

APPENDIX 17 - Guidelines on Tree Pruning

Guidelines on Tree Pruning

**Greening, Landscape and Tree Management Section
Development Bureau**

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Introduction

This guidance document presents a recommended standard of good practice for tree pruning in Hong Kong that helps sustain healthy development of our precious tree assets. Trees provide a lot of benefits to human beings, wildlife and the environment, in particular in densely populated cities like Hong Kong. Trees help to suppress adverse impact from climate change and heat island effect; provide screening effect against noise and pollutants; improve amenity and aesthetic value in the city; provide food source and habitats to wildlife and promote biodiversity in urban environment; and improve air quality by producing oxygen and absorbing greenhouse gases such as carbon dioxide, etc. Nevertheless, trees in urban environment interfere with human lives and urban development at the same time. As they become bigger and older, trees occupy more space on pavements and the roadsides; interfere with underground utilities; block scenery views of residents; and create hygienic concerns due to fallen flowers, fruits and leaves. Tree failures that occur due to extreme weather, poor tree health or poor structural conditions also threaten human lives and result in property damage.

In order to maximise the benefits and minimise the hazards associated with trees in our city, well-developed urban forest and well-planned tree management have become more important. Urban trees should be continuously cared for throughout their life span through measures such as proper irrigation, mulching, fertilisation and appropriate mitigation measures, such as pruning and provision of supporting system. Amongst the various mitigation measures, tree pruning is essential in every tree maintenance and risk management scheme. Tree pruning is a practice of removing specific portions of a tree to achieve long-term maintenance of good tree health, structural integrity, aesthetics and safety of public and properties. Appropriate pruning parameters (e.g. pruning type, pruning time and pruning extent) should be carefully determined according to different pruning objectives, tree species and tree conditions, etc. Given its significance in ensuring good health and structure of trees, thereby, protecting public safety, pruning work should follow a set of good working procedures, standards, and safety guidance, and be performed by registered personnel with adequate knowledge and skills in tree pruning and work supervision.

This guidance document cross-references relevant local and international standards, guidance and publications and those published by the

Greening, Landscape and Tree Management Section (the GLTMS) of the Development Bureau. Tree management personnel should make reference to this guidance document when planning and conducting tree pruning, in conjunction with other local and international standards, guidance and publications listed in the “Reference” section as appropriate. This guidance document provides guidance on good tree pruning practice, and its recommendations are not intended to be mandatory. It is recognised that experienced practitioners may wish to adopt alternative methods to those recommended herein. Practitioners are encouraged to comment at any time to the GLTMS on the contents of this guidance document, so that improvement can be made to future editions.

Part 1. Overall Management

1.1. Objectives

In tree risk management, tree pruning is one of the most commonly used risk mitigation measures. Before carrying out tree pruning, the objectives of the pruning work should be clearly defined to prevent any unnecessary or excessive pruning. The most common objectives of tree pruning are divided into the following categories:

- (a) Reducing Risk and Nuisance to Public
 - (i) Upon identification of potential tree failure risks, it is important to reduce or eliminate the risks as soon as possible. Regular and appropriate tree pruning is an effective mitigation measure to reduce tree failure risks and maintain a safe urban environment.
 - (ii) As they grow bigger, roadside trees may obscure the sight of pedestrians and motorists; physically obstruct vehicular accesses, road signs, lampposts and power lines; and leave insufficient headroom for pedestrians, vehicles and double-decked buses, etc. Roadside trees require regular pruning in order to provide adequate clearance to road users.
 - (iii) Trees planted next to buildings or premises may cause disturbance or nuisance to occupiers due to overgrown tree crowns towards the structures. Tree pruning to remove overgrown branches, reduce crown size or uplift tree canopy can reduce tree failure risks and nuisance caused.
- (b) Maintaining or Improving Tree Health, Form and Structure
 - (i) As trees grow towards maturity, the number of dead and diseased tree parts start to accumulate. By removing weak and undesirable branches, shoots/sprouts and trunks, food reserve and water supply can be allocated to healthier parts of the trees while encouraging further tree development and recovery.

- (ii) Appropriate tree pruning can prevent invasion of pests and diseases. By removing dead or infected tree parts and by thinning the dense crown, spreading and harbourage of pathogens within the same tree or to adjacent trees can be prevented or eliminated.
 - (iii) Proper tree pruning removes overcrowded leaves, twigs and branches. This allows more sunlight penetrating to the inner and lower part of canopies and increase photosynthesis rate of trees. Better air circulation within tree crowns can avoid excessive moisture inside the crowns, where is favourable to fungal infection. Besides, when competing branches are reduced or selectively removed, dominant leaders and scaffolding branches would be developed and tree structures can be improved.
 - (iv) Better tree form with strong and balanced framework can be trained by early tree pruning. Pruning at young tree stage can significantly reduce the need and cost of pruning in upcoming tree lifespan. Poor and declining tree health and structure should be mitigated as early as possible.
 - (v) Regular tree pruning can help developing good and stable tree structures particularly for those with poor and unstable root system, and those growing on locations with severely restricted rooting area, insufficient soil mass and precipitous slope, etc.
 - (vi) Urban development and construction may change the original tree growing conditions. Sufficient pruning can help the retained and transplanted trees conform to their new environment by controlling their growth rate and changing their tree forms.
- (c) Enhancing Resistance to Inclement Weather
- (i) Pruning is one of the best precaution measures of tree failure during extreme weather condition. Crown reduction and crown thinning can reduce wind resistance of trees and minimise the potential of tree failure by reducing tree height and crown loading.

- (ii) The survival rates of well-pruned urban trees are generally higher than unpruned trees under inclement weather. Proper tree pruning can protect trees from damage and failure under strong wind and heavy rain and reduce tree failure risks to public and properties.
 - (iii) Structural pruning (also called formative pruning) during young tree stage can help to establish a healthier urban forest in the future with lower wind resistance and lower tree failure rate during typhoon season. Tree growth can be directed to develop and maintain good structures including single dominant leader, strong branch attachment and balanced tree crown. In the meantime, structural pruning also serve as correction of bad structural issues such as multiple stems, included bark and lion-tailing.
- (d) Improving Aesthetics and Urban Environment
- (i) Formative pruning can help to maintain trees in their most desirable form and appearance, in particular when conducting in nursery stage or young tree stage. Nursery trees may be regularly pruned to control their form, foliage density and size to fulfil specific landscape objectives and constraints at planting site.
 - (ii) A tree treated by proper pruning can create a more pleasant living environment. By providing a satisfying amount of shading from trees, this can change the microclimate under the tree and reduce the temperature. Sufficient vegetation coverage can also reduce urban heat island effect.
 - (iii) Trees play an essential role in urban landscape by serving as greenery enhancement and unsightly view screening. Appropriate tree pruning including crown thinning, reduction and raising can create more desirable views in urban areas.

1.2. Work Plan

Before conducting tree pruning work, it is highly recommended that a pruning plan should be prepared by Inspection Officer in advance. By listing out the important components in a pruning plan, Inspection Officer can manage the workflow of pruning work systematically, identify the required personnel and equipment and address any associated risks and constraints during pruning work. The objectives of the pruning should be clearly conveyed to the Tree Work Supervisors and Tree Workers involved as well as other professional personnel such as the architect/engineer/supervising officer of a contract, and project/resident landscape architect, etc.

When planning the pruning work, the decision and recommendation made in the latest tree inspection report should be taken into consideration. The pruning plan should also take into account the site conditions of the pruning work as well as weather condition on the proposed works. A sample pruning plan is provided in Appendix A for reference. Inspection Officer may suitably amend the sample plan to comply with its own tree management requirements and should include but not be limited to the following considerations.

(a) Assessing Potential Risks of Pruning Work

All risks associated with the pruning work should be assessed and appropriate safety measures should be implemented to alleviate or mitigate the potential risks. Tree Work Supervisors and Tree Workers should be alerted to all potential hazards prior to the pruning work. The potential risks of the pruning work may be associated with the following factors:

- (i) Use of pruning tools, e.g. hand saw and chainsaw;
- (ii) Work at height, e.g. tree climbing and use of elevated platform;
- (iii) Condition and stability of trees, e.g. leaning, cracks, decay, fungal fruiting bodies and root-plate movement;
- (iv) Impact of one tree part on lower tree parts and site conditions during pruning work, e.g. fallen branch or whole tree failure;

- (v) Weather conditions, e.g. strong wind, heavy rain, very hot weather;
- (vi) Health issues related to tree work, e.g. allergic reaction and heat stroke;
- (vii) Site conditions that may affect tree stability, e.g. soil erosion, stability of adjacent stonewall or retaining structure, recent site changes due to construction, grade change, site clearing;
- (viii) Electrical hazards, e.g. underground utilities and overhead cables;
- (ix) Adjacent structure, e.g. buildings, highway structure, lamppost and signboard;
- (x) Traffic conditions, e.g. vehicles, double-decker buses, heavy trucks and railways; and
- (xi) Wildlife and habitats on tree, e.g. bird nests, snakes, ants and beehives.

(b) Scheduling Pruning Work

When setting up the schedule of pruning work, the following categories should be considered:

- (i) Management Factors
 - (1) Issuance of tree work contracts;
 - (2) Pruning objectives;
 - (3) Work programme of building and construction;
 - (4) Mobilisation of Tree Workers;
 - (5) Mobilisation of necessary equipment and machineries; and
 - (6) Site accessibilities and limitations.
- (ii) Tree Factors
 - (1) Tree growing, flowering and dormant seasons;
 - (2) Likelihood of tree failure;
 - (3) Actual pruning procedures; and
 - (4) Pruning interval.

In case the tree work cannot be completed in one operation, phased work plan should be prepared where appropriate. For pruning of more than 25% of the total live foliage, the elapsed time should be at least six months to one year between two pruning work operations.

(c) Managing site operations

The responsible department should, as far as practicable, provide and maintain a safety system of work to ensure safety and health of Tree Workers. Tree pruning work should be conducted with well-organised site management to prevent or reduce adverse impacts on trees to be pruned, adjacent trees, site users and surrounding environment. Some of the necessary measures are listed as below:

- (i) If the pruning site is situated within or close to an area with high intensity of use such as crowded street, public parks, expressway, railway, construction site and car park, a risk assessment should be undertaken prior to the commencement of tree work to identify potential hazards, and recommend and implement necessary mitigation measures.
- (ii) When conducting tree pruning work, Tree Worker should be fully aware of the potential risks to public safety. Proper notice and cordoning-off of the pruning site may be necessary to restrict unauthorised entry.
- (iii) Tree Worker should pay attention to the adjacent buildings, utilities and properties around the site and take necessary procedures to avoid any damage that may arise from the pruning work.
- (iv) Cleaning and disposal of tree debris from the working site should be completed after each operation to restore the site as soon as practicable.

Other measures on managing site conditions are given in Part 4.5

Occupational Safety and Health and Part 4.6 Cleaning and Disposal.

(d) Avoiding Transmission of Pests and Pathogens

Pests and diseases sometimes may spread from one tree to another through pruning equipment and tools. Therefore, any equipment and tools used in pruning trees should be kept clean and sterilised regularly before and after operations. If tree pruning work is carried out on trees infected by pests and diseases, particular attention should be drawn to avoid transmission of pathogens from the infected trees to other trees and sites nearby.

When pruning a tree infected with Brown Root Rot Disease (BRRD), particular precaution measures on pruning equipment and the removed tree parts should be undertaken. For trees on government land, responsible tree maintenance departments should report the suspected BRRD cases to the GLTMS and take prompt remedial measures in accordance with the “Guidelines for Tree Risk Assessment and Management Arrangement and Manual on the Management of Brown Root Rot Disease” promulgated by the GLTMS.

(e) Protecting Wildlife and Habitat

Before undertaking pruning work, the concerned trees and working sites should be comprehensively inspected to identify any presence of wildlife and habitat within the site. The potential risks and adverse impacts of pruning work to protected and rare animals, plants and their associated habitats should be carefully assessed and prevented by the following measures:

- (i) Active nesting, breeding and roosting of any protected wild animals, including birds, bats and squirrels on trees and adjoining ground should be identified and should not be interfered with.
- (ii) Remove, destroy or wilfully disturb nests or eggs of any protected wild animal are prohibited.
- (iii) Rare or endangered tree species, such as *Aquilaria sinensis*; and

rare or endangered plants on trees or adjoining ground, such as orchids should be protected and preserved as far as practicable.

- (iv) Contamination and disruption of soil, water source and wildlife habitats caused by pruning work are strictly prohibited.
- (v) Schedule of pruning works at or near egretries (i.e. breeding locations of egrets or herons) should take into account the breeding season of egrets or herons (i.e. March to August).

If the pruning work would interfere with or have adverse impacts on wildlife and habitats, when necessary, further advice/assistance should be sought from relevant government departments and/or other relevant parties, such as the Agriculture, Fisheries and Conservation Department. If emergency tree pruning is necessary due to the presence of imminent danger to public safety but the pruning work may interfere with wildlife and habitat, relevant government departments should first be contacted for further advice/assistance on wildlife protection. Ordinance in relation to wildlife conservation and protection are specified as below:

- (i) Country Parks Ordinance (Cap. 208);
- (ii) Forests and Countryside Ordinance (Cap. 96) and Forestry Regulations (Cap. 96A);
- (iii) Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); and
- (iv) Wild Animals Protection Ordinance (Cap. 170).

1.3. Timing

The best time for pruning throughout a year should be carefully determined. During different times of pruning, trees may have different degrees of response, which vary with tree species, life stages as well as growing seasons.

(a) Pruning Cycle

The pruning cycle refers to the time interval between each pruning exercise. Pruning work should be arranged according to an appropriate pruning cycle (i.e. at appropriate time interval) such that the pruning work would not pose significant health and structural problems to the trees.

- (i) There is no single pruning cycle that fits all types of trees and situations. Every individual tree or tree group needs to be assessed and evaluated individually to determine an appropriate pruning cycle.
- (ii) Pruning cycle can be bi-annually, annually, or even every two to three years depending on the pruning objectives, site conditions, tree species characteristics, tree life stages, health conditions and environmental constraints of trees etc.
- (iii) Sufficient time between consecutive pruning work should be provided for the tree to recover from pruning stress and to complete wound closure. The larger the pruning extent and cuts, the longer the recovery time is required and longer elapsed time between pruning exercises should be scheduled.
- (iv) Pruning cycle in the nursery stage is an exception, which depends on the actual needs for structural pruning. Young trees in nursery stage may require two to five times more frequent pruning exercises than mature trees to direct their growth and structural development. Pruning cycle of nursery trees is not applicable for general maintenance of mature trees.

(b) Pruning Time throughout Seasons

The best time for individual tree pruning varies between different tree species and pruning objectives. Seasonal factors and tree characteristics should be taken into account when deciding the pruning schedule around the year. The recommendations of tree pruning during different seasons are described below.

(i) All time in a year

Crown cleaning can be undertaken to remove defective branches anytime as practicable. Structural pruning can be conducted in any season to remove branches of no more than 25% of total live foliage.

(ii) Late winter to early spring

Tree pruning should be minimised during growing season to prevent removal of new leaves and buds. As food reserves are depleted during spring growth, pruning may adversely affect tree vitality.

(iii) Late spring to summer

Tree growth can be directed effectively with summer pruning by slowing down the seasonal growth of trunks or branches. Foliage abnormalities such as sparse, wilted, and absent of foliage on dead, deteriorating branches; and excessive growth of new foliage, which may lead to heavy lateral limbs can be easily spotted for pruning when foliage density reach maximum during growing season, especially for deciduous trees. However, excessive crown reduction should be avoided to prevent large area of previously shaded tissues damaged by sunburn. If the tree is storm-damaged, it is better to conduct restorative pruning as soon as practicable.

(iv) Late-summer

Live branch pruning can be carried out following the seasonal growth so that tree development would not be affected, i.e. when all new leaves become mature and the colour turns stable.

(v) Autumn

Autumn is not a good time for pruning. Dormancy of deciduous trees may be delayed and it is the time of sporulation of many decay fungi. New shoot growth stimulated by pruning cut may easily deteriorate when temperatures drop.

(vi) Winter

In Hong Kong, under sub-tropical region climate, pruning during winter is always more preferable than during other seasons of the year. In winter season, trees are less likely to be infected by fungi and pests when most of them are dormant or inactive. Moderate to heavy cut can stimulate cambial activities, in particular for evergreen trees, which have faster compartmentalisation abilities in the coming growing season. Pruning of deciduous trees after shedding leaves in dormant season is also more preferable as the following spring growth can be stimulated.

1.4. Dosage

Pruning dose refers to the estimated percentage of live foliage to be removed from an entire tree as compared to the amount of existing foliage prior to pruning. The pruning dose should be carefully determined with the following considerations:

- (a) The pruning objectives and pruning time as discussed above.
- (b) Not more than 25% of the total live foliage should be removed from a healthy, vigorous tree within an annual growing season. Over-pruning may lead to a stressed tree with health decline; excessive water sprout development; irreversible structural damage; reduced tolerance to pests and diseases; and/or sunburn bark tissue.
- (c) For trees with significant health defects or at senescence stage, the pruning dose should not be more than 10% of the total live foliage.
- (d) The percentage and distribution of live foliage to be removed should

be adjusted according to the tree species, tree health, growing stage, tolerance to pruning and site conditions.

- (e) When conducting crown reduction or thinning, sufficient healthy branches should be retained to sustain the growth and recovery of parent stems or remaining branches.
- (f) In general, young or healthy trees have greater tolerance to pruning work; better recovery abilities from live branch removal; and less adverse effects on tree wounds than mature or unhealthy trees. Old or stressed trees are more vulnerable to infection caused by pathogens and excessive pruning work.
- (g) In some cases, a larger pruning dose may be warranted. More than 25% of total live foliage sometimes needs to be removed to mitigate a significant structural defect. The pruning objectives, rationale, potential severity of defects and mitigation measures should be carefully assessed and evaluated prior to the operation.
- (h) According to the Development Bureau Technical Circular (Works) No. 4/2020 – Tree Preservation, the excessive tree pruning proposal should be submitted in a Tree Preservation and Removal Proposal (TPRP) to the responsible Tree Works Vetting Panel (TWVP) for approval when necessary. If excessive crown, limb or root pruning is required for trees to be retained or transplanted, the pruning proposal with justifications, method statements and supervision requirements of the pruning work must be approved by the responsible TWVP.

Part 2. Best Practice

2.1. Types

The common types of pruning being used to achieve different pruning objectives as discussed in Part 1 are set out below:

(a) Formative Pruning / Structural Pruning

(i) Definition

Selective pruning of the lateral branches of a tree so as to develop a desirable tree form with a strong and straight trunk, a well-balanced crown with properly spaced scaffolding branches and a clear central leader.

(ii) Techniques and Applications

It is typically used in young trees during their nursery stage and early stage after planting. Formative pruning should aim at reducing the development of tree structural weaknesses while encouraging young trees to accommodate the growing constraints, such as obstructions from adjacent roads and utilities. Details of formative pruning are further discussed in Part 3.1 - Pruning Young Trees.

(b) Crown Lifting / Crown Raising

(i) Definition

Selective pruning to remove or shorten lower branches to increase vertical clearance from ground level (Figure 1).

(ii) Techniques and Applications

Lower branches heavily shaded by branches above may tend to grow downward and outward to absorb more sunlight. These branches should be shortened or removed to provide adequate headroom clearance and prevent development of undesirable overgrown branches. Removal of lower branches should preferably be not more than 15% of the live crown height and the remaining live crown should make up at least two-third of the

tree height, except for young trees undergoing formative pruning. Crown lifting is applied primarily to prune lower and overhanging branches obstructing adjacent buildings, pedestrians, vehicular traffic flow and other utilities.

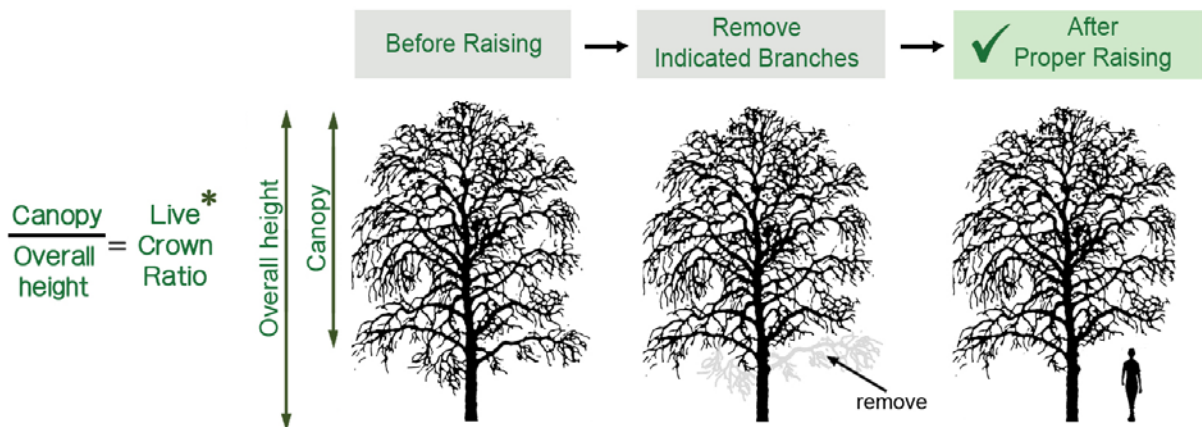


Figure 1. Illustration of proper crown lifting/crown raising practice

(c) Crown Reduction

(i) Definition

Selective pruning to reduce the overall tree height and/or spread of the crown, while maintaining a well-balanced and natural form and shape (Figure 2).

(ii) Techniques and Applications

The tree characteristics as well as its health conditions should be carefully assessed in advance. Crown reduction should be avoided for old or stressed trees. The purpose is to control the development of tree shape, crown size and length of branches in order to reduce tree failure potential and prevent obstruction of the adjacent utilities. Branches with excessive loading, overextended length or severe structural defects such as included bark, crack and cavity can be shortened or removed to minimise the likelihood of failure.

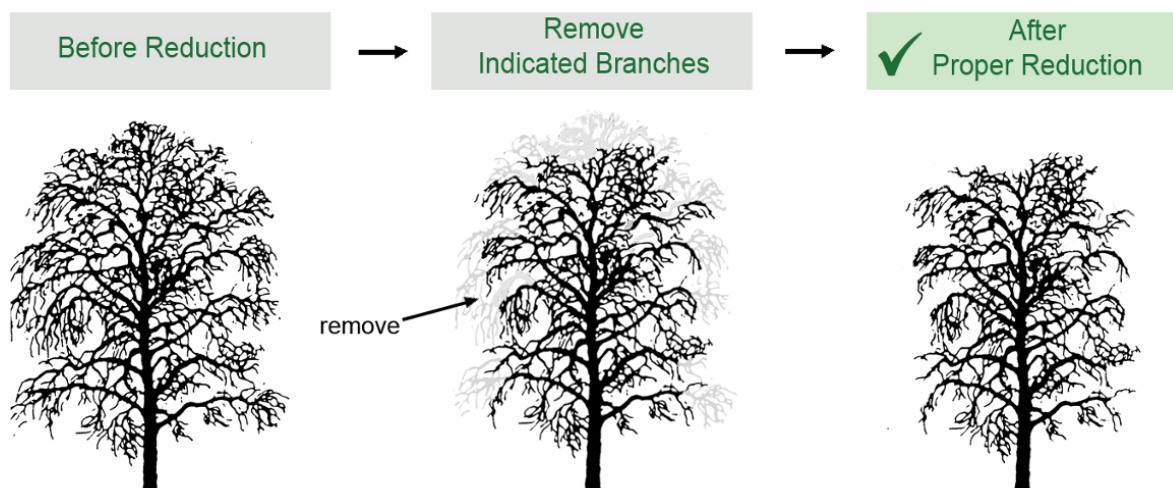


Figure 2. Illustration of proper crown reduction practice

(d) Crown Thinning

(i) Definition

Selective pruning to remove weak, thin, crossing branches and branches growing inward to reduce the foliage density (Figure 3).

(ii) Techniques and Applications

Crown thinning would maintain an even distribution of foliage with a well-spaced and balanced branch structure while not affecting the overall height and spread of trees. By reducing the crown density, wind loading on trees would decrease while sunlight penetration and air circulation within the crown would increase. Crossing branches and branches that raise close together should be selectively pruned to provide more growing space for remaining ones. If the objective is to reduce overall loading of the tree canopy, crown reduction should be considered instead of crown thinning. Over-thinning may result in excessive water sprout development and lion-tailing that increase the likelihood of failure.

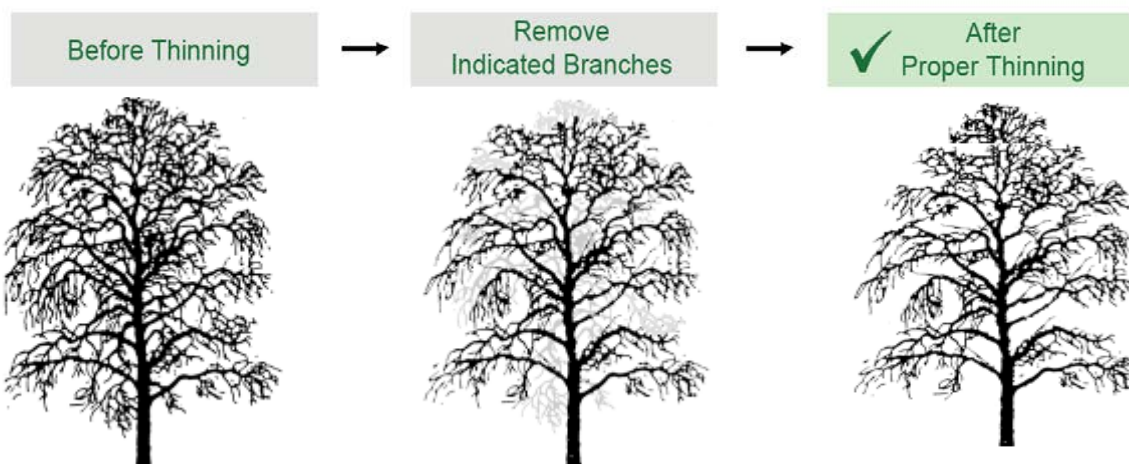


Figure 3. Illustration of proper crown thinning practice

(e) Crown Cleaning

(i) Definition

Selective pruning to remove dead, withered, damaged, broken or diseased branches, twigs and stems from trees (Figure 4).

(ii) Techniques and Applications

Crown cleaning can be accomplished at any time of the year. The objectives are to reduce tree failure risks and improve tree health and appearance by removal of defective parts from trees. The amount of tree materials to be removed and the number and diameter of pruning cut(s) should be kept minimal. Parasitic plants and foreign materials such as dodder, mistletoe, *Mikania micrantha*, nails, angle irons and wound dressing should be removed from trees as far as practicable.

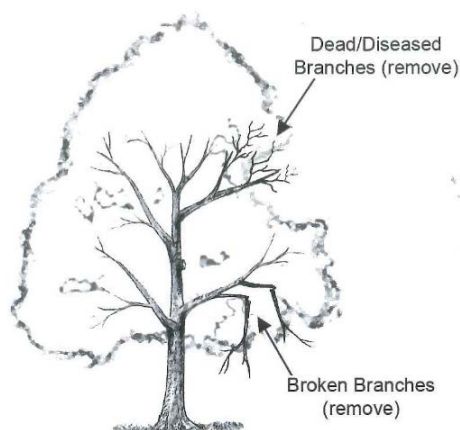


Figure 4. Illustration of possible defective tree parts requiring crown cleaning

(f) Restorative Pruning

(i) Definition

Selective pruning to remove damaged, crossing and dead branches to restore tree health and structure to a better and more natural condition.

(ii) Techniques and Applications

Restorative pruning aims at prolonging the life expectancy of damaged trees. It is generally applied to trees that have lost their natural tree form and structural integrity due to storm damage, poor pruning practices and severe mechanical damage, etc. By conducting a series of pruning throughout the years, tree health and structure can be restored while the tree growth and production of epicormics can be managed. Details of restorative pruning would be mentioned in Part 3.4 - Pruning Storm-damaged Trees.

2.2. Techniques

Pruning work should be completed by proper techniques and with good qualities. Some recommendations for pruning practices are listed below for reference:

- (a) Pruning should be performed by registered Tree Workers and under proper supervision by registered Tree Work Supervisors with expertise in horticulture, arboriculture and tree care to ensure that it is done safely and properly. Details of the qualification requirements for Tree Work Supervisors and Tree Workers are given in the “List of Minimum Personnel Requirements for Landscape Works, Tree Management Works and Vegetation Maintenance Contracts” promulgated by the GLTMS.
- (b) Over-pruning would adversely affect the healthy growth of trees. A good practice is that removal of crown should be limited to not more than 25% of total live foliage in each pruning work. Also, the crown should be kept in a well-balanced and natural form and appearance after pruning as far as practicable.

- (c) Selective pruning should be conducted to prune a tree branch by branch or layer by layer to achieve pruning objectives. Appropriate types of pruning and pruning cut should be determined according to pruning objectives.
- (i) Removal cut (thinning cut) refers to a cut to remove a branch at the union with parent branch or trunk.
 - (ii) Reduction cut (lateral cut, cutting to a lateral, drop-crotch cut) refers to a cut to shorten the length of a branch by removing one of a branch of codominant branches or multiple branches while the remaining lateral branch is at least one-third the diameter of the pruned branch.
 - (iii) Heading cut (topping) refers to a cut to shorten the length of a branch by pruning in the middle of the branch or by pruning back to a lateral branch which is less than one-third the diameter of the pruned branch. This practice is considered to be inappropriate pruning as the pruned trees would be extremely damaged. It should never be used for reducing tree height or crown size. However, in exceptional circumstances, heading cut might be applied as a temporary measure to mitigate tree risk. For example, only the damaged part of a large branch will be removed instead of removing the whole branch which will leave a large pruning cut on the trunk. The headed branch should be followed-up by frequent monitoring and subsequent pruning in the coming years.
- (d) The diameter of a branch removed should generally be not more than one-third of the diameter of the remaining branch or parent stem. The branch cutting should be as small as possible resulting in a relatively smaller area for wound closure.
- (e) Pruning work should adopt the practice of “3-Point Cut” (Figure 5) and “Natural target pruning” (Figure 6) techniques, which are very efficient and least damaging ways to remove branches. These techniques can avoid bark tearing and unnecessary wounding caused by pruning cuts and allow the tree to compartmentalise the wound as

quickly as possible.

- (i) Through the “3-Point Cut” technique, a branch is removed in three sequential cuts:
 - (1) The first cut should be an undercut on target branch at some distance away from the parent branch or stem. It is made to prevent causing bark tearing and cracks close to the trunk or parent stem when the branch is fell;
 - (2) The second cut should be a top cut undertaken slightly further out than the first cut to remove the outer part of the target branch and a stub would be left; and
 - (3) The final cut should be a cut just adjacent to but not within the branch collar or branch bark ridge to remove the remaining stub without bark tearing.

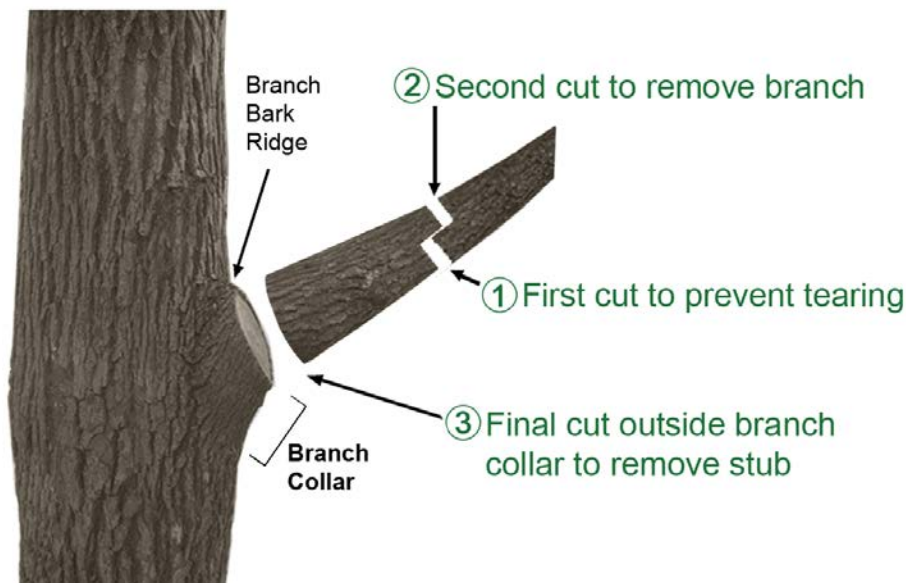


Figure 5. Illustration of “3-Point Cut” procedures

- (ii) Natural target pruning refers to making cut at a proper location without damaging the branch bark ridge and branch collar.
 - (1) If branch collar is visible, the final cut should be made just outside the edge of branch collar;

- (2) If there is no visible branch collar but just branch bark ridge, the final cut should be made just outside the branch bark ridge and cutline should not be parallel to the parent branch; or
- (3) If neither branch collar nor branch bark ridge is visible, the final cut should be made just outside the basal flare of the branch and cutline should not be parallel to the parent branch.

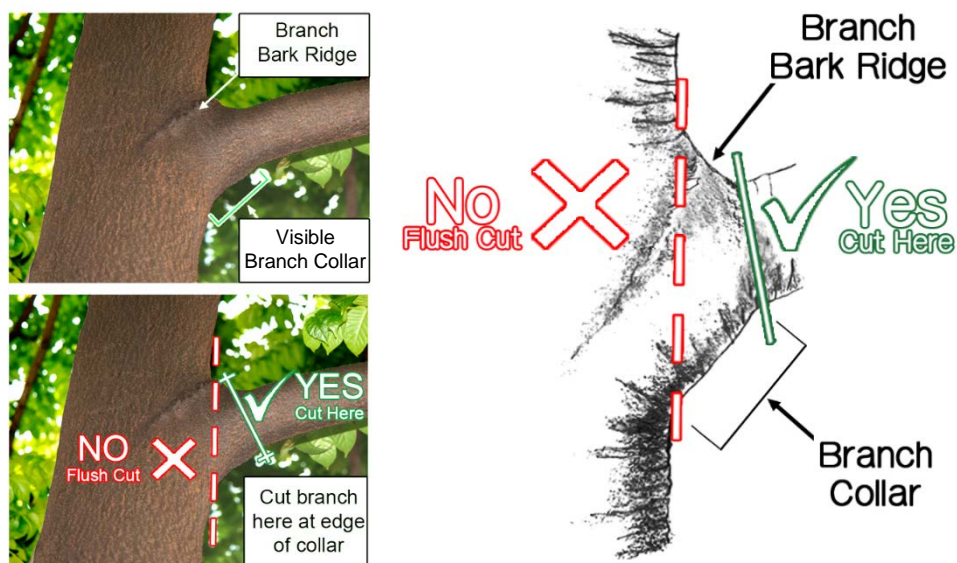


Figure 6. Illustration of “Natural target pruning”

- (f) Tree Workers should use appropriate and sharp tools to produce smooth and clean cuts to facilitate better wound closure.
- (g) When removing a branch with narrow or V-shaped angle at branch union, the pruning cut should be started from the underside or the outside of the target branch in order to facilitate the pruning operations and to prevent damage to the remaining branch or trunk.

2.3. Malpractices

Trees treated with poor and wrong pruning practises may resulted in irreversible health decline and structural failure. Appendix B – Adverse Effect of Malpractices in Pruning provides more details. Poor tree health and structure can result in failures that lead to casualties or property damage. Some common structural defects caused by malpractices in pruning are summarised as follow (Figures 7 to 15):

Figure 7. Topping



Removal of main stem at its apical end and always involves removal of a large portion of stem and branches.

Figure 8. Lion-tailing



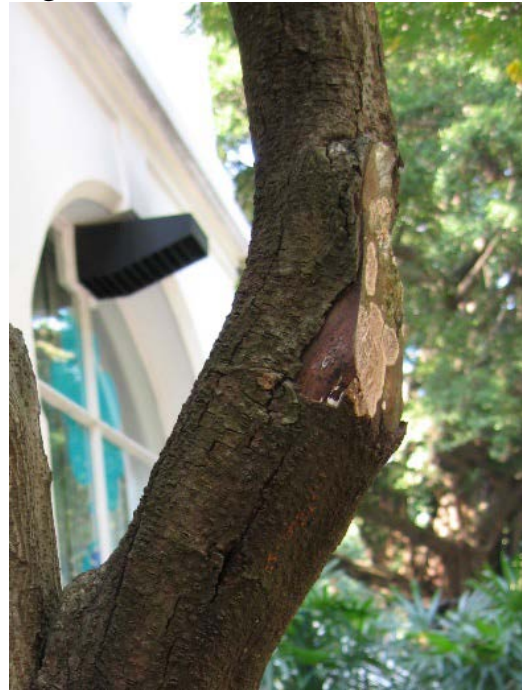
Removal of interior branches, leaving a cluster of small branches and foliage at the end of a branch.

Figure 9. Over-lifting



Excessive removal of lower branches of a tree and results in a very low live-crown-ratio.

Figure 10. Flush Cut



Cutting into the branch collar that may damage the branch collar and trunk tissue.

Figure 11. Stub Remaining



A large portion of stub remains if the location of pruning cut is far beyond the branch collar.

Figure 12. Large Pruning Cut



Cutting outside of the branch collar exposing a large area of heartwood.

Figure 13. Bark Tearing



Unnecessary tearing of tree bark and expose a large area of living tissue caused by improper pruning.

Figure 14. Jagged Wound



Pruning wound with rough surface and torn edges resulting from poor pruning techniques.

Figure 15. Wound Dressing



Any paint or material that being placed on wound.

Part 3. Pruning Scenarios

3.1. Pruning Young Trees

Young tree stage, a period with the most rapid growth rate in a tree's lifespan, is a critical period to conduct formative pruning, which is known as tree structural training. This practice is a special type of pruning which allows tree accommodating the future planting site constraints. By undergoing proper formative pruning, the major framework and growing direction of young trees can be established. In general, formative pruning should be completed either in the nursery stage, or during or right after the planting stage. The major steps of formative pruning are described below.

(a) Developing Dominant Central Leader

Tree structure is much stronger and stable with a dominant leader extending well upwards in the crown. The leader may or may not be straight depending on its genetic code as well as in response to its growing environment. During the nursery or young stage, subordination pruning is critical for central leader and tree form establishment. The size of a branch relative to the trunk or parent branch is known as branch aspect ratio, which is an important parameter to determine the central leader. Key steps of subordination pruning to develop a dominant leader are:

- (i) Identify single stem that would make the best leader (e.g. more vertical stem, the largest stem or the highest stem);
- (ii) Determine which stems are competing with the best leader (e.g. upright branches with large branch aspect ratio); and
- (iii) Decide the location of reduction cut and remove those competing stems.

(b) Identifying Permanent Lower Branches

Permanent and temporary branches should be classified and pruned differently for structural development. Identifying the lowest

permanent branches in the permanent canopy would facilitate the management of lower temporary branches. Branches that have originated below the lowest permanent branches are temporary branches while those above become permanent branches in the crown. Key steps to identify and maintain the lowest permanent branches:

- (i) Treat all the branches as temporary branches for young and recently planted trees that may not be tall enough yet to have any permanent branches;
- (ii) Determine the height of the lowest permanent branch based on the development of desirable tree form and headroom clearance requirements for future site use;
- (iii) Remove long, horizontal and large branches below the lowest permanent branches; and
- (iv) Leave short, lateral, and small diameter branches unpruned during the nursery stage.

(c) Maintaining Small Branch Aspect Ratio

Branches with small branch aspect ratio (e.g. less than 50%) are more strongly secured to the trunk than branches with large branch aspect ratio. When branches are much smaller in diameter than the trunk (e.g. 30% smaller), a natural branch protection zone may develop within the branch basal area and extend inside the trunk. This zone is rich in chemicals that inhibits spread of decay from the pruning wound into the trunk tissue. Keeping branch diameter less than half the trunk diameter ensures that the branch collar and branch protection zone would remain intact. Key steps to maintain strong branch attachments are:

- (i) Identify and maintain branches with sizes less than one half the diameter of the trunk or parent stem (branch aspect ratio less than 50%);

- (ii) Maintain a single branch and remove other branches that raises at one location; and
- (iii) Select and remove branches with bark inclusion in the attachment.

(d) Suppressing or Removing Branches with Bad Attachments

Included bark is a structural defect that causes weak union between branch and trunk. Inclusions on codominant, large, and long branches are the greatest concern. The mechanical stress from heavy static loading and weak union support are more likely to cause branch failure. Growth of branches with included bark should be suppressed to minimise the chance of breakage. Key steps to suppress and remove branches with bad attachments are:

- (i) Identify branches with bad attachment such as with narrow or V-shaped angle, with included bark, crossed with adjacent branches or trunk;
- (ii) Select branch with the largest diameter to be pruned first within the identified branches; and
- (iii) Remove or suppress the growth of branch with bad attachments by removal or reduction cuts.

(e) Spacing Main Branches along Central Leader

Branches spaced along and around trunk are better connected to the trunk than those clustered together and originate from one location. When several branches raise at one point on the trunk, there is not enough space for trunk tissue to wrap around the branch base for better branch attachment. Key steps to space main branches along central leader are:

- (i) Identify and selectively prune branches whose branch attachments are touching or nearly touching at the same vertical point as moving up, down or around the central stem;

- (ii) Select the larger and lower branches to be pruned for improving vertical spacing;
- (iii) Try to maintain evenly spaced intervals between lateral branches; and
- (iv) Do not remove any branch directly above or adjacent to another branch that has already been removed.

3.2. Pruning Trees Adjacent to Utilities

When trees are growing under the following circumstances, directional pruning should be applied to reduce or remove lateral or over-extended branches growing towards the utilities. Tree growth would be directed away from and prevent any interfering and obstruction to public, adjacent infrastructure, utilities, traffic and lines-of-sight.

Although topping maybe a wide-spread practice in provision of sufficient clearance from utilities, it is considered as an unacceptable tree pruning practice. Topping stimulates the growth of water sprouts that have similar growing direction towards utilities as the original branches. Continuous topping can increase failure risks, deplete tree food reserves, increase susceptibility to pests and diseases and disfigure tree forms. On the contrary, directional pruning by reduction cut back to lateral branches is more preferable for utility pruning. Tree pruning should be minimised as far as possible to reduce stresses on trees while obtaining adequate clearance from utilities.

(a) Adjacent to Roads and Railways

Tree parts over-extended towards roads may probably be hit by moving vehicles and severe mechanical damage can be caused by large vehicles. Lower and over-extended branches may obstruct the vision of drivers, potentially causing traffic accidents. Roadside trees should be pruned regularly to provide sufficient headroom over roads and railways. Requirements on headroom for different traffic users are laid down in the Structures Design Manual for Highways and Railways.

(b) Adjacent to Pedestrian Streets and Cycling Tracks

Trees with lower branches and drooping branches may hinder pathways of pedestrians and cyclers. Those tree crowns should be lifted to provide sufficient headroom over pedestrian streets and cycling tracks. Regular tree pruning should be conducted to protect road users from fallen defective branches. Twigs/branches with failure potential should be removed as soon as possible. General requirements on headroom for different traffic users are laid down in the Structures Design Manual for Highways and Railways.

(c) Adjacent to Building Structures

When trees grow tall or wide enough, they may interfere with building structures nearby. To direct the growth of branches which is very close to properties, reduction pruning should be carried out to provide sufficient clearance from adjacent building structures and prevent branches from interfering with and damaging adjacent properties in windy conditions. Trees growing close to buildings may act as bridges for pests and animals to gain access to residential and commercial properties. By keeping branches away from buildings, hygienic and security problems can be prevented.

(d) Under Overhead Cables

In order to ensure safe and reliable electricity to the city, interlacement between trees and overhead energised lines should be prevented. Trees in the proximity of overhead cables should be pruned regularly to maintain an acceptable clearance and avoid contacts with conductors. Over-extended branches should be trimmed to provide sufficient distance away from overhead cables.

(e) Adjacent to Lampposts and Signboards

Over-extended and over-crowned trees may obstruct lampposts and signboards on streets. Sufficient lighting and clear traffic signage is essential to the safety and convenience of road users. Branches blocking lampposts and signboards should be pruned to maintain

visibility and clearance of road conditions.

3.3. Pruning Before Wet Season

Tree failure incidents frequently occur during and after rainy and typhoon season and may result in casualties and/or severe damage to properties. Weak and stressed trees are usually more vulnerable to strong wind and heavy rain while trees with good health and structure generally have higher storm tolerance and pose less failure risk to the public. Proper tree management should identify and mitigate any potential tree failure hazards before wet season.

(a) Regular Tree Inspection and Tree Risk Assessment

Tree inspection should be arranged prior to wet season, particular in areas of high pedestrian and vehicular traffic flow. Tree health and structural conditions should be monitored and maintained in good condition. Regular tree risk assessment should be undertaken in order to identify any tree with particular concerns or growing under specific environmental constraints which can be significantly damaged by typhoons and rainstorms. Trees that require regular inspection include but not limited to the following:

- (i) Damaged, diseased, deteriorating or dead trees;
- (ii) Trees with significant defects or poor structures such as severely leaning, asymmetric tree crown, poor taper, co-dominant trunks or branches with included bark, lion-tailing, decay, crack, cavity, fungal fruiting bodies and girdling root;
- (iii) Tree species with brittle wood structure (e.g. *Delonix regia*, *Aleurites moluccana*, *Senna siamea*);
- (iv) Trees with dense canopies and heavy crown loading;
- (v) Trees highly exposed to wind or their neighbouring trees are recently removed;
- (vi) Trees growing at poor site conditions such as confined root system, on precipitous slope, compacted soil, shallow soil depth

or poorly drained soil;

- (vii) New planting trees and transplanted trees;
- (viii) Trees with recent tree failure records;
- (ix) Trees infected with BRRD or trees growing in the same root zone area of a BRRD infected tree; and
- (x) Any tree of particular interest.

(b) Precautionary Measures to Reduce Tree Risks

If any potential tree hazard is identified, necessary mitigation measures should be conducted as soon as possible and before wet season. The preventive pruning should take into consideration the following categories:

- (i) Remove dead, wilted, diseased, damaged branches and trunks;
- (ii) Thin or reduce a dense canopy by removing some interior or overgrown small branches;
- (iii) Encourage single stem leader and good branch attachment by shortening or removal of branches competing with the leader and/or conflicted with other branches;
- (iv) Direct the leader of a leaning tree to a more upright lateral stem by shortening or removing outgrown branches;
- (v) Shorten or remove any branches overhanging on or overextended towards buildings and utilities; and
- (vi) Avoid inappropriate pruning such as topping and lion-tailing to prevent the trees becomes more susceptible to typhoon damage.

3.4. Pruning Storm-damaged Trees

Storm-damaged tree pruning is essential for tree restoration. It selectively removes branches, water sprouts, and stubs from trees that have been

severely damaged or broken in storm. The aim is to manage the growth of new epicormics and branches from a storm-damaged tree and to restore the tree health and structure. After a storm, trees are damaged or collapsed under extreme gust wind. Trees have to use stored energy to recover from damage and produce new growth. Therefore, during the cleaning process, removal of live wood should be minimised. Post-inclement weather inspection is paramount to ensure public safety, and appropriate mitigation measures must be carried out as soon as possible. The restorative pruning procedures may have to be repeated for a period of years until tree health and forms are recovered to their desirable conditions.

(a) Considerations for Restorative Pruning

Not all storm-damaged trees can be restored. Storm-damaged trees should be evaluated for the possibility and necessity of restorative pruning. Reference should be made to the inspection record of the latest TRA conducted by the responsible Inspection Officer. Key considerations when conducting pre-restoration assessment are given in the following paragraphs.

(i) Extent of Damage

The location of damaged tree parts, proportion of damage and wound sizes would determine the possibility of tree recovery. The larger the wound in relation to the size of parent branch or stem, particularly with heartwood exposed, the less likely the wound closure and compartmentalisation can be achieved; and the more vulnerable the tree would decay, invaded by diseases and become stressed. Numerous damages and significant loss of tree crown would adversely affect the ability of recovery from storm damages.

(ii) Tree Size and Age

Younger and smaller trees can restore much quickly than more mature and larger trees. Old and senescence trees, which have accumulated multiple defects over years, often become more susceptible to damage in subsequent storms.

(iii) Tree Species

Tree species characteristics should be considered when

evaluating the value of restoration. Species that may not fully compartmentalise the wounds and may be prone to further decay should generally not be restored. Storm-damaged trees of any invasive species, such as *Leucaena leucocephala*, are recommended to be removed and replanted with native tree species or other tree species as appropriate.

(iv) Tree Conditions

Storm-damaged trees with better health and structural conditions are worth to be restored as they can recover more quickly and easily. Trees suffering from poor health and extensive damage would be more susceptible to failure and further health decline after a storm. Uprooted trees are not recommended to be restored as the root plate is already destabilised and root system is severely damaged.

(v) Site Conditions

Trees growing at poor site conditions such as confined root system, precipitous slope, compacted soil, shallow soil depth or poorly drained soil are very susceptible to wind loading especially with substantial root damage after a storm. Trees such as *Acacia confusa* in afforestation planting on slope, which have outgrown from the compact growing environment or are reaching the end of their life cycle, are not recommended for restoration. If trees are suppressed by dense tree population or shaded by building structures, tree removal of these damaged trees is more preferable.

(vi) Tree Value

In addition to its economic value and ecological services, damaged trees may be memorial trees, or have historical significance, or associated with other cultural attributes. Restoration of trees of particular interest such as Old and Valuable Trees, Stonewall Trees (SWTs) and “Fung Shui” trees should be considered as far as practicable due to potential public concerns.

(b) Strategies in Restorative Pruning

After all the safety concerns have been addressed and justifications to restore storm-damaged trees have been made, the primary objective of restorative pruning should be retaining as much of the live wood as possible. Typically, restorative pruning requires over a period of years to restore the original foliage mass and desirable tree form. This would maintain tree vitality and encourage good management of water sprouts. The major strategies in restorative pruning are given in following paragraphs.

(i) Removing Hazards from Public

After a storm, tree parts with imminent failure risks should be removed from targets as soon as possible. Cleaning tree canopies of damaged or broken branches, hangers and stubs should be the focus of mitigation measures. Moderate crown reduction or crown lifting may be necessary to perform restoration.

(ii) Restoring Tree Health and Structure

Defective branches should be pruned by natural target pruning, which allows better closure of pruning wounds. In order to sustain recovery, removal of live wood should be kept at the least amount to minimise additional stress to damaged trees. Structural restoration should be conducted by progressive reduction of lever of arms and lion-tailing to achieve a balanced tree crown. Some live branches can be removed to redistribute the loadings and relocate the center of gravity in tree crown. Heading cuts should be avoided as a large proportion of lateral branches would be removed that results in large pruning wounds and severely disfigured tree form.

(iii) Sprout Management

Most of the damaged trees would develop water sprouts from wounds and weakened tree parts. The ultimate goal of sprout management is to relocate energy reserves, develop new branch leader and encourage wound closure. Measures can begin approximately one to two years after crown cleaning and typically require multiple pruning practices over years to

remove interfering sprouts and to direct new growth. Sprouts on recovering trees usually grow aggressively but weakly attached to parent stems, therefore growth of sprouts should be managed properly.

The most vigorous sprouts often develop side branches, which should be left for lateral branch development. Then, sprouts located near the selected sprouts should be removed to provide sufficient growing space. In general, sprouts management requires more than two times of pruning in order to develop new branches from dominant sprouts. Sprout management can be performed in conjunction with normal pruning work for better resource management.

(c) Other Mitigation Measures

- (i) During the recovery process, it is important to manage root zones for optimum tree growth, through providing adequate irrigation, mulching, mitigation of compacted soil, and proper drainage.
- (ii) In order to prevent further failure and provide support to weaken trees, appropriate guying and cabling should be provided to trees with significant structural defects such as severe leaning, asymmetric crown and heavy lateral limb.
- (iii) When restorative pruning is not applicable and there are imminent dangers posing to public or properties by storm-damaged trees, tree removal should be conducted as soon as practicable.

3.5. Pruning Palms

Palms are monocots and they grow differently from other trees. They should not be excessively pruned and primarily only be pruned to remove fronds, flowers, fruits, loose petioles which, if not removed, may pose potential hazards to targets. The general guidelines of palm pruning are listed below:

- (a) Dead, chlorotic, broken fronds should be removed. Palms that produce hazardous large fruits or frequently drop old fronds may require pruning works every 3 to 6 months. The location of cuts should be close to the petiole base and without damaging the stem.
- (b) Removal of live, healthy fronds should be avoided. Excessive loss of healthy fronds may inhibit palm growth, cause spreading of pests and diseases, and threaten palm health. If healthy fronds must be removed, removal of fronds growing upright or above 20 degrees in relation to the horizontal plane should be avoided.
- (c) All fronds are originated from the top of the palm – terminal bud. Therefore, terminal bud of a palm should never be damaged or removed as it would lead to poor frond development and palm death. For multi-stemmed or clumping palm species, entire stem can be removed due to aesthetic or risk management reason.
- (d) Some climbing devices, such as spikes which would create wounds on palms should not be used. The wounds would leave permanent scarring and palms health would decline due to the infestation of pest and pathogens at wounded tissues.

3.6. Root Pruning

As pruning of roots may adversely affect normal tree health and growth, in general, root pruning is strictly prohibited for mature trees. However, root pruning may be necessary under the following circumstances.

- (a) Removing girdling roots;
- (b) Cutting dead, diseased and severely damaged roots back to sound wood;
- (c) Preparing root ball for tree transplanting; or
- (d) Avoiding irreparable damages and encroachments to underground utilities or infrastructures by root development.

Pruned roots should be sharply cut and covered by wet hessian or backfill soil with adequate watering to prevent the death of absorbing roots, minimise exposure to pest and pathogens, reduce pruning stresses and increase the chance of survival.

Some tree species, such as *Ficus microcarpa*, can develop extensive aerial root systems. Aerial roots should be retained as far as practicable and trimming of them should be the last resort. Guide tubes or ushering ropes can be installed to improve aerial root anchorage and strengthen tree support and nutrient uptake. A majority of SWTs in Hong Kong are *Ficus microcarpa*, which require intensive care. Details of various aerial roots treatments of SWTs are provided in the “Management Guidelines for Stonewall Trees” promulgated by the GLTMS.

TPRP with justification of the dose and needs of root pruning should be prepared and submitted to the responsible TWVP for approval, prior to the pruning works, if necessary.

Part 4. Quality Control

4.1. Implementation

Inspection Officers should ensure that clear pruning instructions are delivered to Tree Work Supervisors and Tree Workers (Figure 16). Form 1, Form 2 or other proper inspection reports should be prepared to compile a pruning plan and provide at least but not be limited to the following information:

- (a) Pruning objective;
- (b) Tree information (i.e. tree no., species, height, crown spread, DBH);
- (c) Location, site condition and presence of wildlife and habitat (if any);
- (d) Site observations;
- (e) Tree parts with potential failure risks to public and properties, if any;
- (f) Proposed pruning types and techniques;
- (g) Proposed tree parts to be pruned and the extent of pruning;
- (h) Time frame for pruning work and pruning interval;
- (i) Specific equipment and tools, if any;
- (j) Occupational Safety and Health as mentioned in Part 4.5;
- (k) Technical circular, ordinance and guidelines, if necessary;
- (l) Clear location map to show the pruning site location; and
- (m) Photographic record in colour to illustrate the whole view of the tree, concerned tree parts and the recommended pruning procedures.

4.2. Work Supervision

Government departments should monitor and ensure the efficacy and quality of pruning work. The process and outcome of pruning work should follow the instructions provided by the responsible Inspection Officer as far as

practicable. Pruning work should be under supervision in accordance with the following steps:

- (a) A Tree Work Supervisor should be arranged to provide on-site tree work supervision;
- (b) Full photographic records should be taken before and after the pruning work;
- (c) A tree work completion report providing at least but not be limited to the following information should be prepared by Tree Work Supervisors or Tree Workers and submitted to the Inspection Officer for endorsement;
 - (i) Tree information (i.e. tree no., species, height, crown spread, DBH);
 - (ii) Location of pruning work;
 - (iii) Pruning work taken;
 - (iv) Date of work completion;
 - (v) Photographic records of the whole tree and tree parts taken before and after pruning work.
- (d) The pruning work can only be endorsed upon its satisfactory completion.

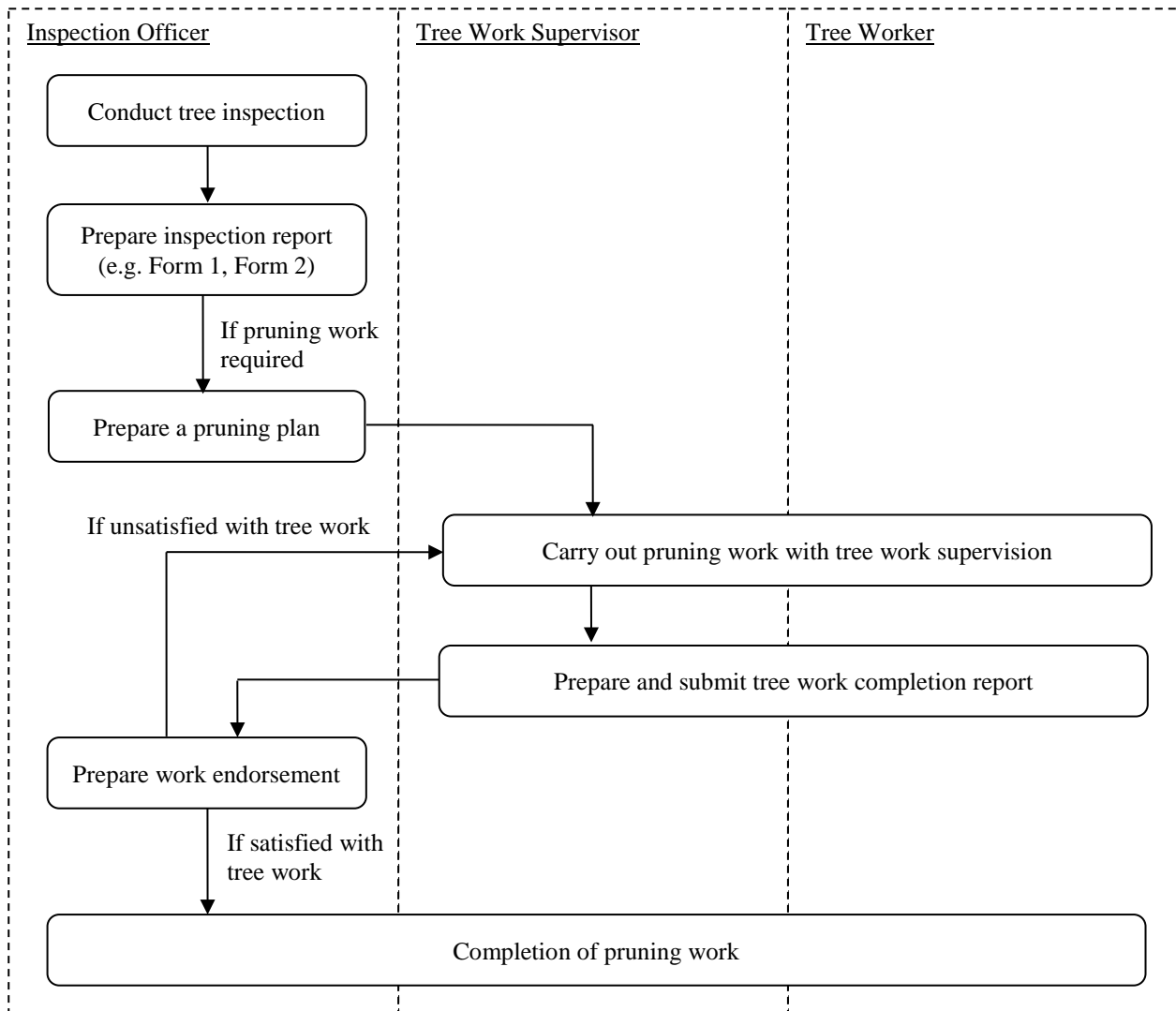


Figure 16. Flowchart of work implementation and supervision

4.3. Personnel Qualifications

Tree pruning requires arboricultural knowledge and professional techniques in the use of mechanical equipment and tools that pose potential occupational safety hazards. Tree management personnel should have academic, professional and training qualification as well as work experience as appropriate as set out below.

- (a) Details of requirements for Inspection Officers conducting Form 1 and Form 2 are stipulated in Appendix 3 of the “Guidelines for Tree Risk Assessment and Management Arrangement (10th Edition or latest edition)” promulgated by the GLTMS.

- (b) Details of requirements for Tree Work Supervisors, Tree Climbers and Tree Workers are stipulated in “List of Minimum Personnel Requirements for Landscape Works, Tree Management Works and Vegetation Maintenance Contracts” promulgated by the GLTMS.
- (c) Details of requirements for Tree Work Supervisors, Tree Climbers and Chainsaw Operators are stipulated in the Registration Scheme for Tree Management Personnel managed by the GLTMS.

4.4. Equipment and Tools

Different kinds of equipment and tools are recommended to be used to assist and complete tree pruning work in different scenarios. Pruning objectives, tree part size, pruning cut location, accessibility, and other factors should be taken into account in choosing the appropriate pruning equipment and tools. Equipment such as spurs and spikes that may damage tree bark or conductive tissues should not be used. The following equipment and tools (Figures 17 to 24) are commonly used in pruning work:

Figure 17. Hand pruner



It can be used to cut small living branches less than 1.5cm in diameter.

Figure 18. Looper



It can be used to prune small branches up to around 2.5cm in diameter.

Figure 19. Extension pruner



It is useful for pruning small branches at height and less than 2cm in diameter.

Figure 20. Hand saw



It is more appropriate to be used for pruning branches larger than 2.5cm in diameter.

Figure 21. Pole saw



It is commonly used for pruning branches at height or at far distance.

Figure 22. Chainsaw



It can be used for pruning tree parts of different size.

Figure 23. Tree climbing



Pruning may be carried out at height by registered Tree Climbers in accordance to the “Guidelines on Arboriculture Occupational Safety and Health” (OSH Guidelines).

Figure 24. Elevated platform



It should be used for tree pruning at height where practicable.

4.5. Occupational Safety and Health

Tree pruning work should be completed in a safe and proper manner. When conducting tree pruning works, tree management personnel should comply with relevant safety requirements of the site and have good communication with safety officers, if necessary. Details of guidance in provision of a safe system of pruning work, are stipulated in the OSH Guidelines. The following safety measures for pruning work are recommended in order to protect the operatives and public:

(a) Planning Factors

- (i) Prepare work plan and assess risks of tree work with mitigation measures;
- (ii) Inspect and evaluate trees and sites in question before the operation to identify any potential safety concern, then prepare necessary safety measures;

- (iii) Determine any underground utilities and overhead cables around the sites and coordinate with relevant utility companies as appropriate; and
- (iv) Ensure safe and clear access routes to the tree and site for Tree Workers, elevated platform and other necessary equipment; and
- (v) Check latest weather forecast prior to tree work and avoid pruning trees under undesirable weather such as humid, strong wind and extreme hot days as far as possible by re-scheduling the tree work, when necessary.

(b) Environmental Factors

- (i) Identify and reduce/eliminate failure potential of any objects in height, such as pruned tree parts, tools and debris;
- (ii) Clear and cordon-off tree pruning areas during pruning work to prevent entry by unauthorised persons;
- (iii) Deploy adequate manpower to maintain uninterrupted traffic flow;
- (iv) Implement Temporary Traffic Arrangement, if necessary, following the requirements mentioned in the "Code of Practice for the Lighting, Signing and Guarding of Road Works" issued by Highways Department;
- (v) Place directional/warning lighting and signage to divert pedestrians and traffic;
- (vi) Provide adequate cool drinking water and/or temporary sunshade, especially during hot weather;
- (vii) Keep flammable materials such as chainsaw fuel at least 3m away from the heat source;
- (viii) Prevent interference to wildlife and habitats, especially

protected wild animals and rare or endangered species; and

- (ix) Be aware of hazards associated with animals and plants such as snakes, mosquitoes, ants, beehives and poisonous plants.

(c) Personnel Factors

- (i) Wear appropriate clothing and put on proper personal protective equipment (PPE) such as goggles, hearing protections, helmets, chainsaw trousers, safety boots, gloves, and reflective vests, if necessary;
 - (1) Chainsaw operators should wear chainsaw protective clothing, safety helmet, eye and hearing protection, gloves and safety shoes/boots during chainsaw operation;
 - (2) Tree Climbers and Tree Workers on elevated platform should always wear suitable PPE such as safety helmet, and safety harness with lanyard(s) anchored to secure anchor point(s);
- (ii) According to the OSH Guidelines, Chainsaw operators should have completed recognised training on chainsaw operation before handling any tree pruning work by using chainsaw;
- (iii) Adopt safe and proper operational procedures of chainsaw during tree work by chainsaw operators;
- (iv) According to “Overview of Work-at-height Safety” published by the Labour Department, a power-operated elevated platform should only be operated by persons who have received suitable training and are competent to operate the machine;
- (v) Perform sufficient and effective communication and teamwork between Tree Work Supervisors and Tree Workers;
- (vi) Always stay alert to other Tree Worker’s activities, surrounding environment and potential hazards during tree work;

- (vii) If tree climbing is applied, arrange at least two Tree Workers with aerial rescue qualification at the same site as far as practicable, in case of emergency situations;
 - (viii) Only those who receive relevant training in handling electrical hazards can engage in pruning work near power lines;
 - (ix) Ensure correct posture for manual and mechanical handling of tree pruning such as pulling, pushing and lifting;
 - (x) Be aware of health conditions of every tree management personnel, e.g. allergic reaction, heat stroke and dehydration;
 - (xi) Bring along a first-aid kit for emergency; and
 - (xii) Must not smoke when handling flammable liquid.
- (d) Equipment Factors
- (i) Select appropriate equipment for corresponding tasks such as hand saws, chainsaws, pole saws, extension pruners and ropes;
 - (ii) Use equipment only for operations within its capabilities and in accordance with standards, guidelines and recommendations provided by the manufacturers;
 - (iii) Carry out tree work at ground level and safe conditions as far as practicable by the use of suitable hand tools such as extension pruner and pole saw;
 - (iv) Cut large or heavy tree parts into smaller pieces and make use of equipment such as tree rigging systems to move heavy tree parts and to avoid overloading of manual delivery;
 - (v) Use equipment, such as ropes, rigging equipment and elevated platform, to move any materials at height to a safe dropping zone;
 - (vi) If tree climbing is applied, provide at the pruning site suitable and

secure anchor point(s) at height, independent lifeline(s) or fall arresting system(s), and continuous attachment to the safety harness for the Tree Climbers;

- (vii) According to “Overview of Work-at-height Safety” published by the Labour Department, ladders should only be used for work at height of less than 2m above ground and should normally be restricted for ascending and descending purposes only;
- (viii) Clean and regularly sterilise all pruning tools by alcohol (75%) or bleach solution (10% bleach and 90% water) before and after pruning work, especially when working with infected trees in order to prevent the spread of pests and diseases among trees.

4.6. Cleaning and Disposal

The working area should be kept safe and tidy at all time during and after each pruning work. Any tree materials, debris and wood chips, generated from the pruning work should be removed from the site as soon as practicable and disposed at an appropriate waste depot or landfill.

- (a) Accumulation of debris at pruning sites may cause hygienic problems as it provides favourable breeding and decomposition sites for insects, fungi and bacteria.
- (b) Tree debris of some tree species (e.g. *Leucaena leucocephala*) should be removed from sites as soon as possible in order to prevent the growth of water sprouts from the tree debris.
- (c) If trees are infected with pests and diseases such as BRRD, particular precaution measures such as sterilising the pruning tools by alcohol (75%), soil treatment and properly disinfecting and disposal of infected tree debris should be undertaken. Details of handling procedures of BRRD infected trees are provided in the “Manual on the Management of Brown Root Rot Disease” promulgated by the GLTMS.
- (d) To reduce yard waste generated from pruning work, clean and

uninfected wood waste can be utilised as the followings:

- (i) To be retained on site to achieve conservation benefits such as providing micro-habitat, composting of organic matters and recycling of nutrients to the environment.
- (ii) To be chipped for mulching to improve the quality of soil; and
- (iii) To be converted into usable products such as biofuel, furniture, decorative features and handcrafts.

Details of general guidance regarding the handling of tree debris treatment are provided in the “Guidelines on Yard Waste Reduction and Treatment” promulgated by the GLTMS.

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Appendix A. Sample Pruning Plan

Pruning Plan

A. General Information	
Department / Agency: _____	Project / Contract No.: _____
Inspection Report: <input type="checkbox"/> Form 1 <input type="checkbox"/> Form 2 <input type="checkbox"/> Other form	File Ref.: _____
Inspection Officer: _____	Tree Work Supervisor: _____
Tree Worker: _____	
Date of Inspection: _____	Anticipated Completion Date of Works: _____

B. Site Information	
Location: _____	
Target	<input type="checkbox"/> Pedestrian road <input type="checkbox"/> Cycling track <input type="checkbox"/> Public road <input type="checkbox"/> Railway <input type="checkbox"/>
Description:	Building/structure <input type="checkbox"/> Carpark <input type="checkbox"/> Power lines <input type="checkbox"/> Lamppost <input type="checkbox"/> Signboard <input type="checkbox"/> Others: _____
Site Limitation:	<input type="checkbox"/> No <input type="checkbox"/> On slope <input type="checkbox"/> Traffic/expressway <input type="checkbox"/> Railway <input type="checkbox"/> Restricted area <input type="checkbox"/> Others: _____
Wildlife and Habitat:	<input type="checkbox"/> No <input type="checkbox"/> Bird nest <input type="checkbox"/> Bee hive <input type="checkbox"/> Others: _____

C. Tree Information	
Tree ID No.: _____	Species: _____
Height(m): _____	Crown Spread(m): _____ DBH(mm): _____
Observation:	<input type="checkbox"/> Dead branch/stub <input type="checkbox"/> Dead trunk <input type="checkbox"/> Broken branch/trunk <input type="checkbox"/> Hanger <input type="checkbox"/> Crack <input type="checkbox"/> Leaning <input type="checkbox"/> Overgrown branch <input type="checkbox"/> Heavy lateral limb <input type="checkbox"/> Others: _____
Pruning Objective:	<input type="checkbox"/> Regular maintenance <input type="checkbox"/> Reduce failure risk/nuisance <input type="checkbox"/> Enhance resistance to inclement weather <input type="checkbox"/> Improve aesthetics and urban environment <input type="checkbox"/> Others: _____
Mitigation Measure:	<input type="checkbox"/> Crown raising <input type="checkbox"/> Crown reduction <input type="checkbox"/> Crown thinning <input type="checkbox"/> Crown cleaning <input type="checkbox"/> Formative pruning <input type="checkbox"/> Cabling <input type="checkbox"/> Pest & disease control <input type="checkbox"/> Others: _____
Pest & Disease:	<input type="checkbox"/> No <input type="checkbox"/> Termite <input type="checkbox"/> Brown root rot disease <input type="checkbox"/> Others: _____

D. Pruning Work Information	
<p>Tree Part(s) to be Pruned:</p> <p><input type="checkbox"/> Crown: % of foliage: _____</p> <p><input type="checkbox"/> Branch:</p> <p>Quantity: Fall distance(m):</p> <p>_____</p> <p>Cut size(mm): Length of tree part(m):</p> <p>_____</p> <p><input type="checkbox"/> Trunk:</p> <p>Quantity: Fall distance(m):</p> <p>_____</p> <p>Cut size(mm): Length of tree part(m):</p> <p>_____</p> <p><input type="checkbox"/> Others: _____</p>	<p>Photo record</p>
<p>Equipment & Tools:</p> <p><input type="checkbox"/> Hand pruner <input type="checkbox"/> Looper <input type="checkbox"/> Extension pruner</p> <p><input type="checkbox"/> Hand saw <input type="checkbox"/> Pole saw <input type="checkbox"/> Chainsaw</p> <p><input type="checkbox"/> Tree climbing gear <input type="checkbox"/> Elevated platform</p> <p><input type="checkbox"/> Others: _____</p>	
<p>Tree Part(s) to be Pruned:</p> <p><input type="checkbox"/> Crown: % of foliage: _____</p> <p><input type="checkbox"/> Branch:</p> <p>Quantity: Fall distance(m):</p> <p>_____</p> <p>Cut size(mm): Length of tree part(m):</p> <p>_____</p> <p><input type="checkbox"/> Trunk:</p> <p>Quantity: Fall distance(m):</p> <p>_____</p> <p>Cut size(mm): Length of tree part(m):</p> <p>_____</p> <p><input type="checkbox"/> Others: _____</p>	<p>Photo record</p>
<p>Equipment & Tools:</p> <p><input type="checkbox"/> Hand pruner <input type="checkbox"/> Looper <input type="checkbox"/> Extension pruner</p> <p><input type="checkbox"/> Hand saw <input type="checkbox"/> Pole saw <input type="checkbox"/> Chainsaw</p> <p><input type="checkbox"/> Tree climbing gear <input type="checkbox"/> Elevated platform</p> <p><input type="checkbox"/> Others: _____</p>	

E. Occupational Safety and Health (OSH)

Factors with Potential Risk:

- Work at height
- Overhead object
- Delivery of tree debris
- Traffic flow
- Use of equipment
- Fire precaution
- Heat related disorder
- Application of chemical
- Inclement weather
- Very hot weather
- Electrical hazards
- Wildlife and habitat
- Others: _____

Mitigation Measure:

- Personal protective equipment
- First-aid kit
- Appropriate clothing
- Appropriate and safe equipment and tools
- Directional/warning signage/notice
- Cordoning-off work site
- Deploying staff to maintain traffic flow
- Temporary traffic arrangement
- Safe access/working platform
- Adequate cool drinking water
- Temporary sunshade
- Others: _____

F. Other Information

Wood Waste Disposal: Waste depot or landfill Retained on site Mulching
 Upcycling

Remarks: _____

Appendix A. Example 1 - Tree pruning in residential area

Pruning Plan

A. General Information	
Department / Agency:	Project / Contract No.:
<u>Housing Department</u>	<u>TRA for KE Region (CB20170219 3rd cycle)</u>
Inspection Report:	File Ref.:
<input type="checkbox"/> Form 1 <input checked="" type="checkbox"/> Form 2 <input type="checkbox"/> Other form	_____
Inspection Officer:	Tree Work Supervisor:
_____	_____
Tree Worker:	_____
Date of Inspection:	Anticipated Completion Date of Works:
<u>3/3/2020</u>	<u>3/5/2020</u>

B. Site Information	
Location:	<u>Kai Yip Estate</u>
Target	<input checked="" type="checkbox"/> Pedestrian road <input type="checkbox"/> Cycling track <input type="checkbox"/> Public road <input type="checkbox"/> Railway
Description:	<input checked="" type="checkbox"/> Building/structure <input type="checkbox"/> Carpark <input type="checkbox"/> Power lines <input type="checkbox"/> Lamppost <input type="checkbox"/> Signboard <input checked="" type="checkbox"/> Others: <u>Playground</u>
Site Limitation:	<input checked="" type="checkbox"/> No <input type="checkbox"/> On slope <input type="checkbox"/> Traffic/expressway <input type="checkbox"/> Railway <input type="checkbox"/> Restricted area <input type="checkbox"/> Others: _____
Wildlife and Habitat:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Bird nest <input type="checkbox"/> Bee hive <input type="checkbox"/> Others: _____

C. Tree Information	
Tree ID No.:	<u>KY-T0437</u> Species: <u><i>Ficus microcarpa</i></u>
Height(m):	<u>7</u> Crown Spread(m): <u>6</u> DBH(mm): <u>320</u>
Observation:	<input checked="" type="checkbox"/> Dead branch/stub <input type="checkbox"/> Dead trunk <input type="checkbox"/> Broken branch/trunk <input type="checkbox"/> Hanger <input type="checkbox"/> Crack <input type="checkbox"/> Leaning <input checked="" type="checkbox"/> Overgrown branch <input type="checkbox"/> Heavy lateral limb <input type="checkbox"/> Others: _____
Pruning Objective:	<input checked="" type="checkbox"/> Regular maintenance <input checked="" type="checkbox"/> Reduce failure risk/nuisance <input type="checkbox"/> Enhance resistance to inclement weather <input type="checkbox"/> Improve aesthetics and urban environment <input type="checkbox"/> Others: _____
Mitigation Measure:	<input type="checkbox"/> Crown raising <input checked="" type="checkbox"/> Crown reduction <input type="checkbox"/> Crown thinning <input checked="" type="checkbox"/> Crown cleaning <input type="checkbox"/> Formative pruning <input type="checkbox"/> Cabling <input type="checkbox"/> Pest & disease control <input type="checkbox"/> Others: _____
Pest & Disease:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Termite <input type="checkbox"/> Brown root rot disease <input type="checkbox"/> Others: _____

D. Pruning Work Information

Tree Part(s) to be Pruned:

Crown: % of foliage: 20%

Branch:

Quantity: _____ Fall distance(m): _____

Cut size(mm): _____ Length of tree part(m): _____

Trunk:

Quantity: _____ Fall distance(m): _____

Cut size(mm): _____ Length of tree part(m): _____

Others: _____

Equipment & Tools:

Hand pruner Looper Extension pruner

Hand saw Pole saw Chainsaw

Tree climbing gear Elevated platform

Others: _____

Photo record



Tree Part(s) to be Pruned:

Crown: % of foliage: _____

Branch:

Quantity: 1 Fall distance(m): 5

Cut size(mm): <100 Length of tree part(m): 0.5

Trunk:

Quantity: _____ Fall distance(m): _____

Cut size(mm): _____ Length of tree part(m): _____

Others: _____

Equipment & Tools:

Hand pruner Looper Extension pruner

Hand saw Pole saw Chainsaw

Tree climbing gear Elevated platform

Others: _____

Photo record



D. Pruning Works Information

Tree Part(s) to be Pruned:	
<input type="checkbox"/> Crown: % of foliage: _____	
<input checked="" type="checkbox"/> Branch:	
Quantity:	Fall distance(m):
<u>3</u>	<u>5</u>
Cut size(mm):	Length of tree part(m):
<u><100</u>	<u>0.5</u>
<input type="checkbox"/> Trunk:	
Quantity:	Fall distance(m):
_____	_____
Cut size(mm):	Length of tree part(m):
_____	_____
<input type="checkbox"/> Others: _____	
Equipment & Tools:	
<input type="checkbox"/> Hand pruner <input type="checkbox"/> Looper <input type="checkbox"/> Extension pruner	
<input type="checkbox"/> Hand saw <input checked="" type="checkbox"/> Pole saw <input type="checkbox"/> Chainsaw	
<input type="checkbox"/> Tree climbing gear <input type="checkbox"/> Elevated platform	
<input type="checkbox"/> Others: _____	

Photo record

**E. Occupational Safety and Health (OSH)**

Factors with Potential Risk:	Mitigation Measure:
<input type="checkbox"/> Work at height	<input checked="" type="checkbox"/> Personal protective equipment
<input checked="" type="checkbox"/> Overhead object	<input checked="" type="checkbox"/> First-aid kit
<input checked="" type="checkbox"/> Delivery of tree debris	<input checked="" type="checkbox"/> Appropriate clothing
<input type="checkbox"/> Traffic flow	<input checked="" type="checkbox"/> Appropriate and safe equipment and tools
<input checked="" type="checkbox"/> Use of equipment	<input checked="" type="checkbox"/> Directional/warning signage/notice
<input type="checkbox"/> Fire precaution	<input checked="" type="checkbox"/> Cordoning-off work site
<input type="checkbox"/> Heat related disorder	<input checked="" type="checkbox"/> Deploying staff to maintain traffic flow
<input type="checkbox"/> Application of chemical	<input type="checkbox"/> Temporary traffic arrangement
<input type="checkbox"/> Inclement weather	<input type="checkbox"/> Safe access/working platform
<input type="checkbox"/> Very hot weather	<input checked="" type="checkbox"/> Adequate cool drinking water
<input type="checkbox"/> Electrical hazards	<input type="checkbox"/> Temporary sunshade
<input type="checkbox"/> Wildlife and habitat	<input type="checkbox"/> Others: _____
<input type="checkbox"/> Others: _____	

F. Other Information

Wood Waste Disposal: Waste depot or landfill Retained on site Mulching
 Upcycling

Remarks: _____

Appendix B. Adverse Effect of Pruning Malpractices

Pruning Malpractices	Possible Adverse Influences on Tree							
	Increase branch / tree failure potential	Health and growth rate decline	Disfigure tree form	Stimulate growth of water sprouts	Cause damage to branch collar or trunk tissue	Hard to complete compartmentalisation	Become vulnerable to pests and diseases	Become vulnerable to sunburn
Topping	✗	✗	✗	✗		✗	✗	✗
Lion-tailing	✗	✗	✗	✗			✗	✗
Over-lifting	✗	✗	✗	✗			✗	✗
Flush cut	✗				✗	✗	✗	
Stub remaining	✗					✗	✗	
Large pruning wound	✗			✗	✗	✗	✗	
Bark tearing	✗				✗	✗	✗	
Jagged wound	✗			✗	✗	✗	✗	
Wound dressing		✗			✗	✗	✗	

✗ Possible adverse effect