

## Branch Pruning Guidelines I

*branch attachment strength study in Singapore*



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This technical note aims to guide arborists in Singapore on branch pruning of tropical trees. Young trees can be trained to develop strong branch attachments and eliminate structurally weak co-dominant trunks. Mature trees can be pruned to develop strong branch attachments. The guidelines are based on results of a branch research project completed by CUGE.

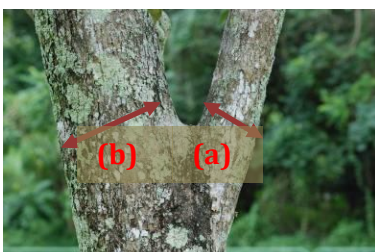


Branch failure at joints

### Background

In Singapore the distribution of tree failure types followed this decreasing order of occurrence: branch failure (70%) > root failure (20%) > trunk failure (10%). By reducing branch failure, overall tree failure incidences can be reduced.

There are many factors that affect branch failure at the joints, such as wood decay, extreme wind, excessive weight of branches and weak branch attachments. To minimise the likelihood of branch failure due to weak branch attachment strength, one simple rule to follow is to selectively remove branches that exceed a threshold value of branch diameter ratio. This is further explained below.



$$\text{Diameter Ratio} = \frac{\text{Branch Diameter (a)}}{\text{Attachment Branch Diameter (b)}}$$

Several studies using temperate tree species have determined that branch attachment strength is best predicted by diameter ratio (branch diameter/attachment branch diameter {larger branch}).

**A study on branch attachment strength** conducted by NParks on *Samanea saman*, *Pterocarpus indicus*, *Khaya senegalensis*, *Tabebuia rosea* and *Syzygium grande* also determined that diameter ratio is a good predictor to use to determine branch strength.

Branches with diameter ratios 0.80 and above required less breaking stress to break than those below 0.80. Accordingly, **diameter ratio 0.80 is the recommended threshold value to be used to guide branch pruning in Singapore**. All branches of our trees with diameter ratios 0.80 and above should be removed, subordinated or thinned to reduce the risk of branch failures whenever possible.

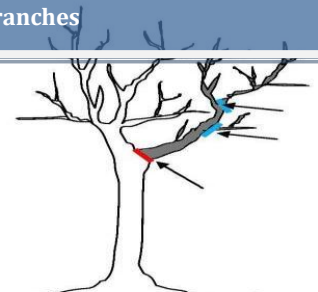


Branches with diameter ratios less than 0.8



Branches with diameter ratios 0.8 and above

### How to use threshold diameter ratio 0.80 to guide branch pruning of our trees?

Girth of Branch (see shaded branch)	Maintenance Operation	Recommended Pruning	
More than or equals to 0.5m	During regular branch pruning or formative pruning, look out for branches with <b><u>threshold diameter ratio 0.80 and above</u></b>	Only cut off some lateral branches on one branch <b>(in blue)</b> and keep all the lateral branches on the other intact.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>Either cut off some lateral branches</p>  </div> <div style="border: 1px solid black; padding: 5px; text-align: center; margin-top: 10px;"> <p>Or Cut off the whole branch</p> </div>
Less than 0.5m		Either keep one branch by cutting off the other branch <b>(in red)</b> , or, cut off some lateral branches on one branch <b>(in blue)</b> and keep all the lateral branches on the other intact.	

**Expected Outcome.** A stronger, dominant leader should develop over a few years with other side branches comparatively smaller in diameter i.e. the diameter ratios for most branches will be less than 0.80.

#### NOTE

With special care taken during each branch pruning session, it is possible to suppress one branch and train another without excessive pruning overtime. For young trees, the recommended pruning should be done during formative pruning. For mature trees, the recommended pruning can be done during crown reduction.