



Australian Government

AHCARB810 Analyse edaphic interactions of trees and structures

Release: 1

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Modification History

Release	Comments
Release 1	This version released with AHC Agriculture, Horticulture and Conservation and Land Management Training Package Version 5.0.

Application

This unit of competency describes the skills and knowledge required to analyse the edaphic interactions of trees and structures through investigations into soil characteristics and effect on tree and structure stability, tree roots and interactions with structures, and their relationship resulting in potential tree and structural failure.

The unit applies to individuals with highly specialised advanced theoretical and technical knowledge for professional work and research in arboriculture. They exercise advanced cognitive, technical and communication skills and demonstrate complete autonomy, judgement and adaptability in research and analysis for complex problems.

No licensing, legislative or certification requirements are to this unit at the time of publication.

Pre-requisite Unit

The prerequisite unit of competency for this unit is:

- AHCARB804 Analyse tree structure and biomechanics.

Unit Sector

Arboriculture (ARB)

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Determine soil attributes for a specified site	1.1 Investigate angle of repose of soils and impact on structures 1.2 Investigate soil plasticity and impact on structures 1.3 Investigate the effects of soil moisture on cohesion and plasticity 1.4 Investigate modes of soil liquefaction and soil stability 1.5 Conduct tests on soil properties to establish soil stability for

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	<p>specified site</p> <p>1.6 Assess level of soil cohesion for site</p> <p>1.7 Determine shear strength of soil for site</p> <p>1.8 Investigate load bearing capacity of soil for site</p> <p>1.9 Determine mass of the soil plate for site</p>
2. Determine root attributes for trees on site	<p>2.1 Determine tree root morphology, division and distribution</p> <p>2.2 Determine amount of buttressing</p> <p>2.3 Determine anatomical features of tree roots for identification purposes</p> <p>2.4 Identify tree roots based on anatomical features</p>
3. Calculate forces from roots	<p>3.1 Research, test and determine forces and pressures exerted by trees through roots in soil</p> <p>3.2 Estimate and measure dimensions of roots exerting a force on structures on site</p> <p>3.3 Calculate total surface area of the roots exerting a force on structures on site</p> <p>3.4 Calculate force exerted by roots per unit of surface area of structure</p> <p>3.5 Calculate total force exerted by roots of a given surface area</p>
4. Determine attributes of structures	<p>4.1 Measure and determine volume of structures impacted by roots</p> <p>4.2 Research and calculate mass of structures on site</p> <p>4.3 Determine the impact of gravity on structural mass</p> <p>4.4 Determine effect of leverage of forces exerted by tree roots on structures</p>
5. Define the root–soil matrix factors for root/soil breakage	<p>5.1 Determine factors of root–soil matrix interactions</p> <p>5.2 Investigate area of contact between root and soil</p> <p>5.3 Investigate elasticity, tensile strength and breaking stress of roots</p> <p>5.4 Investigate root cross-sectional morphology</p> <p>5.5 Assess root plate for factors that may contribute to failure</p> <p>5.6 Estimate impact of static and dynamic testing for root plate stability</p>

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	5.7 Evaluate the likelihood of root failure by root breakage 5.8 Evaluate the likelihood of anchorage failure by soil breakage or slippage
6. Research structural engineering solutions	6.1 Investigate and assess effects of increasing mass of structure to prevent damage 6.2 Investigate and assess methods and effects of increasing the modulus of rupture to prevent damage 6.3 Investigate and assess effects of use of curved structures to prevent damage 6.4 Investigate and assess effects of soil mass and friction on structure stability 6.5 Investigate and assess effects of anchors, braces and props on trees to improve stability 6.6 Compile investigations and assessments into a reference portfolio
7. Prepare stability and expert witness reports	7.1 Prepare report on potential tree damage to structure 7.2 Provide design suggestions to mitigate potential damage 7.3 Review root plate evaluation and prepare report on stability of tree 7.4 Provide design suggestions to mitigate likelihood of tree failure 7.5 Prepare final report on potential structure and tree stability
8. Communicate with project personnel	8.1 Discuss installation and protection measures with project personnel using industry-specific language 8.2 Negotiate and resolve installation and protection issues

Elements and Performance Criteria

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<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Determine soil attributes for a specified site	1.1 Investigate angle of repose of soils and impact on structures 1.2 Investigate soil plasticity and impact on structures

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<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	<p>1.3 Investigate the effects of soil moisture on cohesion and plasticity</p> <p>1.4 Investigate modes of soil liquefaction and soil stability</p> <p>1.5 Conduct tests on soil properties to establish soil stability for specified site</p> <p>1.6 Assess level of soil cohesion for site</p> <p>1.7 Determine shear strength of soil for site</p> <p>1.8 Investigate load bearing capacity of soil for site</p> <p>1.9 Determine mass of the soil plate for site</p>
2. Determine root attributes for trees on site	<p>2.1 Determine tree root morphology, division and distribution</p> <p>2.2 Determine amount of buttressing</p> <p>2.3 Determine anatomical features of tree roots for identification purposes</p> <p>2.4 Identify tree roots based on anatomical features</p>
3. Calculate forces from roots	<p>3.1 Research, test and determine forces and pressures exerted by trees through roots in soil</p> <p>3.2 Estimate and measure dimensions of roots exerting a force on structures on site</p> <p>3.3 Calculate total surface area of the roots exerting a force on structures on site</p> <p>3.4 Calculate force exerted by roots per unit of surface area of structure</p> <p>3.5 Calculate total force exerted by roots of a given surface area</p>
4. Determine attributes of structures	<p>4.1 Measure and determine volume of structures impacted by roots</p> <p>4.2 Research and calculate mass of structures on site</p> <p>4.3 Determine the impact of gravity on structural mass</p> <p>4.4 Determine effect of leverage of forces exerted by tree roots on structures</p>
5. Define the root–soil matrix factors for root/soil breakage	<p>5.1 Determine factors of root–soil matrix interactions</p> <p>5.2 Investigate area of contact between root and soil</p> <p>5.3 Investigate elasticity, tensile strength and breaking stress of roots</p> <p>5.4 Investigate root cross-sectional morphology</p>

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	<p>5.5 Assess root plate for factors that may contribute to failure</p> <p>5.6 Estimate impact of static and dynamic testing for root plate stability</p> <p>5.7 Evaluate the likelihood of root failure by root breakage</p> <p>5.8 Evaluate the likelihood of anchorage failure by soil breakage or slippage</p>
6. Research structural engineering solutions	<p>6.1 Investigate and assess effects of increasing mass of structure to prevent damage</p> <p>6.2 Investigate and assess methods and effects of increasing the modulus of rupture to prevent damage</p> <p>6.3 Investigate and assess effects of use of curved structures to prevent damage</p> <p>6.4 Investigate and assess effects of soil mass and friction on structure stability</p> <p>6.5 Investigate and assess effects of anchors, braces and props on trees to improve stability</p> <p>6.6 Compile investigations and assessments into a reference portfolio</p>
7. Prepare stability and expert witness reports	<p>7.1 Prepare report on potential tree damage to structure</p> <p>7.2 Provide design suggestions to mitigate potential damage</p> <p>7.3 Review root plate evaluation and prepare report on stability of tree</p> <p>7.4 Provide design suggestions to mitigate likelihood of tree failure</p> <p>7.5 Prepare final report on potential structure and tree stability</p>
8. Communicate with project personnel	<p>8.1 Discuss installation and protection measures with project personnel using industry-specific language</p> <p>8.2 Negotiate and resolve installation and protection issues</p>

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential for performance in this unit of competency but are not explicit in the performance criteria.

Skill	Description
Reading	<ul style="list-style-type: none"> Identify and interpret relevant information from complex texts, reports, maps and plans to formulate a detailed understanding of soil characteristics and impact on trees
Writing	<ul style="list-style-type: none"> Create complex arborist reports, demonstrating control over a range of writing styles and using industry-specific language appropriate for target audience
Numeracy	<ul style="list-style-type: none"> Interpret complex numerical data and use complex formulae to measure and calculate volumes and mass of soils and structures for impact on tree roots

Unit Mapping Information

Code and title current version	Code and title previous version	Comments	Equivalence status
AHCARB810 Analyse edaphic interactions of trees and structures	AHCARB803 Analyse edaphic interactions of trees and structures	Performance criteria clarified Foundation skills added Assessment requirements updated	Equivalent

Links

Companion Volumes, including Implementation Guides, are available at VETNet: - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=c6399549-9c62-4a5e-bf1a-524b2322cf72>