IRREGULAR ROT AND MISSING WOOD DEDUCTION METHODS 8

8.0 Catface Rot - Single Catface

The essential measurements required to arrive at rot volumes are:

- The defect length in metres to the nearest tenth of a metre, and
- The width and height (large end) of the defect in rads.

8.1 Example and Illustration - Single Catface

In the example illustrated, a portion of the tree's circumference has been scarred. As a result, it does not form a cylinder for part of its length. Where the catface tapers out as illustrated, the defect approximates the shape of a segment of a cone.

This log is 7 m long with a 20 rad top and a 24 rad butt. The conical catface is 4.8 m long and is 18 rads wide by 10 rads deep at the butt face.

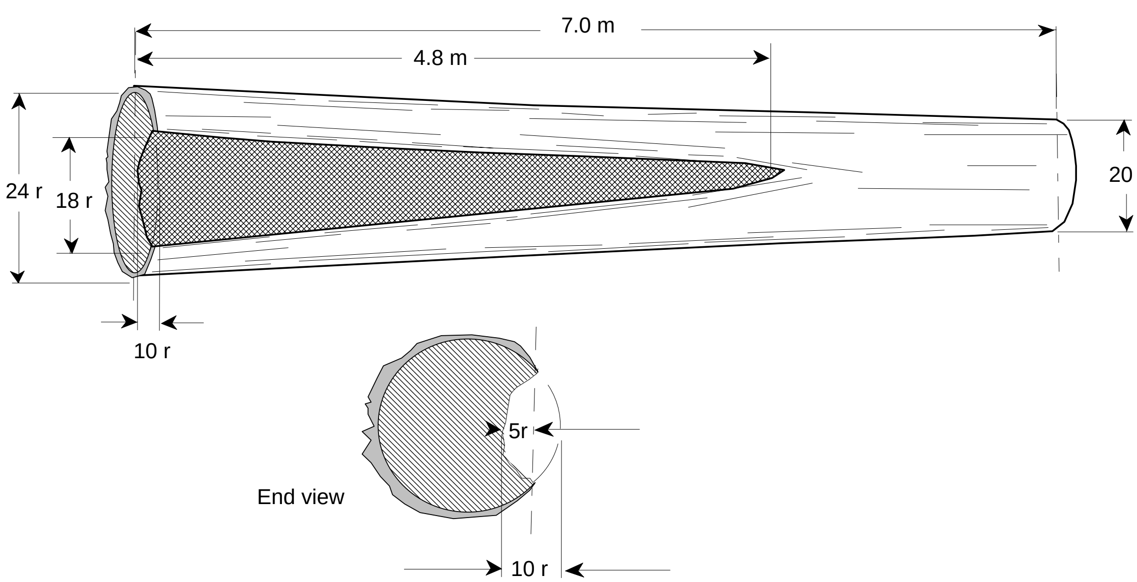

Figure 8.1 A log with conical catface

Figure 8.2 Catface deduction methods

Figure 8.3 These logs may have been damaged due to an animal eating the inner cambium

Figure 8.4 The large log in this photo may have been scarred at an early age. It healed with the catface at the butt

Figure 8.5 The above log may have been scarred by another tree falling and rubbing the sapwood of one side. It healed with a dry dead side

8.1.1 Field Calculation - Length Deduction

Calculate an end defect measurement in rads by dividing the sum of the width and height by 2.

$$\frac{10 + 18}{2} = 14 \text{ rads}$$

Calculate the defect volume by first looking up the half volume for 4.8 m 14 rads.

Half volume of 4.0/14	=	123 dm^3
Half volume of 0.8/14	=	+ 25 dm^3
Half volume of 4.8/14	=	148 dm^3

Next calculate the full volume by multiplying the half volume by two.

$$148 \times 2 = 296\ dm^3$$

Finally calculate the volume of the cone by dividing the cylinder volume by three.

$$\frac{296}{3} = 99$$

Defect volume = 99 dm^3

Calculate the average unit volume of the log by adding the ten metre half volumes of the end measurements of the log and dividing by 10, or by adding the unit volumes of the measurements and dividing by 2.

Half Volume of 10.0/24	=	905 dm^3
Half Volume of 10.0/20	=	+ 628 dm^3
Full Volume of 100/20/24	=	1533 dm^3
Unit volume of 010/20/24	=	153 dm^3 (AUV)

Calculate the length deduction by dividing the defect volume by the unit volume of the log.

$$\frac{99}{153} = 0.64\ m$$

Length deduction is rounded to 0.6 m.

Calculate the net length of the log by subtracting the length deduction from the gross length of the log.

7 m - 0.6 m	=	6.4 m
Net Volume	=	0.981 m^3 or 981 dm^3

Record the net dimensions as:

Length	Top	Butt
064	20	24

8.2 Catface Rot - Double Conical

The essential measurements required to arrive at rot volumes are:

- The defect length in metres to the nearest tenth of a metre, and
- The width and height at the largest point (usually near the middle) of the defect in rads.

8.2.1 Example and Illustration - Double Catface

In this figure a full double conical catface affects a 7 m log. A portion of the tree's stem has been scarred and does not form a cylinder for part of its length. Where the catface tapers out on both ends as illustrated, the defect approximates the shape of two cones attached at the base.

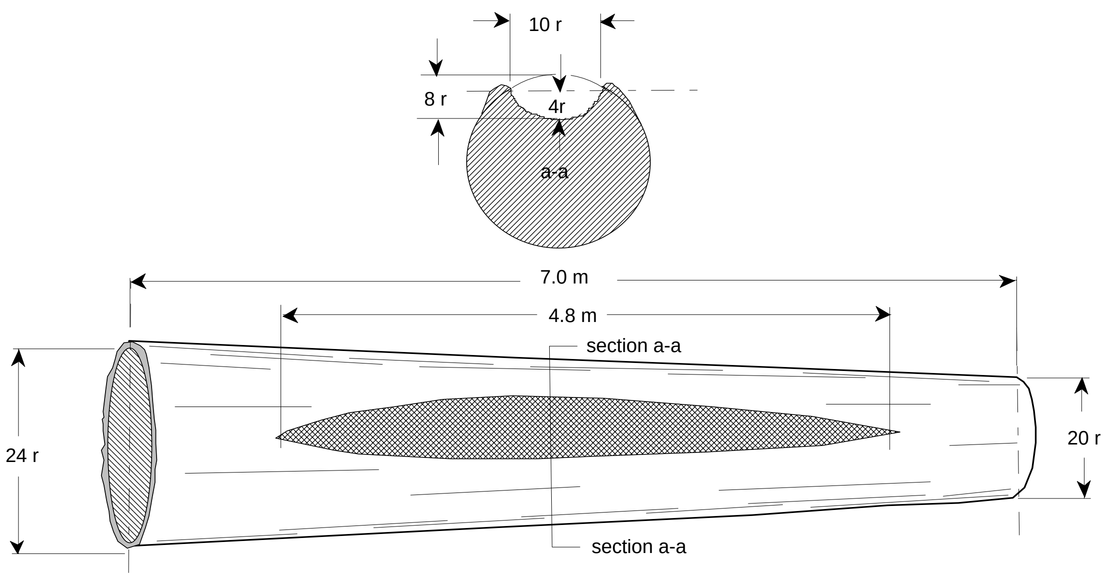

Figure 8.6 A log with a double conical catface

8.2.2 Field Calculation - Length Deduction

Calculate a centre defect measurement in rads by dividing the sum of the width and height by 2.

$$\frac{8 + 10}{2} = 9 \text{ rads}$$

Calculate the defect volume by looking up the half volume for the length of the defect, or 4.8 m and 9 rads.

Half volume of 4.0/09	=	51 dm^3
Half volume of 0.8/09	=	+ 10 dm^3
Half volume of 4.8/09	=	61 dm^3

(The half volume of a log 048/09 to get the full volume of 024/09)

Full volume of 2.4/09/09	=	61 dm^3
Volume of cone 2.4/09	=	61÷3 = 20 dm^3

Calculate the average unit volume of the log by adding the ten metre half volumes of the end measurements of the log and dividing by ten.

Half volume of 10.0/24	=	905 dm^3
Half volume of 10.0/20	=	+ 628 dm^3
Full volume of 10.0/20/24	=	1533 dm^3
Unit volume of 1.0/20/24	=	153 dm^3

Calculate the length deduction by dividing the defect volume by the unit volume of the log.

$$20 \div 153 = 0.13\text{m}$$

Length deduction is rounded to 0.1 m.

Calculate the net length of the log by subtracting the length deduction from the gross length of the log.

7 m - 0.1 m	=	6.9 m
Net Volume	=	1.025 m^3 or 1,025 dm^3

Record the net dimensions as:

Length	Top	Butt
069	20	24

Figure 8.7 Triangular rot in different sizes

Figure 8.8 Irregularly shaped rot

8.3 Triangular Rot Deduction Methods - Example

This log has pockets of rot. The pockets fit best into a triangle shape, and because there are no other indicators, the rot is assumed to travel half way through the log. This method may be applied to any other defect, which most closely fits a triangle shape.

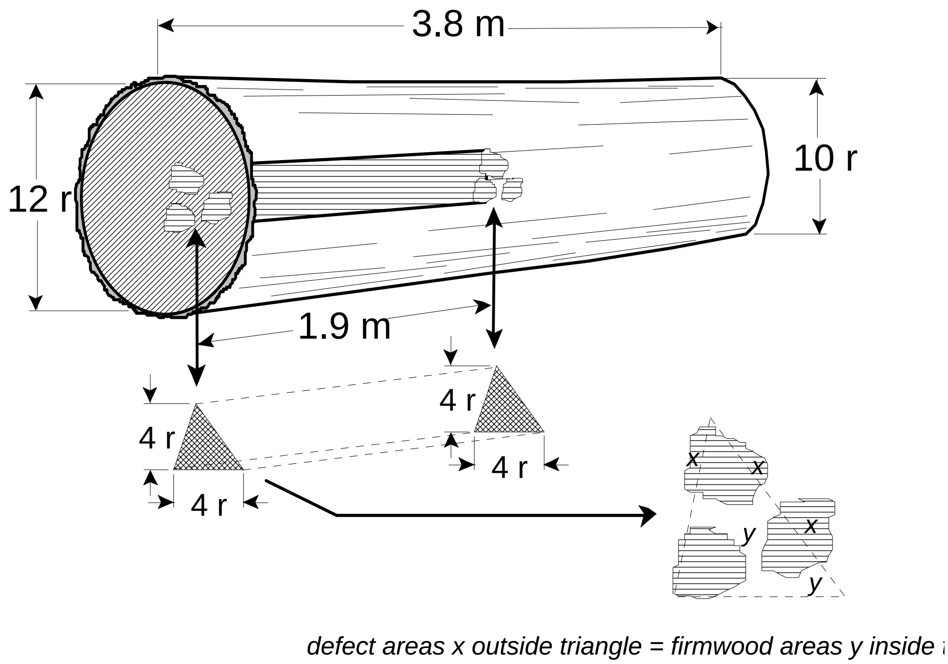

Figure 8.9 A log with partial length triangular defect

8.3.1 Field Calculation, Length Deduction Using the Prism Formula

This method of making a deduction is appropriate in cases where the shape of the defect most closely approximates that of a triangle.

In the case of multiple scattered pockets (5 rads or more apart) pockets, calculate the volume of each one and add them together and use one measurement.

Where there are several small close pockets (less than 5 rads apart), visually group them together and use one measurement.

The volume of firmwood between the pockets must be accounted for as shown above.

Whatever form a triangle may take the formula for finding its area is always one half the base times the height.

The triangle formula for scaling purposes is:

Unit volume	=	BH x 0.2

For the pocket rot visible at the end of the log:

Base	=	04 r
Height	=	04 r
Unit volume	=	04 x 04 x 0.2
Unit volume	=	3.2 dm^3

Multiply the defect unit volume by the length of the defect:

Defect volume	=	3.2 x 1.9 = 6 dm^3

Calculate the average unit volume for the log by adding the ten metre half volumes of the end measurements of the log and dividing by 10:

Half volume of 10.0/10	=	157 dm^3
Half volume of 10.0/12	=	+ 226 dm^3
Full volume of 10.0/10/12	=	383 dm^3
Unit volume (01.0/10/12)	=	38.3 or 38 dm^3

or by adding the unit volumes and dividing by two:

Unit volume of 10	=	31 dm^3
Unit volume of 12	=	+ 45 dm^3
The sum of same	=	76 dm^3
Divided by two	=	38 dm^3

Calculate the length deduction by dividing the defect volume by the average unit volume of the log:

$$\frac{6}{38} = 0.157\ m$$

The length deduction rounded is 0.2 m.

Calculate the net length by subtracting the length deduction from the gross length of the log.

3.8 m - 0.2 m	=	3.6 m
Net Volume	=	0.138 m^3 or 138 dm^3

Record the net dimensions as:

Length	Top	Butt
036	10	12

8.4 Missing Wood and Other Surface Defects

The essential measurements required to arrive at rot or missing wood volumes are:

- The length of the log in metres to the nearest tenth of a metre,
- The calipered diameters of both ends of the log at the points where the log is not affected by the defect,
- A factor for the missing portion of the log, or
- The measurements required for the shape of the defect in rads.

> It is tempting to reduce the length of the log by 1/2 the length of the defect, but it is a dangerous concept to "fold in" 1/2 of the defect. In this example, the defect is 4.8 m long, so a deduction of 2.4 m will understate the volume of the defect. If this same defect occurred at the top end of the log, the 2.4 m deduction would overstate the volume of the defect. The relationship between the defect and the average unit volume of the log must be established, and *only experienced scalers can visualise the correct deduction in this way.*

8.4.1 Missing Segments

Missing wood can take many forms. This example demonstrates the use of a percentage factor to represent the missing part, but any of the other methods described previously will serve just as well if they are more representative of the shape of the defect.

8.4.2 Example and Illustration - Missing Wood

The defect shown is typical of missing wood. Such defects as burn saddles or charred wood could also apply to this example, and in this case, the missing portion is equal to 50 percent or 1/2 the diameter of the log for 4.8 m.

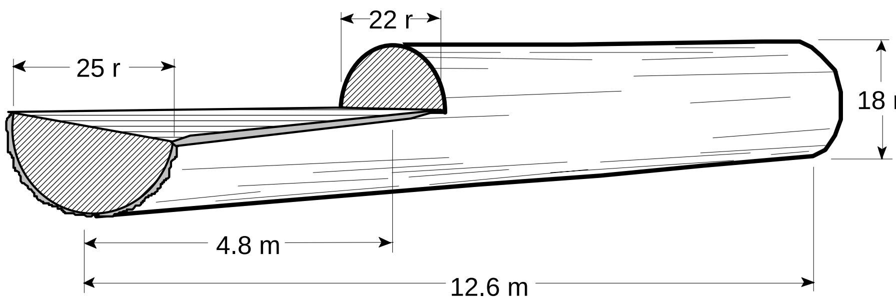

Figure 8.10 A log with missing wood

Figure 8.11 Log with missing portion

Figure 8.12 Log with missing wood

8.4.3 Field Calculation - Length Deduction

To reduce the recorded length measurement of the log to create a log with net dimensions equal to the net volume in the example, first look up the volume of a cylinder of the diameter and length of the log affected by the defect.

The half volume at the upper limit of the defect:

Half volume of 04.0/22	=	304 dm^3
Half volume of 00.8/22	=	+ 61 dm^3
Half volume of 04.8/22	=	365 dm^3

Plus the half volume at the lower limit of the defect:

Half volume of 04.0/25	=	393 dm^3
Half volume of 00.8/25	=	+ 79 dm^3
Half volume of 04.8/25	=	472 dm^3

Equals the full volume of the portion of the log affected by the defect:

Full volume of 4.8/22/25 = (365 + 472) = 837 dm^3

Multiplied by the percentage missing, is the volume of the defect:

Volume of defect = 837 x 0.5 = 418.5 = 418 m^3

Calculate the average unit volume for the log by adding the ten metre half volumes of the end measurements of the log and dividing by 10 or by adding the Unit volumes and dividing by 2.

Half volume of 10.0/18	=	509 dm^3
Half volume of 10.0/25	=	+ 982 dm^3
Full volume of 10.0/18/25	=	1491 dm^3
Unit volume of 01.0/18/25	=	149 dm^3

Calculate the length deduction by dividing the defect volume by the unit volume:

$$\frac{418}{149} = 2.805 \text{ m}$$

The length deduction rounded is 2.8 m.
Calculate the net length by subtracting the length deduction from the gross length of the log.

12.6 - 2.8	=	9.8 m
Net Volume	=	1.461 m^3 or 1461 dm^3

Record the net dimensions as:

Length	Top	Butt
098	18	25

8.5 Missing Sectors – Example and Illustration

This log has a pie-shaped sector split out of it. This sector is about 15 percent of the whole piece. Other surface defects such as lightning scars and frost checks *if they contain rot* are good candidates for this method of firmwood deduction.

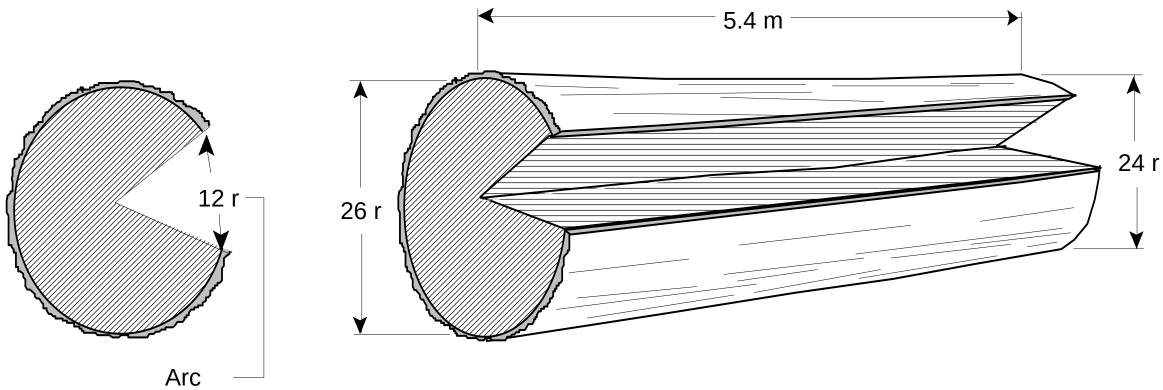

Figure 8.13 A log with sector defect extending to the heart

8.5.1 Field Calculation, Length Deduction Using a Factor

This example uses the application of a factor to determine net volume, in the same way as demonstrated in the previous example for missing wood. With pie-shaped defects that do not extend to the pith, however, it may be easier to find the volume of the defect by applying another shape as described in the Measurements Section of this chapter. This is because it is much more difficult to estimate the defect factor if it does not extend to the pith. That is, 75 percent of a log's volume is contained in the outer 50 percent of its diameter. If a defect penetrates half way to the heart, for example, the deduction is reduced by 25 percent.

To reduce the recorded length measurement of the log to create a log with net dimensions equal to the net volume in the example:

Using the scale stick, find the top end half volume:

Half volume of 05.0/24	=	452 dm³
Half volume of 00.4/24	=	+ 36 dm³
Half volume of 05.4/24	=	488 dm³

Find the butt end half volume:

Half volume of 05.0/26	=	531 dm^3
Half volume of 00.4/26	=	+ 42 dm^3
Half volume of 05.4/26	=	573 dm^3

Add the half volumes:

Full volume of 5.4/24/26	=	(488 + 573) = 1061 dm^3

85 percent of this log is sound, and the remaining 15 percent is defect, so the factor becomes 15/100 or 0.15. This factor may be easily visualised, if it is in simple fractions such as 1/4, 1/3, and 1/2. It can be calculated as a ratio of the circumference by multiplying the diameter by π and dividing the result into the arc of the defective sector, but finding the arc is not practical with conventional scaling tools. Degrees of arc is one option, using a watch or compass dial to learn to visualise sectors which are not obvious divisions of 360 degrees.

Factor from formal calculation:

Radius times π	=	26 x 3.14159 = 82 r circumference
Defect arc factor	=	12r arc ÷ 82 = 0.146 = 0.15 or 15 %

Factor from a clock face, major divisions in 12ths (secondary divisions in 60ths (minutes) which are equal to 6 degrees):

Position of hands	=	12:00 to 9 minutes
Defect arc factor	=	9 ÷ 60 = 0.15 or 15 %

Factor from a compass, major divisions in 8ths or 16ths (secondary divisions in 36ths or 10 degrees):

Position from north	=	54 degrees
Defect arc factor	=	54 ÷ 360 = 0.15 or 15 %

There are several incremental options available to the scaler just from these two common objects, and of course, that which is most comfortable and familiar is preferred, even a piece of paper, which may be easily and accurately folded into 16ths.

Multiply the gross volume by the factor to obtain the volume of the defect.

Volume of defect	=	1061 x .15 = 159 dm^3

Calculate the average unit volume for the log by adding the ten metre half volumes of the end measurements of the log and dividing by 10:

Half volume of 10.0/24	=	905 dm^3
Half volume of 10.0/26	=	+ <u>1062 dm^3</u>
Full volume of 10.0/24/26	=	1967 dm^3
Unit volume of 01.0/24/26	=	197 dm^3 (AUV)

or by adding the unit volumes and dividing by two.

Unit volume of 24	=	181
Unit volume of 26	=	+ <u>212</u>
The sum of same	=	393
Divided by two	=	196.5 or 196 dm^3 (AUV)

Calculate the length deduction by dividing the defect volume by the average unit volume of the log (two examples are shown here to demonstrate that although the result from using half volumes and from using unit volumes is different (197 vs. 196), the length deduction is the same):

$$\frac{159}{197} = 0.807 \text{ m}$$

or

$$\frac{159}{196} = 0.811 \text{ m}$$

The length deduction rounded is 0.8 m.

Calculate the net length by subtracting the length deduction from the gross length of the log.

5.4 - 0.8	=	4.6 m
Net Volume	=	0.905 m^3 or 905 dm^3

Record the net dimensions as**:**

Length	Top	Butt
046	24	26

8.5.2 Field Calculation, Length Deduction Using a Factor, Shortcut

In a "net" volume scale, it is easiest to simply apply the defect factor to the gross length of the log.

Calculate the length deduction by multiplying the gross length of the log by the defect factor.

5.4 x 15 % (0.15) = 0.81 m

Calculate the net length by subtracting the length deduction from the gross length of the log.

5.4 - 0.8 = 4.6 m

Net Volume = 0.905 m^3 or 905 dm^3

Record the net dimensions as:

Length	Top	Butt
046	24	26