

ULTIMATE FORESTS COMPANY

# HEALTH AND SAFETY FORESTRY OPERATIONS

# PROCEDURES

## 1. Objective

The objective of this procedures is to protect workers from occupational safety and health hazards in forestry work and to prevent or reduce the incidence of illness or injury by providing practical guidelines on:

(a) The key components of safety policies and procedures at national, enterprise, and worker levels effectively communicate minimum requirements to all persons concerned and aid in the planning and organization of work.

(b) The establishment of a framework for consultation and cooperation on safety, health, and welfare involving those who create the risks, those who are subsequently exposed to these risks, and those bodies which are responsible for the inspection and enforcement of regulations and standards.

(c) Basic requirements governing the execution of forest operations so that the risk of injury or ill health is minimized.

(d) A system for recording, reporting, and monitoring occupational accidents, diseases, and dangerous occurrences that may be used to measure compliance with requirements and/or the effectiveness of steps already taken to enhance the status of safety and health.

## 2. General requirements

All tools, machines, and hazardous instruments used in forestry should:

(a) Comply with safety and health requirements as prescribed in international or national be used only for work for which they have been designed or developed, unless a proposed additional use has been assessed by a competent person who has concluded that such use is safe.

(b) be used or operated only by workers who have been assessed as competent and/or hold appropriate skill certificates.

(c) Tools, machines, and equipment should be of good design and construction, considering health, safety, and ergonomic principles, and they should be maintained in good working order.

(d) Appropriate checklists which are based on a complete assessment of all relevant criteria should be used when selecting a machine. This helps to create a healthy and productive working environment and ensures that the machine is suitable for its intended purpose.

(e) Employers, manufacturers, or agents should provide comprehensive and clear instructions and information on all aspects of operator/user maintenance and the safe use of tools and equipment. This should include any requirements for personal protective equipment and the need for training.

(f) Equipment should be designed to allow easy and safe maintenance and minor repair at the worksite. Workers should be trained to do maintenance

**3. Hand tools**

a) Hand tools for cutting and splitting should be manufactured from good-quality steel, which maintains its cutting edge and effectiveness with the minimum amount of maintenance.

b) The head of a cutting and splitting tool should be fixed securely onto the handle with a practical device, such as a wedge, rivet, or bolt.

c) Handles should provide a secure grip and be made of good-quality wood or other suitable materials. The specification of tools, such as size, length of handles, and weight, should be appropriate to cater to the work's needs and the user's physical attributes.

d) sharp-edged tools should be sheathed with an appropriate device when not in use.

**4. Machinery, Portable**

a) The controls of machines such as chainsaws, brush saws, and grass-cutters must be conveniently placed and their function clearly marked.

b) The position and dimension of the handles must be comfortable for the operator in all normal working modes.

c) In line with the state of the technology, noise, vibration, and harmful exhaust emissions should be as low as possible. Biodegradable fuels and chain oils can significantly reduce hazards from exposure to exhaust gases and spilling.

d) Machines should be as light as practicable to strike a balance between the machine size and power required for the job on the one hand and the avoidance of operator fatigue and damage to the Musculoskeletal system on the other.

e) All protective devices must be in place and regularly inspected for apparent defects. The engine-stopping device must have a positive action and be clearly marked.

**5. Machinery, Self-propelled or Activated by Prime Mover**

a) Machines should be equipped with shock-absorbent, fully adjustable seats for drivers, and fitted with safety belts meeting at least the requirement of ISO 8797 or its national equivalent.

b) Interior space and machine controls should be designed and located to suit the physique of the operators most likely to use such machines.

c) The means of access to and exit from machinery, such as steps, ladders, and doors should be designed to provide hand and footholds of a convenient height and spacing.

d) All pulleys, shafts, belts, and fan blades should be securely guarded.

e) Machines should be equipped with a roll-over protection structure in accordance with ISO 3471 and ISO 8082 or an appropriate national standard.

**6. Work clothing and personal protective equipment**

**6.1. General provisions**

a) Working clothes should be manufactured from materials that keep the workers' bodies dry and at a comfortable temperature.

b) For work in hot and dry climates, appropriate clothing should be used to avoid excessive thermal insulation and allow respiration.

c) Adequate protective clothing should be provided where there is a risk of UV radiation or biological hazards, such as poisonous plants, animals, and infections.

d) Clothing should be of a color that contrasts with the forest environment to ensure that workers are clearly visible.

e) The use of personal protective equipment should be regarded as a first resort when risk reduction by technical or organizational means is not feasible. Only in these circumstances should suitable personal protective equipment having regard to the specific risks be used.

f) Personal protective equipment for forestry work should include the relevant items listed in Table 1, which identifies the equipment required for specific tasks.

g) Personal protective equipment should comply with international or national standards.

h) A sufficient supply of personal protective equipment should be readily available to ensure that operators consistently understand the paramount importance of safety and health.

### 6.2. Personal protective equipment appropriates for forestry operations

Each employer should evaluate the need for personal protective equipment in the prevailing conditions. This Table shows the generally accepted practices in the use of this equipment. Workers should be provided with personal protective equipment, except where the employer can demonstrate that no other protective equipment affords the same or a higher level of protection.

| Parts of the body to beprotected: | Feet | Legs | Trunk, arms, legs | Hands | Head | Eyes | Eyes/face | Hearing |
|---|---|---|---|---|---|---|---|---|
| PPE is normally | Safety | Safety | Close- | Gloves | Safety | Goggles | Visor | Ear |

| appropriate: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | boots or shoes[1] | trousers[2] | fitting clothing | | helmet | | (mesh) | muffs[3] |
| **Operation** | | | | | | | | |
| **Planting** | | | | | | | | |
| **Manuel** | V | | | v | | | | |
| **Mechanized** | v | | v | | | | v | |
| **Weeding/ Cleaning** | | | | | | | | |
| **Smooth-Edged tools** | v | | | v | | v | | |
| **Handsaw** | v | | | v | | | | |
| **Chain-Saw** | v | v | v | v | v | v | v | v |
| **Brush-saw with metal blade** | v | v | v | v | v | v | v | v |
| **Brush-saw with nylon filaments** | v | | v | | | v | v | v |
| **Flail** | v | | v | v | | | | v |
| **Pruning** | | | | | | | | |
| **Hand Tools** | v | | | v | v | v | | |
| **Felling** | | | | | | | | |
| **Hand tools** | v | v | v | v | v | | | |
| **Chain-Saw** | v | v | v | v | v | v | v | v |
| **Mechanized** | v | | v | | v | | v | |
| **Debarking** | | | | | | | | |
| **Manual** | v | | | v | | | | |
| **Mechanized** | v | | v | v | | v | v | |
| **Splitting** | | | | | | | | |
| **Manual** | v | | | v | | v | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Mechanized** | v | | v | v | | v | v | |

## 7. First aid, emergency rescue, and occupational health services

### 7.1. First Aid

a) Since forestry workers often work in small groups at separate locations, some should be trained in basic first aid.

b) First-aid training should be repeated at regular intervals to ensure that knowledge and skills are maintained and not outdated or forgotten.

c) The provision of first-aid facilities and trained personnel should be prescribed by laws and regulations.

d) Well-maintained first-aid kits or boxes should be readily available at the worksite and should be protected against contamination by moisture and debris. These containers should be clearly marked and contain nothing other than first-aid equipment.

e) All operatives should be informed of the location of the first-aid equipment and the procedure for obtaining stocks.

### 7.2. Rescue

a) Provisions should be made for the quick evacuation of a person in the event of an injury or illness that requires medical assistance.

b) Transport or a means of communication should be available at the worksite to contact rescue services in case of an emergency. The functioning of the communication arrangements should be checked.

c) All workers should be informed about the telephone number or radio call sign of the nearest hospital, ambulance station, or physician. Information should also be given on the worksite's location and a meeting point for transportation.

## 8. Nutrition and drinking water

a) When employers provide food, they should ensure that the energy intake is sufficient for performing heavy physical work and that the diet is composed of a good balance of carbohydrates, fats, and animal protein.

b) Sufficient supplies of safe drinking water should be available at the worksite, considering that dehydration quickly reduces physical and mental ability, thus reducing productivity and increasing the risk of accidents.

**c)** Forestry workers should be educated about the importance of sufficient nutrition and a balanced diet for their health and productivity.

## 9. Reporting, recording, notification, and investigation of occupational accidents and diseases

### 9.1. General provisions

Reporting, recording, notification, and investigation of occupational accidents and diseases should be undertaken to:

(a) provide reliable information about occupational accidents and diseases at the enterprise and national levels.

(b) identify major safety and health problems arising from forestry activities.

(c) define priorities of action.

(d) evolve effective methods for dealing with occupational accidents and diseases.

(e) monitor the effectiveness of measures taken to secure satisfactory levels of safety and health.

The competent authorities should in particular:

(a) specify which categories or types of accidents, occupational diseases, dangerous occurrences, and incidents are subject to requirements for reporting, recording, notification, and investigation.

(b) make appropriate arrangements for the necessary coordination and cooperation between the various authorities and bodies.

### 9.2. Occurrences subject to reporting and notification

The following should be subject to reporting and notification:

(a) All fatal accidents.

(b) Occupational accidents causing loss of working time, other than insignificant loss.

(c) All occupational diseases included in a national list or covered by the definition of such diseases affecting any person, whether employed or self-employed.

(d) For the purposes of internal safety and health management, recording at the enterprise level should be extended beyond the requirements stipulated above to cover commuting accidents, dangerous occurrences, and accidents not causing loss of working time.

### 9.3. Practice of reporting, recording, notification and investigation

The reporting, recording, notification, and investigation of occupational accidents and diseases should follow standardized procedures to ensure the collection of reliable information.

#### 9.3.1. Reporting, recording, notification and investigation

1. All notifiable accidents and occupational diseases should be reported in writing using a standardized format.

2. The respective information on occupational accidents and diseases subject to notification and the prescribed standard form of notification should be specified by national laws and regulations.

3. Occupational accidents and diseases should be notified, as required by laws and regulations, to:

(a) The accident victim's family should be informed as soon as possible.

(b) The competent authority.

(c) The appropriate compensation authority (for example, social security or insurers).

(d) The body compiling national occupational safety and health statistics.

(e) Any other body concerned.

## II. Technical guidelines for safety and health at theforestry worksite

### 1. General provisions

1. A wide variety of working methods are used in forestry operations, and the work consists of many different tasks. This code cannot, therefore, provide an exhaustive description of safety requirements for every possible variable used, either in terms of selection or detail. The methods covered in this part of the code have thus been selected based on those methods and techniques in common use worldwide, as well as the activities involving the highest risks for the safetyand health of forestry workers.

2. Work methods deviating in detail or totally from those described in this codemay be used if a competent body authorizes them or if employers can demonstrate that such methods provide an acceptable level of safety and health protection.

### 2. Planning and organization of forestry work

1. All forestry activities should be thoroughly planned and organized in advance to prevent inefficiency and ensure proper levels and control of safe practices and work progress.

2. The planning and organization of operations should be based on a forest management plan, which should indicate:

- What type of work is necessary.
- The objectives of the operation.
- The location of designated worksites.
- The time schedule for specific operations.
- Specifications for products or other outputs.
- Specifications for working methods to be used.
- The person responsible for carrying out and supervising the operations.
- A contingency plan in the event of bad weather or problems with equipment.

3.For each task, the best and safest method available should be chosen. Standardized methods that have been approved should be used.

4. As far as practicable, manual and motor-manual work should be supported by machines, particularly to minimize lifting and carrying of heavy loads and to reduce hazards arising from the handling of power-driven handheld machines.

5. Infrastructure requirements should be assessed before work, considering the present location, the traffic ability of roads and trails, and the need for additional installations. They should be planned according to the transport facilities used for personnel, material, and produce.

Evacuation routes and procedures in case of emergency should be planned thoroughly.

- The location of shelter facilities and storage for tools, equipment, and materials should be determined and prepared well in advance to reduce workload and increase productivity by avoiding strenuous carrying of loads over long distances.
- Appropriate means for transporting personnel, tools, equipment, and material to and from the worksite should be provided and maintained in good condition.
- The direction of work progress and transport boundaries should be identified and marked in the field before work is started. Sufficiently detailed maps of the work area are essential tools for adequate planning of forest operations

**Site inspection and planning**

- The variable environment in which forestry operations are carried out gives rise to many different situations. It is essential to evaluate environmental factors that have an impact on safety as part of the planning process.

- Prior to the commencement of forestry operations at a new worksite, a person assigned by management should conduct a risk assessment as a means of identifying any characteristics prejudicial to safety and health. Both natural and man-made hazards should be noted. The risk assessment should consider in particular:

(a) the topography of the land.

(b) working methods and equipment to be used.

(c) dangerous trees, such as toxic trees, dead or rotten standing trees, and other worksite hazards.

(d) consultations with the responsible party on standing live or dead trees that can be safely retained as natural habitat.

(e) electricity or telephone lines, roads, hiking or skiing tracks, or other infrastructure.

- Identified hazards should be marked on a map of the area and on the ground, with a ribbon or barrier, for example, whenever practicable.

Work organization

- The tasks and responsibilities of workers and supervisors should be clearly defined.

- Clear instructions should be given to workers, in writing where appropriate, but at least verbally. These should include:

(a) job specification.

(b) location of the worksite.

(c) required tools and machines.

(d) identified risks and relevant safety rules.

(e) required personal protective equipment.

(f) information about rescue procedures in the event of an accident requiring evacuation.

(g) need for liaison with other workers, including any contractors.

- Work methods, tools, and equipment should be safe and comply with ergonomic principles. If alternative work methods are available, the method involving the least hazards for safety and health should be chosen. The activities should be carried out in accordance with the prescriptions in the present part of this code.
- To reduce prolonged unfavorable working positions and workloads inherent in certain jobs, workers should be encouraged to practice job rotation among the members of their group. This should be supported by training in different tasks and by organizational measures.
- No person should be required to work in a location so isolated that assistance in an emergency cannot be summoned. Forest workers should be linked to their base or their superiors by a reliable means of communication when working in isolated situations. Regular contact must be made during the workday, including contact at the end of the day. In the event that scheduled contact is not achieved, it is imperative that search and rescue operations commence without delay.
- In any operation where cutting, extraction, or loading is carried out, there should be a team of at least two workers who should be in visible or audible contact with one another. Exceptions to this requirement may be made for workers provided with two-way radios, mobile telephones, or other effective means of communication.
- Employers should conduct a briefing with workers before commencing work, informing them of the findings of the risk

assessment and providing directives on how to deal with the hazards identified.

- Supervision of work in progress should be entrusted to a trained and competent person.
- If an operation becomes unsafe because of inclement weather conditions or darkness, work should be discontinued until conditions change to allow safe operations.
- Where work during darkness is unavoidable, the worksite should be provided with enough lighting to maintain normal safety standards.
- When unexpected hazards are encountered, or a task cannot be performed in accordance with safe methods, such as described in the following chapters, work should be stopped, and the competent supervisor should be consulted on how to proceed.
- Where several crews, contractors, or self-employed persons work on the same site, arrangements need to be made to ensure coordination and to assign and communicate responsibility for supervision.

## 3. Manual clearing

### *Organization*

- Hazards arising from dead trees or slash should be assessed prior to silvicultural operations. If, for any reason, dangerous trees must be retained, their location should be made known to all workers operating in the vicinity. A risk zone should be marked clearly and unmistakably.
- If slash is left on the site in heaps or piles, its position should be planned to avoid hindrance to further activities.
- The appropriate time of the year should be chosen for burning slash.

Burning should only be undertaken when it can be controlled. Very dry or windy conditions should be avoided. The provisions for firefighting and fire management in Chapter 15 apply accordingly.

***Equipment***

- Workload and work progress in manual clearing activities depend mainly on the type of vegetation to be removed and the density of vegetation and debris. Workload should be minimized by choosing appropriate tools for the specific type of vegetation:

  (a) For herbaceous vegetation, scythes or sickles should be used.

  (b) For the removal of small woody growth, shears or saws should be considered alternatives to brush hooks or machetes.

- If site conditions vary significantly, workers should be supplied with a choice of different tools to allow the use of those most appropriate.

- When stumps must be uprooted, all roots must be cut or broken to prevent them from falling back and causing injury. Pulling stumps out manually should be avoided as far as practicable. It is safer to use machine-mounted winches. When manual uprooting is unavoidable, poles or stakes of sufficient strength should be used as levers to reduce physical effort.

***Operation***

- When using cutting tools, workers should keep a safe distance from other people.

- Workers should maintain a safe and balanced stance with a secure handle grip. The direction of the cutting must be away from the feet and legs.

**9. Site preparation with hand-held machines**

*Equipment*

- For safety and ergonomic reasons, chain-saws should only be used where stem diameters exceed 100 mm. Where chain-saws are used for motor-manual clearing, the provisions in Chapter 14 apply accordingly. The lightest saw and shortest guide-bar practicable should be used for clearing activities.
- Clearing-saws/brush cutters should be equipped with:

(a) a clearly marked on/off switch.

(b) vibration damping.

(c) an adjustable suspension ring for harness.

(d) blades suitable for specific types of vegetation.

(e) a blade guard and blade cover.

- For supporting the clearing-saw, workers should use a harness, adjusted to their bodies in accordance with the manufacturer's recommendations.
- Workers should be provided with a spare blade and an adequate tool kit for corrective and preventive maintenance.
- Workers should be provided with and use personal protective equipment in accordance with the provisions

***Operation***

- For the operation of chain-saws, the provisions
- Before starting work, clearing-saw operators should check that:

the blade guard is undamaged and securely fixed in the correct position

(a) The blade is seated correctly, is sharp and not cracked, and the blade retaining nut is secure.

(b) The balance of the saw is correct for the operating condition.

(c) The handles provide a comfortable working stance. The weight is spread evenly over both shoulders, and the blade hangs straight in front of the worker's body.

(d) The blade is stationary when the engine is idling.

- Clearing-saw blades should always be kept sharp using file types as specified by the manufacturer. Blades with cracks or missing teeth must be changed immediately and discarded.

Safe use of brush cutters/clearing-saws



- When operating a clearing-saw, a safety distance of 15 m or twice the height of the stems to be cut, whichever is the greater, must be maintained between the operator and other persons.

- A clearing-saw should always be used at full throttle for safe and smooth cutting.
- The clearing-saw should be operated so that debris ejected by the saw is propelled into a safe zone.
- The blade must not be touched when the engine is running.

**10. Mechanized site preparation**

***Equipment***

- Machines used for clearing should be designed, manufactured, and equipped according to the provisions

***Operation***

- When using a tractor or winch for pulling trees or stumps, the tractor must be securely braked and positioned at a safe distance from the tree or stump to be pulled. Pulling should be done with the winch and not by moving the tractor. Particular care should be taken on slopes in order to avoid the tractor overturning.
- When wood chippers or mechanically operated rakes are used, a safety zone should be established to prevent injuries from flying debris or other moving material.

**Planting**

**Organization**

- Excessive debris should be piled in heaps or rows to facilitate access.

- Work-rest schedules should be established to avoid acute or chronic fatigue (tree planter "burnout").
- The maximum weight recommendations should not be exceeded
- Locations for plant storage and distribution should be pre-planned and evenly spread over the planting area to keep transport distances as short as possible.
- Planters should be trained to maintain optimal working postures, such as using their body weight to insert planting tools to avoid back twisting and using the planting tool as a support when bending.
- Each worker should undertake the planting and carrying of plants to provide variety and avoid short-cycle repetitive planting work.
- When planting on sloping terrain, the direction of planting should always be uphill to avoid excessive back bending.
- Workers should be informed when plants have been chemically treated. If treated plants have to be planted, workers should be instructed about the health risks arising from the chemicals used. Information and training must be provided on safe handling procedures and the requirements for personal protective equipment.
- On large planting sites where workers are scattered, an audible assembly signal should be agreed upon in case of emergencies.

**8. Planting of untreated plants**

*Equipment*

- When carrying trays of containerized plants or bundles of bare-rooted plants, suitable backpacks or harnesses with good weight distribution should be used to reduce fatigue and the risk of injuries due to stumbling and falling when carrying heavy loads.

- Manual transport of plants or seedlings over longer distances should be avoided as far as practicable to safeguard workers' health. If available, animals, vehicles, and particularly small off-road vehicles should be used.
- Tools used for tree planting should be designed for this purpose. Agricultural and construction tools, such as pickaxes, are usually not suitable for tree planting.
- Planting tools should be designed and manufactured in accordance with the provisions
- When selecting specific planting tools, consider the size of the plants, the ground and soil conditions, and the body size of the workers.
- The handles of planting tools should be designed to minimize the transmission of shock to the hand if the blade hits a hidden rock or root. They should also be of contrasting color for easy retrieval in the field.
- Planting tool heads should be secure, and the handle should be free from splinters and cracks.
- Blades of planting tools should be kept sharp. For sharpening the blade, suitable files with handles should be available at the worksite.
- The use of water-filled pails for carrying plants should be avoided. If bare-rooted plants must be protected from drying out, wet peat moss or similar material should be used.

***Operation***

- Workers should maintain a balanced stance, keep the planting tool blade clear of their feet and legs, and maintain a safe distance from other persons.
- Workers should try to avoid striking any hard obstructions.
- Tools should be carried in a safe manner, i.e. with the blade well away from the body.

9. **Planting by hand-held power post-hole borer (rock drill)**

- The correct augers for the type of operation and ground should be selected.
- Hand-held post-hole borers should be operated and maintained according to the manufacturer's instructions.
- Operators should ensure that the machine is in a safe working condition by frequent inspection.
- The auger must remain stationary when the engine is idling.
- Machines should be lifted using the leg and arm muscles and keeping the back straight.
- The appropriate auger speed and drilling pressure for the conditions encountered should be maintained, and the bit should not be forced.
- When clearing the auger of any unwanted material, the engine must be switched off.
- On sloping ground, operators should adopt a safe, well-balanced stance at the site to be drilled, keeping their feet well clear of moving parts.

**Tending**

- The work area should be divided into manageable sectors to allow workers to keep a safe distance from others, as well as to have an overall view of their work progress and maintain an efficient work speed.
- Tools appropriate to the diameter and the species of the trees being cut should be used.
- Machines for mechanized tending should be designed and constructed according to the provisions
- When using hand tools, chain-saws, or clearing-saws for tending, the prescriptions apply, as do the provisions pertaining to personal protective equipment

## Pruning

### Organization

- Trees designated for pruning should be marked clearly.
- High pruning from the ground using a saw with a long handle causes a high static load for the shoulders and arms and an unfavorable neck position. This method should be avoided, particularly for pruning trees with large branch diameters. To avoid acute discomfort, the use of a ladder should be the preferred option.
- If tree climbing is necessary above 3 m, a device should be used to minimize the risk of falling and allow optimal working postures.

### Equipment

- Tools capable of reaching the pruning height required should be chosen.
- Tools should be designed, manufactured, and maintained in accordance with the provisions
- It should be recognized that different tree species require a different saw-tooth configuration to minimize the workload and achieve high productivity.
- Cutting edges should be maintained in sharp and clean condition.
- The following equipment should be readily available at the worksite:

(a) Spare blades, a spare handle, and securing devices; for example, screws, bolts, or rivets.

(b) Suitable files for sharpening the blade.

(c) Tools for blade replacement.

(d) A solvent to clean blades.

(e) Blade protection for transport.

- When working from ground level, head and eye protection should be worn.
- Workers should wear personal protective equipment in accordance with the regulations. Footwear should incorporate a non-slip sole to provide a good grip on both the ground and the ladder.
- Ladders should be made of light material and should allow a safe stance. The steps should be of equal distance. The ladder should either be equipped so that it can be securely attached to the tree, or the base of the ladder should be 25 percent of the climbing height away from the base of the tree.

**Operation**

- Workers should:

(a) Maintain a safe working distance from other people.

(b) Ensure there is enough clear space, so the sawing action is unimpeded.

(c) Stand well clear of falling branches and other debris.

(d) Carry tools safely and cover blades when in transit.

**Harvesting**

1. General provisions

➢ Harvesting operations should be planned well in advance to promote efficiency and ensure proper guidance and control. This is particularly important where preparations have to be made, such as the planning and layout of extraction routes. When selecting work methods and equipment, planners should take the slope limitations of machines into account (see paragraph 436).

➢ The organization should incorporate contingencies to cope with unexpected difficulties.

➢ There should always be equipment on site or within easy reach to be able to take down hung-up trees safely.

➢ A detailed transportation plan should be drawn up, including:

(a) the amount of timber to be harvested.

(b) the specifications of produce and volume per assortment.

(c) the means of transport to be used for extraction, for example, skidder,forwarder, cable-crane.

(d) the direction of extraction routes and the location of landings and

roadside stacking areas.

- All extraction routes and associated catchment areas should be clearly marked on maps and in the forest. In tropical forests or other areas where planning involves decisions about individual trees, the approximate direction of fall for each tree to be felled should be determined and marked on the tree using the extraction plan as a guide.
- Dead or rotten standing trees involve an especially high risk of debris falling, often falling unexpectedly in any direction. They should be taken down by highly skilled personnel, preferably before the felling operation, using machines or other methods assessed as safe. If this operation must be carried out manually, work organization, which may include remuneration arrangements, should ensure that safety is a priority.
- No felling, crosscutting, or debranching should be undertaken in an areamade hazardous by a leaning dead tree or a dead tree that has been brushed by a felled tree until the tree causing the hazard has been felled.
- During all operations, the worksite should be kept as clear as possible. It should also be large enough for machine operators to retreat safely and speedily in an emergency.
- The work should be so planned as to minimize manual handling of timber. Accurate directional felling relative to the topography and extraction route is an important factor in achieving this.
- As far as practicable, manual and motor-manual (chainsaw) felling operations should be assisted by machines, particularly to minimize the lifting and carrying of heavy loads and to reduce hazards arising from hung-up trees

**Felling and Conversion**

*Organization*

- When planning the felling direction, the method of extraction and the route are important factors because safety and productivity are highly dependent on how logs are positioned relative to the direction of extraction.

- Felling areas should be divided into zones, which should be clearly allocated to workers engaged in the operation so that no two workers are closer than twice the length of the tallest tree to be felled. The felling zones should preferably be marked in the stand, for example, by painting arrows on edge trees.

- No person should approach closer to the feller than twice the length ofthe tree being felled unless the feller has acknowledged that it is safe to do so. Inany event, no persons other than the feller should be at the base of the tree being felled unless they are:

(a) Helping take down the tree.

(b) Exercising control on behalf of the management.

(c) Undergoing training as a feller.

(d) Needed to help overcome a specific falling difficulty, and the feller acknowledged that it was safe to do so.

- Special care is required when work is carried out on slopes. If the gradient is steep, workers should not be allowed to work directly below others. Operations should be planned to prevent workers from being exposed to rolling or sliding material.

*Equipment*

Depending on the diameter of the tree being felled, workers should be supplied with:

I. A handsaw of appropriate size and design.

II. Chain-saw, which is sufficiently powered and equipped with a guide bar of sufficient length. The lightest possible saw and the shortest practicable guide bar provide a sound ergonomic combination.

- Except for very small trees (for example, less than 100 mm i n diameter), axes should not be used for felling because the felling direction is difficult to control. furthermore, the workload and amount of timber wasted are much higherthan when felling with a saw.

- The following aid tools should be available and may be used for felling:

(a) A breaking bar or lever.

(b) A small and a large alloy or plastic wedge.

(c) A sledge or splitting hammer.

(d) A turning hook or a turning strap.

(e) An axe (for clearing and debranching). optional:

(f) A tree jack.

(g) A felling cushion. or

(h) other felling aids.

- Iron wedges should not be used in any case.
- Specially designed spades should be used for manual debarking, as they reduce the workload considerably compared to a machete or other tool not designed for this purpose.
- All tools should be designed, manufactured, and maintained
- Cutting edges should be maintained in good working condition and always kept sharp and safe.
- Chain-saws should be designed and equipped in accordance with the following provisions. they should incorporate:

(a) Separate handles for both hands when wearing gloves.

(b) An on/off switch which is reachable with the right hand on the throttle and wearing gloves.

(c) A throttle control lock-out that prevents the chainsaw from being started unexpectedly because two levers must be pressed simultaneously.

(d) a rear handle guard for protection of the right hand.

(e) An anti-vibration system consists of rubber shock absorbers between the engine block and handles.

(f) A chain brake activated manually by the front handle guard and by means of a non-manual mechanism in the case of kickback.

(g) A chain catcher.

(h) A spiked bumper that allows the weight of the saw to rest securely on the log during crosscutting.

(i) A front handle guards to protect the left hand from the chain.

(j) A chain guard for avoiding injuries during transport.

(a) Workers should be provided with and use personal protective equipment

***Operating a chainsaw***

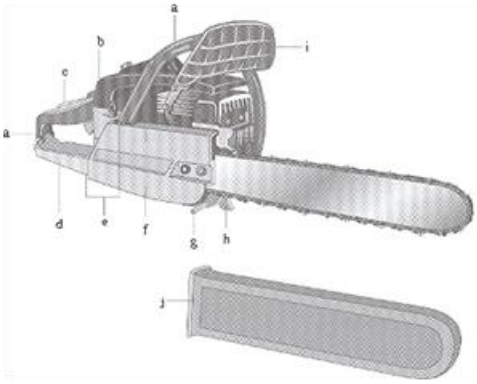
Workers who are assigned to chain-saw operations should demonstrate their knowledge about and skills in:

(a) Mandatory safety features on chain-saws.

(b) Mandatory personal protective equipment.

(c) Maintenance of the motor, chain, and guiding bar of the chain-saw.

Safety devices on chain-saws




a) To reduce the health hazards arising from chain-saw operations, such as exhaust gases, noise, and vibration, the duration of chain-saw work should be minimized as far as practicable by rotation with other tasks that do not require the chain-saw. These might include sorting end products, scaling, machine operating, choke ring, and involvement in the planning and control of the operation. Operators should preferably not work with a chainsaw under load for more than five hours daily.

(*Note:* This limit is usually achieved by a combination of refueling, maintenance, other work, and rest periods unless excessive overtime is undertaken.)

b) Chain-saw operators should be provided with and use personal protective equipment

c) The lightest saw and the shortest guide bar possible should be used.

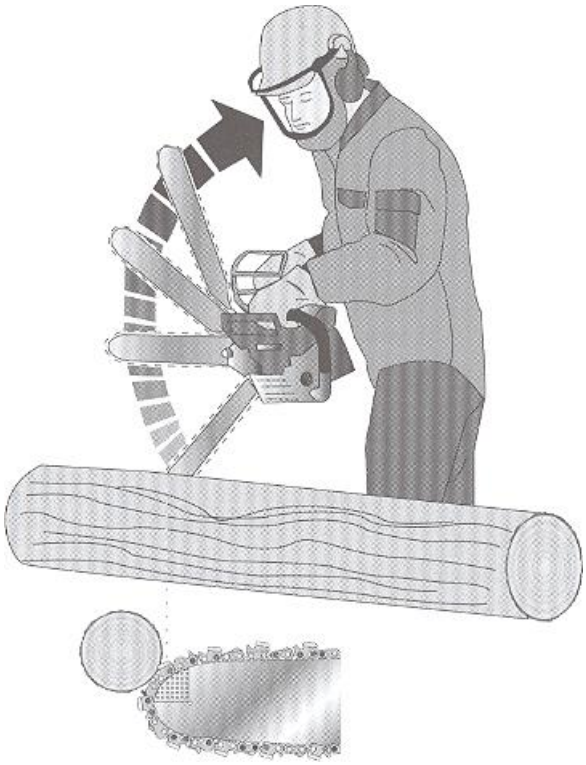
d) Chain-saws should always be kept in a clean condition and effective working order.

e) The carburetor should be adjusted in a way that the chain is stationary when the engine is idling.

f) The functioning of the chain brake should be tested regularly.

g) When starting the chain-saw, a safe distance from other persons must be maintained. It should be ensured that the saw chain is clear of obstructions.

Chain-saw kick-back



- Chain-saws should not be operated above shoulder height because of the risk of kick-back and the resultant backward rotation of the guide bar.
- Chain-saws should always be switched off or the chain brake engaged when moving about.
- When fueling a chainsaw, a safe distance from all ignition sources should be maintained. Smoking while fueling should be strictly prohibited. Containers should be clearly labeled and have securely fitting caps. Plastic containers must be designed and approved for use with petroleum spirit.
- Nobody should ever work with a chain-saw alone unless the requirements

***Operation***

- Felling operations should only be carried out in daylight hours or with adequate lighting and in weather conditions that allow good visibility. When the wind is too strong to allow safe directional felling, felling operations should not be undertaken.
- On steep, icy slopes, felling operations should only be undertaken when a safe stance can be maintained.
- When carrying out felling operations in old-growth or natural forests, particular attention should be paid to intertwining branches, climbers, and dead trees.
- Workers should be encouraged to ask for help if they do not feel competent to cope with specific felling difficulties.
- When starting to fall a tree, workers should ensure that nobody who is not involved in the felling is in the felling area. The safety distance is at least twice the height of the fallen tree.

- Escape routes should be chosen in advance and kept clear of brushes, tools, and other obstructions that would impede a quick escape.
- The base of the tree should be free from obstacles, and fellers should ensure they can maintain a balanced stance.
- The main felling cut should be made at a sufficient height above the highest ground level to enable the worker to cut safely, control the felling direction, and have freedom of movement to step away from the stump when the tree starts falling. Generally, trees should be felled as close to the ground as the conditions permit.
- Any felling technique that has been assessed as safe by a competent authority or training institution may be used. Where no technique has been assessed as safe or in addition to these, the recommended technique for felling trees with a

(a) Reduce buttresses as necessary to achieve a more or less cylindric tree base and facilitate directional felling.

(b) Cut a front notch at a 90° angle to the direction of fall and have a depth of one-fifth to one-quarter of the butt diameter. the top and bottom cuts of the notch should meet exactly. Any over-cutting could weaken the hinge.

(c) Make the main felling cut, which should be slightly higher than the notch, and leave a hinge of about one-tenth of the butt diameter. This hinge is essential to guide the tree in the planned direction of fall.

- When felling large trees, wedges or a breaking bar should be inserted into the back cut to prevent the tree from settling back and jamming or trapping the saw. This will also help push the tree in the designated felling direction.
- When the back cut is deep enough to allow the tree to fall, the tree should be brought to fall using a lever or a wedge. The tree should not

be completely severed to preserve the hinge and keep control over the planned felling direction.

- The standard technique should be modified if the trees:

  (a) Have a one-sided crown or a significant lean.

  (b) Are leaning in a direction opposite to that chosen for felling.

  (c) Have a diameter of more than twice the effective length of the guide.

  (d) Are systematically brought down with winch support.

  (e) Are dead or have symptoms of rot.

In these cases, an appropriate modified felling technique should be used, adapting the depth of the notch, the shape of the hinge, and the use of wedges according to the specific requirements.

- When a metal lever is used in motor-manual felling, workers should make the felling cut so that the saw chain cannot touch the lever.
- When a tree starts falling, the adjacent canopy should be watched carefully for branches or treetops that might be released from either the falling or neighboring trees. Particular attention should be paid to dense stands and natural or virgin forests, where intertwining branches, climbers, or unstable trees could increase this hazard.
- All trees on which felling has started should be brought down safely before further work is undertaken. If this is not possible, then the location and position of the "cut-up" or "hung-up" tree must be brought to the attention of all persons who may come into the danger area.
- If a cut-up or hung-up tree cannot be brought down, for example, because assistance is not available, the risk zone under and around the tree should be clearly marked, and all personnel should be excluded from the risk zone until the tree has been brought down safely.

- Particular care should be taken in felling dead trees and working around them. Stump height should allow maximum visibility and freedom of activity during felling. Whenever possible, dead trees should be felled in the lean direction, using as deep a notch as necessary to minimize the use of wedges and the consequential shock vibration.

**Taking down cut-up or hung-up trees**

- Cut-up and hung-up trees are a potentially fatal hazard and should be taken down immediately using an authorized method. When taking down hung-up trees, workers should strictly observe the following.

(a) work under the hung-up tree.

(b) fell the holding tree.

(c) climb the hung-up tree.

(d) cut lengths from the butt of the hung-up tree except for small timber with less than 20 cm base diameter.

(e) fell another tree onto the hung-up tree.

Failure to comply is hazardous, increasing the risk of serious injury.

Loading and transport

**Loading**

- Manual loading should be avoided. When it is unavoidable, hand winches or similar aids should be used to reduce physical strain.
- Vehicles being loaded should be parked safely and braked securely.
- No person should be in the cab or on the platform of the vehicle while loading is in progress, unless the cab of the vehicle is adequately protected.

- Truckloads should be properly balanced and secured by binders that are of sufficient strength to prevent logs from becoming dislodged or shifting in transit.

Workers operating in loading and transport operations should be equipped with and wear personal protective equipment

**Road transport**

*Organization*

- The gradient of roads should, wherever practicable, not exceed 10 percent.
- Roads used in wet weather conditions should be adequately drained and constructed with a rock base, gravel surface, or other durable material.
- Forest roads and bridges must be properly maintained in advance to allow heavy vehicles to travel safely without damaging the road surface, which could lead to erosion and costly repairs.
- All truck transport should be carried out in a manner that will minimize road damage. Transport operations should, therefore, be tailored to the bearing capacity of the road. Drivers should:

(a) Hold the legally required license appropriate for the type of vehicle they are operating.

(b) Always observe national traffic regulations.

(c) Have a thorough knowledge of the regulations and instructions for operating the particular type of vehicle they are driving.

(d) Be able to carry out routine servicing and minor repairs.

(e) Have the final responsibility to ensure that the truck is loaded correctly and securely and that the truck is not overloaded. The latter is best ensured by weighing the truck. Where no weighing facilities exist, tables

of volume-weight ratios for common species, as well as operator experience, should be used, with the necessary caution.

- A daily, full inspection should be made of trucks and trailers, paying particular attention to the steering mechanism, lights and reflectors, brakes, boosters, brake hoses and connections, reaches, bunks, bunk blocks, and couplings. Any defect that makes the vehicle unsafe to operate should be replaced or repaired before the vehicle is put back into service. Wheels should be checked regularly for cracks, uneven tread and pressure of tires, and loose or missing lug bolts.

***Equipment***

- Timber trucks should be sturdy and reliable and able to operate on forest roads.
- The trucks should be equipped and in a roadworthy condition, to comply with the requirements of national laws or regulations concerning road safety. This applies equally to timber trucks operating only on private forest roads.
- To protect the cabin from falling objects or penetration by an unsecured load, timber trucks should incorporate an adequate barrier between the load and the cabin.
- While operating frequently in remote areas, trucks should be equipped with two-way radios or mobile telephones.
- A safe and adequate means of access to and egress from the loading workstation should be provided on self-loading trucks.
- Working and walking surfaces on vehicles should be designed and constructed so as to eliminate slippery conditions.

***Operation***

- Trucks should not approach a landing when there is danger from incoming produce.

- Workers should keep well clear of swinging or falling logs and outside the risk zone in the event of a fractured cable.
- Vehicles should not be overloaded. There must be strict adherence to traffic laws concerning maximum loads.
- Riding on any part of a timber truck other than in the cab should be strictly prohibited.