

QUALITY CONTROL IN FOREST OPERATIONS

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SYNOPSIS

This paper describes the methods used for making quality control assessments and the resulting penalties for poor quality in all silvicultural operations carried out by N.Z. Forest Products Ltd.

The emphasis is placed on making objective assessments which provide information for stand histories and management purposes as well as quality control.

INTRODUCTION

With the advent of large-scale silvicultural operations during the past ten to fifteen years, the control of quality as laid down in the specifications for each particular operation is an important function of a field supervisor's job.

To enable field supervisors to make objective assessments of quality, various simple methods of making these assessments have been devised.

Apart from providing information for the calculation of contract and bonus payments, and management purposes, these assessments also provide the individual supervisor with a yardstick for measuring his own performance in supervision.

Quality control checks or assessments cover the following operations: Planting, blanking, release cutting, regeneration treatment, underscrubbing, pruning, and marking for thinning.

The above operations are all carried out by either wages labour with an incentive payment scheme or straight contract labour.

Descriptions of the quality control methods for pruning and marking for thinning operations are set out below.

QUALITY CONTROL OF PRUNING

Pruning in N.Z. Forest Products Ltd. forests, in three stages up to 32 ft, is done both by wages gangs and contractors. No selection or tallying of prunable trees is done prior to pruning, so that quality checks are concerned with these two aspects as well as with pruning quality.

The company makes all quality check data available to the contractor concerned, who is paid per tree, and usually bases his wage payments on his men's tallies, thus encountering the old problem of distinguishing between real and imaginary trees. The bonus payments to wages gangs are also based on the men's tallies, making the same safeguards necessary.

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Quality checks are done by the supervisor who initiates the operation, and he is always accompanied by the contractor or gang foreman.

The method used is a sampling of at least $2\frac{1}{2}\%$, using 0.1 acre strip plots spread evenly over the stand. The supervisor decides the number and approximate positions of his plots by examining an aerial photograph of the area. He carries a 4-chain terylene cord on a small fishing reel, and to begin a plot he ties one end of it to light undergrowth. He then walks in as straight a line as possible until the cord is all paid out. It can then be pulled free and reeled in.

The line forms the centre of the plot, and the supervisor examines all trees whose centres are within 8 ft 3 in. of the line. Stems per plot are recorded under the following headings:

- (1) Pruned: all trees which have been pruned in the current operation, regardless of quality.
- (2) Not Pruned: Trees which should have been pruned but were not.
- (3) Wrong Selection: Pruned trees (already included in (1) above) which should not have been pruned because of undesirable characteristics. If a worker starts pruning a tree before discovering a defect which makes it undesirable, he leaves one or more 12 in. branch stubs to show that the tree is not to be counted as pruned.
- (4) Bad Pruning: Trees pruned badly — *e.g.*, with avoidable branch stubs of over $\frac{1}{4}$ in., stem damage, or insufficient pruned height. If a tree has been classed as wrongly selected, it will not also be classed as badly pruned, although the description may fit.

Defects are pointed out to the foreman or contractor on the spot, so that the standards required by the supervisor are understood, and remedial action can be taken.

At the end of each half-monthly pay period, the contractor supplies a tree tally based on his men's counting. The supervisor corrects his own assessment figures for slope where necessary, multiplies the number of stems per acre (s.p.a.) by the net acreage, and compares the result with the contractor's tally. If they agree within 5%, payment is based on the contractor's tally.

Where the contractor's tally exceeds the assessment figure by more than 5%, payment is based on 105% of the assessment figure, and if it is more than 5% under, payment is based on 95% of the assessment figure.

Quality deductions are then made as follows:

- (1) For wrongly selected trees, the net acreage is multiplied by the s.p.a. in this category, and the resulting number of trees is subtracted from the payment.
- (2) For bad pruning, the same procedure is used, but only one quarter of the number are subtracted.

- (3) No deduction is made for trees not pruned, but if the number is excessive, say, above 10% of the pruned total, the gang would be sent back over the area. This seldom happens over more than ten or twenty acres because of the frequency of assessments. No quality deduction is made if the contractor has 2 s.p.a. or less in all categories.

Contractors are informed as soon as possible of the number of trees in their payment, so that their men's individual tallies can be scaled, and wage payments made. Contractors whose wage payment periods do not coincide with contract payments spend a considerable amount of supervision time in checking their own men's work. In addition to line plot sampling as described above, a very effective method is used by one contractor to prevent tally inflation by his employees, *i.e.*, each man is obliged to call to the contractor every time he has completed ten trees. The contractor notes the time lapse since the last call, and, if the time appears too short, he checks the man concerned to see whether he can keep the performance up. If he cannot, he is warned or dismissed.

In the case of wages gangs, where foremen are paid the same number of bonus hours as the men, defects which average more than 2 s.p.a. in any category result in the bonus paid to the foreman being reduced by up to 20%.

The scale of deductions for foremen is as follows:

Average no. of defects per acre:	0.2	2.4	4.8	8-16	16+
% reduction in bonus:	0	5	10	15	20

Leading hands are penalized at half this rate, while the forest hands' bonus is not affected. No penalties are applied if a gang has spent less than two weeks on an unfamiliar operation.

A schedule of operations and defects appears in Appendix 1.

QUALITY CONTROL OF MARKING FOR THINNING

The purpose of these quality checks is to provide factual information about marking for thinning which will help staff engaged in assessment, prescription, marking and operational control to improve the standard of stand management and maintain it at a high level.

The object in thinning is to maximize the harvest of usable wood from a stand over its rotation life.

Prescriptions. The prescriptions set for any individual stand are expressed in the form "mark as residuals x trees out of y trees". This prescription applies to stands where the value of y is known. In practice, the prescription is expressed as "the best of z trees" depending upon age and condition of the stand.

All trees are marked as residuals if their removal would increase the size of any gap or cause the stand edge to retreat. Trees pruned to 20 ft or 32 ft are normally marked as residuals, unless damaged or obviously wrongly selected for pruning.

Quality Check Method. The method adopted for checking the quality of marking for thinning and relating the quality to bonus payments varies from that described for other silvicultural operations.

Quality checks are carried out once a week by the Yield Control Forester with the marking crew in attendance; this ensures liaison with the marking crew and discussion of marking quality on the spot.

At least 3 tenth-acre square plots are laid out randomly in an area where the marking crew is currently working. A sample plot sheet in Appendix 2 shows the data collected during the check. An inspection of gaps within the plot or adjacent gaps and stand edges is carried out, where necessary. In the example shown, 17 trees were marked out of a possible 20. Of these, 2 were wrongly marked and are entered on the right-hand side under the appropriate heading. The two trees which, according to the prescription, should have been marked are also entered.

Bonus Demerits. Trees entered on the right-hand side of the sheet result in bonus demerits. In the case of trees under the "To fulfil prescription" heading, one-half demerit is recorded for each tree and under the "Regardless of Prescription" heading one demerit is recorded for each tree. The total number of demerit points awarded to the crew is then translated into a quality factor, ranging from 1.05 for nil demerits to 0.65 for 15 demerits.

The quantity performance for the week is then multiplied by the quality factor to arrive at the bonus payable, if any, to the marking crew.

DISCUSSION

These quality control checks are designed to enable any supervisor to give an objective assessment of the quality specifications for any operation. In addition, they have a direct effect on contract or bonus payments of the prime contractor or foreman, respectively. This tends to make "on the job" supervisors far more conscious of the need to maintain constantly the correct standard of quality.

Incentive schemes tend to place too much emphasis on quantity rather than quality, or fail to have adequate safeguards to ensure that quality standards are adhered to. The quality control measures described above ensure that the quality standards are not sacrificed in favour of low costs or large bonus earnings.

APPENDIX 1

TERMS AND ABBREVIATIONS USED IN QUALITY CHECK REPORTS

All figures show stems per acre, and the same terms are used in wages and contract operations.

(1) *Planting*

- (a) *B.P.* Bad planting. Tree planted incorrectly — *e.g.*, at wrong depth, or by wrong method.
- (b) *B.S.* Bad spacing. More than 6 in. out in either direction.
- (c) *N.P.* Not planted. A blank space which should contain a tree.

(2) *Release Cutting*

- (a) *N.R.* Not released.
- (b) *B.R.* Badly released. Insufficient removal of competing vegetation.
- (c) *CUT.* Live tree cut off below recovery level.

(3) *Regeneration Treatment*

- (a) *N.C.* Not cut. Tree left standing which should have been felled.
- (b) *B.C.* Badly cut. Tree not cut low enough, or not severed from stump, or cut in a way which damages an adjacent tree.
- (c) *W.C.* Wrongly cut. Tree felled which should not have been.

(4) *Pruning from 7 ft Upwards*

- (a) *P.* Pruned. Total s.p.a. pruned in current operation.
- (b) *N.P.* Not pruned. Trees not pruned which should have been.
- (c) *W.S.* Wrong selection. Trees pruned which should not have been.
- (d) *B.P.* Badly pruned. Coathangers, stem damage, or insufficient pruned height.

(5) *Underscrubbing*

- (a-d) as above.
- (e) *N.C.D.* Not cut down. Trees standing which the slasher operators should have felled.
- (f) *W.C.D.* Wrongly cut down. Trees felled which should have been left, whether pruned or not.

APPENDIX 2
MARKING QUALITY CHECK PLOTS

Date: 3.4.69. Observer: C. McKenzie Stand No.:

Age Class: Plot Area:

Prescription for stand: Best out of 200

Tree No	No. marked in group	Right/ Wrong		
1		R	<i>To fulfil prescription —</i>	
2		R	(a) Should be marked.	Demerits
3		R	1	1/2
4		R	(b) Should not be marked.	
5		W	1 spacing	1/2 1
6		R	<i>Regardless of prescription —</i>	
7		R	(a) Should be marked	
8		R	1 32' Pruned	1
9		R	(b) Should not be marked	
10		R	1 Top broken out	1 2
11		W		—
12		R		3
13		R	No. marked/acre: 170	
14		R	Comments:	
15		R		
16		R		
17		R		

Gap Inspection: O.K.

Tree Edge Inspection: Two badly leaning trees marked. Three trees missed adjacent to dump.