

Technical demonstrations and safety for
tree work

樹木工作技術及安全示範

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攀樹鋸橫枝青年跌傷



Personal Protective Equipment in Arboriculture Field 樹木工作的安全裝備

Tree surgeons expose themselves to high risk of health and safety hazards. Personal Protective Equipment should be regarded as the one of the most important measures to protect against health and safety risks.

樹木護理人員經常要面對高度危險的工作。而穿戴個人安全裝備可算得上是一項重要的保護員工健康與及安全的守則。

However, in arboricultural field, Personal Protective Equipment (PPE) is one of the most important aspects to protect tree surgeons against safety and health risks. In Britain, the Health and Safety Executive (HSE) recommends that the following factors be considered when assessing the suitability of PPE :-

無論如何，個人安全裝備在樹木護理工作方面是其中一項十分重要的元素，用以保障樹木護理人員的健康和安全。在英國，健康及安全委員會建議當挑選合適的安全設備時要考慮下列因素：－

1. is it appropriate for the risks involved and the condition at the place where exposure to the risk may occur ?
2. does it prevent or adequately control the risks involved without increasing the overall level of risk ?
3. can it be adjusted to fit the wearer correctly?
4. has the state of health of those who will be wearing it been taken into account ?
5. what are the need of the job and the demands it places on the wearer ?
6. if more than one item of PPE is being worn, are they compatible ?

1. 是否適合於有關的工作環境和可能發生的意外？
2. 設備是否可以提供足夠的保護並且不會增加整體的危險程度？
3. 穿戴者能否調校設備以應所需？
4. 有沒有將穿戴設備人員的健康狀況加入考慮之列？
5. 穿戴者的工作需要及要求是什麼？
6. 假若需要穿戴多於一種個人安全裝備，它們是否可以互相兼容

Personal Protective Equipment

Chainsaw is the most vital equipment for the surgeons. When designing and manufacturing chainsaw protection equipment, there are three main principles to be applied :

個人安全裝備

鏈鋸是樹木護理人員的必備工具，當設計及生產防止鏈鋸安全裝備時，有三大原則需要遵守：

1. providing a surface that the saw chain will not readily bite into;
2. using fibres that have a high resistance to cutting and absorb rotational energy which reduces chain speed; and
3. long, loosely woven fibres that will be pulled into the cutting chain train and clog chain rotation.

1. 表面層不會被鋸鏈切入；
2. 所使用的纖維料可以阻慢切割，可以吸收鋸鏈的旋轉力和減慢鋸鏈的速度；
3. 運行中的鋸鏈，把那些鬆散和長的纖維拉進鏈鋸內，阻止鋸鏈的轉動。

To avoid running saw chain being in contact with naked legs, the European Directives and European Standards require manufacturers to produce 4 classes of chainsaw protective trousers for different chain speeds. They are :-

為了防止運行中的鋸鏈接觸雙腿，歐洲的指引和標準要求生產商生產四種不同級別的保護褲，而他們是要符合不同鋸鏈的速度 :-

- Class 0 16 metres per second
- Class 1 20 metres per second
- Class 2 24 metres per second
- Class 3 28 metres per second

- ○級 秒速16公尺
- 一級 秒速20公尺
- 二級 秒速24公尺
- 三級 秒速28公尺

Leg protection will feature three design types : -

a. 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 further 5 cm past the left seam. The purpose of the extra 5 cm is to help combat trouser rotation around the leg on saw chain contact.

而腿部的保護要符合三種不同的設計：

甲 第一類款式

保護功能的物料要覆蓋的範圍由右面縫口至左面縫口後的五厘米。而左面多出的五厘米是用來抵禦因鋸鏈接觸腿部而帶動褲管轉動所產生的褲管移位的危險

a. Type B

- These are the same as A but with an additional 5 cm 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 and other European countries.
- Both A and B are intended for use by certificated operators engaged in normal harvesting operations on the forest floor.

乙 第二類款式

- 因應市場的要求，這款式與第一類款式相同，但在右面縫處後面亦需要有五厘米的保護物料。估計英國及其他歐州國家對此款式產品沒有興趣。
- 第一類款式及第二類款式設式是專門供給認可的木材收割員在森林地面所穿的

c. 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 reason but it also encompasses tree surgeons who, are involved in climbing.

丙 第三類款式

- 這一種款式將整條腿包括前和後都覆蓋保護，即是完全保護型的設計。
- 他的對象是沒有資歷的人士或非熟練操作員與及在樹上工作的樹木護理人員。

Foot protection falls into two general categories :

(i)rubber and (ii) leather.

- Rubber boots meet the test requirements easier than the leather due to their providing a surface that the saw chain will not readily bite into.
- As a result, an additional lower chain speed of 16 m/sec has to be introduced for leather boots.
- Boots should therefore carry the relevant chain speed class and the 'CE' mark in order to comply.

保護足部的安全靴大致可以分為二類：

(1)橡膠和(2)皮革。

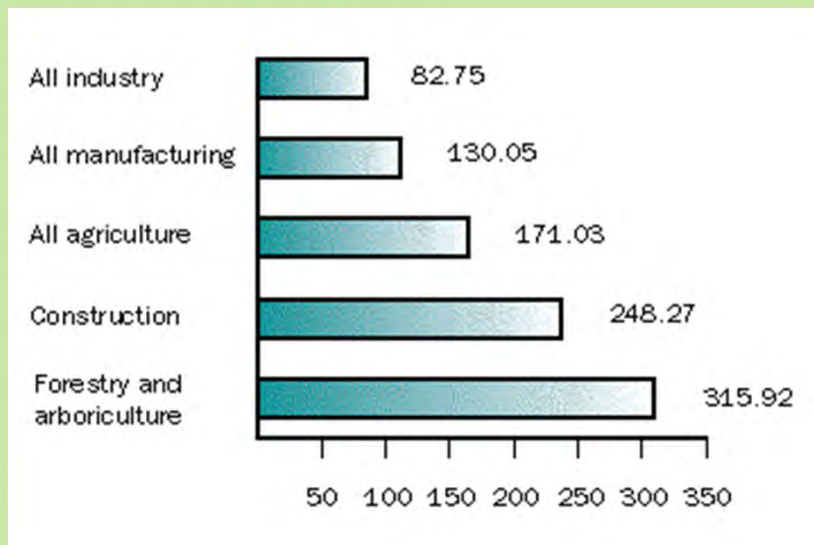
- 當測試安全標準時，發覺橡膠靴的表面較皮靴的表面更有效地防止鋸鏈切入。
- 而部份皮靴只符合鋸鏈秒轉速16公尺的要求。
- 而所有安全靴則需要印有歐洲安全標準符號 'CE' 標誌及鋸鏈的轉速以資識別。

- Noise protection is an important aspect for the chainsaw operator.
- Ear injury cannot readily be detected .
- It was quite interesting to know that previously it was generally accepted the more noise an ear defender kept out the better.
- It is now realised that a tree surgeon needs to be aware of a certain level of ambient noise, such as traffic, or warning calls, etc. also for safety reason.
- 噪音保護對電鋸操作員來說是很重要的一環。
- 聽覺受損在很多情況下都很难察覺得到的。
- 在以前，一般人認為聽覺保護裝備越能減低噪越好。
- 現在發覺到為了安全見，樹木醫護人員當戴上聽覺保護裝備後亦應能察覺到附近環境一定程度的噪音，比如車輛、聲音警告等。

- although a great deal of progress has been made in reducing the noise level of chainsaws and other arboricultural equipment
- he days when an operator can safely dispense with ear defenders is still a long way off
- it is also realised that the helmet that the defenders are mounted on plays an important part in successful noise controls so that helmet and defenders are regarded as an integral unit and random mix match is no longer recommended
- the manufacturers will have to make information available as to which helmets their ear defenders have been tested on in complying with the relevant examination tests of the appropriate standard
- 雖然在減低鏈鋸噪音及其他樹木維修工具有很大的進展
- 但是要令操作員完全不需穿戴聽覺的保護設備則仍需要假以時日再作進一步改善
- 頭盔連耳罩可以有效地控制噪音，所以兩者不能和其他型號產品互相代用
- 生產商會提供各款頭盔及有關耳罩的安全測試結果和標準

- Harness and climbing rope ensure that a climber works safely at height
- The working position safety harness with legs strops provides maximum protection
- The safety working load (SWL) of the climbing rope is one-third of the loading weight
- The minimum SWL. is 300kg for standard 12mm dia climbing rope
- Its extensible ability serves as cushion effect which can firm hold a sudden vertical drop at 1 meter above
- 安全帶和爬樹繩確保在樹上工作人員的安全
- 工作位置型的安全帶連大腿固定帶可以提供最佳的保護
- 爬樹繩的安全負荷量是它可承受重量的三份一
- 一條十二毫米直徑的爬樹繩的安全負荷量是三百公斤
- 當操作員在一公尺高垂直墮下時，爬樹繩除了能夠承托下墮的重量外
- 他的伸延特性亦提供軟墊效能，從而減少弄傷操作員的可能

- Every employer shall ensure that suitable personal protective equipment and adequate training are provided to his employees who may be exposed to risks to their safety or health while at work
- Every employers and employees shall ensure that personal protective equipment is maintained in an efficient state, in efficient working order and in good repair
- It must be remembered that no PPE can ensure 100% protection; there is no substitute for safe working practices and the worst thing an operator can do is to feel that because he is fully equipped with PPE he is invulnerable
- 如果員工需要在對安全和健康有威脅的地方工作，僱主要確保各員工有適當的個人安全裝備和提供適合的訓練
- 各僱主及員工要確保個人安全裝備是在良好的狀態、功能和有妥善的維修
- 千萬要緊記個人安全裝備不能夠提供百分之一的保護功能，安全的工作習慣是無可代替的。最壞的事情無過於操作員以為配戴各類型的個人安全設備後是不會受傷害，而忽視其他安全守則



Average fatal and major injury rates per 100 000 employees (1990/91 – 1995/96)

Tree work is dangerous work.

HSE – UK

Between 1990 and 1996
38 people were killed
average of 6 per year

Fuelling

- 23 Petrol vapour is invisible and can travel considerable distances from spillage or fuelling sites. Maintain a safe distance from all sources of ignition at all times.
- 24 Store fuel to avoid vapour ignition from any source such as fires, people smoking or the chainsaw. Select a site shaded from direct sunlight.
- 25 Use fuel containers specifically designed for chainsaw use that incorporate a non-spill spout. The containers must be clearly labelled and have caps which fit securely.
- 26 Replace all fuel and oil caps securely. Ensure the O-ring seals on the fuel and oil caps are in good condition.
- 27 Move a safe distance (normally at least 4 m) from the fuelling point before starting the chainsaw.

Starting the saw

- 28 Chainsaws must be used with the right hand on the rear handle. The thumb of the left hand must be under the front handle.
- 29 Maintain a safe distance from other people.
- 30 Be sure the saw chain is clear of obstructions.
- 31 From cold:
 - Put the saw on the ground.
 - Set the controls as recommended by the manufacturer.
 - Place one foot on the rear handle plate and the left hand on the front handle.
 - Pull the starter cord firmly.
- 32 From hot:
 - As from cold but without using the choke or the half throttle stop controls or
 - Thigh or knee start:
 - Grip the rear handle firmly between the knees.
 - Grip the front handle with the left hand.
 - Pull the starter cord firmly.
- 33 Where conditions prevent a cold start on the ground, a thigh or knee start may be used.
- 34 Check that the chain brake works correctly. Apply the chain brake when walking on site, or if the saw is not being used for short intervals (more than 15 seconds). Apply the chain brake with the back of the left wrist. Switch the saw off if it is not in use for longer periods.

Further reading

Basic chainsaw felling and manual takedown AFAG302
 Chainsaw shredding AFAG303
 Chainsaw cross-cutting and manual stacking AFAG304
 Chainsaw clearance of window AFAG306
 Chainsaw felling of large trees AFAG307
 Top-handled chainsaws AFAG308
 Use of winches in directional felling and takedown AFAG310
 Emergency planning AFAG302
 Electricity at work: Forestry and arboriculture AFAG304
 First aid at work: Your questions answered INDG214
 Managing health and safety in forestry INDG294
 Chainsaws at work INDG317
 Protect your hearing or lose it! INDG363

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This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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Using petrol-driven chainsaws

Arboriculture and Forestry Advisory Group

Manual takedown

- 23 Make every effort to take down a hung-up tree immediately. If this cannot be done, establish adequate exclusion zones. Move to an alternative felling area until the hung-up tree can be safely dealt with.
- 24 Ensure that no other person is within a distance equal to twice the length of the tree or directly below on steep slopes.
- 25 Even proper felling techniques and manual aid tools have their limitations when it comes to dealing with heavy loads. In such situations use mechanical assistance.
- 26 Carefully assess the tree to decide the safest and most effective method of takedown, and identify the danger areas around the tree.
- 27 When using a chainsaw to remove part or all of the hinge, work from a safe position at the side of the tree.
- 28 When rolling lodged trees use a pushing movement. Maximum leverage and muscular effort is obtained by keeping the lever between waist and chest height. Stay outside the danger zone (see Figure 4).



Figure 4 Rolling lodged tree

- 29 When moving the butt using a pole as a lever, keep behind the pole, and use the legs to push.
- 30 When the tree begins to fall let go of the pole or levers.
- 31 Do not:
 - fell the supporting tree in an attempt to free the hung-up tree;
 - climb a hung-up tree;
 - fell another tree across the hung-up tree in an attempt to dislodge it;
 - walk or work under a hung-up tree;
 - cut pieces off the butt end of a hung-up tree in an attempt to dislodge it.

Further reading

Using petrol-driven chainsaws AFAG301
 Chainsaw shredding AFAG303
 Chainsaw cross-cutting and manual stacking AFAG304
 Chainsaw clearance of window AFAG306
 Chainsaw felling of large trees AFAG307
 Use of winches in directional felling and takedown AFAG310
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Basic chainsaw felling and manual takedown

Arboriculture and Forestry Advisory Group

Free Leaflets _ Tree Work

<http://www.hse.gov.uk/pubns/forindex.htm>



Free Leaflets - Tree Work

- Chainsaws at work [📄](#)
- Managing health and safety in forestry [PDF 275KB] [📄](#)
- Tree work accidents: An analysis of fatal and serious injuries [📄](#)
- PUWER 98 : how the regulations apply to agriculture and forestry [PDF 25KB] [📄](#)

Lifting and handling

- LOLER : how the regulations apply to forestry [PDF 30KB] [📄](#)
- LOLER : how the regulations apply to arboriculture [PDF 25KB] [📄](#)

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- 203 Clearing saw [PDF 100KB] [📄](#)
- 204 Flails and mulchers in tree work [PDF 125KB] [📄](#)

一般安全

1. 執行風吹倒樹工作的人員需要對倒樹和鋸樹等工作有足夠經驗和認識。
2. 需穿戴安全帽, 護耳罩, 防電鋸手套, 足部保護設備, 防電鋸鞋及急救包。
3. 不要在風吹倒樹下或樹根底部穿越或工作。
4. 避免沿風吹倒樹下的樹幹往來。
5. 評核現場環境和訂出危險
6. 工作最理想由樹底部至頂部
7. 在斜坡工作要在坡底部做起
8. 檢查所有輔助工具包括拉力器並確保可供隨時使用
9. 若有電線在現場上方, 要保持兩樹高的距離. 在沒有聯絡電力公司前, 不要在範圍內工作。

工作

10. 確保你和其他同事完全明白工作詳情
11. 當倒樹或切除傾側和斷枝時, 確保其他人員不在兩樹高的範圍內. 主管人員可縮減距離.
12. 採取一個穩固和平衡的姿勢
13. 用鏈鋸時切勿起越肩膊的高度
14. 鋸樹時感覺接近斷的時候要關機或殺鍊器
15. 保持暢通的工作空間及當有倒樹壓著小樹時要小心檢查情況. 要在消除壓力和張力後才處理大樹
16. 選擇和保持逃生路線的暢通
17. 小心枯木, 不穩固的樹木或爛樹頂, 包括要處理的樹木和鄰近的樹等
18. 其它物件或壓力對樹幹構成移動要保持醒覺
19. 確保切口要盡量接近樹幹底部

20. 若樹根底部懸空, 在切割前要固定它的位置
21. 樹幹鋸完後, 樹根部份要盡量回復穩固位置.
22. 當樹枝彎曲時要找出受壓和張力點. 經常記著很幼的樹枝也會造成巨大的力度
23. 第一刀要在受壓點
24. 假如發覺樹幹會有彈起的危險, 最後一刀要落在張力點, 亦要距離受壓點那刀的一吋
25. 當樹幹的粗度大過鋸板的長度時, 要落最後一刀時要站在受壓的位置, 而樹幹亦要用拉力器保持穩固

斷樹

26. 首先要切除冠頂枝條用以減輕樹冠的重量, 或利用拉力器拉離折斷部份
27. 可利用一般倒樹技巧倒直立的樹幹. 如果斷了的樹冠仍然掛在樹上, 要在九十度方向倒樹





Unsafe Tree Work

[video 1](#)

[video 2](#)

Technical Training

[CS Pract v.1](#)

[CS Pract v.2](#)

Examination

[CS Exam v.1](#)

[CS Exam v.2](#)