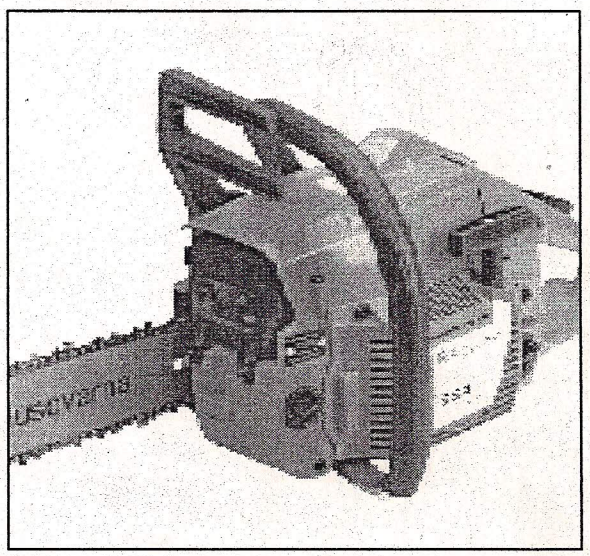
UNIVERSITY OF CENTRAL LANCASHIRE
Cumbria Campus

UNIVERSITY OF CENTRAL LANCASHIRE, CUMBRIA CAMPUS
NEWTON RIGG, PENRITH, CUMBRIA, CA11 0AH

■ Telephone: (01768) 863791 ■ Facsimile: (01768) 867249 ■ E-mail: info@newtonrigg.ac.uk ■ Website: www.newtonrigg.ac.uk



CHAINSAW
19/9/96

Newton Rigg

UNIVERSITY OF CENTRAL LANCASHIRE

Course Training Manual

Forestry Chainsaw Course

Fitness to Operate a Chainsaw

In general, safe use of a chainsaw calls for the operator to have a reasonable degree of both physical and mental fitness. People with disabilities need not necessarily be excluded from work with chainsaws, however, medical advice may restrict the tasks they can do and require increased levels of supervision. Although it is not a legal requirement, it is recommended that employers undertake pre-employment screening when selecting chainsaw operators. It is suggested that further medical advice should be sought if prospective operators have any condition affecting:

- mobility (eg arthritis, stroke etc),
- alertness (eg diabetes or alcohol/drug dependency);
- physical strength (eg heart conditions);
- vision (where it is unable to be corrected by glasses or contact lenses);
- manual dexterity/grip strength (eg vibration white finger);
- balance (eg vertigo or giddiness).

Operators should inform their employers - then they are taking prescribed medication. Check with the operator's medical practitioner if the medication can affect a person's ability to operate a chainsaw safely.

Chainsaws and young people

Chainsaws should not be operated by anyone under minimum school leaving age (MSLA), which is on, or near the age of 16 years, depending on when the last day of the school year falls Employers of young people (ie above MSIA but under 18 years old) will need to ensure:

- they have the physical capacity to operate the chainsaw safely;
- particular account is taken of their inexperience, immaturity and lack of awareness of relevant risks;
- they are supervised by a person competent in the use of a chainsaw for the work being done by the trainee and who, where appropriate, holds the relevant competence certificate or award.

Health risks

Chainsaws expose operators to high levels of noise and hand-arm vibration which can lead to hearing loss and conditions such as vibration white finger. These risks can be controlled by good management practice including:

- purchasing policies for low-noise/low-vibration chainsaws (eg with anti-vibration mounts and heated handles);
- provision of suitable hearing protection;
- proper maintenance schedules for chainsaws and protective equipment;
- information and training of operators on the health risks associated with chainsaws and use of personal protective equipment (PPE) etc.

Encourage existing chainsaw operators to report any signs or symptoms which may affect their ability to use a chainsaw safely or may indicate adverse health effects from noise and/or vibration. Employers are required to carry out health surveillance of their employees where noise or hand-arm vibration exposure cannot be reduced to safe levels.

All chainsaw use

Chainsaws are potentially dangerous machines which can cause major injury if used by untrained people. Anyone who uses a chainsaw at work should have received adequate training and be competent in the use of a chainsaw for that type of work. The training should include:

- dangers arising from the chainsaw itself;
- dangers arising from the task for which the chainsaw is to be used; and
- the precautions to control these dangers, including relevant legal requirements.

Use of chainsaws in tree work

The Approved Code of Practice supporting regulation 9 of the Provision and Use of Work Equipment Regulations 1998 (PUWER 98) sets a minimum standard for competence of people using chainsaws in tree work.

'All workers who use a chainsaw should be competent to do so. Before using a chainsaw to carry out work on or in a tree, the operator should have received appropriate training and obtained a relevant certificate of competence or national competence award, unless they are undergoing such training and are adequately supervised. However, in the agricultural sector, this requirement only applies to first-time users of a chainsaw.'

This means everyone working with chainsaws on or in trees should hold such a certificate or award unless:

- it is being done as part of agricultural operations (eg hedging, clearing fallen branches, pruning trees to maintain clearance for machines); and
- the work is being done by the occupier or their employees: and
- they have used a chainsaw before 5 December 1998.

In any case, operators using chainsaws for any task in agriculture or any other industry must be competent under PUWER 98.

Training provision

Training is usually carried out by specialist instructors at organised training courses. Advice on suitable training courses (and competence assessment where appropriate) is available from your industry National Training Organisation and sources listed under 'Further advice

Where training is being consolidated through workplace-based experienced, the trainee should be supervised by a person competent in the use of a chainsaw for the work being done by the trainee and who, where appropriate, holds the relevant competence certificate or award.

It is recommended that all chainsaw operators have regular refresher/update training to ensure they work to industry best practice and maintain their levels of competence. Suggested intervals for such training are

- occasional users - every 2 to 3 years;
- full-time users - every 5 years.

Avoid working alone with a chainsaw. Where this is not possible. establish procedures to raise the alarm if something goes wrong. These may include:

- regular contact with others using either a 1 radio or telephone;
- someone regularly visiting the worksite;
- carrying a whistle to raise the alarm;
- an automatic signalling device which sends a signal at a preset time unless prevented from doing so;
- checks to ensure operators return to base or home at an agreed time.

First aid

Anyone working with chainsaws needs to understand how to control major bleeding and to deal with crush injuries, so it is recommended that operators hold an emergency first-aid certificate. In remote sites, people who have been injured may also be at risk of hypothermia. Make sure operators always carry a personal first-aid kit (incorporating a large wound dressing) with them and have reasonable access to a more comprehensive kit.

Training and Standards of Competence for People Working with Chainsaws

Guidance Notes are published under five subject headings:

- Medical
- Environmental Hygiene
- Chemical Safety
- Plant and Machinery
- General

Guidance Note GS48 (New Edition)

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

Introduction

1 This guidance note is aimed at people who either use chainsaws at work or employ others to do this work. It has obvious application to industries where chainsaws are in frequent use, such as forestry, arboriculture and farming It is also likely to be of relevance in other industries such as the utilities, sawmilling and construction.

2 Portable hand-held chainsaws are widely accepted as being potentially dangerous machines which need to be handled with the utmost care. This guidance is designed to encourage adequate training to reduce the risks of accidents and injury arising from chainsaw work. Further detailed guidance on the safe use of chainsaws from the Health and Safety Executive (HSE) and the Forestry and Arboriculture Safety and Training Council (FASTCo) is listed in the 'Further reading' section.

Legal Requirements

3 Regulation 3 of the Management of Health and Safety at Work Regulations 1992 (MHSWR) requires employers and the self-employed to assess risks arising from their work activities which may affect the health and safety of themselves. their employees and other people, identifying what needs to be done to satisfy legal duties under other health and safety legislation. For the use of chainsaws at work the principal legal duties are briefly described in paragraphs 4 to 7.

4 Regulation 9 of the Provision and Use of Work Equipment Regulations 19922 requires those who use work equipment (the self-employed and those employed by others) to have received adequate training for the purposes of health and safety, including training in the methods which may be adopted when using the work equipment, any risks which such use may entail and the precautions to be taken.

5 Employers have an additional duty under regulation 11 of MHSWR to ensure that their employees are given adequate health and safety training upon their recruitment and on being exposed to new or increased risks in their work. This duty applies to the provision of training relevant to all the risks to which the employees might be exposed. including risks to their health

6 Under the Health and Safety (Young Persons) Regulations 19973 employers need to ensure their MHSWR assessment for work done by employees who are under 18 years old (young people). takes particular account of their inexperience, immaturity and lack of awareness of relevant risks. Employers will need to make sure that they do not employ young people m work situations where:

(a) these factors or a lack of training would give rise to an unacceptable risk: or

(b) the work is beyond their physical or psychological capacity.

7 This restriction does not apply if the young people are over minimum school leaving age, the work is a necessary part of their training, they are properly supervised and risks are reduced to the lowest level which is reasonably practicable.

The Hazards

Contact with the moving chain

8 The most obvious hazard when using a chainsaw is contact with the moving chain. Table 1 shows that apart from very limited guarding and use of protective devices, the provision of adequate information, instruction, training and supervision is the primary control against this hazard.

Table 1 Measures to prevent access to the dangerous parts of machinery

Recommended control measure	*As practicable on a chainsaw*
Fixed guards enclosing every dangerous part of the machine	Not practicable
Movable guards, adjustable guards, or automatic guards enclosing every dangerous part of the machine	Not practicable
Guards which partly enclose the dangerous parts of the machine	Small guard partly enclosing the saw chain drive sprocket
Other protective devices which stop movement of the dangerous parts before contact is made	The front hand-guard-operated automatic anti-kickback device; chain catcher; rear hand-guard
Jigs, holders, push-sticks or similar protection appliances used to control workpieces as they are machined	Not practicable
The provision of information, instruction, training and supervision	Practicable

Being struck by timber

9 Of even greater importance is the risk of being struck by timber when using the chainsaw leg when telling, pruning, working on windblown trees etc) and this can result in fatal accidents It is often lack of knowledge trial lies at the root of such accidents and the provision of adequate information. instruction. training and supervision is the only way of overcoming this.

10 In addition to the legal requirements set out in paragraphs 4 to 7. The following guidance paragraphs on nose. manual handling and personal protective equipment (PPE) all stem from statutory duties on employers to provide training.

Noise and vibration

11 Operators are also exposed to noise and hand-arm vibration when using chainsaws. Keeping levels within the manufacturer's original specification can only be achieved if the operator has a thorough knowledge of how to maintain the chainsaw properly. Operators also need to understand the nature and causes of noise-induced deafness and vibration white finger so they can take appropriate precautions and recognise early symptoms.[4,5]

Manual handling

12 Incorrect handling of the chainsaw and wood products (timber, logs etc) can lead to operators suffering serious back injuries. Training to good manual handling techniques and in the use of handling aids/tools should reduce the risk of such injuries.[6]

Use of PPE

13 Chainsaw PPE only acts to mitigate against injury and does not prevent accidents occurring. Operators need to understand the limitations of chainsaw PPE and be trained in its correct use and care.[7]

Adequacy of Training

14 The wide range and dangerous nature of the hazards of work with chainsaws means that chainsaw users, whether they are self-employed or employed by others, should be adequately trained (see Appendix).

15 Once training for a particular task or set of tasks is complete. obtaining a relevant certificate of competence or national competence award (National Vocational Qualification (NVQ) or Scottish Vocational Qualification (SVQ) recognised by industry will show that adequate training has been received. If operators are to undertake tasks different from those covered by their present level of training, then additional training will be necessary (see Appendix).

Selection of Chainsaw Operators

16 Select people who have shown themselves to have a reliable and mature attitude to their work, and who have the ability to do the job in a responsible manner. Safe use of chainsaws calls for a reasonable degree of both physical and mental fitness, and of intelligence. However, people with disabilities need not necessarily be excluded from work with chainsaws. and medical advice should be obtained about their suitability for the particular duties that will be required of them.

17 People selected to operate chainsaws should not have any physical condition that might pose a threat to their own health or safety, or the safety of others who might be affected by their operation of chainsaws. Further, to make effective use of the safety features on a chainsaw, they should be able to use a chainsaw right-handed.

18 Always judge fitness for operating a chainsaw on an individual basis. Where an employee is taking drugs prescribed by a medical practitioner, establish that these will not affect operating ability. Points to be considered concerning the normal level of fitness required are:

(a) **General** - Full movement of the trunk, neck and limbs and normal agility is usually needed by chainsaw operators. A stable disposition is also needed, but a history of previous mental illness should not necessarily preclude selection. An individual who is dependent on alcohol or non-prescribed drugs should not be employed as a chainsaw operator.

(b) **Cardiovascular conditions** - The extent to which these conditions may bar a person from operating a chainsaw will depend upon the condition and the success of any prescribed treatment and will require medical assessment on a case-by-case basis.

(c) **Vision** - Guiding the chainsaw and the item on which it is being used depends upon good judgement of space and distance and this generally requires the effective use of both eyes. If vision is corrected by glasses or contact lenses these should always be worn while using the chainsaw.

(d) **Hand-arm vibration syndrome** (including vibration white finger (VWF) and similar conditions). These conditions commonly reduce the feeling in people's hands and fingers and may affect a person's ability to grip the chainsaw. Moreover, such conditions are likely to be made worse by using a chainsaw. People selected as full-time chainsaw operators need to be assessed for VWF before starting this type of work.

(e) **Disorders of balance** - People who suffer attacks of vertigo and giddiness will need to be medically assessed for the particular duties they will be required to perform.

(f) **Epilepsy** - This should not debar individuals if they are eligible for an ordinary driving licence (ie have had no waking seizures for 2 years) but any recurrence of seizures must always be reassessed medically

19 Further advice is available from the Employment Medical Advisory Service at your local HSE office.

Training

Provision of training

20 Because training is such an important control against accidents and ill health arising from the use of chainsaws. it needs to be of the highest quality. Selecting only competent trainers to deliver the training will ensure that you, or those who work for you, receive quality instruction. Training is usually carried out by specialist instructors at organised training courses (see Appendix). However, training can be carried out at work by a person who is experienced and competent in the task to be taught. In either case instructors need to:

(a) know the dangers and the precautions to be taken when using chainsaws. including knowledge of relevant HSE/industry guidance (see 'Further reading' section);

(b) know the legal obligations to which they and their trainees are subject including the requirements of the Management of Health and Safety at Work Regulations 1992 and the Personal Protective Equipment at Work Regulations 1992;

(c) have the necessary range of instructional skills to communicate effectively in ways which suit the needs of different trainees:

(d) have undergone appropriate first-aid training.

Supervision of trainees at training courses and training at work

21 Instructors need to organise training to maintain a suitable ratio of trainees to instructors. Factors to be considered include:

(a) the level of experience of trainees:

(b) the content of the training;

(c) the location/terrain where the training is being done.

22 See Table 2 for the recommendations given as a general guide to the ratio of trainees to instructors.

Table 2 Recommendations for the ratio of trainees to instructors

	Organised training course	*Training at work*
Overall ratio	1:4	1:2
During initial practical training	1:1	1:1
Once trainee can work safely	Degree of supervision may be reduced for individual trainees so long as instructor continues to supervise on a full-time basis	May return to 1:2 once trainee(s) have reached satisfactory level of competence then instructor may carry out work in the vicinity

23 Where trainees are deemed to be safe and competent but need to consolidate their competence through workplace-based experience, a suitable record of training and achievement may need to be kept. During any such consolidation period. suitable levels of supervision (as detailed in Table 2) need to be maintained.

References

1 *Management of health and safety at work. Management of Health and Safety at Work Regulations 1992. Approved Code of Practice* L21 HSE Books 1992 ISBN 0717604128

2 *Work equipment. Provision and Use of Work Equipment Regulations 1992. Guidance on Regulations* L22 HSE Books 1992 ISBN 0 7176 0414 4

3 *Young people at work: a guide for employers* HSG165 HSE Books 1997 ISBN 0 7176 1285 6

4 *Noise at work. Noise Guide No 1: Legal duties of employers to prevent damage to hearing. Noise Guide No 2: Legal duties of designers, manufacturers, importers and suppliers to prevent damage to hearing. Noise at Work Regulations 1989* HSE Books 1989 ISBN 0 7176 0454 3

5 *Hand-arm vibration HSG88 HSE Books 1994* ISBN 0 7176 0743 7

6 *Manual handling. Manual Handling Operations Regulations 1992. Guidance on Regulations* L23 HSE Books 1992 ISBN 0 7176 0411 X

7 *Personal protective equipment at work. Personal Protective Equipment at Work Regulations 1992. Guidance on Regulations* L25 HSE Books 1992 ISBN 0 7176 0415 2

Further Reading

HSE free publications

Chainsaws AS20 (rev) HSE Books 1994

Farm forestry operations AS 15 (rev) HSE Books 1996

Hand-arm vibration - advice for employers INDG 175 HSE Books 1994

Introducing the Noise at Work Regulations INDG75 HSE Books 1989

Watch your back. Avoiding back strain in timber handling and chainsaw work INDG145 HSE Books 1993

FASTCO Safety Guides

301 *Petrol-driven chainsaws*

302 *Basic felling by chainsaw*

303 *Chainsaw snedding*

304 *Cross-cutting and manual stacking*

305 *Takedown of hung-up trees*

306 *Chainsaw clearance of windblow*

307 *Felling large trees*

310 *Hand winches*

401 *Tree climbing operations*

403 *Mobile work platforms for tree work*

505 *Use of tractors with winches in directional felling and takedown*

801 *Noise and hearing conservation*

802 *First aid*

804 *Electricity at work - forestry and arboriculture*

Available from FASTCo, 231 Corstorphine Road. Edinburgh EH 12 7AT. Tel: 0131 314 6247 Fax: 0131 316 4344.

APPENDIX

TRAINING AND QUALIFICATIONS

1 Further information on training can be obtained from a number of sources including:

ATB LandBase, National Agricultural Centre, Kenilworth, Warwickshire CV8 2LG. Tel: 01203 696996 Fax: 01203 696732;

FASTCo, 231 Corstorphine Road, Edinburgh, EH12 7AT. Tel: 0131 314 6247 Fax: 0131 316 4344; and colleges offering courses in agriculture, forestry, arboriculture and other rural-based activities.

2 Information on qualifications in England and Wales can be obtained from:

Edexcel Foundation, Stewart House, 32 Russell Square, London WC 1 B 5DN. Tel: 0171 393 4444 Fax: 0171 393 4445;

National Proficiency Tests Council, National Agricultural Centre, Kenilworth, Warwickshire CV8 2LG.
Tel: 01203 696553 Fax: 01203 696128.

3 Information on qualifications in Scotland can be obtained from:

Scottish Skills Testing Service (SSTS), Ingliston, Edinburgh EH28 SNE.
Tel: 0131 333 2040 Fax: 0131 333 2488;.

Scottish Qualification Authority (SQA), Hanover House, 24 Douglas Street, Glasgow G2 7NQ.
Tel 0141 248 7900 Fax: 0141 242 2244.

4 The following is a list of tasks for which chainsaw training and qualification is available. Contact the training providers listed in this appendix for more information.

- Aerial tree rescue of arboricultural chainsaw operators
- Chainsaw maintenance
- Chainsaw work in proximity to overhead power lines'
- Cross-cutting and stacking of produce
- Delimbing/snedding of felled conifer and/or broadleaved trees
- Felling individual windblown trees including use of equipment (eg winches etc) to control root plates and/or timber under tension in individual windblown trees
- Felling of multiple windblown (and broken) trees including use of equipment (eg winches etc) to control root plates and/or timber under tension in multiple windblown (and broken) trees
- Felling small/medium/large conifer and/or broadleaved trees including takedown of hung-up trees using appropriate equipment (hand tools. winches etc)
- Site management and support for above-ground chainsaw work
- Using a chainsaw from a rope and harness
- Using a chainsaw on mobile elevating work platforms for pruning and dismantling trees'
- Work techniques and equipment for dismantling trees from above the ground
- Work techniques and equipment for pruning trees from above the ground

* under development

This list is not exhaustive and some of the skills involved in the above areas of work may be applicable to work with materials other than timber (eg processed wood products, plastic, meat etc).

Training and Standards of Competence for People Working with Chainsaws

The Provision and Use of Work Equipment Regulations 1998 introduced a new requirement for those people who use chainsaws on or in trees to hold a certificate of competence.

As from 5h December 1998 anyone working with a chainsaw on or in trees is expected to hold a recognised certificate of competence or national competence award.

People whose use of chainsaws is restricted to agricultural operations and who are an employer or employee who have used a chainsaw prior to 5 December 1998 are exempted from PUWER 98 however!

Heath and Safety Executive guidance note GS48 new edition places a responsibility on both employers and employees to ensure they have received adequate training in the operations they intend to carry out with a chainsaw.

In the event of an accident H&SE will refer to PUWER 98 and GS48 new edition as illustrating good practice.

In order to achieve a certificate of competence for chainsaw use, the chainsaw operator must undertake a recognised training course for the particular task or set of tasks he/she wishes to undertake. On completion of the training course the trainee will receive a Certificate of Training and Achievement. This certificate allows for a period to consolidate skills under suitable levels of supervision.

When the trainee is ready he/she presents themselves for assessment in the task/tasks they have been trained to undertake. A successful assessment leads to the award of a Certificate of Competence for the chainsaw tasks assessed. If operators are to undertake tasks different from those covered by their present training then additional training will be necessary, followed by additional assessments.

The National Proficiency Tests Council and Scottish Skills Testing Service issue the Assessment Schedule of Standards for Certificates of Competence in chainsaw and related operations other wise known as the "Blue Book". The assessment schedule is broken down into units of competence.

The basic certificate of competence comprises Unit CS30 with CS36. Unit 30 covers the regulations and safety requirements related to the use of chainsaws and the preparation for use and maintenance of the chainsaw to prescribed standards. Unit 36 covers the crosscutting of timber using safe and efficient techniques. The level of training in units 30 and 36 does not prepare the chainsaw operator to attempt to sever the root plate from a fallen tree. The chainsaw operator is trained to deal with lengths of timber free from branches laid on the ground.

Chainsaw unit 31 covers the felling of trees with a maximum effective diameter at felling height of 380mm (15") using a chainsaw with a maximum guide bar length of 380mm (15"). Chainsaw unit 30 is a pre-requisite. CS31 is divided into four elements - 31.01 Fell

Trees, 31.02a Sned conifers and/or 31.02b delimb broad-leaves, 31.03 Cross cut and stack produce, 31.04 Take down of hung up trees using hand tools. Element 31.04 Take down of hung up trees must not be confused with the removal of wind blown trees. Dealing with wind blown trees is an advanced skill for which specialist advanced training is required.

Chainsaw unit 32 covers the felling of trees with effective diameter at felling height of between 300mm (15") and 760mm (30") using a chainsaw with maximum guide bar length of 380mm (15"). Again the unit is divided into four elements 32.01 Fell trees, 32.02a Sned conifers and/or b Delimb broad-leaves, 32.03 Cross cut and stack produce, 32.04 Take down of hung up trees using a winch.

Chainsaw unit 33 covers the felling of large trees over 760mm (30") diameter at felling height and includes boring through the sink.

Chainsaw unit 34 covers the methods of dealing with individual windblown trees, the pre-requisites for which are CS30, 31, 32. There are three elements 34.01 Sever individual wind blown stems, 34.02 Use of winch to control root plate and/or side tension, 34.03, Take down of leaning and half blown trees.

Chainsaw unit 35 covers the methods of dealing with multiple wind blown trees. Dealing with wind blown trees involves the use of advanced chainsaw techniques. Only competent experienced chainsaw operators should undertake training for multiple windblow.

Chainsaw unit 37 covers the method of breaking down a medium size hardwood crown using safe techniques. This unit is designed for operators with units30 and36 to enable them to assist in aboricultural operations.

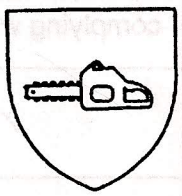
Introduction

The Personal protective Equipment (EC Directive) Regulations 1992, have been in force for chainsaw Personal Protective Equipment (PPE) in Britain since 1 July 1995. The main purpose of the Directive is to remove trade barriers and to ensure that PPE meets basic safety standards.

The Directive requires a risk assessment to be undertaken to identify what PPE is required. This paper is drawn together to help the end user make an informed decision on the most appropriate type of PPE for a given chainsaw operation.

Identification

Manufacturers are required to mark each product with the "CE" mark to confirm that it complies with the law. In addition chainsaw PPE which conform to the relevant European Standard will be marked with the logo of a chainsaw within a shield as shown below.



Chainsaw boots

A published European Standard exists for testing chainsaw boots (EN381 parts 3 and 6). Chainsaw boots will be tested at four chain speeds to identify the level of protection offered.

Class 0 offers protection from chains travelling at 16 metres per second (m/s). This level of protection is an intermediate level that is acceptable for chainsaw boots up to the year 2000.

Boots purchased before 1/1/00 may continue to be used provided they are in good condition. As other boots are available in the higher protection categories a risk assessment should be carried out to identify if they are suitable and sufficient for the task being carried out.

Class 1 offers protection from chains travelling at 20 m/s.

Class 2 offers protection from chains travelling at 24 m/s.

Class 3 offers protection from chains travelling at 28 m/s.

All chainsaw boots should show the "CE" mark, the chainsaw logo and the appropriate class (0-4). Chainsaw boots will however be marked EN345 part 2. This covers the general requirements for safety boots, such as impact resistant toe caps, and provides additional chainsaw protection.

Leg protection

A published European Standard exists for leg protection (EN381 parts 2 & 5). Leg protection is divided into three types. .

Type "A" - 180 degrees front protection with 200 millimetres above crotch on the front plus 50 millimetres each left seam (to combat cut through if the trousers are pulled round).

Type "B" - same protection as "A" but with additional extra 50 millimetres down right seam of left leg.

Type "C" - 360 degree protection with 200 millimetres above the crotch on the front and to within 50 millimetres of the crotch on the back.

All trousers have to meet a minimum of Class 1 which is 20/metres per second. All of these types can be made as leggings so long as they are joined across the front. Types "A" and "B" are suitable for normal forest and on the ground work. Type "C" should, be worn if any chainsaw work above ground in trees (arboricultural) is undertaken.

Leg protection should bear the "CE" mark and the chainsaw logo.

Gaiters

At the time of writing this paper no published Standard is in place. However a proposed Standard (prEN381 parts 8 and 9) can be followed in order to confirm it complies with the European standard. No gaiters should cant' the chainsaw logo until the Standard is fully published. Gaiters purchased and used should therefore bear a "CE" mark.

Gloves

A published European Standard exists for testing chainsaw gloves (prEN381 parts 4 and 7) can be followed in order to confirm it complies with the European standard. Gloves purchased and used should therefore bear a "CE" mark.

Head protection

Chainsaw head protection specifications are in 3 sections. Head, eye and hearing protection will not carry the chainsaw logo within the shield.

Section 1, the helmet, should comply with EN397 and carry a "CE" mark.

Section 2, hearing protection, should comply with EN352 part1 (ear muffs).

Section 3, eye protection, afforded by the visor should comply with EN169.

Industry Standard

The following table identifies the minimum standard of chainsaw protective clothing required for differing operations as identified in FASTCo Safety Guides.

Item (EN Number)	Forestry and work on the ground	Work Activity Arboriculture work in trees	Occasional Use
Safety Helmet EN397	✓	Mountaineering type helmet or helmet complying with EN 397	✓
Eye Protection EN169	✓	✓	✓
Hearing Protection EN352 part 1	✓	✓	✓
Leg protection EN381 parts 2 & 5	Type 'A' or 'B' Trousers	Type 'C' Trousers	Leggings Type 'A' - 'C'
Gloves EN381	✓	Chainsaw gloves not recommended. Climers' gloves recommended.	✓
Boots EN345 part 2	✓	✓	Boots or alternatively gaiters may be used with steel toe cap boots if working on surfaces without trip hazards or mud or ice, eg sawmills or grass surfaces.

J A Dewar
Forestry Commission Safety Officer

Chainsaw Personal Protective Equipment

Denis Welstead, HN Senior Principal Inspector, Health and Safety Executive, National Interest Group, Forestry, Agriculture and Allied industries, explains the current situation regarding the legal requirements for chainsaw PPE.

Chainsaw PPE such as boots, gloves and trousers made in or imported into EEC member states since July 1 1995 must comply with the Personal Protective Equipment (EC Directive) Regulations 1992 which incorporate into British Law, the requirements of Council Directive 89/686/ EEC which concerns new PPE. The directive's main purpose is to remove trade barriers within the community and to ensure that PPE meets basic safety requirements.

When buying PPE look for the 'CE' mark which must be put on the product by its maker to confirm that it complies with the law. Most chainsaw PPE will carry a logo of a chainsaw as well as the CE mark which can easily be affixed to the product where it is made in accordance with chainsaw harmonised PPE European Standard, often called BSENs.

The chainsaw logo is helpful, for example, when deciding if boots are chainsaw boots or industrial safety boots. Both will carry the CE mark, but the former will usually have the chainsaw logo.

Not all chainsaw PPE will carry the chainsaw logo. It cannot be attached where BSENs for the product are not yet available of the PPE has been made so that it complies with the regulations but made different to the specifications in BSENs. Your supplier should be able to advise you about the most suitable type of chainsaw PPE for your purposes.

Before manufacturers put chainsaw PPE on the market they must send examples to a government approved inspection body often called a test house, who will examine and test the product to establish whether it meets the appropriate safety requirements of the PPE regulations.

The examination procedure will involve testing and checking the PPE using the test procedures and specifications in either BSENs, draft BSENs, national standards or other technical information. A technical file containing information has to be compiled and held by each manufacturer for each item of PPE as well as a certificate of conformity which the manufacturer must produce on demand.

The enforcement of the regulations for new PPE is the responsibility of Trading Standards Officers; the use of PPE by people at work is an enforcement responsibility of HSE inspectors.

PPE stocked before July 1 1995 and not yet sold can be purchased legally even though it may not carry the CE mark provided the makers have met their obligations under Section 6 of the 1974 Health and Safety at Work etc Act.

Existing chainsaw PPE already in use and sent to suppliers before July 1 1995 may continue to be used quite legally whilst it is still suitable and provides the necessary protection.

Please contact your local HSE office for advice on the use of PPE and enquiries regarding new PPE should be made with the local Trading Standards Officer.

What it means to you

As is usual, new legislation tends to create uncertainty and even confusion initially and the regulations on PPE would, writes *Pete Newman, Technical Manager, Husqvama Forest and Garden,* judging by the enquiries we receive, appear to be no different. This is intended in basic or layman's terms to clarify the situation and provide an interpretation of the intention of the standard concerned, namely to offer a recognised level of protection against typical chainsaw accidents.

It has to be remembered that all items of PPE do not protect by utilising the same method. There are three main functional principles applied:

- Providing a surface that the chainsaw will not readily bite into.
- Using fibres that have a high resistance to cutting and absorb rotational energy which reduces chain speed.
- Long, loosely woven fibres that will be pulled into the cutting train and clog chain rotation.

The latter can only be used in its entirety in leg protection as long fibre lengths are essential to the clogging action. Smaller garments use the other methods.

Nevertheless, whichever method is used, all garments have to pass their appropriate test to determine their resistance to cut-through as laid down by the new European standards. As from July 1 1995 manufacturers are not permitted to produce leg protection trousers and leggings, foot protection or head and ear protection that does not comply with the relevant European standards and CE requirements that apply to them.

This does not affect PPE that had entered the supply chain prior to July 1 so there will be a period of overlap until this is worked through the system but larger manufacturers had planned ahead and were able to introduce PPE to the new requirements very soon after July 1.

The situation regarding gloves and gaiters will not be full finalised until later this Spring but for the interim these PPE items will be manufactured to the latest specification agreed by the Standards Committee so as to enable them to comply with CE requirements. In the unlikely event that there are any interim adjustments to the specifications, manufacturers would have to accommodate them accordingly.

Now to the products themselves.

Leg Protection

Trousers and leggings are regarded as one and the same therefore, in order to provide the same area of protective coverage as trousers, leggings will no longer be separate items but will be joined across the front.

Leg protection will feature three design types, but leggings may not be available in all of them so you should ask your dealer about this.

Type A
The protective material will cover the area across the front of the leg from the right seam in each leg to the left seam with a further 5cm past the left seam. The purpose of the extra 5cm is to help combat trouser rotation around the leg on saw chain contact.

Type B
These are the same as A but with an additional 5cm of protective material past the right seam in the left leg only. The design was agreed at the request of some Scandinavian markets and is not expected to have much interest in the UK.

Both A and B are intended for use by certificated operators engaged in normal harvesting operations on the forest floor.

Type C
This will have full protection totally encircling the legs so what is required at the front will also be required at the rear; in other words full all-round protection.

The design is intended to be used by non-qualified or unskilled operators for obvious reasons but it also encompasses tree surgeons who, although highly skilled, cannot, due to the stresses involved in climbing, always rely on the protective material being in the right place at the right time if they were wearing design types A or B.

In addition to the three designs, manufacturers have also been given the flexibility of choosing any one of three chain speeds when having their products tested. These are 20 (Class 1), 24 (Class 2) or 28 (Class 3) metres per second. Twenty m/sec has been the basis of the Swedish standard for many years and to date there is no evidence of any manufacturer using either of the higher speeds.

However, the important thing to remember is that whichever of the speeds that the garment will protect against has to be stated on the outside by a logo illustrating a chainsaw and stating the relevant chain speed: it may also contain other symbols as well, but the intention is that the purchaser can be in no doubt as to the level of protection being bought.

Similarly, and in order to comply with CE regulations, labelling on the inside of the garment will provide class rating, sizing and manufacturing details and washing/ cleaning instructions. Both the logo and interior CE labelling must be attached to the garment to ensure that it meets the latest regulations. Without them it does not comply.

Foot Protection

Design types as such do not apply here as there is only one design in terms of specified protective coverage area, but the choice of test chain speeds does and is the same for leg protection. As foot protection fall into two general categories – rubber or leather boots – it creates an additional aspect in testing. Rubber boots meet the test requirements easier than leather due to their providing a surface that the saw chain will not readily bit into. As a result an additional lower chain speed of 16m/sec has to be introduced for leather boots. This is known as Class 0 and will be valid only until the end of the decade.

Boots should therefore now carry the relevant chain speed class and the CE mark in order to comply.

Head and Ear Protection

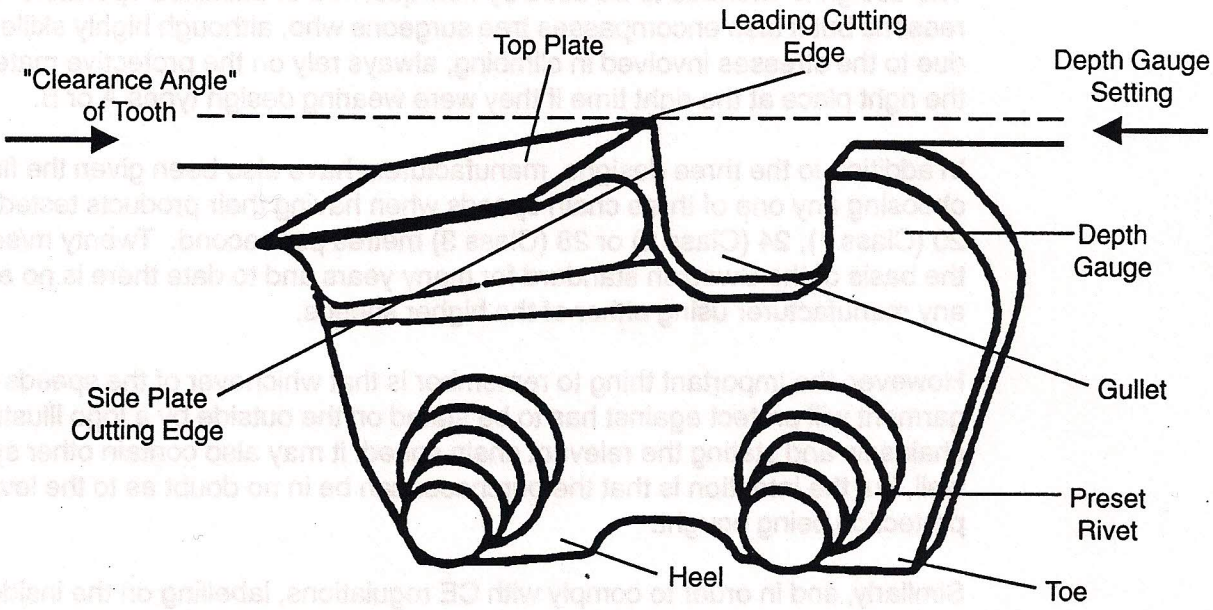
This area has been developed considerably. Whereas previously it was generally thought that the more noise an ear defender kept out the better it was, it is now realised that for his own safety, an operator needs to be aware of a certain level of ambient noise, such as traffic, or warning calls, etc.

Basically, attention is now being given to noise levels above 82dBA, the potentially harmful area.

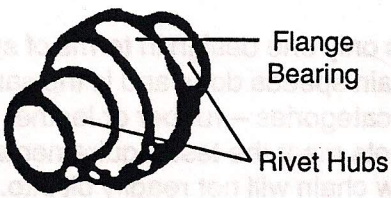
Saw Chain Components

To help you to understand saw chain, a brief review of the component parts is helpful. Please use this page to reference the terms used in this manual.

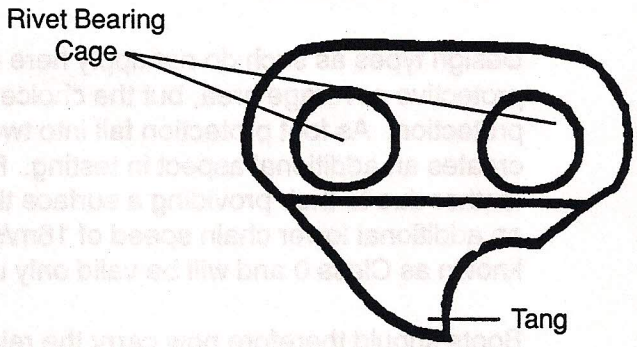
The Cutter Tooth



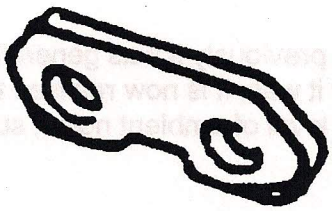
The Rivet



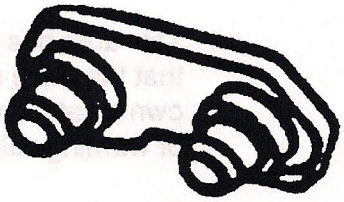
The Drive Link



Tie Straps



Plain Tie Strap



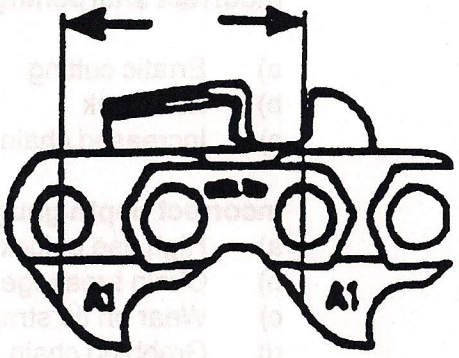
Preset Tie Strap

SAW CHAIN PARTS MAY LOOK ALIKE BUT THEY ARE NOT INTERCHANGEABLE! NEVER INSTALL USED REPAIR PARTS OR MIX DIFFERENT MANUFACTURERS' PARTS WHEN REPAIRING OR MAKING UP CHAIN LOOPS. ALWAYS USE ONLY THE MANUFACTURER'S REPLACEMENT PARTS.

Also important to know are the pitch and gauge of saw chain.

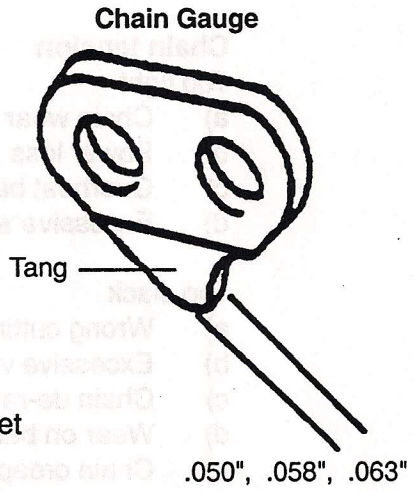
Saw Chain Pitch

The word pitch actually means size. The larger the pitch (measured in thousands of an inch) the larger the saw chain. Pitch is determined by measuring the distance between the centrelines of 3 consecutive rivets and dividing this distance in half. In other words, 3/8 pitch saw chain (.375") measures 3/4 of an inch (.750") between the centrelines.



Saw Chain Gauge

Saw chain gauge refers to the thickness of the drive link tangs that fit into the guide bar groove and is also measured in thousandths of an inch. There are three standard gauges for hand held chain saw cutting chain; .050", .058", and .063". It is important that the saw chain's gauge match the guide bar gauge.



1. Saw chain pitch must match the pitch of the drive sprocket and guide bar sprocket tip.

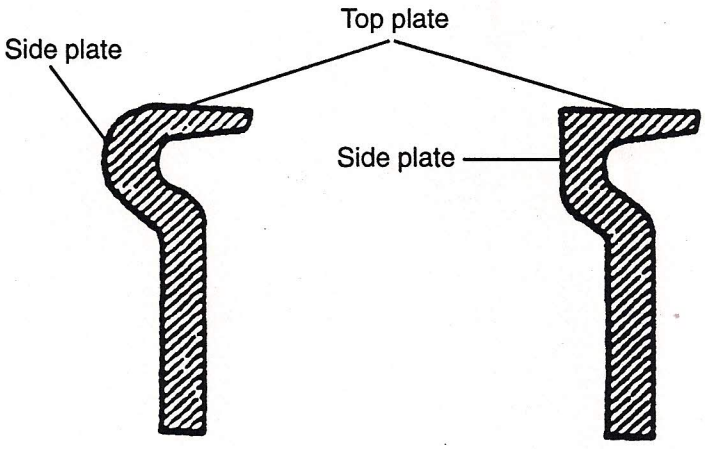
2. Saw chain gauge must match the gauge of the guide bar.

Any mismatch of the items mentioned above will lead to premature failure of saw chain, bar or sprocket.

Cutter profiles:

Semi-chisel – NOT as aggressive as full chisel, holds cutter edge better.

Full chisel – Aggressive fast cutting chain, used by most professionals.



Rounded Cutter (Semi-chisel) **Square Cutter (Chisel)**

Incorrect sharpening Ie varying cutter lengths, causes:

a) Erratic cutting
b) Kick back
c) Increased chain wear

Incorrect depth gauge too low
a) High rise of kick back
b) Chain breakage
c) Wear on tie straps
d) Grabbing chain

Chain tension
Too tight
a) Chain wear at heel and toe
b) Power loss
c) Overheat bar and chain
d) Excessive wear on bar rails

Too slack
a) Wrong cutting angle
b) Excessive vibration
c) Chain de-railing
d) Wear on bar rails
e) Chain creep at kick over

NB Kick back is the violent backward/or upward motion of the chainsaw guide bar occurring when the chain near the nose or tip of the guide bar contracts, branches or logs, or when the kerf closes in and pinches\\\ the saw chain in the cut.

Saw Chain Cutter Sharpening

Before sharpening always make sure chain is correctly tensioned.

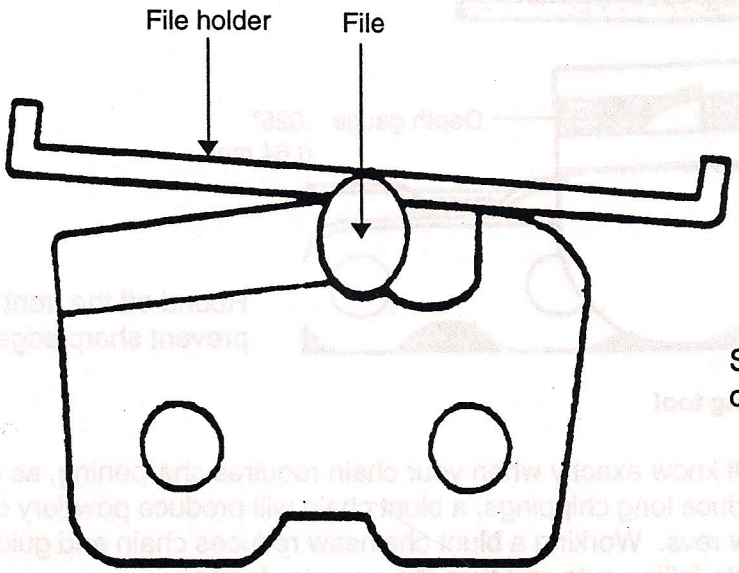
Use correct file:

325" pitch requires 3/16" or 4.8mm round file
3/8" pitch requires 7/32" or 5.5mm round file

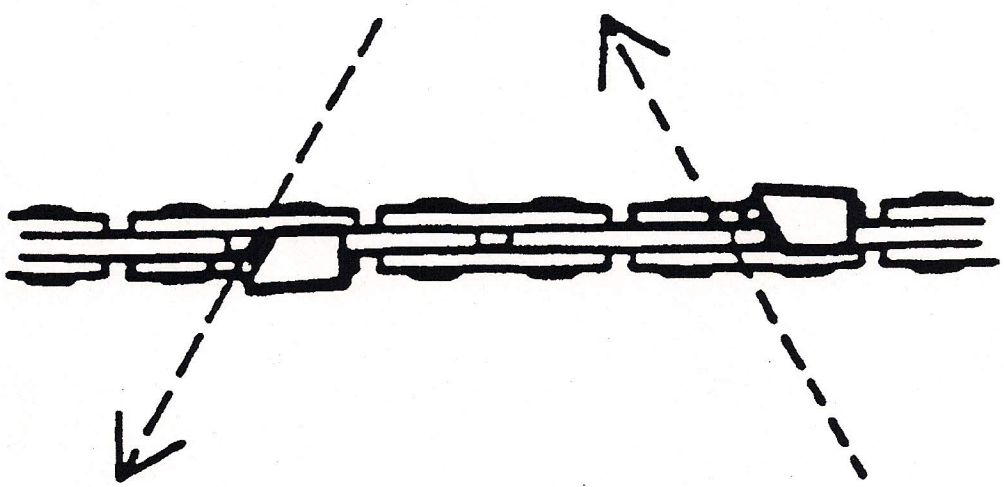
NB: ALWAYS USE FILE GUIDE

Plate Type Guide

Keep the correct top plate filing angle line on your file guide parallel with your chain. Be sure 15-20% of the file diameter is held above the cutters top plate.



Support a flat type file holder on the cutter and depth gauge.



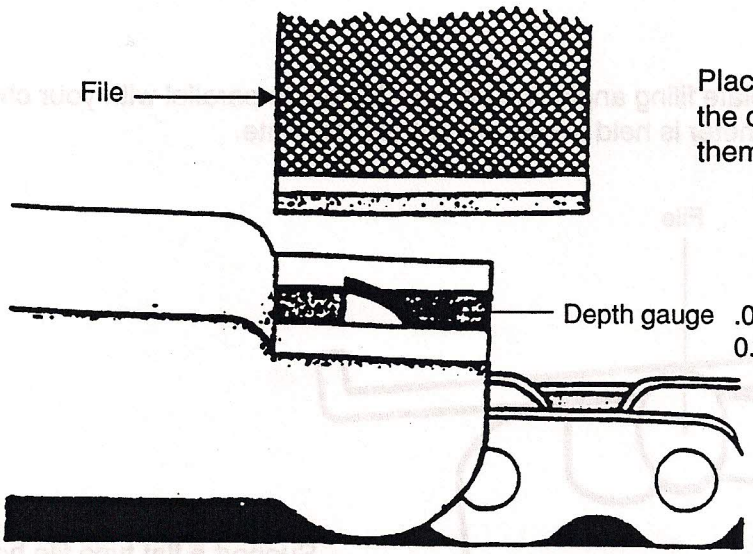
Assuring correct file angle, sharpen cutters on one side of the chain, file from the inside of each cutter to the outside, then turn your saw round and repeat the process.

File all cutters from the inside only. This means filing all the cutters on one side before turning the chain round and filing all the cutters on the other side.

If damage is present on the chrome surface of the top plate file back until damage is removed. *Keep all the cutter lengths equal.* Use callipers to measure smallest cutter and then set all cutter lengths to calliper setting. Use single strokes, do not file backwards.

Use the file handle to lightly tap off the filing burrs. *If left on they could wrap over the cutting edges, or break back and crack the cutting edge.*

Check depth gauge settings every 2-3 sharpens. Always use correct guide. Use a flat file to remove any depth gauge protruding above the guide, always maintain the correct shape of depth gauge by rounding off the corner.



Place the gauge tool on the chain. If the depth gauges are above the slot file them down level with the tool.

Round off the front corner to prevent sharp edges forming.

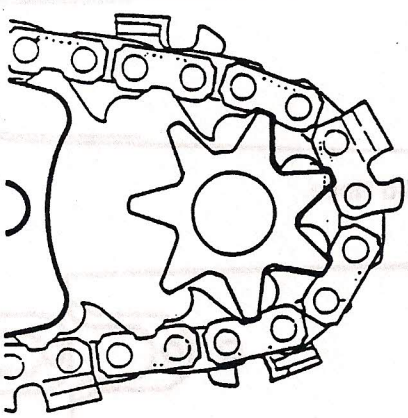
Using depth gauge setting tool

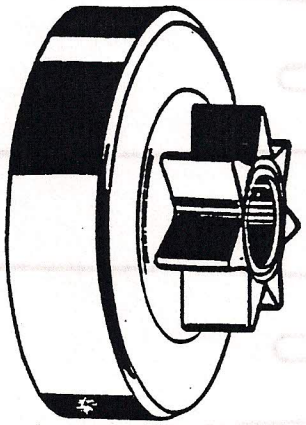
With experience you will know exactly when your chain requires sharpening, as an indicator – a sharp chain will produce long chippings, a blunt chain will produce powdery chippings and have high chainsaw revs. Working a blunt chainsaw reduces chain and guide bar life, it also makes for inaccurate felling cuts and tires the operator faster.

Drive Sprocket

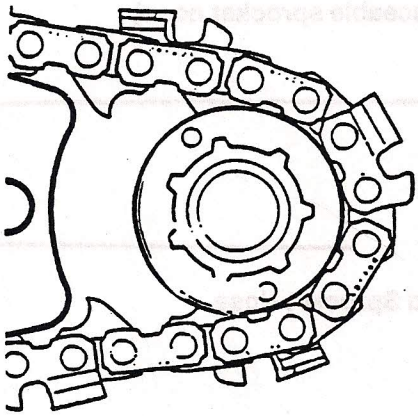
When removing sprockets remember:

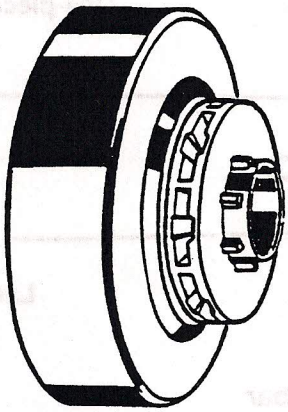
- The sprocket locking nut has a left-hand thread.
- Use the manufacturer's crankshaft locking device.
- If this unobtainable, lock the crankshaft by inserting some clean rope into the cylinder through the spark plug hole.





Spur sprocket





Replacement sprocket rim

When replacing the sprocket:

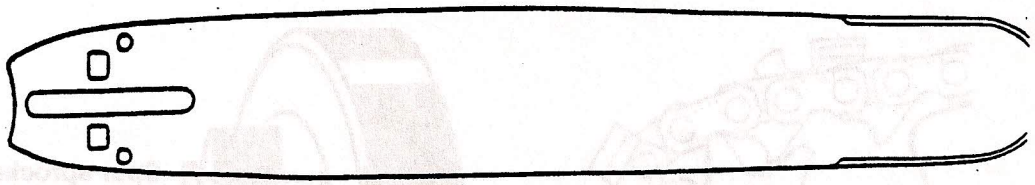
Grease the sprocket bearing.

Ensure that the sprocket is correctly located and centred on the shaft.

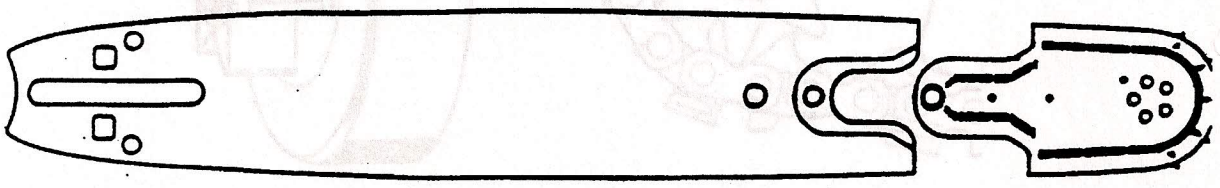
Guide Bars and Maintenance

Guide bars require minimal maintenance. Look for burrs and make sure oil holes and grooves are free of sawdust and grit, inspect bar for cracks, twist and burrs, file any burrs using a flat file, file away from bar groove, using light strokes, check that the bar rails are even. By turning the guide bar every day, you can prolong the bars life. Check groove depth as with wear the rails make the groove shallow. If the chain becomes to sloppy in groove, think about replacing the bar.

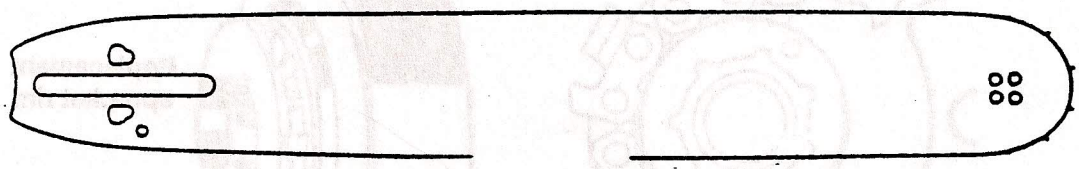
NB Always use a good chain oil for lubrication.



Solid Nose



One-piece (replaceable sprocket nose)



Laminated Sprocket Nose

Fit chain and bar

a) *Check oil flow*

Automatic chain oilers can only be checked by running the saw.

Never run the saw without a guide bar and chain. *There is a danger of the sprocket becoming detached.*

Follow through this guide, and check oil flow when starting up.

b) *Fit chain and bar:*

Clean all dirt from sprocket and bar fixing areas.

Always reverse the bar each time refitting, this evens out wear.

Fit the guide bar then place the chain on the guide bar and over it's sprocket. Ensure it is the right way round, ie cutters facing away from the saw on the top, towards it on the bottom.

Fit the side plate and clamp nuts loosely. Ensure that the shim with the oil-hole is correctly positioned, otherwise oil will not reach the chain.

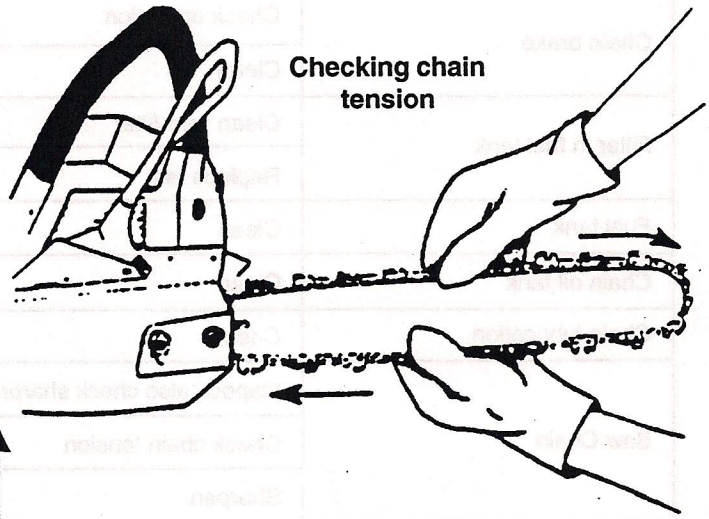
Hold the guide bar up whilst tensioning the chain.

The chain is correctly tensioned when it can be pulled round by both hands, but not one hand.

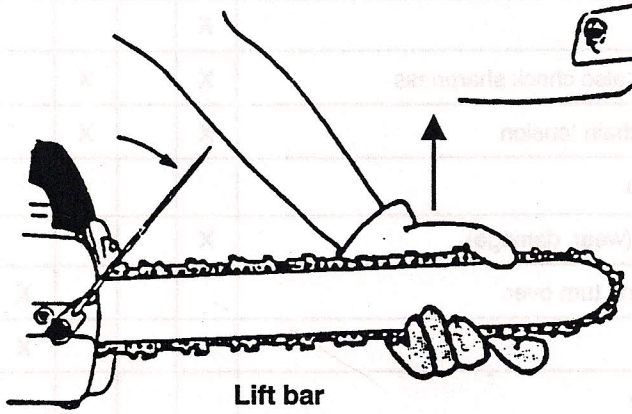
Wear strong gloves or use a thick rag to avoid injury.

Check that the chain-brake mechanism works correctly.

Tighten clamp nuts, holding the bar upwards.



Checking chain tension



Lift bar while tightening

All chain adjustments should be made when the bar and chain are cold.

If adjusted when hot, the chain will be too tight when it cools, causing damage to the chain and bar.

Maintenance Chart

Note: Different models may have different parts and controls		Before starting work	After finishing work or daily	After refueling stop	Weekly	Monthly	If faulty	If damaged	As required
Complete machine	Visual inspection (condition, leaks)	X		X					
	Clean		X						
Throttle trigger, safety throttle lock, Master control	Check operation	X		X					
Chain brake	Check operation	X		X					
	Clean								X
Filter in fuel tank	Clean wire filter					X			
	Replace felt								
Fuel tank	Clean					X			
Chain oil tank	Clean					X			
Chain lubrication	Check	X							
Saw Chain	Inspect, also check sharpness	X		X					
	Check chain tension	X		X					
	Sharpen								X
Guide Bar	Inspect (wear, damage)	X							
	Clean and turn over				X		X		
	Deburr				X				
	Replace							X	X
Chain sprocket	Check				X				
Air filter	Clean	X					X		
	Replace							X	
Cooling inlets	Clean		X						
Cylinder fins	Clean					X			
Carburetor	Check idle adjustment – chain must not turn	X		X					
	Readjust idle								X
Spark plug	Readjust electrode gap						X		
All accessible screws and nuts (not adjusting screws)	Retighten								X
Rubber vibration buffers	Inspect				X				
Spark arrestor screen	Inspect	X							
	Clean or replace							X	
Chain catcher	Check	X							
	Replace							X	

Maintenance Summary

After re-fuelling:

1	Check chain tension	**3.6**
2	Check chain lubrication by running chain with bar nose held over a clean stump; a line of oil should be thrown off the chain.	

Daily Maintenance:

1	Check operation of controls and security of saw components	**1.1**
2	Clean air filter	**2.1.5**
3	Maintain chain (daily and as required), clean and lubricate guide bar	**3.4.3** **3.3.2**

Weekly Maintenance:

1	Check condition of starter rope	**2.2**
2	Inspect spark plug	**2.3**
3	Clean cooling system	**2.4**
4	Clean saw body and remove any deposits from silencer	

Correct maintenance is the basis for safe use

Components can be divided into three groups - controls, power train and cutting train.

Controls

Check security and operation of:

1.1 Ignition switch - positive 0N-OFF operation is a legal requirement;

1.2 Handles and anti-vibration mountings - see makers instructions for checking movement in AV rubbers;

1.3 Front hand guard - fitting is a legal requirement;

1.4 Chain brake - should stop chain positively when applied at maximum chain speed;

1.5 Throttle controls - trigger, latch and half-throttle stop;

1.6 Chain catcher - replace if damaged.

Power Train

The power unit and systems associated with it:

2.1 Fuel System

2.1.1 Fuel Supplies

Fuel containers should be regularly checked for cleanliness and presence of condensed water. A 20 litre jerry can make a suitable **mixing** container, allowing a realistic quantity of oil to be mixed with the petrol (eg 400 ml: 20 L petrol = 50:1). Larger quantities may be too heavy to shake thoroughly.

2.1.2 Refuelling the Saw

1 Before re-fuelling clean around chain oil tank filler and fill tank with saw chain oil.

2 Use makers recommended fuel:oil mixture.

3 Mix fuel and oil in a suitable container, never in the saw fuel tank.

4 Clean around fuel filter cap; shake fuel container thoroughly and fill tank using a filter funnel.

5 Move well away from re-fuelling point before starting saw.

2.1.3 Fuel Tank Maintenance

1 Empty fuel tank.

2 Shake pick-up filter from filler hole (or fish out with a wire).

3 Remove filter element: ensure that hose is not damaged and does not slip back into tank.

4 Wash filter element in clean fuel or replace.

5 Refit filter element to hose and drop filter back into tank.

6 Refill fuel tank as 2.1.2.

7 Check that fuel tank vent (in filler cap or breather tube) is clear of dirt.

2.1.4 Carburettor Maintenance

Carburettor faults should not occur within the life of the saw and routine maintenance is limited to tuning - see 2.9. However, if dirt passes the fuel pick up filter, it will accumulate in the pump section of the carburettor and the needle valve fuel screen. These areas may be cleaned by removing the pump diaphragm cover.

2.1.5 Air Filter Maintenance

1 Close choke control

2 Remove filter cover and retaining screws

3 Wash filter in water and detergent; dry thoroughly

4 Clean inside filter cover and re-assemble - do not run engine without filter

2.2 Recoil Starter

1 Inspect cord for wear, especially just below the handle.

2 To replace cord, recoil spring or starter pawl springs, remove starter cover.

3 Cord pulley bearing may be lubricated sparingly but excess lubricant attracts dirt and tends to jam mechanism.

2.3 Ignition System

1 Little maintenance is required (especially with electronic systems which do not use a contact breaker assembly) apart from the spark plug.

2 Remove plug and carefully scrape off deposits - take care not to damage insulator.

3 Adjust electronic gap to recommended setting - usually 0.5 mm (0.025).

4 Replace plug taking care not to cross threads - do not over-tighten.

5 Chain saw plug life is short: renew after one month, 80 to 100 hours use, with plug of correct size and heat range.

6 Some electronic units can be irreparably damaged if the engine is rotated, with the ignition on, without the plug being securely earthed.

2.4 Cooling System

1 Remove starter unit and engine cover.

2 Clear any debris from between cooling fans and from air inlet grill on starter cover.

3 Wipe the inside of any covers clean and re-assemble.

2.5 Exhaust System

1 Remove silencer from engine.

2 If evidence of carbon build up in silencer, this can be removed by soaking in caustic soda solution or heating the silencer in a fire - carefully.

3 Rotate engine until the piston blanks off the exhaust port.

4 Remove any carbon deposits from the port with a soft scraper - eg a hardwood spill. Take care not to touch the piston.

5 Shake loose carbon from the port.

6 Refit silencer with a sound gasket.

2.6 Cold Starting

1 Shake saw to ensure that fuel is thoroughly mixed.

2 Set choke fully on.

3 Set half throttle.

4 Switch on ignition.

5 Place saw on firm ground with bar clear of any obstruction. Hold the saw down firmly, with the left hand on front handle, right foot (or heel) on rear hand guard.

6 With right hand, pull starter handle slowly to engage pawls; continue with a short sharp pull to rotate engine.

7 Keep hold of starter handle as the cord recoils and repeat 6 until the engine fires.

8 Put choke off.

9 Repeat 6. When the engine fires again it will run at half throttle, do not pick up the saw.

10 Squat down, rev up the saw to warm up engine.

11 Apply full power and operate chain break.

12 Switch off to check on/off switch operation.

13 Switch on and restart, check chain oil supply.

14 If on/off switch or chain break fail to work, repair saw before use.

2.7 Stopping the Engine

Use the ignition switch, not the choke (or de-compressor).

2.8 Warm Starting

Once warmed up the saw should start without choke , at idling speed.

2.9 Carburettor Tuning - see page 36

Cutting Train

The clutch, drive sprocket, guide bar and chain (together with chain oil supply and chain brake) make up a train of matched components.

3.1 Clutch

Centrifugal clutch shoes and drum are normally un-lined and, properly used, require little maintenance other than:

1 Shoe return spring(s) - may stretch and require replacement.

2 Clutch bearing (between clutch drum and crankshaft) should be sparingly lubricated as appropriate.

3.2 Drive Sprocket

Sprocket/drum assembly or rim sprocket should be replaced with chain; to extend sprocket life a number of chains may be used concurrently on the same sprocket. When replacing sprocket ensure that:

No. of drive teeth (and therefore sprocket dia.)
No. of splines (on rim sprocket)

Tooth Pitch - are as recommended

3.3 Guide Bar

3.3.1 Bar Types:

Solid nose - reinforced with hardwearing material;

Roller nose - chain supported at nose - this type largely superseeded by;

Sprocket nose - also available in asymmetrical form - Oregon Guard-Tip

3.3.2 Bar Maintenance

1 Scrape the build-up of saw dust from the bar groove once a day.

2 Lubricate nose sprocket bearing at least twice daily.

3 Burr forming on edge of rail - remove as soon as noticeable with flat file. Finish off with a very light chamfer on rail edge. Do not file near nose reinforcing - any burr must be removed with a flat stone.

4 Rail height - both rails should be the same height, so that the chain sits squarely. Check squareness with a straight edge and correct any unevenness by filing - maintain bar profile.

5 Rail spread - correct by hammering with a correct width gauge between rails, against a solid flat surface.

6 Check bar groove entry points; if damaged, smooth entry funnel with a diamond file.

3.4 Saw Chain

3.4.1 Chain components - see page 17

3.4.3 Chain maintenance - see page 20

3.5 Cutting Train Re-assembly - see page 23

3.6 Chain Tensioning

Allow bar and chain to cool off before tensioning.

1 Solid nose bars: lift nose of bar to take up movement and tighten tensioning screw until bottom of chain touches bar. Rotate chain (with gloved hand) and check for slack. Chain should snap lightly back onto bar when pulled away and released.

2 Sprocket nose bars: lift nose of bar and tighten tensioning screw until chain can just be pulled round with gloved hand. Insufficient tension on sprocket nose bars can result in:

(1) Rapid rail wear after chain leaves nose sprocket;

(2) Chain jumping rails;

(3) Accelerated chain and sprocket wear.

3.7 Chain Lubrication

Typically, chain oil is drawn, via a pick up filter, from the oil tank by a plunger pump which is driven by gearing from the clutch drum.

Sufficient oil should be supplied to maintain an oil film between bearing surfaces (especially drive link, tie straps and bar rails) under the heaviest cutting conditions that will be met. More oil is required for cross cutting or felling cuts, frozen wood and new chains than for snedding.

Many saws have adjustable oil pumps to accommodate different conditions, but it should be checked that the oil supply is not so high that the oil tank empties before the fuel tank.

3.8 Running-in a New Chain

Chain life and strength can be seriously reduced if a new chain is not run-in.

1. Soak chain in oil overnight before use.
2. Fit chain to saw and adjust tension correctly.
3. If oil pump is adjustable, set to maximum.
4. Run chain slowly, adding oil to chain with a can or manual oiler.
5. Stop saw, allow bar and chain to cool and re-tension chain.
6. Start saw, make a few light cuts and repeat 5.
7. Start work involving light cutting - avoid large felling cuts and cross-cutting. Check tension frequently during first hour.
8. When chain keeps tension, i.e. does not stretch significantly, adjust oil supply as desired (see 3.7)

3.9 Chain Defects

Correctly maintained, the chain will exhibit normal patterns of wear on tie straps and drive links. However, certain defects will result from incorrect maintenance or use.

It is the operator's responsibility to ensure that his saw is in a safe working condition. All mechanical and safety defects must be reported.

1. Saws should be supplied with 2 chains, ideally 3.

2. A new set of chains should be fitted on to a new (Rim) sprocket.

3. New chains should be soaked in oil before use.

4. New chains must be properly run in.

Tools and Equipment

5. T-wrench

6. Small screwdriver.

7. Grease gun.

8. Round file and file holder c.w. handle.

9. Flat file c.w. handle and depth guage tool.

10. Bar groove scaper.

11. Box spanner/allan key.

12. Filing clamp.

13. Cleaning fluid.

14. Fuel and containers.

15. Spare chain(s)
    Spare spark plug
    Spare air filter
    Spare chain catcher
    Spare starter cord
    Spare nuts and bolts

Periodic Maintenance

16. Refuelling

DO NOT START THE SAW WITHIN 4M OF REFUELLING POINT

17. Grease the guide bar sprocket at each refuelling. (Grease clutch bearing as necessary).

18. Touch up sharpening on the guide bar frequently. (Check chain catcher and replace is necessary.)

A CORRECTLY SHARPENED CHAIN IS SAFER AND MORE PRODUCTIVE

19. Check chain tension regularly, but only when chain and guide bar are cool. (Engine off, use gloved hand.)

20. Check that the chain is receiving sufficient oil. (Fuel should run out before oil.)

Daily Maintenance (at worksite)

21. Air filter - clean or exchange

DO NOT CLEAN WITH PETROL OR PETROL OIL MIXTURE

22. Starter rope - check, adjust or replace if necessary.

23. Air intakes - clean.

24. Check nuts and screws - secure.

25. Clutch cover - remove, clean out clutch, sprocket and oil gallery area.

26. Chain brake - clean, check its function and adjust if necessary.

27. Guide bar - clean, check, remove burrs and grease sprocket.

28. Chains - check for damage and sharpen as necessary. Use chains on a rota basis to keep all at same stage of wear.

CHECK THE WORKING OF THE CHAIN BREAK WITH THE SAW RUNNING AT THE START OF EACH DAY'S WORK.

Weekly Maintenance (in workshop)

Additional tools required

Wire brush
0.5 mm feeler gauge
Chain filing vice
Measuring device for cuttings

29. Removable parts may be soaked in cleaning fluid diluted with water to aid cleaning.

30. Carburettor compartment - clean out sawdust etc, keep carburettor air intake covered.

31. Starter unit - remove, strip, clean, replace starter rope if necessary, clean spring.

32. Air intake slots - clean thoroughly

33. Chain brake - thoroughly clean, lubricate linkage.

34. Clutch bearing - after assembly of clutch apply 2 shots of grease gun to end of crankshaft.

35. Top cover - remove and clear the cooling fins.

36. Spark plug - remove, check colour (straw colour) clean with wire brush, check and adjust gap.

DO NOT CHECK THE PLUG FOR SPARK

FAILURE TO EARTH WILL RESULT IN IGNITION FAILURE AND EXPENSIVE REPAIR

37. Check all nuts and screws are secure.

38. Exhaust - scrape off resin etc. from front of exhaust box.

39. Oil filter - clean if accessible.

40. Chains - check wear, sharpen all cutters to same length, adjust depth regulators with correct guage and flat file.

41. Guide bar - check for damage, clean, remove burrs, slightly bevel edge of rails and maintain bar contour, grease sprocket bearing.

Monthly Maintenance

42. Petrol tank - rinse out.

43. Oil tank - drain and wash out with diesel.

CHAINSAWS MUST NEVER BE STARTED WITHOUT CHAIN GUIDE BAR AND CLUTCH COVER FITTED.

Adjusting a Diaphragm Carburettor

Note: Diaphragm carburettors are fitted to Chainsaws and Clearing saws. The settings of the adjusting screws vary slightly according to the make/model of machine. The sequence in-which the work is carried out, however, is always the same. The recommended settings can be found in the Operator's Handbook supplied by the Manufacturer.

1. The carburettor may need adjustment when the engine misfires, smokes badly or loses power. Carry out the following simple checks before deciding to adjust the carburettor.

   i. Sufficient fuel in tank and fuel system not leaking.

   ii. Correct fuel mixture is being used.

   iii. Fuel filter functioning.

   iv. Air filter clean and properly seated.

   v. Spark plug clean, correctly set and properly seated.

   vi. Chain correctly tensioned.

2. If these checks fail to cure the fault then adjust the carburettor as follows:

   i. Turn the HIGH and LOW speed-adjusting screws clockwise until they are seated. DO NOT ATTEMPT TO EXERT FURTHER PRESSURE OR THE NEEDLE SEATS MAY BE DAMAGED.

   ii. Turn the HIGH and LOW speed-adjusting scews anti-clockwise by one turn, at which setting most saws will start. If not, use the settings recommended by the manufacturer in the operator's manual. If the saw still fails to start there is probable carburettor or ignition fault.

3. Start the saw and warm up the engine by making several cuts.

4. Adjusting the Low Speed Jet:

   i. Increase the engine speed by turning the throttle adjusting screw clockwise until the chain begins to creep forwards.

   ii. With the saw running at fast tickover, turn the low speed adjusting screw slowly in (clockwise) until the engine falters.

   iii. Turn the low speed adjusting screw slowly out (anti-clockwise) through the point of fastest r.p.m until the engine slows again.

   iv. Return to the point of fastest r.p.m.

   v. Turn the low speed adjusting screw out (anti-clockwise) by 60^0 - 10 minutes on a clock face.

   vi. Open the throttle quickly several times; if the engine picks up without hesitation the low speed jet is correctly set. If it does not, then turn the low speed jet slightly out (anti-clockwise) to enrich the mixture and check again.

N.B. Do not alter this low speed jet setting in order to eliminate slow throttle response after adjusting the high speed jet.

vii. Adjust the throttle adjusting screw to obtain correct tickover ensuring that the chain does not move round the bar with the engine at tick over (2000 - 2500 r.p.m.) and the starter pawls are disengaged.

5. Adjusting the High Speed jet by ear:

i. With the throttle fully open, turn the high speed adjusting screw slowly in (clockwise) until the pitch of the engine noise rises towards maximum r.p.m. Do not leave the engine on this setting for many seconds or it may seize.

ii. Turn the high speed adjusting screw out (anti-clockwise) until high pitched engine note changes to a deeper 'bubbling' note.

iii. Turn the high speed adjusting screw out (anti-clockwise) a further 60° - 10 minutes on the clock face.

iv. Governed carburettors (e.g. Husqvarna 154) will not go far beyond the r.p.m. at which the 'bubbling' note ceases. The technique is to turn the high speed adjusting screw in (clockwise) until the revs cease to rise, turn out (anti-clock wise until the revs begin to fall, then turn out another 60° (10 minutes on a clockface).

v. Open the throttle quickly several times. If the engine does not respond immediately to the throttle, then turn the high speed adjusting screw slightly out (anti-clockwise) and check again. N.B. Do not disturb the low speed jet at this stage.

6. Adjusting the High Speed Jet by hand held Tachometer.

As saws become quieter, they become more difficult to tune by ear, and hand held tachometers are fast becoming essential items of equipment for tuning.

i. With guide bar and chain fitted and the throttle fully open, adjust the high speed adjusting screw to obtain the r.p.m. recommended for the model (see table below):

Chainsaws:

Husqvarna Model	133	13500 rpm
	234	13500 rpm
	444	13000 rpm
	154	13800 rpm governed
	162	12500 rpm
	480	11500 rpm
	131	12500 rpm
	285	10500 rpm
	2100	10500 rpm
Stihl	024	12500 rpm
Jonsereds	451/2	13000 rpm

Clearing saws:

Husqvarna	244RX	13500 rpm
	244R	12500 rpm
	165R	11400 rpm

ii. Open the throttle quickly several times. If the engine does not respond immediately, then turn the high speed adjusting screw slightly out (anti-clockwise) and check again.

N.B. Do not disturb the low speed jet at this point.

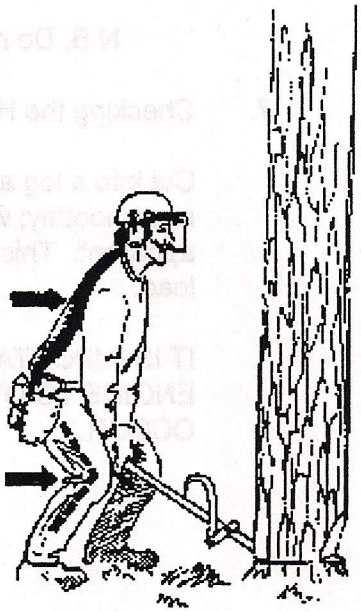
7. Checking the High Speed Setting:

Cut into a log at full throttle. As the saw is cutting, i.e. under load, the engine should run smoothly; when the saw is eased in the cut, the deeper 'bubbling' note should be apparent. This should change to the smooth note when the saw is again put under load.

IT IS IMPORTANT THAT THE SETTING IS NOT TOO WEAK, THIS WILL CAUSE THE ENGINE TO OVERHEAT AND CONSIDERABLE MECHANICAL DAMAGE MAY OCCUR.

Spare Your Back

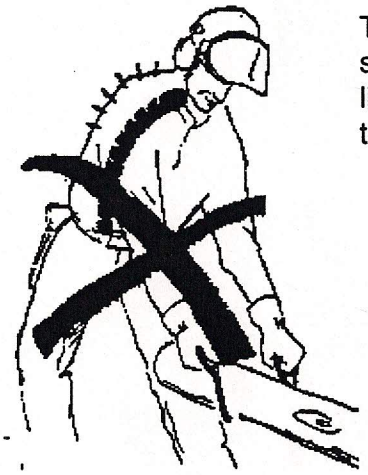
Work in the forest involves many physically exerting opera put a considerable strain on your back and certain joints. I you use a correct lifting technique and proper posture, you be able to withstand the effort, since the load will be distrib evenly.



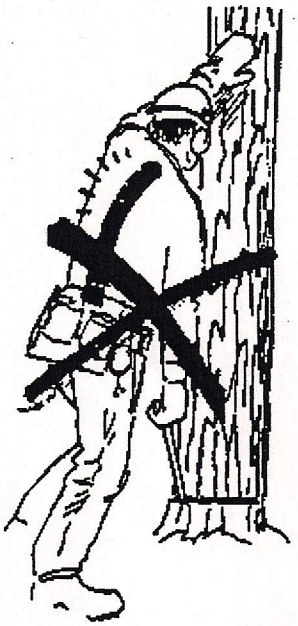
How to lift properly
Always keep your back straight and as upright as possible to ensure even distribution of the load.

Knees bent *and* back straight is the rule for a correct lifting posture. In this way, you can apply the strength of your leg muscles.

Avoid lifting with your back not straight



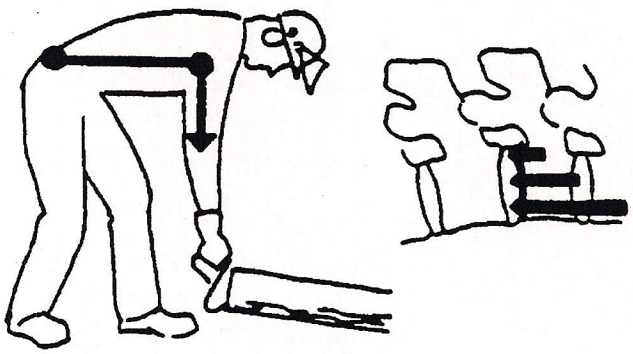
The time at which you are most likely to strain your back is when you attempt to lift something at the site, with your body twisted



This is a common way of straining backs: with the right lifting the felling lever and the left pushing on the tree.

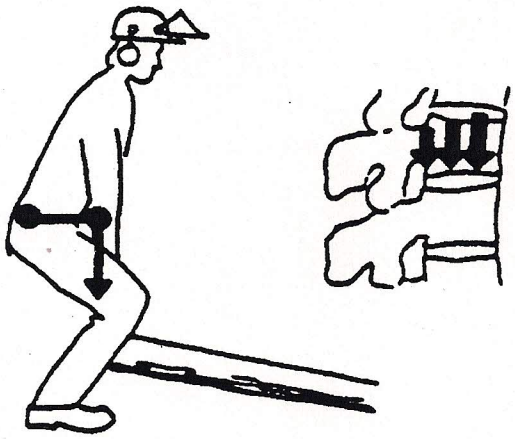
Think about leverage

A long lever results in ...



.. excessive and uneven loading on the vertebrae

A short lever results in ....



... less strain and in more even loading on the vertebrae

Support the saw against your leg

If you rest the saw against your leg you take the weigh off your back.

Always hold the saw close to your body as this will reduce the risk of your straining your back or tiring your muscles.

Keep the strain off your back

Keep any strain on your back to an absolute minimum.

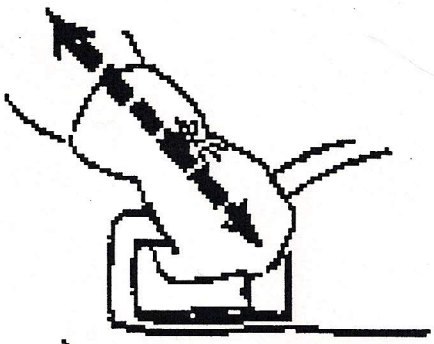
Support your elbows on your knees when you are working in a crouched or bent position, such as when you are cutting the felling cut or clearing brush around the tree.

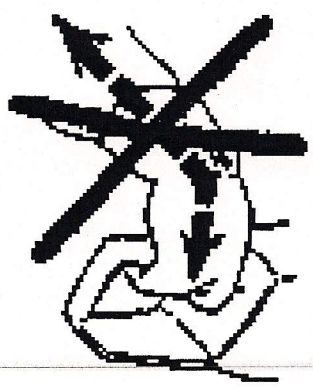
Whenever possible, use the trunk as a support.

Use the proper grip

Your left thumb must always be around the front handle to prevent the saw being wrenched from your hands in the event of kick-back.

Allow your left hand to slide along the handle bar and change your grip when changing working position.





Keep your wrists straight

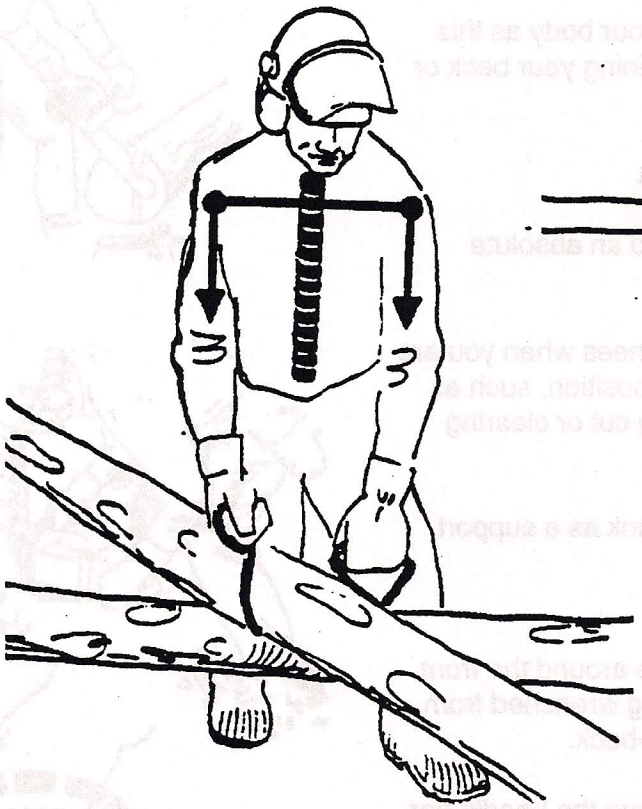
Always keep your wrists straight. Bent wrists cause unnecessary strain on the muscles and your arms will quickly become tired.

Let the rear handle twist in your hand when you change the position of the saw, so that your hand functions as a bearing.

Note that since you allow the rear handle to twist in your hand, there will be times when you have to use your thumb instead of your fingers to operate the throttle control trigger.

Use both hands in lifting, so that your back will be loaded evenly on both sides.

Keep your back straight and utilize your leg muscles even when pulling.



Use of Chainsaws - Hand Arm Vibration Syndrome (HAVS)
Formerly Vibration White Finger (VWF)

---

1. Hand Arm Vibration Syndrome (HAVS) is the whitening of fingers resulting from reduced blood circulation caused by using vibrating tools. In forestry, the tool most commonly involved is the chainsaw.

2. The condition is progressive, and 4 stages of severity are recognised. These with their symptoms and effects, are set out in the attached Addendum. Especially in Stages 1 and 2 the symptoms are not continuously apparent, tending to appear when the body is cold. Attacks of HAVS may last about an hour, and as feeling returns to the fingers pain can be experienced to a greater or lesser degree according to the stage of the condition. The stage reached will depend upon:-

   a) the amount of vibration in the tools used;

   b) the length of time vibrating tools have been used; and

   c) the susceptibility of the individual user.

3. In cold weather people with relatively poor blood circulation may experience similar symptoms even though they do not use vibrating tools. Such people are more susceptible to HAVS, and should therefore avoid work which involves the use of such tools.

4. Developments in the design of chainsaws have reduced vibration principally through the incorporation of anti-vibration handles in the late 1960s. All chainsaws supplied by FC have the vibration levels within the limit recommended by the Health and Safety Executive. Chain saws are also provided with heated handles to reduce the occurrence of symptoms by keeping the hands warm. Despite these improvements, the total avoidance of HAVS cannot be guaranteed.

5. Accordingly, in order to ensure that the development of HAVS in individual chainsaw operators is reduced to the lowest level reasonably practicable, operators need to take certain precautions. Failure to take these precautions may result in a premature inability to do chain saw work and interference with hobbies and social activities. The necessary precautions are as follows:-

   a. Hold the saw firmly but without exerting undue force. This will reduce the vibration absorbed by the hands. It can be assisted by using the lightest saw suitable and resting the saw as much as possible on the tree or on the large thigh muscle; and also by reducing the need to force-feed the saw into the tree by ensuring that the saw chain is correctly sharpened. Often the first sign of HAVS is on one or two finger joints which have taken most of the vibration due to too tight a grip.

   b. Switch off the chainsaw whenever possible and where practical break-up chainsaw work with other work, as vibration hazards are increased by continuous vibration exposure over long periods.

   c. Ensure that the chainsaw is properly maintained, particularly in respect of AV rubbers, sprockets, guide-bars and chains, and that chains are properly sharpened with the recommended depth gauge clearance. Poorly maintained saws have higher vibration levels.

   d. Wear chainsaw gloves to help keep the hands warm. Wet gloves are less effective in this respect. Therefore ensure that dry gloves are put on to start work at the beginning of the day and where practicable after meal breaks. Mitten-type gloves are warmer than gloves with separate fingers. Except in very warm weather , always use the heated handles on the chainsaw. Also wear suitably warm (and where necessary waterproof) body and arm clothing to ensure good circulation to the arms and hands. It is better to be slightly too warm than to risk being cold.

   e. Avoid smoking during the day, as nicotine reduces the blood supply to the hands and fingers.

To summarise:-

a. Use the lightest saw suitable for the job;

b. Hold the saw firmly but not too tightly;

c. Support the saw on the tree or thigh whichever practicable;

d. Stop the saw and do other work as frequently as practicable;

e. Ensure a high standard of saw maintenance, and inform the supervisor of any defect which cannot be corrected including any noticeable increase in vibration;

f. Use the heated handles;

g. Wear dry gloves whenever practicable;

h. Keep the arms and the body warm and dry; and

i. Avoid smoking.

6. The Forestry Commission will continue to try to reduce the incidence of HAVS in chain saw workers by investigation and discussions with manufacturers and medical experts. In the mean time, if you have HAVS symptoms notify your supervisor, at once and they will arrange for an examination through the Civil Service Regional Medical Officer.

7. A medical surveillance programme involving the Civil Service Occupational Health Service (CSOHS) has been introduced in the Forestry Commission with the agreement of the Trade Unions. This programme has been introduced to ensure that you receive appropriate advice and guidance to prevent the development of severe symptoms and to monitor the prevalence of HAVS symptoms. Health questionnaires will be routinely issued to you by the Forest District Management on a 6 monthly basis and thereafter annually, but if you develop symptoms which you consider may be due to HAVS at any time notify your supervisor at once and they will arrange for an appropriate assessment through the CSHOS. Confidential access is also available to CSHOS through the Regional and Chief Welfare Officers.

Stages of Raynauds Phenomenon (including Hand Arm Vibration Syndrome)

Stage	Condition of Digits	Work and Social Interference
0	No blanching of digits	No complaints
o_r	Intermittent tingling	No interference with activities
o_n	Intermittent numbness	No interference with activities
1	Blanching of one or more fingertips with or without tingling and numbness	No interference with activities
2	Blanching of one or more fingers with numbness.	Slight interference with home and social activities. No interference at work Usually confined to winter
3	Extensive blanching. Frequent episodes summer as well as winter.	Definite interference at work, at home and with social activities. Restriction of hobbies.
4	Extensive blanching. Most fingers; frequent episodes summer and winter.	Occupation changed to avoid further vibration exposure because of severity of signs and symptoms.

Note: Complications are not used in this grading.

Basic Chainsaw Technique - Cross Cutting

(For safety aspects refer to FSC Guide No 13)

Cuts other than reducing cuts should be from tension to compression wood.

Tension on topside of log (see fig 1)

1 Hold the saw firmly with arms kept close to the body.
Support the saw engine on the left knee and keep the left foot forward.
Cut from the topside downward using full throttle (Top cut, see Fig 2).

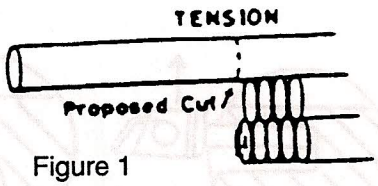


Figure 1

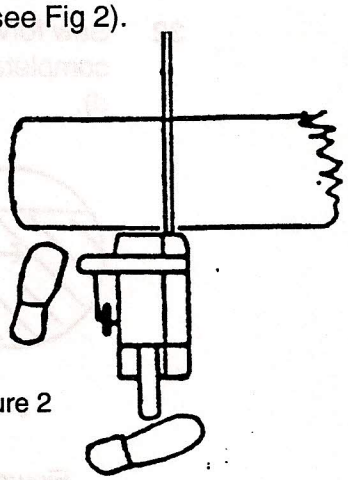


Figure 2

2 Reduce excessive tension by first making a cut on the compression side of the log (i.e. and under cut). (See fig 3)

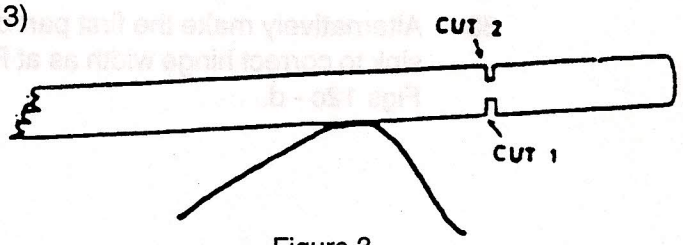


Figure 3

Tension of underside of log (see fi

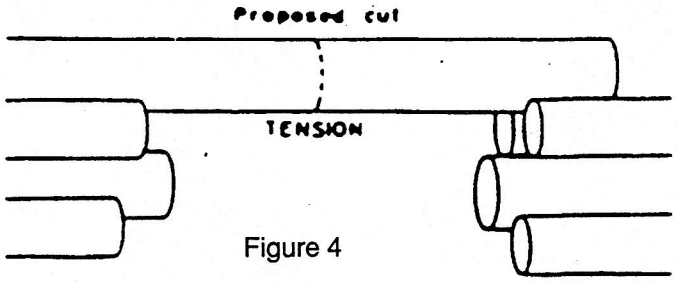


Figure 4

3 Hold the saw firmly with arms close to the body.
Support the saw with rear handle resting against the right knee or thigh.
Cut from the underside upward using full throttle (see fig 5)

4 Ensure that the left foot is kept well away from the log during undercutting.

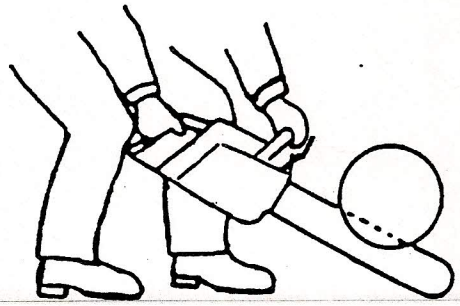


Figure 5

30 Check that the back of the sink is at right angles to the felling direction. (Use the breaker bar as a set square or offset the sink wedge in the sink as a check on alignment). Take corrective action as at para 13 if necessary.

31 From the right hand side of the tree, start the main cut by boring in a little way behind the eventual line of the hinge. Commence with the bar at an angle so that use is made of a point just behind the tip of the bottom edge of the bar. (Fig12). Once the tip is buried bring the saw forward to bore in parallel to the hinge, to at least half the diameter of the tree (Fig 12).

32 Saw forward to the correct hinge width (Fig 12b) then saw backwards in an arc to complete them main felling cut, taking care to leave an intact parallel hinge (Fig 12c & d).

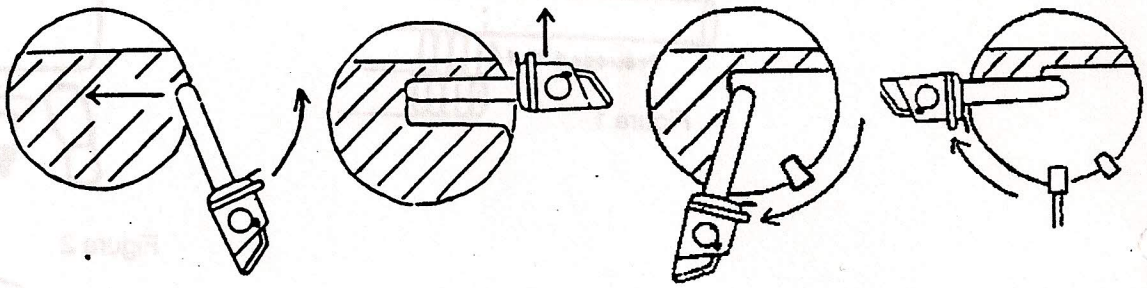


Figure 12a Figure 12b Figure 12c Figure 12c

33 Alternatively make the first part of the main felling cut by sawing forward parallel to the sink to correct hinge width as at Fig 8. Complete the felling cut by sawing in an arc as at Figs 12c - d.

Basic Chain Saw Techniques - Takedown of Lodged Trees

(For safety aspects refer to FASTCo 305)

Take down of trees which can be rolled out of the canopy

1 Suitable aid tools - breaker bar, turning strap, turning hook.

2 Assess direction of roll.

3 If the hinge is intact, use a pulling chain to remove 80% of the hinge working in the direction of roll. (Fig 1)

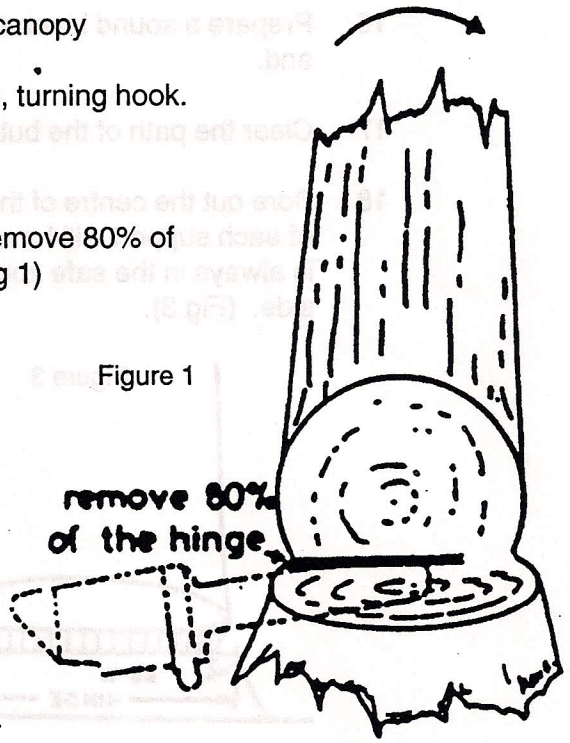


Figure 1

Figure 2

4 Attach the aid tool firmly to the tree so that the handle is at 90° to the stem and between waist and chest height (Fig 2).

5 Turning straps should wrap around the tree and over the spikes in the direction of roll.

6 Roll the tree by pushing forward on the handle (Fig 2).

7 Reposition the aid tool to stay out of the danger area (Fig 2).

8 As the tree falls let go of the handle.

Take down of small trees which cannot be rolled out of the canopy

Use of rope strop or turning strap.

9 Sever the hinge using a cut parallel to the top sink cut.

10 Clear the path of the butt.

11 Attach the strop/strap to the base of the tree. When using a turning strap thread the loop through the spiked buckle.

12 Place the hands inside the loop, feet level and to either side of the line of take down.

13 Pull the tree off the stump using the leg muscles and keeping a straight back.

14 Keep the feet clear of the butt as it moves.

Take down of large trees which cannot be rolled

15 Suitable aid tool on hard ground - simple lever.

16 Prepare a sound lever at least 2 metres by 10 cm diameter. Cut a flat face at the thick end.

17 Clear the path of the butt.

18 Bore out the centre of the hinge leaving 10% either end. Assess what effect the cutting of each support will have on the tree. Plan the sequence of cuts ensuring your position is always in the safe zone. Remove the remainders with a series of V cuts from the side. (Fig 3).

Figure 3

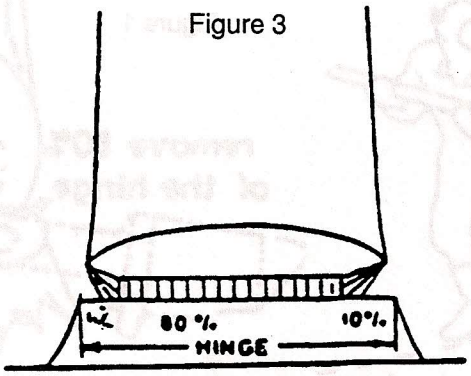
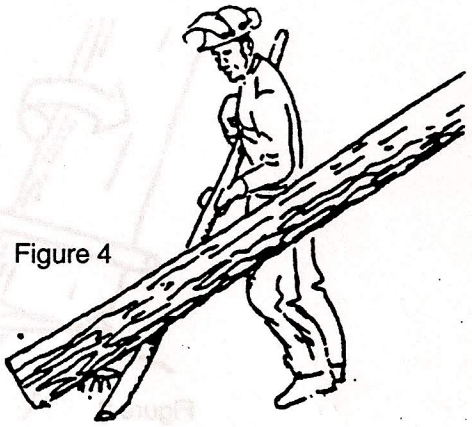


Figure 4



19 If the butt drops below the lip then shape the stump to provide a level or down sloping path for the butt.

20 Position the lever under the tree close to the butt forming an angle of approx. 30° to the ground.

21 Lift and push the lever to ease the butt backwards (Fig 4)

22 Remain in the working area by taking bites and reposition the lever frequently.

Take down of trees too heavy for manual methods

23 Suitable aid tool - hand winch.

24 Sever the hinge as at para 18.

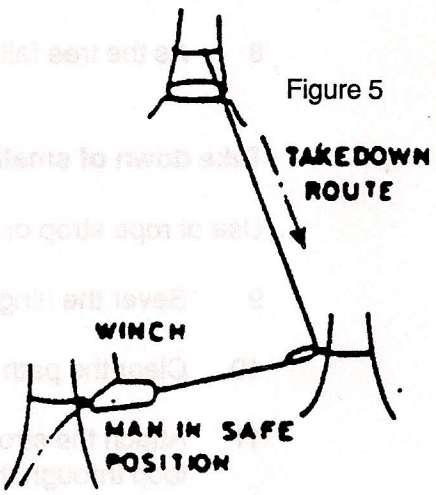
25 Clear the take down route.

26 Select a suitable anchor (tree or stump) - roughly in line; sound; well rooted; as far away as winch rope allows.

27 Position a strop on the anchor as high as possible.

28 Position a strop on the butt as low as possible.

Figure 5



29 Attach the winch rope to the butt strop by the safety hook.

30 Set the winch to free wheel, pull it out to the anchor strop and attach by the safety hook.

31 Ensure the winch is properly set and operate it until the tree falls.

32 When the butt is to be pulled down a steep slope, offset the winch via a pulley to give a good view and a safe working position for the operation (Fig 5).