



Joint Task Force of

The Hong Kong Institute of Landscape Architects (HKILA)

and

The Hong Kong Institution of Engineers (HKIE)

on

Management of Stonewall Trees

A Review and Recommendation Report

July 2016

Executive Summary

- (a) The Hong Kong Institute of Landscape Architects and The Hong Kong Institution of Engineers set up a Joint Task Force (JTF) to conduct an independent review of the prevailing practice of managing stonewall trees adopted by the Hong Kong SAR Government.

- (b) Key findings of the review include:
 - (i) Current guidelines adopted for assessing risk of stonewall trees focus on health defects of the trees. There lacks a well-established and comprehensive guideline which covers the stability assessment of stonewall trees.

 - (ii) Public's acceptance of carrying out mitigation measures against the risk of stonewall tree collapse is not sufficient.

- (c) The JTF recommends the following for consideration by the Administration:
 - (i) Raising public awareness of the risk of stonewall tree collapse and the need for necessary precautionary mitigation measures through enhanced public education.

 - (ii) Promoting research and development of technical work pertaining to stonewall tree safety with collaboration of arboricultural, landscape architectural and engineering professionals.

- (iii) Stepping up the arboricultural maintenance guidelines for enhancing safety of stonewall trees.
- (iv) Reviewing the integrated approach for management of stonewall trees.
- (v) Enhancing the training and education requirements of personnel involved in assessment of stonewall tree safety.

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Part 1 - Background

1. According to the Tree Register maintained by Development Bureau (DEVB), there are 309 stonewall trees on Government land. Majority of those stonewall trees are located in densely developed urban areas. They are of memorable significance to many citizens, and the consequence of tree collapse is not low. Management of these stonewall trees should aim to provide a sustainable environment for the tree growth without compromising public safety.
2. In August 2015, the HKILA invited the HKIE to establish a Joint Task Force (JTF) with an aim to conducting an independent review of the prevailing management practice of stonewall trees adopted by the Hong Kong SAR Government and providing recommendations to the Administration for betterment of the stonewall tree management. The membership of the JTF is presented in Annex A.

Part 2 - Desk top study and interviews

3. In reviewing the prevailing management practice, the JTF has scrutinised the following documents:
 - (a) LC Paper No. CB(1)1222/14-15(01) - Administration's response to the letter from Dr Hon Kenneth CHAN dated 10 August 2015 on the removal of the stonewall trees on Bonham Road on 7 August 2015 and the Administration's work on tree management
 - (b) *Urban Tree Risk Management: A Community Guide to Program Design and Implementation* by the United States Forest Service of the Department of Agriculture

- (c) DEVB Technical Circular (Works) No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features
 - (d) *Management Guidelines for Stonewall Trees* by Greening, Landscape and Tree Management Section (GLTMS), DEVB.
 - (e) *Guidelines for Tree Risk Assessment and Management Arrangement (8th Edition)* by GLTMS, DEVB.
 - (f) *Study on Masonry Walls with Trees (GEO Report No. 257)* by CM Wong & Associates Ltd & Jim, C.Y.
 - (g) *Management Guidelines for Mature Trees* by GLTMS, DEVB.
4. The JTF convened interviews with the following bodies, the major stakeholders in managing registered stonewall trees, for an in-depth appreciation of the operations involved in the prevailing management practice:
- (a) Landscape Unit of the Highways Department
 - (b) Landscape architects of the Architectural Services Department
 - (c) GLTMS, DEVB
5. The JTF also invited the Expert Panel on Tree Management for an interview. Members of the Expert Panel including Mr John K C Ho, Dr Kevin Eckert, Mr Ken K Y So and Dr Eric Y T Lee attended the interview and presented their views to the JTF.

Part 3 - Prevailing practice of managing stonewall trees - an overview

6. The Government adopts an "integrated approach" for the management of trees on Government land, i.e. the department responsible for the maintenance of an area or a facility is also responsible for the maintenance of trees there (see also DEVB Technical Circular (Works) No. 6/2015). This approach has been applied to all trees in Hong Kong including stonewall trees.
7. The Tree Management Office (TMO) of GLTMS establishes technical circulars and guidelines pertinent to tree risk assessment. In accordance with LC Paper No. CB(1)1222/14-15(01), the TMO has made reference to international standards and best practices, including "*Urban Tree Risk Management: A Community Guide to Program Design and Implementation*" by the Department of Agriculture in the US and guidelines issued by the International Society of Arboriculture, to develop technical guidance for screening trees of obvious problems or defects for follow-up mitigation measures.
8. Tree management departments follow TMO's technical guidance for assessing tree risk. Currently, guidance stipulated by the *Guidelines for Tree Risk Assessment and Management Arrangement (8th Edition)* and *Management Guidelines for Stonewall Trees* is used for identifying potential problems or defects of trees on stonewalls and determining necessary mitigation measures.
9. Every registered stonewall tree requires regular tree risk assessment by qualified personnel. The assessment is carried out on individual tree basis, and the inspection personnel is required to complete the tree risk assessment form promulgated by the *Guidelines for Tree Risk Assessment and Management Arrangement (8th Edition)*.

10. When credible evidence of potential tree failure is identified, mitigation measures including tree support system, tree pruning, etc. will be proposed and carried out by the responsible tree management departments.
11. Tree management departments undertake necessary public consultation on the proposal of the mitigation measures. The TMO provides technical support and audit to the tree risk assessments. When necessary, advice of the Expert Panel on Tree Management would be sought.

Part 4 - Discussion

12. Guidance stipulated by the *Guidelines for Tree Risk Assessment and Management Arrangement (8th Edition)* focuses on health defects of trees and is developed for all types of trees in Hong Kong.
13. Trees on stonewalls grow in stressful site conditions where the growth of tree roots is constrained by stonewalls. The vertical or sub-vertical wall face on which they attach to is an unfavorable locality to strive for stability. Trees leaning away from stonewalls are subject to the action of their body weight due to the eccentricity, resulting in a tendency towards toppling. Sufficient anchorage and strength of tree roots need to be developed in order to prevent the trees from uprooting or detachment from stonewalls. Limiting the crown size may also be effective to avoid excessive overturning force leading to uprooting subject to the tree anchorage conditions.
14. Currently, the *Guidelines for Tree Risk Assessment and Management Arrangement (8th Edition)* and *Management Guidelines for Stonewall Trees* do not provide detailed guidance sufficient for an effective assessment of the toppling potential of stonewall trees except the *Management Guidelines for Stonewall Trees* states a general rule of thumb that stonewall trees leaning beyond 40° should

deserve a close attention. The *Guidelines for Tree Risk Assessment and Management Arrangement (8th Edition)* provides illustrations on the classification of tree root typology and failure modes of stonewall trees, however, how those pieces of information should be incorporated into the tree risk assessment has not been explicitly stipulated. The *Management Guidelines for Stonewall Trees* also recommends tree management departments to conduct regular inspection to identify the need of pruning to reduce excessive branch end weight, rectify imbalanced tree crown and maintain optimal size of tree crown to avoid excessive load leading to tree failure. A clear guidance on determining the extent of pruning which can effectively address the concern on the imbalanced load would be desirable.

15. There is a general consensus amongst stakeholders who were interviewed by the JTF that the safety of trees on stonewalls in Hong Kong is a unique subject. It is noted that the subject has not been covered in international standards and best practices (see also para. 7). There lacks a well-established and comprehensive guideline which covers the assessment of stonewall tree toppling potential.
16. Establishment of the assessment guidelines should be supported by the arboricultural knowledge about tree root anchorage, tree properties (e.g. biomass, wetted weight, etc.), and understanding of the mechanics of tree toppling. There have been quite a few well-documented research and development work in these aspects. Nevertheless, development of sufficient technical knowledge for establishment of the assessment guidelines has been constrained by the availability of in-depth arboricultural data and limited collaboration between professionals of disciplines in arboriculture, landscape architecture and engineering mechanics in local practice.
17. In addition to the assessment guidelines, standards (e.g. design wind load and safety margin requirement, etc.) for design of tree supports

to mitigate risk of tree collapse applicable for local conditions are lacking. The *Management Guidelines for Stonewall Trees* mentions that the design of tree supports should take into account tree dynamics, however, technical details of tree dynamics have not been provided. The *Study on Masonry Walls with Trees (GEO Report No. 257)* investigates tree loading on masonry walls for the purposes of the design of upgrading works of masonry walls with consideration given to additional mass of trees but not for the assessment of tree stability or design of measures to provide direct support to the trees.

18. Feasibility of a tree support scheme is primarily determined on the basis of physical site constraints, e.g. obstruction of the underground utilities, space availability, etc., however, acceptance by the public is an important aspect in carrying out the necessary tree support measures. The JTF noted that public's support on proposals of providing mitigation measures to stonewall trees is not high. In some cases, even pruning of stonewall trees for the purposes of routine arboricultural maintenance has attracted objections by the public.

Part 5 - Recommendations

19. Having deliberated the above and considered views solicited from various major stakeholders, the JTF would like to make the following recommendations for consideration by the Administration.
20. *Allocation of more resources to public education and public engagement*
 - (a) to conduct public education on the importance of proper tree maintenance, e.g. the need for regular tree pruning, and to raise public awareness of the risk of tree fall, and

- (b) to enhance public engagement on tree management, e.g. to organise public consultation forum at district level for seeking support of critical tree management actions.

21. ***Injection of more resources to research and development pertaining to stonewall tree safety***

- (a) to carry out systematic and detailed investigation of future tree failure incidents in order to identify the causes and gain lessons learnt for improvement of tree risk assessment, maintenance measures and formulation of tree support measures,
- (b) to promote research of the tree anchorage capacity and other properties (e.g. biomass) of trees, and to establish an approach for identifying the tree root extent,
- (c) to foster collaboration between professionals in the arboricultural, landscape architecture and engineering disciplines,
- (d) to enhance guidelines on risk assessment for stonewall trees, including specific provisions to address the tree toppling potential and the extent of regular arboricultural maintenance, with consideration given to interaction between the stonewalls, the trees and their growing environments, and
- (e) to establish a standard for design of support measures to prevent collapse of stonewall trees.

22. In addition to the above, the JTF suggests that it is worthwhile ***to consider refining the strategy of the integrated approach for management of stonewall trees.*** It is agreed that the existing

integrated approach could be generally efficient and cost-effective for managing safety of some typical trees. However, for stonewall trees, this strategy may not be an effective approach for the reason that there still lacks a well-established and comprehensive assessment of the stonewall tree stability. A dedicated unit tasked to focus on stonewall tree management can assure consistency in handling safety issues of stonewall trees. The unit should comprise professional arborists, landscape architects and engineers to establish a centralized risk ranking system for all registered stonewall trees maintained by the Government. This will help the Government identify the most deserving stonewall trees for follow-up actions in accordance with a risk-based priority. Tree management departments can act as works agents to carry out necessary arboricultural maintenance works or tree support works following the design and advice of the dedicated unit.

23. Arboricultural knowledge is definitely required for assessing the potential of tree toppling from stonewalls, while principles of engineering mechanics and studying of the nearby environments can assist in carrying out a scientific diagnosis of the toppling mechanism. The JTF sincerely suggests the Administration *to enhance training and education requirements of personnel involving in risk assessment of stonewall trees to receive top-up courses on engineering mechanics pertaining to the analysis of tree toppling.*
24. The assessment of the health and stability condition of wall trees would need special skills and knowledge in arboricultural aspects as well as engineering mechanics and study of the nearby environments. *In a longer term, a review of the need and appropriateness for establishing a specific register of those capable personnel of such work may be worthwhile.*

Part 6 - Concluding remarks

25. The level of concern about stonewall trees in Hong Kong is high, given the complex technicalities of the tree stability and the public sentiments involved.

26. The HKILA and HKIE are dedicated to contribute to a betterment of the management system of stonewall trees. This Report signifies the concerted effort of the two professional bodies and their commitment to take every endeavor to create a safe and green living environment of Hong Kong.

Annex A

Membership of the Joint Task Force of HKILA-HKIE on Management of Stonewall Trees

Representatives of HKILA

Mr Paul Chan (Chairman of the JTF)

Mr S C Lo

Mr Thomas Tai

Mr Patrick Lau

Mr Matthew Pryor

Mr Isaac So

Mr Paul Chow

Dr Allen Zhang

Mr T C Lam

Representatives of HKIE

Ir Rupert Leung

Ir Chris Lee

Ir Dr Julian Kwan

Ir Barry Shum