



3 February 2010

Report of: Arbor Global (HK) Ltd.

Project: Araucaria Tree Risk Assessment and Risk Reduction
Recommendations

Project Site: Maryknoll Convent School
130 Boundary Street
Kowloon, Hong Kong

1.0 Introduction

Arbor Global (HK) Limited (AG), an international arboricultural consulting company, has been retained by the Leisure and Cultural Services Department (LCSD) to conduct a field inspection and risk assessment on a large, specimen Cook Pine tree (*Araucaria columnaris*) located at the Maryknoll Convent School.

LCSD informed AG that during the week of 18 January 2010, trenches were dug near to the subject tree resulting in the cutting of a large number of roots, including some very large supporting roots.

Field inspections were conducted on 29 and 30 January 2010 by Kevin K. Eckert, International Society of Arboriculture (ISA) Board Certified Master Arborist WE-1785BU, and Leon Marcus, ISA Certified Arborist WE-6935A and Certified Tree Worker 1532.

Based on this inspection and assessment, AG has developed risk reduction recommendations.

This report provides AG's general findings, conclusions and risk reduction recommendations for this tree according to its condition at the time of inspection.

2.0 Assessment Procedure

This risk assessment is based upon a field inspection of this tree and the surrounding site by AG's Qualified Arborists. Inspection was conducted from various vantage points on the ground immediately adjacent to and at a distance from the tree. A thorough visual inspection of the above-ground portion of the entire tree was conducted. Excavation of the soil in selected areas around the tree was conducted using a hand shovel to identify and measure the presence of healthy roots and roots that had been cut. Sounding of the lower trunk was conducted to identify signs of significant internal decay and cavities that may be present and not visible from the outside of the tree. AG conducted internal testing

using a Resistograph tree probe. Tree and site conditions that were inspected and measured included:

- Tree size: Visual review of tree height and crown spread. Diameter measurements were conducted using a tree diameter measuring tape. Height measurement was conducted using a visual estimation based on AG's experience and nearby references.
- Targets: People and property that are within the fall zone of the tree and tree parts.
- Tree form and crown class: Crown symmetry, tree lean and exposure to wind.
- Tree Health: General tree vigor as exhibited by foliage coloration and form, the presence of branch dieback, and growth rates and formation of woundwood.
- Adverse site conditions: Signs and reports of recent construction activity, erosion of the root area and other action or conditions that may damage or restrict roots, or otherwise compromise tree structural stability.
- Defective root conditions: Significant pruning, damage, decay or cavities within the root system or root crown that are evident from a visual inspection on the ground surface or observations of tree condition.
- Trunk defects: Significant decay and cavities, extensive external sap flow, included bark, large cracks or seams within the main trunk or any other major defects that are visible and that may affect or represent a sign of the structural integrity of the tree.
- Scaffold branch/tree crown defects: Dead branches, significant defects or weakness at main attachments of scaffold branches, significant decay and cavities, excessive end weight, and large broken and hanging branches.

AG also referenced information provided by LCSD that included photographs, maps, a Tomograph reading report conducted on 17 July 2009, and a copy of the "Tree Routine Inspection Report" conducted by Dynamic Source Limited, dated 14 October 2009.

AG was accompanied to this tree by LCSD staff on 29 January 2010 to ensure proper identification and provide general background on the tree.

3.0 Findings, Conclusions

AG's general and significant findings and conclusions regarding the current condition of this tree are as follows:

Location: This tree is located in a restricted lawn area bordered on 2 sides by a large, historic building

Tree Characteristics

Tree Species: Cook pine (*Araucaria columnaris*). This tree has been identified by others as a Norfolk Island pine (*Araucaria heterophylla*). AG's experience and review of this tree cause us to believe that it is *A. columnaris*. However, it is important to understand that the minor structural and characteristic differences between these two species do not impact assessments by AG or others.

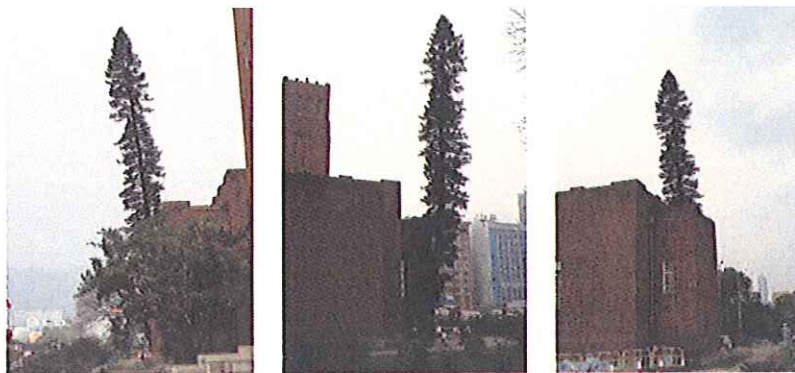
Diameter at Standard Height (1.3 meters above ground): 55.8 cm

Height: 24 meters

Crown Spread: ~ 2.5 meters X ~ 2.5 meters. Crown spread is approximately 50% of normal for this species. This reduced crown spread is likely due to restrictive site conditions.

Crown Class: Dominant. This tree is the most significant specimen in this area and extends above nearby trees and structures.

Form: Tree is slightly asymmetrical with a lower trunk lean of approximately 12° to the west. The lean is asymmetrical with the middle trunk leaning slightly toward the south and then the top portion of the tree naturally corrects to a more upright form.



Tree Views: From South

From North

From East

Tree Health:

Vigor: average Foliage: Color: normal Density: normal Size: normal

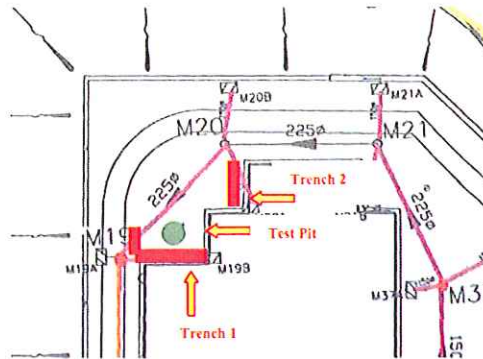
Dieback: none Epicormic growth: none Major pests and disease: none

This tree exhibits signs and symptoms of reasonably good health. A few branches high in the tree crown were observed to be browning. This is generally a normal condition for this species in an exposed site as branches are easily broken.

Site Conditions:

Landscape type: restricted lawn area

Recent site disturbance: Extensive trenching has been recently conducted very near to this tree. Trenching was reported by LCSD to have been conducted during week of 18 January 2010. Two trenches are reported to have been dug at that time.



Trench Locations (drawing provided by LCSD)

Trench 1: Located along the southern side of the tree extending from the inside corner of the building to the west approximately 1.5 meters beyond the tree. The trench was then dug at a right angle to the north for approximately 1 meter. This trench was approximately 30 cm at its closest point. It is reported that the trench was approximately 70 cm deep and 40 cm wide.



Photos of Trench 1 Provided to AG by LCSD

Trench 2: Located along the interior wall of the building measured at 3 meters northeast of the tree.



Trench 2 – Test Pit Dug by AG to Identify Cut Roots

A test pit was dug on the east side of the tree and near to the building wall on 23 September 2009. This pit was reported to be dug approximately 50 mm deep to major roots. Photos show a network of undisturbed large and small roots within this pit. These roots are providing significant support to this tree.

Wind exposure: High. Dominance of the tree on this site causes it to be fully exposed to winds. Its close proximity to the large building may result in accelerated winds and/or vortices caused by the influence of the building. Accelerated winds and vortices increase wind loads and risk of tree or tree part failure.

Tree Condition and Defects:

Roots: A significant number of roots have been cut during the recent trenching operation. This root cutting has reduced the structural support of this tree. AG excavated the root area to conduct root inspection. It is impossible to determine the precise reduction of structural holding capacity of the root system as a result of this root cutting. However, based on AG's experience and interpretation of research findings, it is estimated that the strength reduction is likely in the range of 20%. Specific findings and conclusions relative to roots are as follows:



AG Root Excavation Along Wall South of Tree

Rot/decay: No signs or symptoms of root rot were observed.

Insects/Disease: No signs or symptoms were observed.

Soil lift/crack: No soil lifting or cracking was observed. The recent site disruption destroyed any signs of soil lifting or cracking that may have occurred from root lifting prior to the trench excavation.

Critical root zone restriction: Estimated at approximately 40% total on the east and south side of the tree. The building foundation restricts root growth. However, this tree has developed within this environment over many years showing signs of adaption to the restricted site condition. Araucaria species do not normally possess extensive, large diameter lateral root systems. Root systems of this species often split close to the tree and distribute in smaller diameters. Deep roots and the small diameter lateral roots provide structural support. This permits this specie to be more tolerant and adaptive to sites that restrict root growth.

Inspection of the root system through review of photographs of the trenching provided by LCSD and AG's excavations during the field inspection show that the lateral roots of this tree were generally located within the top 300 mm of the soil surface within the critical root zone.