BUTT ROT 4

4.0 Identifying Butt Rot

Butt logs are usually identified by observing the large end for flare, fluting, and/or faller's signs such as an undercut or hinge in hand felled trees, or the characteristic face left by a harvesting machine. It is important not to confuse heart rot and butt rot. Although heart rot may show in a butt cut log, and butt rot may show in a second cut log, the rot can usually be identified by its nature. For example, brown cubical butt rot is recognizable by the way the wood fibres are affected. As its name implies, the rot is brown, crumbly, and breaks easily into cubes. The "conk" rots, recognizable by the white, yellow, orange, or brown "fleck", are indicators of heart rots and are discussed in the following section on heart rot. Advanced scalers not only know the difference between, and the effects of, different species of rot, but also the variations in the effects by locale. The following basic methods apply to butt rot.

1. Where rot appears only in the butt end of a butt log, treat it as butt rot unless other indicators are present, such as conk knots or conk rot.

2. Butt rot visible at the butt end only will be assumed to be conical in shape, with the same basal diameter as the average diameter of the visible end section of the rot.

3. Conical butt rot that extends the full length of a log may treated as though it is through running heart rot. However, if the rot diameter at the butt is greater than 1.5 times the rot diameter at the top, the cylinder (Smalian's) formula will tend to over deduct the volume of rot, and averaging the diameters will understate the volume of rot. If bucking is impossible, adjustments are required.

   There are two ways to do this; if using the cylinder formula, the rot diameter at the butt may be reduced to the difference between the calipered butt diameter and twice the average collar thickness. If averaging the diameters, the result will be closer to true defect volume of the neiloid or "golf tee" shape typical of logs with a high degree of flare. By adding 1 rad to the average, the result will be closer when the defect is a frustrum of a cone. The cylinder formula is suitable for rot shapes that are parabaloid (bullet) in shape.

4. The diameter of butt rot used for deduction calculations must not exceed that of the recorded butt measurement where the actual measurement of butt rot exceeds the line of normal taper. This is a common occurrence in decadent logs with a great deal of butt flare.

Figure 4.1 Butt rot associated with a frost check

Figure 4.2 Typical butt rot

There are many factors which affect the distance butt rot runs up from the stump, species, flare, taper, size, and age all contribute. Without indicators to establish rot penetration, it becomes necessary to estimate the length of the rot.

In the Yukon, the average distance which butt rot travels in most logs is approximately 15 times the radius of the rot in centimetres, if there are no indicators to the contrary. For example, if the radius is 25 cm, (same as the diameter in rads), 25 x 15 = 375 centimetres, or 3.75 m. The penetration is therefore 3.8 m (rounded).

Figure 4.3 Butt rot with missing wood, showing how butt rot runs as a cone.

4.1 Butt Rot Deduction as a Conical Defect

This method of calculation is usually used for defects found in and confined to the butt end of a first cut or butt (flared) log (i.e., butt rot), but this method may be used for all defects that have a geometrical shape of a cone or portion of a cone.

4.1.1 Example and Illustration - Butt Rot Visible at Butt End of Log

This figure depicts a typical log with conical butt rot measuring 25 rads in diameter and estimated to penetrate 15 times the radius, or 3.8 m.

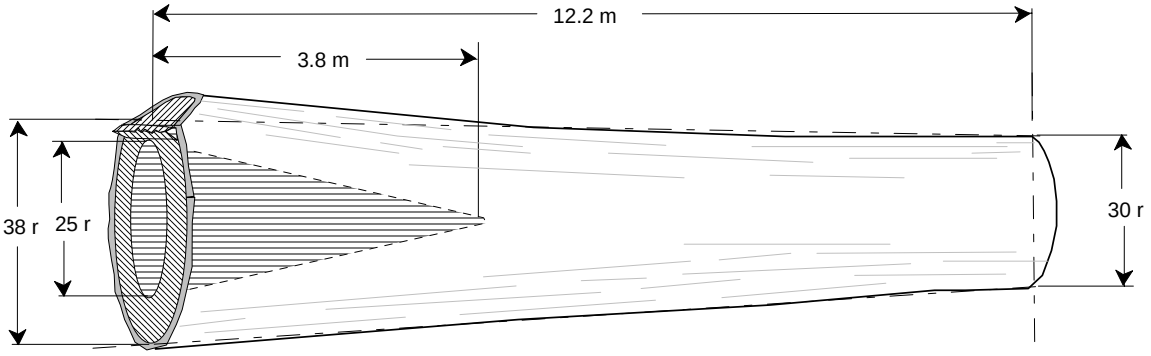

Figure 4.4 A log with butt rot - one end visible

Figure 4.4 shows the essential measurements required to arrive at butt rot volumes:

- The estimated defect length in metres to the nearest tenth of a metre, and
- The defect diameter visible at log end in rads.

4.2 Field Calculation - Length Deduction - Butt Rot Visible at Butt End of Log

The gross length of a log is reduced by an amount equal to the defect volume. The result is a log with a net length equal to the net volume.
Defect volume:

Half volume of 3.0/25	=	295 dm³
Half volume of 0.8/25	=	+ 78 dm³
Half volume of 3.8/25	=	373 dm³
Full volume of 3.8/25	=	746 dm³ (2 x 373)

Divide cylinder volume by three to obtain the volume of the defect:

746 divided by 3	=	249 dm³

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

Half volume of 10.0/30	=	1414 dm^3
Half volume of 10.0/38	=	+ 2268 dm^3
Full volume of 10.0/30/38	=	3682 dm^3
Full volume of 01.0/30/38	=	368 dm^3 (AUV)

Or, calculate the average unit volume of the log by adding the unit volumes of the end measurements and dividing by two:

Unit volume of 30	=	283 dm^3
Unit volume of 38	=	+ 454 dm^3
Total	=	737 dm^3
Divided by 2	=	368.5 dm^3 = 368 dm^3 (AUV)

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

$$\frac{249}{368} = 0.677 \text{ m}$$

The length deduction rounded is 0.7 m.

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

12.2 - 0.7	=	11.5 m
Net Volume	=	4.234 m^3 or 4234 dm^3

Record the net dimensions as:

Length	Top	Butt
115	30	38

4.3 Butt Rot - Through running

The essential measurements required to arrive at the volume of rot where butt rot extends through the entire length of a log are:

- The defect length in metres to the nearest tenth of a metre, (the same as the measured log length), and
- Both defect end diameters in rads.

4.3.1 Example and Illustration - Butt Rot Visible at Both Ends of Log

Figure 4.5 depicts a typical log with conical butt rot measuring 30 rads and 6 rads in diameter and penetrating the full length of the log. Because the rot diameter at the butt is more than 1.5 times the rot diameter at the top, and the shape is the frustum of a cone, (30/6 = 5 times), an overstatement of the defect volume will result from summing the half volumes or from finding the average unit volume, and an understatement of the defect volume will result from averaging the diameters. Although it is possible to arrive at the volume of rot using a formula for the frustum of a cone in these cases, it is not yet practical to apply as a field method.

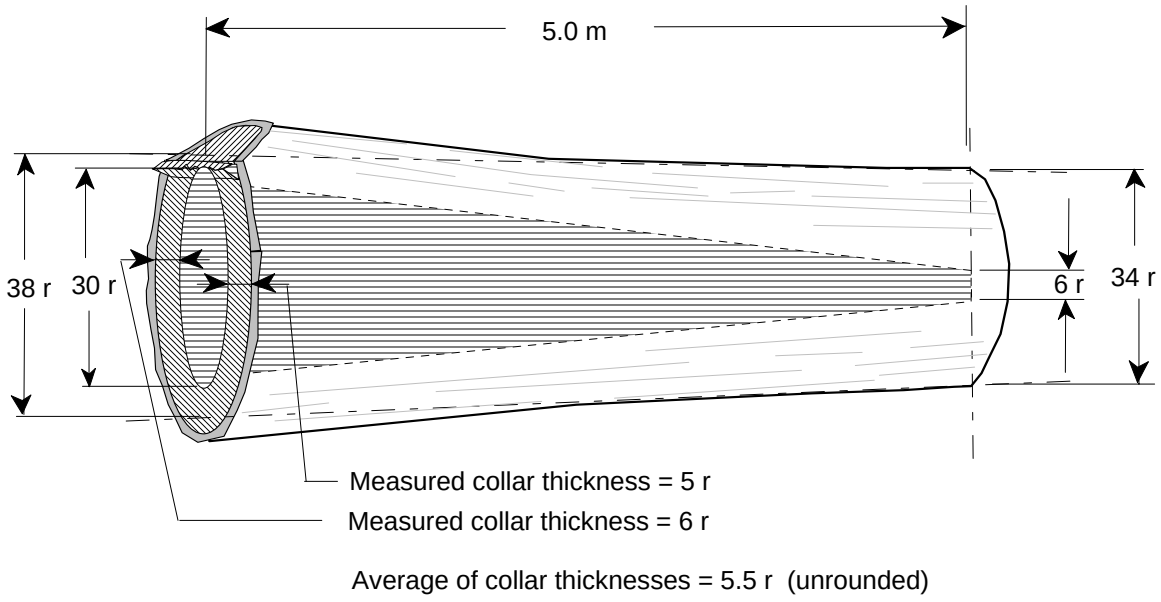

Figure 4.5 A log with butt rot - through running

It is the general rule to treat butt defect as conical, and in many geographical areas, no other treatment is used. However, intimate experience with certain species and growth conditions may indicate that a neiloid (golf tee) shape, a parabaloid (bullet) shape or conoid (frustum of a cone) shape is valid. In these cases, different field approaches may be used for through running defects with extreme taper (the ability to use these parameters is governed by local conditions).

1. If the shape is assumed to be neiloid, average the diameters.
2. If the shape is assumed to be parabaloid, use the average of the end areas.
3. If the shape is assumed to be conoid, use one of the two following field methods.

4.3.2 Field Calculation - Length Deduction

The gross length of the log is reduced by an amount equal to the defect volume. The result is a log with a net length equal to the net volume. When conical butt rot projects through to the top end of a log it becomes a frustum of a cone. There are two field methods to arrive at the defect volume without resorting to excessive calculation.

Method 1 (Neiloid / Conoid)

Determine the difference between the calipered butt diameter and twice the average collar thickness to obtain a reduced rot diameter at the butt (collar measurements are required at the butt to determine average collar thickness).

Calipered butt diameter	=	38 rads		
(Measured rot diameter	=	30 rads)		
Average collar thicknesses	=	$\frac{5 + 6}{2}$	=	5.5 rads
Twice av. collar thickness	=	5.5 x 2	=	11 rads
Reduced butt rot diameter	=	38 - 11	=	27 rads

Defect volume:

Half volume of 5.0/06	=	28 dm^3
Half volume of 5.0/27	=	+ 573 dm^3
Full volume of 5.0/06/27	=	601 dm^3

Method 2 (Parabaloid / Conoid)

Average the top and butt defect diameters. But because the rot is parabaloid and taper is extreme, add 2 rads to the average, i.e. where the defect diameter at the butt exceeds the defect diameter at the top by:

- ≤ 1.5 times, use the average
- > 1.5 times and ≤ 2 times, use the average plus 1 rad
- > 2 times, use the average plus 2 rads

Average defect diameter	=	$\frac{6 + 30}{2}$	=	18 rads
Adjusted defect diameter	=	18 + 2	=	20 rads

Defect volume:

Half volume of 5.0/20	=	314 dm³
Half volume of 5.0/20	=	+ 314 dm³
Full volume of 5.0/20/20	=	628 dm³

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

Half volume of 10.0/34	=	1816 dm^3
Half volume of 10.0/38	=	+ 2268 dm^3
Full volume of 10.0/34/38	=	4084 dm^3
Full volume of 1.0/34/38	=	408 dm^3 (AUV)

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

From method 1:	$\frac{601}{408}$	=	1.47 m
From method 2:	$\frac{628}{408}$	=	1.53 m

The length deduction is rounded to 1.5 m and negates the difference between the two concepts in this case.

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

5.0 - 1.5	=	3.5 m
Net Volume	=	1.429 m³ or 1429 dm³

Record the net dimensions as:

Length	Top	Butt
035	34	38