CGNF Standards and Procedures for the Coast Forest Region

Effective November 1, 2006 (optional)
or January 1, 2007 (mandatory)

BRITISH COLUMBIA

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Introduction and Overview of Call Grading/Net Factoring

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The standards in this manual are developed to assess the use of net factoring and call grading (CGNF) procedures for the coastal appraisal system. This manual contains the standards and procedures used to call grade and net factor timber for appraisal cruising in coastal B.C. They replace the use of the 1976 loss factors and computer grades. See the current *Cruising Manual* for other procedures and standards.

They are a combination of standards and procedures commonly used by the forest industry and the Ministry of Forests and Range, Forest Analysis and Inventory Branch.

CGNF uses cruiser estimates of decay, waste and value for individual logs in a tree. The loss factors use computer based decay, waste and breakage factors that are applied to all logs in a tree equally and log grade algorithms that are linked to pathological indicators and historic scale. CGNF provides better tree and site specific volumes and value than the loss factor system.

The system is designed to be consistent and auditable. The net volume principles, procedures and standards will be fine tuned through an unbiased net volume adjustment process that will be applied as post-cruise compilation factors known as species net volume adjustment factors (NVAF).

It is important that cruisers use a common set of principles, procedures and standards, so that logs are net factored and graded in a similar manner.

Net factors are localized to specific logs. Each loss indicator has a procedure for determining the amount of sound wood deduction for rot and missing wood in each log. The grade is the descriptor for each net factored log and the grades are grouped into end-use sorts for determining the selling prices. The system is based on the principle that the cruiser will always attempt to use the longest standard length within the highest sort.

Following is an example of the CGNF process:

1. Identify potential diameter limits, major form and surface characteristics.

2. Determine the sort lengths (13, 11, 8 metres) and sort length combinations that will provide the best sort per top diameter limits.

3. Inspect for any sound wood losses and use of non-standard log lengths. Calculate the net factors for the log lengths using the conventions illustrated in this manual.

4. Using the standards in this manual, assign the appropriate grade to the log.

1.1 Call Grading and Net Factoring

Call grading and net factoring are processes used to assess timber quality and net tree volume. The processes do not attempt to predict grade based on falling breakage or manufacturing process, or to predict volume loss without direct evidence.

1.1.1 Call Grading

Call Grading is a procedure that assigns a descriptor grade to a standard log length on a tree. As call grading assigns a length to a log. A net factor or percentage of sound wood remaining is also applied.

The process is hierarchical. The cruiser selects the highest "sort" that the tree will support. The standard sorts are lumber, peeler, sawlog, gang, shingle, utility, pulp and non-recoverable.

The cruiser then selects the first grade within that sort which will provide the longest standard log length. Standard log lengths are 13, 11 and 8 metres. For example the lumber sort has three grades (D, F, B). If the tree will support a 13 metre "F", but only an 8 metre "D" then the log will be a 13 metre "F".

The log lengths can be either "standard" or "variable". For the determination of standard lengths the cruiser attempts to assign the longest allowable standard length for a grade in the highest sort. Logs will normally not be longer or shorter than the standard lengths. Variable lengths are allowed for the occurrence of poor tree form and/or severe defect and/or unique grade considerations. See Table 1.

1.1.2 Net Factoring

Net Factoring is a procedure whereby the cruiser assigns a net factor (% sound) to the log that is being graded. The principle for the net factoring procedures is to measure any rot or missing wood directly and reduce the log volume percent sound-wood remaining. If the rot or missing wood cannot be directly measured, then a set of standard procedures for each defect is applied. No other deductions are made for local knowledge.

Deductions normally measured directly are:

- Butt rot (when visible),

- Missing wood (scars, burns, etc.),

- Sap rot.

Deductions normally determined by applying a procedure are:

- Conk,

- Blind conk,

- Rotten branches,

- Root rot,

- Rot in forks,

- Crooks,

- Broken tops,

- Frost cracks, and

- Soundings

The net factors that are used to assign the net merchantable volume will be further adjusted by a series of net volume adjustment factors (NVAF) in the compilation program.

Table 1: Summary of Sorts, Grades, Standard Log Lengths and Application Notes

The following end use sorts, grades and standard lengths will be used:

SORT TYPE	GRADE	STANDARD LENGTHS (m)	NOTES
Lumber	D,F,B	13,11,8	Min length 5 m
Peeler	C	13,11,8	Min length 5 m
Sawlog	H,I	13,11,8	Min length 5 m
Gang	J	13,11,8	Min length 5 m
Shingle	K,L,M	13,11,8	Min length 4 m, 1 m multiple up to 13 m / attempt to use standard lengths.
Utility	U,X	13,11,8	Min length 5 m
Pulp	Y	13,11,8	Min length 3 m, 1 m multiples up to 13 m / attempt to use standard lengths.

Log lengths of 4 and 6 m are allowed for all sorts for helicopter logging only.

NON SORT	GRADE	STANDARD LENGTHS (m)	NOTES
Breakage	Z Shatter and non-recoverable	1 m multiples	Z grade is not intended to meet the statutory definition of firmwood reject.
Missing Wood	N	1 m multiples	Net Factor = "00"

1.1.3 Tree Form

Irregular tree forms such as forks/crooks/pistol butts may necessitate the use of non-standard log lengths. Pencil bucking Y or Z-grade segments is acceptable if the tree form will affect the standard log length and/or sort. See Figure 1.1 where tree form affects the standard log lengths.
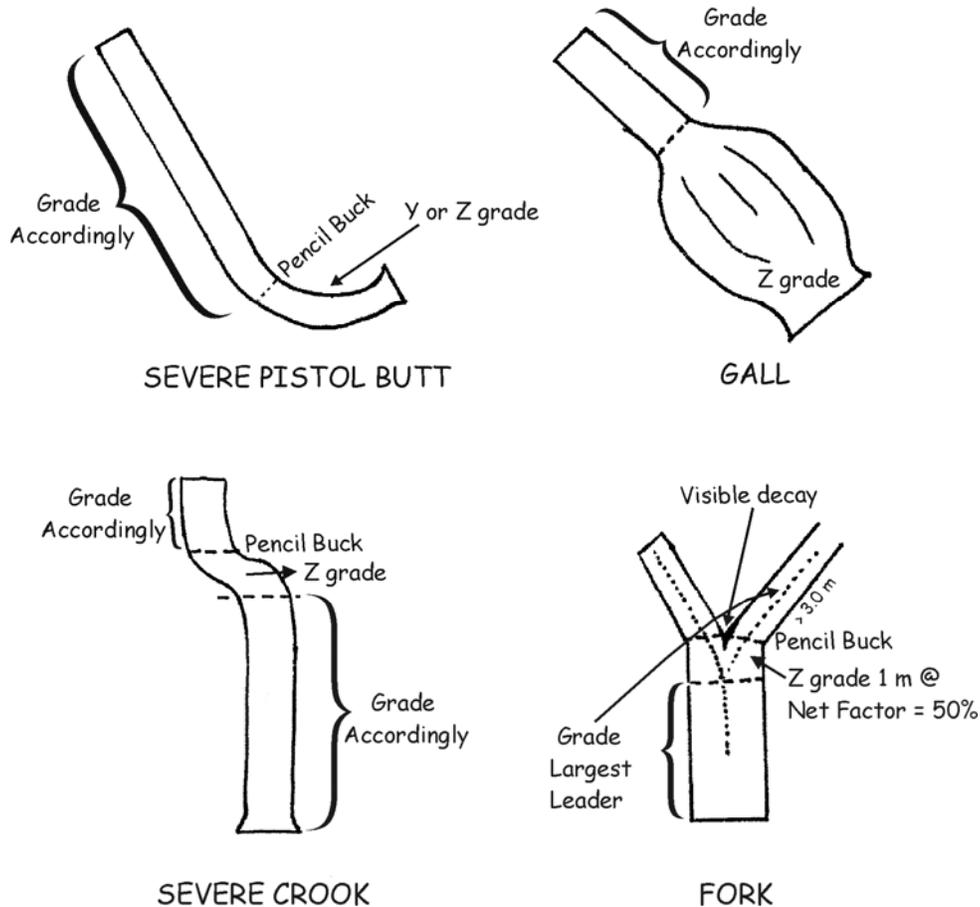
Figure 1.1 Irregular Tree Form.

Major defects may necessitate non-standard log lengths.

Shingle cedar can be 4 metres to 13 metres and 1 metre increments to accommodate excessive decay and bark seams.

Helicopter log lengths are per weight restrictions. The 4 and 6 metre lengths can only be used in pre-identified helicopter cutblocks.

The last log in a tree will almost always have a non-standard length and so it is always coded as a "99". The computer calculates the last log length based on the taper equation and merchantable top diameter.

Fallen trees with roots attached will have a 1 metre Z grade for the first log is they are < 100 cm at DBH and a 2 metre Z grade if they are > or = 100 cm.

1.2 Objectives

To provide a procedure-based estimate of net tree volume and quality that is repeatable and auditable.

1.3 Conventions/Procedures

a. A dead tree is tallied if it contains a butt log 8 metres or more in length and has a grade of U or better.

b. The primary objective is to have logs in the correct end use sort. Grades within the sort are a secondary objective.

c. The grades and the grading rules are modifications of the statutory log grading rules and are not intended to match statutory grading rules and logic.

d. The standard lengths are 13, 11 and 8 metres.

e. Specified helicopter operations have the additional options of 6 metres and 4 metres.

f. Shingle lengths are a minimum of 4 metres increasing in 1 metre increments up to 13 metres.

g. Grade Z is used for non-recoverable and shatter and grade "N" is used for nothing there (missing wood).

h. The last log in a tree is described by "99" to indicate that the sort runs to the top of the tree.

i. Ring shake is recognized for all species except Cedar and Cypress and can be considered on all trees with the following characteristics:

   • Large trees that have been sheltered throughout most of their growth but have a major broken top (40 cm) as a result of wind damage, or

   • Large trees without a broken top which have clearly been exposed to wind over an extended period of time (e.g., vets in an immature stand).

j. Butt logs with ring shake cannot be in peeler or lumber sorts. In general, ring shake should be isolated by using an 8 metre butt log.

k. Windfall trees (with their roots attached) up to 100 cm DBH will have a 1 meter "Z" grade in the butt log.

l. Windfall trees (with their roots attached) over 100 cm DBH will have a 2 metre "Z" grade in the butt log.

m. Standard procedure-based deductions will be used to determine the extent of the defect and the net factor calculation (% sound wood).

n. Pencil bucking is used to section the tree into standard log lengths by sort. A grade is assigned and the log is net factored.

o. Net factoring is only used for sound wood loss only caused by decay or missing wood.

p. If it is necessary to calculate log volumes the convention will be to use DBH for the butt log diameter and the estimated mid-point diameter for logs above the butt log.

q. Sounding will be used to assess the presence of hidden butt rot. If a hollow sound is detected then a 0.8 m length deduction is removed from the butt log. Sounding cannot be applied if there is any visible rot or net factor procedure that affects the tree below 2.4 m.

> It is recommended that an "S" is painted on the tree where the sounding is heard. If there are safety concerns for cruisers or licensees, then do not sound the tree(s).

r. The species codes are required for mountain hemlock (Hm) and western hemlock (Hw or H) because they have separate NVAFs. A tree recorded as H will always default to the western hemlock NVAF.

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Net Factoring 2

2.1 Net Factoring Process

1. In conjunction with the end use sorts, standard log lengths and cruiser call grading rules, determine the applicable log lengths for each tree to the nearest whole metre.

2. Using measurements and procedure-based deductions, calculate the net volume expressed as a net factor for each log section.

3. Loss indicators that extend below ground level are considered in the net factoring process.

    For example, a frost crack that extends from minus 0.5 to plus 1.5 is calculated as a 2.0 metre frost crack. The loss is applied to the first log. Similarly a root rot conk present on the ground is applied to the first log.

4. Assign a net factor to each log. If the log has no measurable sound wood loss then the net factor is 100%. Record the net factor as two dashes (--).

5. Note that direct volume "measurement" deductions (net factoring) by log are made where the decay or missing wood is both visible and physically measurable. For example:

    - Butt rot,

    - Missing wood,

    - Scars,

    - Saprot.

    Where this is not possible, procedure based deductions are applied. For example:

    - Conk,

    - Blind conk,

    - Frost cracks,

    - Rotten branches,

    - Root rot,

    - Rot in forks or crooks,

    - Rot in broken tops,

    - Soundings.

2.2 Net Factoring Deductions

Net factoring deductions for this manual will normally be expressed as length deductions. The net log length expressed as a percent of the gross log length represents the net factor in percent. For example, an 8.0 metre log may have a 0.8 m deduction due to rot. The net factor is 90% because 10% of the log length is missing (7.2/8.0) x 100 = 90%.

Some situations may require lookup tables or log volume calculations.

Logs are considered cylinders for log volume calculations and decayed portions may be rectangular (such as scars), cylindrical (such as conks) or conical (such as butt rot). The following conventions and formulas shown in Table 2 will be used in the calculations.

Diameter: length of a straight line passing through the centre of a circle.

Radius: line extending from the centre of a circle to the circumference (½ diameter).

L = length; W = width; D = depth; R = radius.

Table 2 Formula for Calculating Volume

Shape	Formula
Rectangular solid	Volume = L * W * D
Cylinder	Volume = π R^2 * L
Cone	Volume = (1/3) π R^2 * L
Units must be consistent (all cm or all m).	

2.1.1.2 Applying Deduction Rules

Table 3 Summary of Procedures for Determining Net Factor for Loss Indicators

Defect	Form	Method	Deduction Area	% Sound or Length Deduction Area	Grade
Heart Rot Conk	Cylindrical	Procedure	2 m above conk 4 m below conk	50%	Y
Root rot (fruiting body on ground)	Conical	Procedure	3 m	0.6 metres	assigned*
Blind Conk	Cylindrical	Procedure	4 m above conk 6 m below conk	50%	Y
Frost crack	Other	Procedure	extent of frost crack	0.1 m per lineal metre of frost crack	assigned*
Scar	Rectangular	Calculate	extent of scar	calculated	assigned*
Cat face/Butt rot	Conical	Calculate	extent of scar	calculated	assigned*
Fork	Other	Procedure	if decay present: 1 m below	0.5 metre	Z
Crook	Other	Procedure	if decay present: 1 m below	0.5 metre	Z
Rotten branch	Cylindrical	Procedure	1 m above 1 m below	1.0 metre	Z
Dead top	Other	Calculate	live crown to top of tree	Usually $\left(\dfrac{d}{D}\right)2$	assigned*
Broken top	Other	Procedure	broken off portion if decay present 1.0 m below break	00 1.0 metre	N assigned*
Sounding	Conical	Procedure	0.8 m length deduction	calculated	assigned*
Direct Observation	Other	Procedure	various	calculated	assigned*
* Assigned by cruiser in the field					
* * d = diameter of sound wood/D = outside diameter log					

Table 3 Notes

Calculated = net factor calculated based on formulae in this manual.
Assigned = Grade assigned from grade consideration based on surface characteristics and decay percentage.
Table = Reference tables in this manual.
Z-Grade = non-recoverable fibre.

2.3 Deduction Procedures for Loss Indicators

2.3.1 Heart Rot Conk

The standard is that conk rot extends 2 m above the conk and 4 m below it. This creates a 6 m pulp log (Y grade) with a net factor of 3 metres or 50%.

For example, a tree with 22 m of sawlog quality and a conk at 12 m could be pencil bucked as a sawlog for 8 m, pulp (Y grade) for 6 m (net factor 50%), then sawlog for 8 m.

Table 4 Deduction Procedure for Heart Rot Conk

Form	Cylindrical
Method	Procedure
Deduction area	2 m above conk; 4 m below
% Sound of deduction area (net factor)	50% or 3 metre length deduction
Grade	Y

Formula

Net Factor =   (Net Log Length/Log Length) x 100%

For example (6.0 – 3.0)/6.0 x 100 = 50%

For multiple conks, decay is assumed to extend 2 m above the top conk and 4 m below the lowest conk. The connected length is given a net factor of 50% and a grade of Y.

Do not overlap conk and blind conk deductions as they are not cumulative. The net factor can be less than 50% if there are other indicators associated with a conk or blind conk segment.

> Fomitopsis pinicola is considered a heart rot for this procedure when it is on live cambium. (e.g., not on a dead tree or a dead portion of the tree). See the *Cruising Manual* Appendices for descriptions of the heart rot conks.

2.3.2 Root Rot

All root rots are assumed to be conical in nature. Unless otherwise observed, the standard procedure is that the cone of rot extends 3 m from the ground and that the ratio of the diameter of the rot to the diameter of the butt is 75% (¾).

The length deduction for the 3 metre section is 0.6 metre. If the fruiting body is located on the stem, then the butt rot length will be based on a cone that extends 3 metres above the highest fruiting body and the base of the cone will be a ¾ ratio.

Table 5 Deduction Procedure for Root Rot

Form	Conical
Method	Standard
Deduction area	0 - 3 m
Length deduction	0.6 m (if fruiting body is on the ground)
Grade	Assigned

Formula

Net Factor =   (Net Log Length)/Log Length * 100%

EXAMPLE

Log length: 8 m; Rot extends: 3 m

Net Factor   =   (8 - 0.6) / 8 x 100

        =   7.4 / 8 x 100

        =   93 %

Figure 2.1 Example of Net Factor Calculation for Root Rot.

If Schweintizii butt rot is encountered the net factoring process will apply the loss as a root rot [0.6 metre length deduction].

2.3.3 Blind Conk

Coastal zone: typically the cambium is collapsed.

Table 6 Deduction Procedure for Blind Conk

Form	Cylindrical
Method	Procedure
Deduction area	4 m above conk; 6 m below
% Sound of deduction area (net factor)	50% or a 5 metre length deduction.
Grade	Y

Formula

Net Factor = (Net Log Length/Log Length) x 100

For the example below: $(11 - 5)/11$ x 100% = 54%

EXAMPLE

Log length = 11 m, blind conk at 6 m

Net factor = (11 m - 5 m)/11 m x 100% = 54 %

2.3.4 Frost Crack

Table 7 Deduction Procedure for Frost Crack

Form	Other.
Method	Procedure.
Deduction area	Log.
% Sound of deduction area (net factor)	0.1 metre deduction for each 1 m of frost crack in log.
Grade	Assigned.

Frost crack(s) that run across the grain of the log may result in a loss of merchantable volume and lower sort and/or grade.

Formula

Net Factor = (Net Log Length/Log Length) x 100%

For the example below: (11.0 – 1.4)/11.0 x 100% = 87%

EXAMPLE
Log length: 11 m; Two frost cracks are located as follows: 6 m long (from 0 m to 6 m)   8 m long (from 3 m to 11 m) Deduction = 0.1*(6m+8m) = 1.4 m Net Factor = (11.0 – 1.4)/11.0 x 100 % Net Factor = 87%
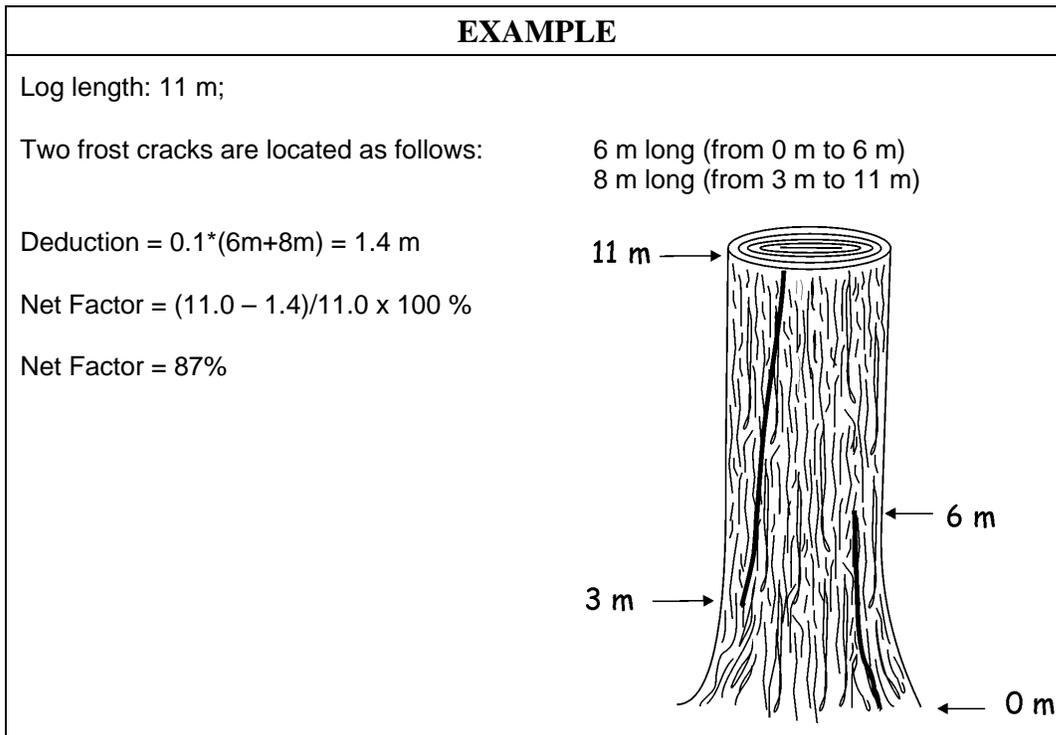
Figure 2.2 Example of Net Factor Calculation for Frost Cracks.

2.3.5 Scar

Table 8 Deduction Procedure for Scar

Form	Rectangular
Method	Calculate
Deduction area	Extent of scar
% Sound of deduction area (net factor)	Calculated
Grade	Assigned

<u>Procedure #1 - When depth of rot can be measured and expressed as a rectangle.</u>

For example, butt scars. Note that this is one procedure that uses volume as a deduction rather than length.

Formula

Net Factor =   (Net volume of Log)/(Gross Volume of Log) * 100%

For the example below: (8.42/8.64) x 100% = 97%

Assume the scar is rectangular:

Decay volume = length * width * depth

Assume the log is cylindrical (diameter at DBH for butt logs, midpoint diameter for other logs):

Log volume = π * radius^2 * length

A net factor less than 95% is rare for a scar.

EXAMPLE

Log length: 11 m; diameter: 100 cm
scar: length 11 m, width 20 cm, depth 10 cm

1. Volume of Decay   = L * W * D (volume of rectangle)
                         = 11 m * 0.2 m * 0.1 m
                         = 0.22 m^3

2. Volume of Log   = π R^2 L (volume of cylinder)
                         = π * (0.5 m)^2 * 11 m
                         = 3.14 * 0.25 m^2 * 11 m
                         = 8.64 m^3

3. Net Factor   = (8.64-0.22)/8.64 * 100%
                         = 8.42/8.64 * 100%
                         = 97.454 - closer to 97%

<u>Procedure #2 - Rot is visible but cannot be easily converted to a rectangular form or cannot easily be measured. This is a length deduction rather than the previous volume deduction.</u>

Formula

Net Factor =   **(Net Log Length/Log Length) x 100%**

For the example below: (12.7/13.0) x 100% = 98%

1. Estimate width and measured length of scar on log.

2. Calculate circumference of log at the scar (π x D).

3. Calculate "length" deduction = 1/2 (width of scar/circumference of log) x scar length.

4. Net Factor = (net log length/original log length) x 100.

EXAMPLE

Log length: 13 m; diameter: 100 cm
scar: length 11 m, width 20 cm, depth pie shape to pith

1. Circumference = π x D = 314 cm

2. Width of scar = 20 cm

3. Length deduction = 1/2 (20/314) = .03

   Length of scar = 11 m, .03 x 11 = .3 m

4. Net Factor = (12.7/13) x 100 = 98%
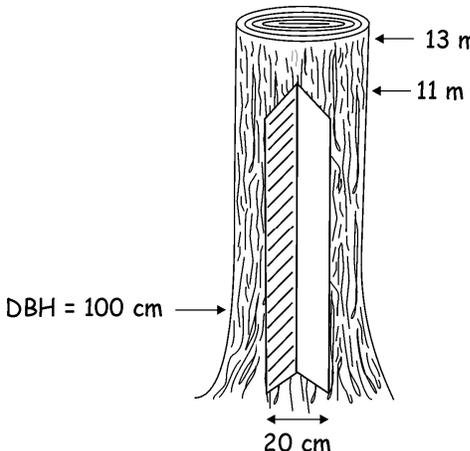
Figure 2.3 Examples of a Net Factor Calculation for Scars with Known Depth.

1. Estimate width and measure length of scar on log.

2. Calculate circumference of log at the scar (π * D).

3. Calculate "Length" deduction = ½ (width of scar/circumference of log) *scar length.

4. Net Factor = (volume of log-decay volume)/volume of log * 100%.

2.3.6 Cat Face/Butt Rot

Cat face is normally a "dry side" without rot. It is usually net factored the same as a scar. If the cat face is rotten then it is treated as butt rot.

Table 9 – Deduction Procedure for Butt Rots

Form	Cylindrical/Conical
Method	Calculate
Deduction area	Extent of Scar
% Sound of deduction area (net factor)	Calculated
Grade	Assigned

There are three methods of dealing with this form of internal decay:

Procedure #1 - Cylindrical Defect of Known Length

Formula

Net Factor =   (Net Log Length/Log Length) x 100%

For the example below: (7.3/13) x 100% = 56%

EXAMPLE

Log length: 13 m; Cylindrical butt rot length; 12 m
Diameter = 80 cm and rot 55 cm

Deduction length = $(55/80)^2$ x 12 = 5.7 metres

Net Factor = (13.0 - 5.7)/13 x 100

= **56%**

13 m →

← 12 m

DBH = 80 cm →

← Decay = 55 cm
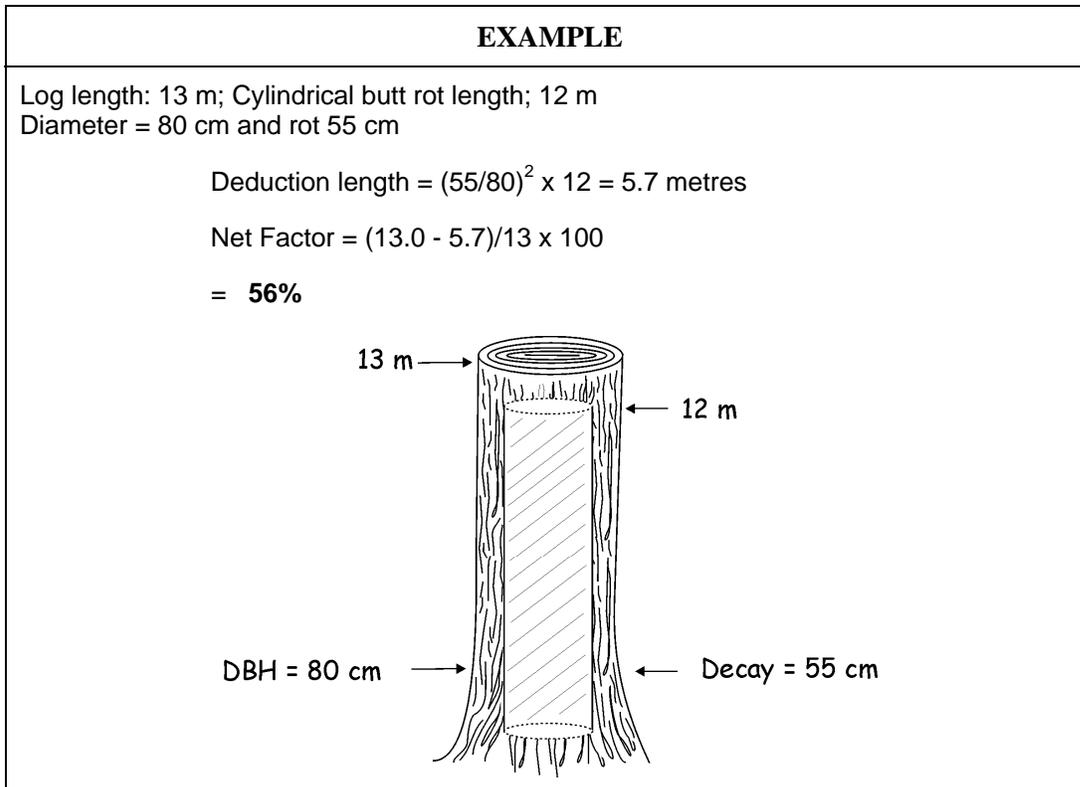
Figure 2.4 Example of Net Factor Calculation for Cylindrical Defect.

Procedure #2 - Conical Defect of Known Length

Formula

Net Factor =   **(Net Log Length/Log Length) x 100%**

For the example below: (11.1/13) x 100% = 85%

Note that a cone is 1/3 of the volume of a cylinder.

EXAMPLE

Log length: 13 m; conical butt rot length; 12 m
 Diameter = 80 cm and rot 55 cm

Deduction length = $(55/80)^2/3$ x 12 = 1.9 metres

Net Factor = (13.0 - 1.9)/13 x 100

= **85 %**
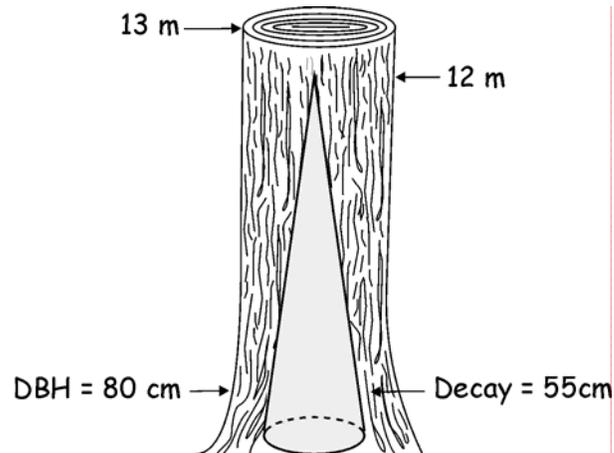
Figure 2.5 Example of Net Factor Calculation (conical).

Procedure #3 - Conical Defect of Unknown Length (See Table 10)

Formula

   Net Factor =   (Net Log Length/Log Length) x 100%

   If the extent or length of rot is unknown then the deduction is based on the
   ratio of the diameter of rot at stump height to the DBH. Figure 2.5 –
   55/80 = approx. ¾.

   From the table (length deduction for 3/4 1.2 metres)

   Net factor = (13.0 - 1.2)/13 X 100 = 91 %

1. Find the ratio (diameter of decay/DBH)

2. Use Butt Rot table for ratio of butt rot.

3. Determine the nearest ratio and apply the length deduction.

4. Net down the log length and express the net factor as a percent of the original length.

Butt rot is generally included with the log for its maximum sort length.

The Butt Rot Guide (Table 10) gives the conical butt rot ratios by log length. Note that
the grade consideration in Table 10 and surface characteristics of the log will determine
the sort. Deductions and grade considerations are based on diameter of rot at stump
height/DBH ratio. Calculate the ratio to the nearest ¼ diameter, determine the length
deduction from the table below, and calculate the net factor. The rot diameter is measured
at the stump height.

Table 10 Butt Rot Guide for Length Deductions

Ratio	Length Deduction (volume loss)	Grade Consideration* (length not availabe for manufacture)
¼ diameter	0.2 m	0.6 m
½ diameter	0.4 m	1.8 m
¾ diameter	1.2 m	3.6 m
$^4/_4$ diameter	2.4 m	4.2 m
Sounding	0.8 m	2.4 m
*Grade consideration denotes the loss of % merch in the log. Merch is defined as capable of sawing 2 by 4's at least 8 feet long.		

EXAMPLE

The butt rot length is not visible, therefore we need a process to determine deduction length.

Rot diameter   = 55 cm; DBH = 100 cm; log length = 11 m

Ratio = rot diameter/log diameter = 55/100=1/2

The deduction is 0.4 m length.

Net Factor   =   (11-0.4)/11

               =   **96%**

Figure 2.6 Example of Net Factor Calculation (using butt rot table).

2.3.7 Sounding

Formula

Net Factor =   (Net Log Length/Log Length) x 100%

               =   (13 – 0.8)/13 x 100

               =   94%

Sounding will be used to assess the presence of hidden butt rot. If a hollow sound is detected then a 0.8 m deduction is removed from the butt log. Sounding cannot be applied if there is any visible rot or net factor procedure that affects the tree below 2.4 m.

2.3.8 Fork

In general, a fork only becomes a "pencil bucking" point if there is significant enough offset in the log that will reduce the % merch. If the crook is severe, like a school marm for example, then it may be bucked out in one-metre lengths as "Z" grade. If there is rot in the fork then it will be net factored.

Table 11 Deduction Procedure for Fork with Visible Decay

Form	Other
Method	Procedure
Deduction area	1 m below
% Sound of deduction area (net factor)	50%
Grade	Z

2.3.9 Crook

In general, a crook only becomes a "pencil bucking" point if there is a significant enough offset in the log that will reduce the % merch. If the crook is severe, like a severe pistol butt for example then it may be bucked out in one-metre lengths as "Z" grade. If there is rot in the crook then it will be net factored.

Table 12 Deduction Procedure for Crook with Visible Decay

Form	Other
Method	Procedure
Deduction area	1 m below
% Sound of deduction area (net factor)	50%
Grade	Z

2.3.10 Rotten Branch

Table 13 Deduction Procedure for Rotten Branch with Visible Decay

Form	Cylindrical
Method	Procedure
Deduction area	1 m above the rotten branch; 1 m below
% Sound of deduction area (net factor)	50%
Grade	Z or assigned

> For multiple, overlapping rotten branches/knots (less than 2 m apart), deduction extends 1 m above and below the series.

2.3.11 Dead Tops

(Broken tops are handled separately.)

Rot must be visible before a net factor can be applied. Rot is treated as sap rot. If the decay is not measurable (e.g., at the top of the tree) then apply a net factor of 85% to the rotten portion. If it can be measured then use the following procedures:

Formula

Net Factor =   (Net Log Length/Log Length) x 100%

For the example below: (6.9/8.0) x 100% = 86%

Table 14 Deduction Procedure for Measurable Sap Rot

Form	Other
Method	Calculate
Deduction area	From top of live crown to tree length
% Sound of deduction area (net factor)	Calculated
Grade	Assigned

Weather checked wood may affect the sort, but will not affect the sound wood content (net factor).

EXAMPLE
Midpoint diameter 20 cm, Length of rot 3 metres, Top log length 8 metres 2 cm depth of sap rot (= 16 cm of sound wood) Sound wood length $(16/20)^2$ x 3 = 1.9 metres Length Deduction = 3 – 1.9 = 1.1 metres Net Factor = (8.0 – 1.1)/8 x 100 = **86 %**

Figure 2.7 Example of Net Factor Calculation for Measurable Sap Rot.

2.3.12 Broken (Missing) Tops

The tree is graded and net factored to the broken top (pencil buck at the break). The missing portion is graded as "N" with a net factor of "00" (no sound wood).

Table 15 Deduction Procedure for Broken Tops

Form	Other
Method	Procedure
Deduction area	from break to original top
% Sound of deduction area (net factor)	00 = no sound wood (length = 99)
Grade	N (nothing)

If a top can not be assigned to a tree then it is treated as a separate piece for "in/out" procedures and is graded uniquely.

If a top is found on the ground and can be assigned to a tree, then attach it to that tree as a log and assign a grade and net factor.

Table 16 Deduction Procedure for Rot Associated with Log Below Broken Top

Form	Other
Method	Procedure
Deduction area	1 m below the break
% Sound of deduction area (net factor)	Calculated
Grade	Assigned

Visible rot is assumed to run 1 m below the break.

Formula

Net Factor =   (Net Log Length/Log Length) x 100%

EXAMPLE
Last log length is 10 m up to a broken top with visible decay. Net Factor   =   ((10m-1.0m)/10m) * 100% = 90%, followed by a "N9900".

Figure 2.8 Example of Net Factor Calculation for Broken Tops with Decay.

2.3.13 Fallen Trees

Fallen trees with their roots attached will have a 1 metre Z-grade for the first log if they are < 100.0 cm at DBH and a 2 metre Z-grade if they are > or = to 100.0 cm. This standard is applied to account for safety and/or machine practices.

The following procedure will be used to record whether the tree is standing or fallen:

- Standing - in the down tree column (63) code blank: trees that are self supporting (that is, the tree would remain standing if all supporting materials were removed).

- Fallen - in the down tree column (63) code E or G. Refer to section A.6.3 of the *Cruising Manual*.

- If the tree has been mechanically or hand felled then the 1 m or 2 m Z grade bucking allowance does not apply.

2.3.14 Multiple Defects

In general, the assignment of net factors to trees with multiple defects is left to the professional judgement of the cruiser.

Several concepts are noted below:

Net factors less than 50% will only occur with severe:

- cylindrical butt rot,

- sap rot,

- missing wood,

- conk or blind conk segments accompanied by other indicators. (do not double call over-lapping conk and blind conk segments.), or

Sound sections 5 m or longer between defects may be treated as separate logs. If sections that are 5 m or longer are a different sort then they must be treated as separate logs. Sound segments less than 5 m are included with the adjacent log segment(s). See Figure 2.9.

EXAMPLE

Conk at 12 m and 20 m. This creates a 2 m section between the defect areas, so we can combine all three sections into one log.

Deduction length	=	$2 \times (4 + 2) = 12$ m
Log Length (from 8 m — 22 m)	=	14 m
Conk Deduction 50% (of 12 m)	=	6 m
Grade (all 3 sections)	=	Y
Net Factor		= (length of log - length of ded.)/length of log * 100%
		= (14 m-6 m)/14 * 100%
Net Factor		= 57%

Note: The same procedure should be used whenever grade is assigned, particularly for butt rot and/or cat face.
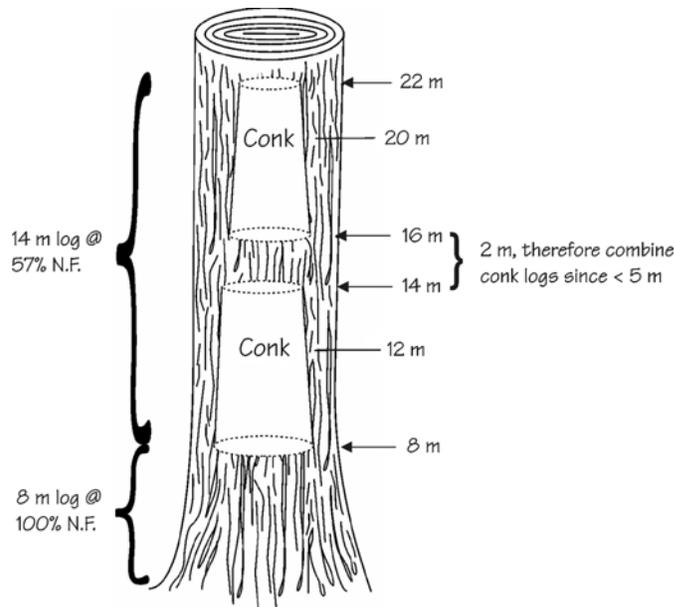
Figure 2.9 Example of Isolated Sections between Defects.

If the upper conk were at 23 m, it would create a 5 m log between the two defects. This log would be treated as a separate sound log with its own grade. This would create three separate logs, each with its own grade and net factor.

2.3.15 Dead Standing and Dead Fallen Trees

a. Dead Trees – dead trees do not have any live cambium at DBH.

b. A dead tree is tallied if it contains a butt log 8 metres or more long and has a grade of U or better. If there is at least an 8 metre U grade log then record all of the logs in the tree.

c. Dead fallen trees must have at least 8 metres of U- grade after the 1 m or 2 m Z-grade segment.

d. Dead fallen and dead standing trees that are shattered (Z grade) or broken below the 8 metre log will commence with the 8 metre assessment after the break or shatter.

e. If down trees have been mechanically or hand felled then the 1 m or 2 m Z-grade bucking allowance does not apply.

Call Grading 3

3.1 Introduction

This section outlines the steps needed to assess the quality of measured trees.

3.2 Definitions

Call grading is the procedure used to assign one of the modified coastal log grades to standing and fallen timber based on the hierarchical log sorts. Grading is a hierarchical process based on the scaling conventions using top diameter inside bark, knot size (location and distribution) as well as the percentage of recoverable or sound wood available for cutting.

3.2.1 Procedures

- The cruiser will be able to grade the log into the appropriate log sort. The sorts are lumber, peeler, sawlog, gang, shingle, utility and pulp.

- Logs are assigned to sorts, the maximum standard log length is selected and then graded based on size, quality, sound wood recoverability and merchantability.

- Grades are assigned using the hierarchy of grades within a sort. Start with the longest standard log length for the highest grade in the sort. If the standard log length for any of the sort grades cannot be accommodated, then use the next lower sort.

- The longest standard length within the sort is assigned. If a sort continues up a tree for say 20 metres, the log will be divided into standard log lengths of 11 m and 8 m, respectively. The last metre will be attached to the next log up the tree.

- A log cannot be "one sort or another". It is not a choice of market preference, current harvesting practices, accessibility, or other factors. A log is the highest grade it qualifies for within the hierarchy.

- ALL trees (live or dead, standing or fallen) will be call graded and net factored.

- All saw log grades must be at least 5 metres long and Y-grade must be at least 3 metres long.

- Record whether the tree is alive (L) or dead (D).

- Record whether the tree is mature (M) or second growth (S).

- Grade consideration is applied by the cruiser to determine the percentage of soundwood available for manufacturing. It includes deductions for rot, missing wood and surface characteristics as well as wood unavailable due to defect shape or characteristics. The grade consideration due to butt rot is shown in Table 18 below. For example, a sawlog (H-grade) fir log that is 8 m long and has a 45 cm top and severe butt rot (3/4 ratio):

    i. Net factor = (8.0 m - 1.2m)/8.0 m = 85%

    ii. Grade consideration = 3.6 m (Table 18) = (8.0 m - 3.6 m)/8.0 m = 55%

    iii. Therefore it is an I-grade since it does not meet the minimum lumber percentage criteria for an H-grade.

Measure all log lengths from the high-side ground level.

Determine the longest standard length and highest sort that the butt log can be based on the grading rules and standard log lengths.

If the length can be maintained for longer than 13 m, then try and assign standard log length combinations to optimize the sort. Record the grades and the length.

Record the grade and the length. For example, a 16 m sawlog would be divided into two 8m sawlogs.

The last grade on the tree will have a "99" recorded to the top regardless, of the utilization limits. Try not to create short logs at the top of the tree.

When the whole tree is the same grade, do not call the whole tree one length using the "99" convention. Use the standard lengths and end with "99".

Cut Stems - If the tree has missing portions then the missing portion is graded as "N" and net factor "00".

Table of Standard Lengths

SORT TYPE	GRADE	STANDARD LENGTHS (m)	NOTES
Lumber	B, D, F, G	13, 11, 8	Min length 5 m
Peeler	C	13, 11, 8	Min length 5 m
Sawlog	H, I	13, 11, 8	Min length 5 m
Gang	J	13, 11, 8	Min length 5 m
Shingle	K, L , M	13, 11, 8	Min length 4 m, 1 m multiple up to 13 m / attempt to use standard lengths.
Utility	U, X	13, 11, 8	Min length 5 m
Pulp	Y	13, 11, 8	Min length 3 m, 1 m multiple up to 13 m / attempt to use standard lengths.

Log lengths of 4 and 6 m are allowed for all sorts for helicopter logging only.

NON SORT	GRADE	STANDARD LENGTHS (m)	NOTES
Breakage	Z Shatter and non-recoverable	1 m multiples	Z grade is not intended to meet the statutory definition of firmwood reject. Use length of "99" for lengths that will be extended to the merchantable top.
Nothing	N	1 m multiples	Use NF = 00

3.2.2 Grading Conventions and Guidelines

Conventions

- All dead trees or pieces, standing or fallen must have at least one U-grade or better butt log that is at least 8 metres long.

- The primary objective is to have logs in the appropriate end use sort. Grades within the sort are a secondary objective.

- The grades and the grading rules are simplifications of the statutory grading rules and are not intended to match statutory grading rules and logic.

- The standard lengths are 13, 11 and 8 metres.

- Specified helicopter operations have additional options of 6 metres and 4 metres.

- Shingle lengths are a minimum of 4 metres increasing in 1 metre increments up to 13 metres.

- Pulp (Y-grade) lengths are in increments of 1 metre. Attempt to use standard lengths.

- Grade "Z" is used for non-recoverable and shatter, and grade "N" is used for nothing there (missing wood).

- The last log in a tree is described "99" to indicate the top of the tree.

- Ring shake is recognized for all species except Cedar and Cypress.

  - Large trees that have been sheltered throughout most of their growth but have a major broken top (40 cm) as a result of wind damage, or

  - Large trees without broken tops which have clearly been exposed to wind over an extended period of time (i.e., vets in immature stands).

- Butt logs with ring shake will not grade peeler or lumber.

- Windfall trees (with roots attached) and up to 100 cm DBH will have a 1 metre "Z" grade in the butt log.

- Windfall trees (with roots attached) and over 100 cm DBH will have a 2 metre "Z" grade in the butt log.

- Standard procedure-based deductions will be used to determine the extent of the defect and the calculation of the net factor (% sound wood).

- Pencil bucking for non-standard log lengths is used for tree shape (forks, pistol butt) as well as extreme decay or missing wood.

- If it is necessary to calculate log volumes the convention will be to use DBH for the butt log diameter and the estimated midpoint diameter for logs above the butt log.

3.2.3 Guidelines

3.2.3.1 Heart Rot:

- Conk, blind conk, and rotten branches have specific lengths and grades applied.

Conk	Y	2 m above, 4 m below, 50% sound
Blind Conk	Y	4 m above, 6 m below, 50% sound
Rotten Branch	Z	1 m above, 1 m below, 50% sound

- Severe cylindrical cat face should be pencil bucked at the top of the cat face, with that length and net factor used to determine the grade.

3.2.3.2 Butt Rot

- Butt rot is generally included with the log for its standard length with the exception of the cedar shingle sort.

- Refer to the Butt Rot Guide for the Length Deduction table. Note that the net factor may determine the grade, based on the % lumber recovery or other grade requirements. The table also provides a guide for "grade considerations".

- Butt rots are considered to be conical unless there is visible evidence that it is cylindrical.

- Schweinitzii - The section affected by schweinitzii and other butt rots can not be a peeler sort.

Table 18 Butt Rot Guide for Length Deductions

Ratio	Length Deduction	Grade Consideration*
¼ diameter	0.2 m	0.6 m
½ diameter	0.4 m	1.8 m
¾ diameter	1.2 m	3.6 m
$^4/_4$ diameter	2.4 m	4.2 m
Sounding	0.8 m	2.4 m
*Grade consideration describes how much of a log will not produce 2 by 4's at least 8 feet long.		

3.2.3.3 Frost Cracks

- Multiple frost cracks and their position around the tree may affect lumber recovery and must be considered in the determination of the sort and grade.

- Peeler sorts will not permit frost cracks.

> The angle, position, or net factor will determine the appropriate grade based on % lumber recovery and/or % merchantable.

3.2.3.4 Occasional Larger Knots

All sawlog grades (H, I, J, U and X grades) can have occasional larger knots (OLK's) to the extent of one per 3 meters of log length [two per 3 meters for X grade logs over 50 centimetres top diameter]. The oversize knots must be confined to the portion of the log where the allowable knots are permitted.

3.2.3.5 Weather Checks and/or Insect Damage

- A check is a separation of the wood, at right angles to the annual rings. There is no sound wood deduction for weather checks or insect damage unless there is rot associated with them.

- Logs with <10 cm sound core are Y-grade

- Logs with <10 cm sound collar are Y-grade.

Formula for Grade Consideration Calculation of Sound % Lumber

where r = radius of the portion that can be sawn into lumber, and
    R = radius of tree

EXAMPLE

DBH = 50 cm; Radius of tree (R) = 25 cm; Sun check = 5 cm
Radius of sawable lumber portion (r) = 20 cm
Whole tree is weather checked

$$\% \text{ Recovered} = \frac{\pi r^2}{\pi r^2} \times 100\%$$

$$= \left(\frac{20}{25}\right)^2 \times 100\% \text{ or } \left(\frac{40}{50}\right)^2 \times 100\%$$

  (These give the same mathematical result.)
  = 64% lumber recovery

Note – If the weather check was sap rot, the net factor would be 64%.
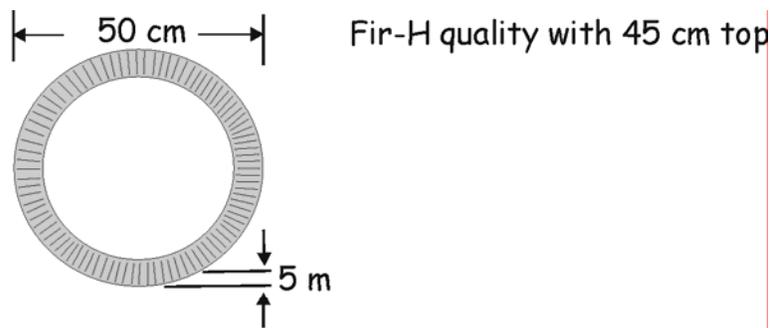
$$\% \text{ Recovery} = \frac{r^2}{R^2} \times 100\%$$

$$= \left(\frac{40}{50}\right)^2 \times 100\%$$

$$= 64\%$$

Figure 3.1 Example of Grade Calculation for Weather Checked Logs.

3.2.3.6 Twist

- There is no sound wood deduction for twist.

- Grade considerations are applied.

- The amount of twist is estimated for 30 cm at the displacement point of the log. The percentage of twist is calculated by dividing by the estimated top diameter of the log. Twist must be less than both of these restriction as per the table below. For example, a D grade must deviate by no more than 6 cm over the 30 cm distance, and the displacement divided by the top diameter in cm must not exceed 4%.

- Twist comprises two factors: percentage of top diameter; and maximum displacement over 30 cm at the mid-point of the log. Table 19 shows the maximum values for specific grades. If the parameters are not met, the next lower grade applies.

> Do not use the procedure for measuring twist that is used in *Chapter 6* of the *Cruising Manual.*

Table 19 Maximum Twist Displacement by Grade

Grades		% of top diameter	Maximum displacement (over 30 cm) estimated @ midpoint
Lumber/Shingle	D, F, G, K	4%	6 cm
Peeler	B, C	7%	8 cm
Sawlog/Shingle	H, L, M	7%	8 cm
Sawlog	I	10%	9 cm
Sawlog	J	10%	4 cm
Utility	U, X	13%	13 cm
Note: Spiral grain that runs from one side of the log to the other within 2 metres is automatically Y grade. If twist only appears on a portion of a tree and will affect the sort, then apply a shorter standard length.			

EXAMPLE

Calculations
Estimated top DIB: 60 cm for log section
Severe twist 8 cm (along 30 cm section)

% twist = (8 cm twist)/(60 cm top) * 100% = 13%

This log is graded as U, since this is the first grade met in the hierarchy (other defects may lower the grade further).

Figure 3.2 Examples of Grade Calculation for Twist.

3.2.3.7 Cedar Shingle Criteria

Cedar will not be graded as a shingle if it can make a sawlog grade. If a log, due to heart rot, butt rot, or is not suitable for sawlog due to fluting, breakage, excessive butt rot, etc. but meets slab thickness requirement for that grade, the log becomes shingle grade. Lengths in 1 m increments are acceptable staring at 4 metres.

Initial Grade	Changes To
D grade	K grade
F grade	L grade
H/I grade	M grade

3.2.3.8 Lumber Grades

Log grade merchantability criteria will typically be written as "90% surface clear". In application this indicates 10% of the log may have knots or knot indicators on any surface from the top of the log with the remaining 90% of the log being clear of knots. There is not a limit to the size of the knots or indicators. The lumber grades do not allow any conk or visible conk stain. Butt rot is allowed as long as the minimum lumber and merchantable requirements are met. If knot indicators are not visible, assume that knot indicators will extend 2 branch whorls below the last visible stubs or branches.

3.2.3.9 Tree Form

Sweep, major forks, pistol butt and any odd shapes which will normally be left behind during logging may be pencil bucked out and graded appropriately.

3.2.3.10 Last Log

- Mature block - last log generally an "X" to the top, sometimes "Y". CGNF to a 15 cm top.

- Second growth block or maturity unknown - last log generally a "U" grade. CGNF to a 10 cm top.

3.2.3.11 Dead/Dry Tops

Dead and dry tree tops are often severely weather checked. If there is evidence of sap rot and the depth will reduce the core diameter to less than 10 cm, then record the log as Y-grade (pulp).

3.2.3.12 Ring Shake

Ring shake or water shake is the separation of the annual rings. If any of the following conditions are met (except cedar and cypress), then the butt log grade will not be considered suitable for the lumber or peeler sorts and a standard log length of 8 metres will be assigned:

- Large trees that have been sheltered throughout most of their growth but have a major broken top (40 cm) as a result of wind damage, or

- Large trees without broken tops which have clearly been exposed to wind over an extended period of time (i.e., vets in an immature stand).

3.2.3.13 Missing Wood and Separated Pieces

a. For all chunks and tree pieces > 8 metres length the DBH is measured 1.3 m up from the big end.

b. If it is obvious that the tree piece originated from a nearby stump, then CGNF all of the portions as one tree.

c. Project the total height of trees with broken tops and record the projected height in the tree height column of the cruise tally card. Record the grade and net factor of the missing portion as "N 99 00".

3.3 Revenue Call Grading Criteria

CGNF CRUISING

FIR & PINE (No Pine Peelers)

DIMENSIONS		CUT (min)	KNOTS (max diameter)
D LBR	▶5.0m ▶76cm	75 %	90% surface clear
F LBR	▶5.0m ▶60cm	75 %	60-75cm, 75% surface clear ▶76cm, knots allowed 75% 1 side or 50% 2 sides
B PLR	▶5.0m ▶60cm	80 % Veneer	60-75cm, 1 clear butt block ▶76cm, knot ind butt block
C PLR	▶5.0m ▶38cm	80 % Veneer	4cm max
H S/L	▶5.0m ▶38cm or ▶50cm	75 % 50 %	▶38cm to 4cm reas well spaced, or 5cm on top 1/2 *, ▶50cm, 5cm on top 2/3 *, or 8cm on top 1/2 * * 2cm on bottom portions
I S/L O/W	▶5.0m ▶38cm or ▶50cm H Quality	75 % 50 % 50 %	▶38cm, to 8cm ▶50cm, to 9cm ▶76cm, to 10cm
J S/L	▶5.0m 15 – 36cm	75 %	15-26cm, to 4cm 28-36cm, to 6cm
U UTL or or	▶5.0m 10-14cm ▶5.0m 15-36cm ▶5.0m ▶38cm	75 % 66.7 % 50 %	10-14cm to 4cm; 15-26cm to 6cm 27-36cm to 8cm; 38-48cm to 10cm 50-74cm to 12cm; ▶76cm to 14cm
X UTL	▶5.0m ▶10cm	33.3 %	same as U, except ▶50cm allow 2 OLK / 3m
Y CHPR ▶3.0m, poorer than X UTL, better than Z NON RECOVERABLE			
Z for appraisal – Z is NON RECOVERABLE (NRec)			

HEMLOCK & BALSAM

D LBR	▶5.0m ▶66cm	75 %	66-74cm 90% surface clear ▶76cm 80% surface clear
F LBR	▶5.0m ▶50cm	75 %	50-64cm 75% surface clear ▶66cm knots allowed 75% 1 side or 50% 2 sides
H S/L O/W	▶5.0m ▶38cm D or F Quality	75 % 50 %	see Fir H knot specs
I S/L O/W	▶5.0m ▶38cm H Quality	75 % 50 %	see Fir I knot specs
J S/L, U UTL, X UTL, Y CHPR, Z NRec see FIR specs			

CYPRESS

D LBR	▶5.0m ▶60cm	75 %	66-74cm 75% surface clear ▶76cm 67% surface clear
F LBR O/W	▶5.0m ▶50cm D Quality	75 %	50-58cm 75% surface clear ▶60cm - knots allowed 75% on 1 side or 50% 2 sides
H S/L	▶5.0m ▶38cm	50 %	see Fir H knot specs
I S/L	▶5.0m ▶38cm	50 %	see Fir I knot specs
J S/L	▶5.0m 15-36cm	75 %	see Fir J knot specs
U UTL, X UTL, Y CHPR, Z NRec see FIR specs			

SPRUCE

F LBR	▶5.0m ▶76cm	75 %	90% surface clear
G LBR	▶5.0m ▶60cm	75 %	60-74cm, 75% surface clear ▶76cm, knots allowd 75% 1 side or 50% 2 sides or 75% shopgrade ▶100cm, 50% shopgrade
H S/L	▶5.0m ▶38cm	75 %	see Fir H knot specs
I S/L or	▶50m ▶38cm ▶50cm	75 % 50 %	see Fir I knot specs ▶100cm to 13cm max
J S/L	▶5.0m 16-36cm	75 %	see Fir J knot specs
U & X UTL, same as Fir except logs ▶100cm allow knots to 16cm			
Y CHPR, Z NRec see Fir specs			

SPIRAL GRAIN - % of top diameter				OCC LGR KNTS
4%	7%	10%	13%	1 per 3m length;
D, E, F, G, K	B, C, H, L, M	I, J Ungrd Spec	U, X	
6cm max	8cm max	I =9cm , J = 4cm	13cm max	X-UTL ʋ50cm up to 2 per 3m

HARDWOODS : DECIDUOUS SPECIES

C (cottonwood only) ▶5.0m ▶25cm Max twist 7% (8cm)	80 % Veneer	Knots < 4cm well spaced NO Conk, NO Butt Rot NO Sweep, No Crook
I S/L ▶5.0m ▶25cm	50%	25-36cm to 4cm; 38-48cm to 8cm; ▶50cm to 9cm
U UTL ▶5.0m 10-14cm or 15-24cm or ▶25cm	75 % 66.7 % 50 %	10-14cm to 4cm; 15-26cm to 6cm 28-36cm to 8cm; 38-48cm to 10cm ▶ 50cm to 12cm;
Y CHPR poorer than S/L, better than NRec, Dead Potential = Y or lower		
Z NRec, see Fir specs		

CEDAR (NO POWDER WORM in D, F, K, L, M, H - n/a CGNF)

DIMENSIONS		CUT	KNOTS (diameter)
D LBR ▶5.0m ▶60cm or ▶120cm		75 % 66.7 %	60-74cm 75% surface clear ▶76cm 67% surface clear
F LBR ▶5.0m ▶50cm		75 %	50-54cm surface clear; 60-74cm 67% surface clear ▶76cm knots allowed 75% 1 side or 50% 2 sides
K SHG ▶4.0m ▶50cm Slab ▶38cm thick		50 SS	50-58cm surface clear ▶60cm same as Cedar D
L SHG ▶4.0m ▶38cm Slab ▶26cm thick		50 SS	50% surf. Clr. Or spacing, round logs >60cm allow spacing
M SHG ▶4.0m ▶38cm Slab ▶16cm thick		50 SS	25% surf clear, or spacing, round logs >50cm allow spcing
H S/L ▶5.0m ▶38cm		75 %	see Fir H knot specs
I S/L ▶5.0m ▶38cm or ▶10.0m ▶50cm O/W H Quality		75 % 50 % 50 %	see Fir I knot specs see Fir H knots
J S/L, U & X UTL, Y CHPR, Z- NRec see Fir specs			

SLABS

Cedar	D,F,K	H,I	L	M	U X
Thickness	38cm	38	26	16	16 10
Mean dia.	50cm	38	38	26	16 10

Cedar : Use knot specs based on slab width. Thickness is rgt. angle to grain
Other species, I S/L & better, 38cm thick & mean diameter ▶grade rule

GENERAL FACTORS & RULES

LOG LENGTHS:
Standard lengths 8m, 11m, 13m
Min lgths 5m, Shingle 4m, Y 3m
Heli Blocks, 4m & 6m allowed

LUMBER – no conk or blind cnk
DEAD – must > 8m Gr U
No Top = Gr N 99 00%

CROOK & PISTOL GRIP in PEELERS
<8.0 m - no loss allowed
8.0 m to <11.0 m-up to 1.2m Grade Con.
▶11.0 m - up to 2.0m Grade Con.

BUTT ROT in PEELERS
<8.0 m - none allowed
8.0 to <11.0 m - to 1/3 butt meas
▶11.0 m - to 1/2 butt meas

SWEEP in PEELERS
<8.0 m - up to 0.6m Grade Con
8.0 m to <11.0 m-up to 1.2m Grade Con.
▶11.0 m - up to 2.0m Grade Con

CONK +2m /-4m NF 50% Gr Y
B/CONK +4m/-6m NF 50% Gr Y
Fork w/decay 1m NF 50% Gr Z
Crk w/decay 1m NF 50% Gr Z
Rot Brch +/– 1m NF 50% Gr Z
Shatter/Breakage – Gr Z
Root Rot Deduct 0.6m

Mental Bucking Allowance
<8.0 m - NO Bucks Allowed
8.0 m to <13.0 m-1 Buck only
▶13.0 m - 2 bucks only

BUTT ROT GUIDE

B/Rot Diam Ratio	N/F Deduction	Grade Consideration Length Not Recoverable
1/4	0.2m	0.6m
1/2	0.4m+	1.8m
3/4	1.2m+	3.6m
4/4	2.4m	4.2m
Sounding	0.8m	2.4m

▶ means equal to or greater than (= or >)
O/W = otherwise
NB: Common lower grades are listed under FIR & PINE

Quality Assurance   **4**

This document outlines the CGNF quality assurance (QA) standards and procedures.

The standards and procedures are:

1. Primary standards – Net Volume and Value.

2. Appraisal standards – timber cruising attributes that do not necessarily affect the volume or value, but affect the appraisal.

3. Plot selection.

4. Quality assurance reporting – the sequence for the reporting levels.

4.1 Primary Standards

a. <u>Mature Net Volume Standard</u> – the original cruise must be within +/- **15**% of the check cruise net volume per hectare.

b. <u>Second Growth Net Volume Standard</u> – the original cruise must be within +/- **12**% of the check cruise net volume per hectare.

c. <u>Mature Value Standard</u> – the original cruise must be within +/- **20**% of the check cruise value per m^3. See Table 22 for the old growth selling prices by species and statutory grades.

d. <u>Second Growth Value Standard</u> – the original cruise must be within +/- **20**% of the check cruise value per m^3. See Table 21 for the second growth selling prices by species and statutory grades.

> The above standards will be reviewed within one year of implementation based on the results of the check cruises.

The net volume and value calculations will be based on the compilation of the original plots in 1.0 hectare and the check plots in 1.0 hectare.

4.2 Appraisal Standards

The current standards in Section 3.6 of the most recent *Cruising Manual* will be used. The appraisal requirements are:

a. Damage coding - +/- 90% of the fire, down tree and insect damage codes must be correct.

b. Plot slope - greater than or equal to 90% of the plot slopes must be within +/- 5 slope percent. The average variation of all slopes checked must be within 5 slope %.

c. Plot Locations - consistent with the standards in section 3.6 of the *Cruising Manual.*

d. Sounding.

> The check cruiser will use an increment borer when they need to confirm the presence of butt rot determined by sounding. The check cruiser will always apply the 0.8 m length deduction when the boring confirms the presence of rot regardless of the thickness of the sound wood collar.

4.3 Plot Selection

Refer to Section 3.6 of the *Cruising Manual* for the details regarding the risk assessment and sampling intensity for check cruising.

In addition, the following minimum standards will apply:

A minimum of 5 full measure plots must be audited in order to reject a cruise (or other types of plots containing at least 20 volume measure trees), unless agreed to by the licensee or consultant.

4.4 Preparing the Quality Assurance Summary

1. Complete a summary report for each check plot and for all the plots checked.

2. Compile the audit sample to determine whether the net volume and value meet the standards. If the net volume and value standards are not achieved, then the cruise will be rejected and the reasons for the excessive variations documented and signed by the check cruiser.

> Note that the net factor for a Z-grade piece is called as per the original cruisers estimate and is not subject to audit.

3. The check cruise report will be sent to the cruiser and licensee.

Selling Price Comparisons

The value standard is based on the average of the Vancouver Log Market selling prices published by Revenue Branch. The average selling prices by maturity and sorts will be used for calculating the selling prices for check cruising purposes and they will be updated June 1st of each year based on the average for the previous 12 months. Further investigation is required to analyse the variation in the selling prices over a two-year period to better understand the volatility of the selling prices. If the prices are stable, then an annual roll-up will be sufficient. Table 20 and 21 are based on the 2005 calendar year. The sort prices/m^3 are weighted by the volume used in the selling price determination for each grade within the sort.

Table 20 Weighted Coast Selling Prices - Mature Grades

($/Cubic Metre)

Sort	Alder	Birch	Maple	Cotton-Wood	Cedar	Cypress	Fir	Hem Bal	Spruce	Pine
B, D, F, G					206	360	332	121	290	54
C				36			151			
H, I	75	75	55	36	120	120	118	62	105	45
J					104	64	81	50	64	61
K, L, M					99					
U, X	75	75	55	36	40	39	44	33	37	28
Y	27	27	20	36	10	11	27	29	28	18
Z, N										

Table 21 Weighted Coast Selling Prices - 2nd Growth

($/Cubic Metre)

Sort	Alder	Birch	Maple	Cotton-Wood	Cedar	Cypress	Fir	Hem Bal	Spruce	Pine
B, D, F, G					144	360	116	70	290	54
C				36			117			
H, I	75	75	55	36	120	120	82	60	62	66
J					100	64	90	45	46	61
K, L, M					30					
U, X	75	75	55	36	42	39	46	35	45	29
Y	27	27	20	36	8	11	32	34	32	27
Z, N										

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Appendix

Appendix I Damage Codes

1. Insect

   The types of defects normally associated with insect damage are sap rot and weather check. Use the sap rot net factor calculation for insect damage. The weather checks affect the quality of the log and are a factor in grade consideration and not volume. Record the insect damage codes as per Appendix A.6.1 of the *Cruising Manual*

2. Fire

   The types of defects normally associated with fire damage are saddle burns and weather checking due to rapid drying by the fire. Saddle burns are net factored the same way as scars and the weather checks are a factor in the grade consideration. Excessive saddle burning may result in 1 or 2 metre segments of Z-grade. Record the fire damage codes as Light (L), Moderate (M) and Heavy (H) as per Appendix A.6.2 of the *Cruising Manual*.

3. Down Tree

   Fallen trees that have their roots attached will have a 1 metre Z grade for the first log if they are < 100 cm at DBH and a 2 metre Z grade if they are > or = 100 cm. Shatter in the tree will be a pencil bucking point. Record the down tree damage code as (E) or (G) and standing trees as (blank). Note that either code E or G can be entered for fallen trees for CGNF cruises since there is not a risk group dependency.

Appendix II Coast Tally Card Details

Blank or dash/dash (--) equals 100% sound in the net factor columns. The code for the computer to compile the grade and net factor to the merchantable height is code 99. See Appendix II for the detailed descriptions of the tally card fields.

Figure A.1 FS 205 – Cruise Tally Sheet.

Coast Cruise Tally Card Details (FS 205) - note that bold positions are required for CGNF cruises.

<u>Card Type 9</u>

*Positions 2 to 7	**Licence number (alpha/numeric).**
*Positions 8 to 10	**Cutting permit number (alpha/numeric).**
*Positions 11 to 13	**Cutblock number (alpha/numeric).**
Positions 14 to 15	**Cruise strip number (alpha/numeric).**
Positions 16 to 17	**Cruise plot number (alpha/numeric).**
Position 18	**Original (O or blank) or Check (C) cruise.**
Positions 19 to 20	**Timber type number (alpha).**
Positions 21 to 24	Age in 10s and Height – required for loss factor cruises only.
Position 25	**Measure (M) or Count (C) plot (alpha).**
Position 26	Vacant
Position 27 to 30	**Main Plot Size (numeric) = fixed area plot size in hectares.**
Positions 31 to 35	**Main Plot Size (numeric) = prism size = Basal Area Factor in M/CM.**
Position 36	**Full (F) measure or Walkthrough plot (alpha).**
Positions 37 to 39	**DBH Limit (numeric) – 12.0 for second growth cutblocks and 17.5 cm for mature cutblocks.**
*Positions 53 to 54	**Harvesting Method (alpha) – see Chapter 6 of the Cruising Manual for the acceptable harvesting method codes.**
Positions 55 to 57	**Slope percent (numeric) – the maximum slope within 15 metres slope distance and within the harvest area.**
Positions 58 to 59	**Year (numeric).**
Positions 60 to 61	**Month (numeric).**

* Data positions marked with an asterisk will not be a check cruise item during check cruises in the field since they may not be known until later.

Card Type 2

Positions 25 to 26	**Tree number (numeric).**
Positions 27 to 29	**Tree height (numeric).**
Positions 30 to 31	**Species – (alpha) – see Chapter 6 of the Cruising Manual for the acceptable genus and species codes.**
Positions 32 to 35	**Diameter at breast height (numeric).**
Position 36	Tree Class – loss factor cruises only (numeric).
Positions 37 to 44	Pathological Indicators – loss factor cruises only (numeric).
Positions 45, 48, 49, 50, 51	Quality Remarks – loss factor cruises only – (alpha/numeric).
Position 59	**Selective Cutting Indicator – mark to cut (C or blank) or leave (L).**
Position 60	Root rot codes J, K, L.
Position 61	**Insect/defoliator codes – (alpha/numeric).**
Position 62	**Fire damage codes A (light), B (moderate), C (Heavy).**
Position 63	**Down tree codes E or G or standing (blank).**
Position 64	**Mature (M) or Second growth (S) – second growth conifer is less than 141 years old and deciduous is less than 41 years old.**
Position 65	**Live (L) or Dead (D) – live trees do not have any live cambium.**
Positions 66, 71, 76, 81, 86	**Log grades #1 to #5 – (alpha) – note that if a tree has more than 5 logs then the next row can be used for logs #6 to 10.**
Positions 67-68, 72-73, 77-78, 82-83, 87-88	**Log lengths #1 to #5 – (numeric) – nearest whole metre – note that if a tree has more than 5 logs then the next row can be used for logs #6 to 10.**
Positions 69-70, 74-75, 79-80,84-85,89-90	**Log net factors #1 to #5 – (numeric, percent soundwood to nearest whole number in percent) – note that if a tree has more than 5 logs then the next row can be used for logs #6 to 10.**

Card Type 3

Positions 25 to 26   Tree number (numeric).

Positions 27 to 29   Tree height (numeric).

Positions 30 to 31   Species (alpha).

Positions 32 to 35   Diameter at breast height (numeric).

Position 36   Crown class codes 1 to 4 (numeric).

Positions 37 to 39   Total age in years (numeric) – note that this age includes corrections.

Position 40   Selective cutting indicator - mark to cut (C or blank) or leave (L).

Positions 41 to 43   Counted age in years (numeric).

Positions 44 to 45   Corrected years (numeric) – note that this value is derived from the Site Index Tables for B.C. in Appendix 9 of the *Cruising Manual*.

Positions 46 to 47   Bored height in metres (numeric) – this is DBH (1.3 metres).

Additional Fields   Borderline tree measurements and tree remarks can be entered.

Back of Cruise Tally Card

The cruiser and check cruiser are required to print and sign their name and date each tally card.