp hand-axe bit, or Hallin hammer, into the end of a log and twisting. If fibers break across, the wood is weakened. Fibers of firm sound wood will cut clean and pull straight out rather than tear or break across.

The significance of mineral stain and firm blackheart varies in different areas. Become familiar with any local guides concerning these indicators.

33.8g - Wormholes

Wormholes are classed as pin size, not over 1/16 inch in diameter; small, not over 1/4 inch in diameter; and large, over 1/4 inch in diameter. Pin and small wormholes are caused by different kinds of beetles; large wormholes by wood borers or grubs. Wormholes are common in logs cut from snags and in some down timber. When found in sap rot, the deduction for rot will also include any deduction for wormholes. When found in connection with catfaces and fire and lightning scars, include large wormholes in the measurements of those defects.

Make deductions only for large (grub) wormholes when they are massed and this condition causes an actual loss of volume. Generally use the pie-cut deduction method. The diameter-deduction method may occasionally be applied when wormholes are uniformly distributed around the log.

33.8g - Exhibit 01
Grubworm Holes - Pie-cut Method