



Australian Government

AHCARB803 Analyse edaphic interactions of trees and structures

Release: 2

AHCARB803 Analyse edaphic interactions of trees and structures

Modification History

Release	Comments
Release 2	This version released with AHC Agriculture, Horticulture, Conservation and Land Management Training Package Version 2.0.
Release 1	This version released with AHC Agriculture, Horticulture, Conservation and Land Management Training Package Version 1.0.

Application

This unit of competency describes the skills and knowledge required to analyse the edaphic interactions of trees and structures.

This unit applies to individuals with advanced theoretical and technical knowledge and skills for professional or highly skilled work and/or further learning in one or more disciplines or areas of practice. This unit applies to individuals with advanced cognitive, technical and communication skills to provide specialist advice, analyse, generate and transmit solutions to complex problems, and to demonstrate autonomy, well-developed judgement, adaptability and responsibility as a practitioner or learner.

The role involves the self-directed application of knowledge in tree anatomy, physiology and the edaphic environment with substantial depth in areas such as tree failures and biomechanics in the built environment.

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

Pre-requisite Unit

AHCARB701 Analyse tree biomechanics

Unit Sector

Arboriculture (ARB)

Elements and Performance Criteria

Element	Performance criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>

Element	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	1.1 Research repose angle of soil materials 1.2 Research soil plasticity 1.3 Measure soil moisture content and field capacity of soil 1.4 Research the effects of soil moisture on soil cohesion and plasticity 1.5 Research modes of soil liquefaction 1.6 Determine soil texture 1.7 Assess level of soil cohesion 1.8 Determine shear strength of the soil of concern 1.9 Research load bearing capacity of soil of concern 1.10 Determine mass of the soil plate
2. Determine root attributes	2.1 Determine root morphology, division and distribution 2.2 Determine amount of buttressing of tree 2.3 Determine species development of tap root system 2.4 Research identifying anatomical features of tree roots 2.5 Identify tree roots based on anatomical features
3. Calculate forces from roots	3.1 Research, experimentally model or demonstrate forces and pressures exerted into or through the soil, directly and indirectly by trees 3.2 Estimate and measure dimensions of roots exerting a force on a structure of concern 3.3 Calculate total surface area of the roots exerting a force on a structure of concern 3.4 Calculate force exerted by roots per unit of surface area of structure 3.5 Calculate total force exerted by roots of a given surface area
4. Determine structure attributes	4.1 Measure and determine volume of structure of concern 4.2 Research and calculate mass of the structure and adjacent structures 4.3 Consider the impact of gravity on mass

Element	Performance criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	4.4 Determine effect of leverage on the forces exerted by tree roots onto structure of concern
5. Define the root-soil matrix factors for root/soil breakage	5.1 Determine factors of root–soil matrix interactions 5.2 Consider area of contact between root and soil 5.3 Consider elasticity, tensile strength and breaking stress of roots 5.4 Investigate root cross-sectional morphology 5.5 Assess extent of root plate damage, deficiencies or defects 5.6 Estimate impact of static and dynamic testing for root plate stability 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 Research and consider effects of increasing mass 6.2 Research and consider methods for, and effects of, increasing the modulus of rupture 6.3 Research and consider effects of use of curved structures 6.4 Research and consider effects of soil mass and friction 6.5 Research and consider effects of use of anchors, braces and props 6.6 Compile a portfolio of above research including personal annotations and calculations
7. Prepare stability and expert witness reports	7.1 Prepare report on likelihood of tree causing damage to structure of concern including all test results, assumptions and calculations 7.2 Provide design suggestions to mitigate likelihood of damage to a similar replacement structure 7.3 Prepare report on relative stability of tree as a result of a defective or damaged root plate 7.4 Provide design suggestions to mitigate likelihood of whole tree failure as a result of defective or damaged root plate 7.5 Prepare expert witness report on harm by roots on structures; or on stability of tree with a defective or damaged

Element	Performance criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	root plate, as required
8. Facilitate teamwork	8.1 Review construction and engineering language terminology 8.2 Discuss installation and protection measures to non-arboricultural project personnel 8.3 Resolve issues in construction and engineering terminology 8.4 Communicate in the language, concepts, basic science and technology of construction, architecture and engineering allied professions

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.

Foundation Skills essential to performance are explicit in the performance criteria of this unit of competency.

Unit Mapping Information

Code and title current version	Code and title previous version	Comments	Equivalence status
AHCARB803 Analyse edaphic interactions of trees and structures Release 2	AHCARB803 Analyse edaphic interactions of trees and structures Release 1	Minor typographical errors corrected	Equivalent unit

Links

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

Assessment Requirements for AHCARB803 Analyse edaphic interactions of trees and structures

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Performance Evidence

The candidate must be assessed on their ability to integrate and apply the performance requirements of this unit in a workplace setting. Performance must be demonstrated consistently over time and in a suitable range of contexts.

The candidate must provide evidence for and demonstrate:

- researching repose angle of soil materials
- researching soil plasticity
- measuring soil moisture content and field capacity of soil
- researching the effects of soil moisture on soil cohesion and plasticity
- researching modes of soil liquefaction
- determining soil texture
- assessing level of soil cohesion
- determining shear strength of the soil of concern
- researching load bearing capacity of soil of concern
- determining mass of the soil plate
- determining root morphology, division and distribution
- determining amount of buttressing of tree
- determining species development of tap root system
- researching identifying anatomical features of tree roots
- identifying tree roots based on anatomical features
- researching, experimentally modelling or demonstrating forces and pressures exerted into or through the soil, directly and indirectly by trees
- estimating and measuring dimensions of roots exerting a force on a structure of concern
- calculating total surface area of the roots exerting a force on a structure of concern
- calculating force exerted by roots per unit of surface area of structure
- calculating total force exerted by roots of a given surface area
- measuring and determine volume of structure of concern

- researching and calculate mass of the structure and adjacent structures
- considering the impact of gravity on mass
- determining effect of leverage on the forces exerted by tree roots onto structure of concern
- determining factors of root–soil matrix interactions
- considering area of contact between root and soil
- considering elasticity, tensile strength and breaking stress of roots
- investigating root cross-sectional morphology
- assessing extent of root plate damage, deficiencies or defects
- estimating impact of static and dynamic testing for root plate stability
- evaluating the likelihood of root failure by root breakage
- evaluating the likelihood of anchorage failure by soil breakage or slippage
- researching and considering effects of increasing mass
- researching and considering methods for, and effects of, increasing the modulus of rupture
- researching and considering effects of use of curved structures
- researching and considering effects of soil mass and friction
- researching and considering effects of use of anchors, braces and props
- compiling a portfolio of above research including personal annotations and calculations
- preparing report on likelihood of tree causing damage to structure of concern including all test results, assumptions and calculations
- providing design suggestions to mitigate likelihood of damage to a similar replacement structure
- preparing report on relative stability of tree as a result of a defective or damaged root plate
- providing design suggestions to mitigate likelihood of whole tree failure as a result of defective or damaged root plate
- preparing expert witness report on harm by roots on structures; or on stability of tree with a defective or damaged root plate, as required
- reviewing construction and engineering language terminology
- discussing installation and protection measures to non-arboricultural team members
- resolving issues in construction and engineering terminology
- communicating in the language, concepts, basic science and technology of construction, architecture and engineering allied professions.

Knowledge Evidence

The candidate must demonstrate knowledge of:

- repose angle of soil materials
- soil plasticity
- soil moisture content
- field capacity of soil
- effects of soil moisture on soil cohesion and plasticity
- modes of soil liquefaction
- soil texture
- soil cohesion

- shear strength of the soil
- load bearing capacity
- mass of soil plate
- root morphology
- root division
- root distribution
- buttressing
- species development of tap root systems
- anatomical features of tree roots
- identification of tree roots based on anatomical features
- research, experimental modelling and demonstration methods
- forces and pressures exerted into or through the soil, directly and indirectly by trees
- estimation and measurement of dimensions of roots exerting a force on a structure
- calculation of the total surface area of the roots exerting a force on a structure
- calculation of the force exerted by roots per unit of surface area of structure
- calculation of the total force exerted by roots of a given surface area
- measurement of volume of structures
- calculation of the mass of structures
- impact of gravity on mass
- effect of leverage on the forces exerted by tree roots onto structure
- factors of root–soil matrix interactions
- area of contact between root and soil
- elasticity of roots
- tensile strength of roots
- breaking stress of roots
- root cross-sectional morphology
- extent of root plate damage
- extent of root plate deficiencies
- extent of root plate defects
- impact of static and dynamic testing for root plate stability
- likelihood of root failure by root breakage
- likelihood of anchorage failure by soil breakage or slippage
- effects of increasing mass
- effects of use of curved structures
- effects of soil mass and friction
- effects of, increasing the modulus of rupture
- effects of use of anchors, braces and props
- portfolio of research
- personal annotations and calculations
- report preparation
- test results and assumptions
- relative stability of tree

- whole tree failure
- design suggestions for mitigation of damage and whole tree failure
- harm by roots on structures
- expert witness reports
- expert witness report on harm by roots on structures
- construction language terminology
- engineering language terminology
- installation and protection measures
- concepts, basic science and technology of structural engineering
- concepts, basic science and technology of construction
- concepts, basic science and technology of architecture.

Assessment Conditions

It is an industry requirement that competency in this unit requires the preparation of a minimum of two (2) different reports:

- a report on harm by roots on structures
- a report on stability of tree with a defective or damaged root plate

Assessment must be demonstrated consistently over time in a suitable range of contexts and have a productivity-based outcome. No single assessment event or report is sufficient to achieve competency in this unit.

Assessment may be conducted in a simulated or real work environment, however determination of competency requires the application of work practices under work conditions.

The mandatory equipment and materials used to gather evidence for assessment include:

- equipment:
 - computer
 - word processing software
 - internet connection
 - digital camera with macro
 - diagnostic tools including sounding hammer, trowel, probe, cordless drill
 - soil testing equipment
 - digital dissection microscope 10 -100x
 - compound microscope
 - microtome, staining and slide mounting equipment
 - slides and coverslips
 - temporary/permanent mountant
 - histochemical stains
- materials:
 - structural damage and stability report
 - glossary of construction, architecture and engineering terminology

Assessors must satisfy current standards for RTOs in the assessment of arboriculture units of competency.

Assessment must be conducted only by persons who have:

- tree biomechanics vocational competencies at least to the level being assessed
- current tree biomechanics skills directly relevant to the unit of competency being assessed
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Links

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