

APPENDIX A

QPs submitting A&A proposals for conservation buildings, sites next to conservation buildings, as well as for large development sites adjoining conservation buildings and areas should factor in the vulnerability of conserved buildings and propose appropriate structural and foundation system to comply with code requirements for the building use throughout its entire design lifespan.

The following table presents the aspects typically considered.

Guidelines on structural proposals as part of A&A to or near Conserved Buildings

No.	Stage	Aspects to be considered (where applicable)	
1	Planning and Design	1.1	<p>Investigate the soil condition at the development site via trial trench, drilled boreholes, and/or desktop study where applicable (e.g., geological map, historical data) to identify the soil stratification, state of the ground condition (e.g., check whether the soil is still consolidating and settling over time) etc.</p> <p><i>The sale and product info of Singapore Geology (2021) Map, the new publication for the geology of Singapore can be accessed via http://go.gov.sg/bundled-geomap-geomemoir</i></p>
		1.2	<p>Assess and design appropriate foundation system to eliminate/reduce some of the known concerns: -</p> <ul style="list-style-type: none">a) Excessive settlement of subject building (e.g., proposed works involve increase in loading due to addition of floors etc.) and consequential heave to adjacent building due to bearing failure from the use of shallow foundation with the presence of soft soil.b) Differential settlement due to incompatible foundation system (e.g., mixture of shallow and deep foundation, or mixture of hard and soft soil formations within the site) between: -<ul style="list-style-type: none">i) the main building structure and its façadeii) the subject building and the adjacent buildingsiii) the façade of the subject building and the adjacent buildings' façades.

No.	Stage	Aspects to be considered (where applicable)	
			<p>c) Vibration caused by the installation of deep foundation.</p> <p>d) Ground movement due to the adoption of displacement piles.</p>
		1.3	Assess the impact of excavation (if any) and provide adequate support or mitigation measures to minimise ground movement and to avoid damage to adjacent buildings.
		1.4	Propose a demolition sequence with the use of appropriate equipment, such as handheld tools, to minimise vibration. Demolition sequence should include measures to redistribute loads (e.g., adequate provision of shoring) if key bracing members or load bearing walls are to be demolished and to ensure adjacent buildings are protected.
		1.5	Design for suitable structural framing system and structural detailing between the façade and the main building structure, and between the façade and adjacent buildings' façade.
		1.6	<p>Carry out comprehensive pre-construction survey to determine the existing structural stability of building and adjacent units, propose adequate instrumentation and monitoring, and measure all cracks.</p> <p>Reference can be made to 2015 BCA Circular "Guidelines on pre-construction survey prior to carrying out construction works" on the required zone to carry out the pre-construction survey based on the type of proposed works.</p>
		1.7	Submit impact assessment to BCA for the proposed works considering the existing condition of adjacent buildings in the planning and design.
		1.8	Design for independent support and foundation (and any other consideration/mitigating measures) so that any new structures do not impose additional load on adjacent buildings during and after construction.
		1.9	Submit a structural investigation report and endorsement by a professional engineer (PE) as part of the planning submission to URA on the existing condition of the building and any strengthening measures proposed.

No.	Stage	Aspects to be considered (where applicable)	
			<p>The structural report should also outline any structural changes to the building, include structural drawings showing relevant changes, and any impact assessment of proposed works near to conserved building where applicable.</p> <p>For structural proposals, including those involving underpinning of facades or foundational works at the five-foot way or party wall of conserved buildings, a method statement for protection and/or restoration of facades and its relevant supporting structures should also be prepared and submitted to URA.</p>
2	During Demolition	2.1	Check that adjacent buildings sustain no damage and monitor during demolition that vibration are within the stipulated review levels.
3	During the Installation of foundation piles	3.1	Provide mitigation measures such as pre-boring, relief wells around the proposed deep foundation, shoulder wall to shelter the effect of soil migration beyond the project boundary and carry out trial installation of proposed deep foundation (if any) to ascertain that impact caused (vibration / ground movement) are within acceptable limits. Provide additional measures where required prior to proceeding with working piles.
		3.2	Check that adjacent buildings are not damaged and monitor that the review levels for vibration and building settlement are not exceeded.