

**Draft National Turf Industry  
Delivery and Assessment Guides**

**Certificate 3 - Horticulture**

**Final Draft  
As at 27 April 2004**

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**Introduction:**

The National Turf Industry Delivery Assessment Guides have been compiled by the National Turf Education Committee and are to be used as additional support to the National Training Package

The National Turf Industry Delivery Assessment Guides provide a consistent framework for education nationally and are sanctioned by the following Organisations:

- Australian Golf Course Superintendents Association (AGCSA)
- Turfgrass Association of Australia (TGAA)
- Bowling Greenkeepers Association

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**Certificate III in Horticulture.**

**RTC3310A OPERATE SPECIALISED MACHINERY & EQUIPMENT.**

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This competency covers the competent operation of a range of specialist turf industry machinery and equipment (see list). Note that other competencies cover basic horticultural machinery (eg: brushcutters, tractors and ride-on equipment), so this competency is targeted at specialist pedestrian turf equipment (not ride-on or tractor mounted). The unit is aimed at training and assessing safe, competent operators who will be able to perform day to day tasks, adjustments and maintenance and work under minimal supervision.

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**Activities and Assessment:**

1. **Operate specialised turf machinery and equipment:** students will be individually assessed for safe operation (usually split into Pre-start checks, Stop/Start procedure, Operate, Adjust, Daily Maintenance and Clean and Store, Maintain Records) of at least five of the following. Refer to operators manuals where required.
  - turf scarifier
  - hollow tyne corer
  - sodcutter
  - wicket roller
  - electric reel mower
  - motorised reel mower
  - motorised spray equipment
  - aeratorAssessment by individual practical demonstration and questioning.
2. **On the reel mowers:** students are also required to adjust height of cut and reel-to-bedknife adjustments.  
Assessment by individual practical demonstration and questioning.
3. **OH&S:** students are required to demonstrate safe operation (eg: personal protective gear, signage, check site conditions etc).  
Assessment by practical demonstration and questioning.

**Key Terms:** Standard operating procedures, Procedure sheets, Award standards, Industry standards, Manufacturers specifications, Operators manual, Procedures and guidelines, OH&S procedures, Oral and written procedures/contracts, Spray application log book/diary, Cultural practices log book/diary, Licenses, Training requirements, Risk assessments

**Resources:**

Codes of practice on Plant and equipment, Machinery safety guards, Noise limits and hearing protection, Storage and Handling of Dangerous Goods (Fuels), Operators Manuals.

**Internet**

National Occupational Health and Safety website ([www.nohsc.gov.au](http://www.nohsc.gov.au))

Workcover website ([www.workcover.vic.gov.au](http://www.workcover.vic.gov.au))

**Recommendation:**

The completion of of RTF2080 Operating machinery & equipment.

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**RTC3401A CONTROL WEEDS**

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This competency covers the ability to recognize weeds, to plan and implement necessary weed control programs while considering any OH&S issues while under limited supervision. Knowledge of integrated pest management programs. The competency also covers the skills to assess any control measures carried out and an understanding of plant biology and weed lifecycles.

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**Activities and Assessment:**

1. Assess weed infestation.  
\***Identify** a minimum 40 Weeds to common name.  
Assessed by identification test.  
\***Knowledge** of the 40 weeds including cultural requirements and the biology life cycle and control methods.  
Assessed by examination.  
\***Collection** of 20 weeds including genus and species including cultural controls.  
Assessment by individual assignment
2. Plan the implementation of control measures:  
\***Interpret** and apply an IPM program for weeds.  
Assessed by written assignment.  
\***Specifics** of any OH&S issues associated with a weed control program.  
Assessed by written assignment.  
\***Knowledge** of minimum 10 herbicide mode of action, toxicity, environmental considerations, application equipment and conditions.  
Assessed by written examination.  
\***Identify** and understand the use, maintenance and storage of specific items of PPE required for weed control.  
Assessed by identification test and written examination.
3. Implement control measures:  
\***Interpret** and apply chemical test result data.  
Assessed by written examination.  
\***Calculate** the quantities of chemical/control material required from the product label.  
Assessed by written examination.  
\***Develop** a detailed program, cost, timing and procedures for a weed control program. With plans for recording and communicating to all relevant staff, employers and contractors.  
Assessed by written assignment.
4. Monitor Control measures:  
\***Record** weed control program results and side effects.  
Assessed by written assignment.  
\***Record** recommend and carry out any alterations to the weed control program.  
Assessed by written assignment.

**Key Terms:**

EPA management systems, Industry Code of Practice, Material Safety Data Sheets, Product labels, Workcover guidelines, OH&S procedures, Spray application log book/diary, Cultural practices log book/diary, Chemical Applicators Licenses, Risk assessments

**Resources:**

**Internet**

[www.msds.com](http://www.msds.com)

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**RTC3404A CONTROL PLANT PESTS, DISEASES AND DISORDERS**

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This competency covers the process of controlling plant pests diseases and disorders of turf. The skills covering implementation of the necessary control programs while considering any OH&S issues. Knowledge of integrated pest management programs. This competency also covers the skills to assess any control measures carried out and an understanding of pest and disease biology and pest and disease lifecycles.

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**Activities and Assessment:**

1. Assess pest diseases and infestation.
  - \***Identify** a minimum 30 Pests/Diseases of turf to common name.  
Assessed by identification test.
  - \***Distinguish** between infectious and non infectious diseases.  
Assessed by identification test and/or written assignment.
  - \***Knowledge** of the 30 Pests/Diseases of turf including cultural requirements and the biology, life cycle, taxonomic classification and control methods.  
Assessed by written assignment including botanical names.
  
2. Plan the implementation of control measures:
  - \***Interpret** and apply an IPM program for a Pest/Disease of turf.  
Assessed by written assignment.
  - \***Specifics** of any OH&S issues associated with a Pests/Diseases of turf control program.  
Assessed by written assignment.
  - \***Knowledge** of pesticide mode of action, toxicity, environmental considerations, application equipment and conditions.  
Assessed by written examination.
  - \***Identify** and understand the use, maintenance and storage of specific items of PPE required for Pests/Diseases of turf control.  
Assessed by identification test and written examination.
  
3. Implement control measures:
  - \***Utilise** proforma reporting, analysis and work procedure documents for control of Pests/Diseases of turf.  
Assessed by written assignment
  - \***Interpret** and apply chemical test result data.  
Assessed by written examination.
  - \***Calculate** the quantities of chemical/control material required from the product label.  
Assessed by written examination.
  - \***Develop** a program, cost, timing and procedures for a Pests/Diseases of turf control program. The student should develop plans/resources for recording and communicating to all relevant staff, supervisors, employers and contractors.  
Assessed by written assignment.
  
4. Monitor Control measures:
  - \***Record** of a pest/disease of turf control program, results and side effects.  
Assessed by written assignment.
  - \***Record**, recommend and carry out any alterations to the pest/disease of turf control program.  
Assessed by written assignment.

**Key Terms:**

EPA management systems, Industry Code of Practice, Material Safety Data Sheets, Product labels, Spray equipment operators manual, Workcover guidelines, OH&S procedures, Spray application log book/diary, Cultural practices log book/diary, Chemical Applicators Licenses, Risk assessments

**Resources:**

**Internet**

[www.msds.com](http://www.msds.com)

Turf Tool Box – [www.westone.wa.gov.au/toolbox4/horticulture](http://www.westone.wa.gov.au/toolbox4/horticulture)

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**RTC3701A      RESPOND TO EMERGENCIES**

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This competency involves the development of skills and strategies that equip a turf employee to implement a rapid and effective response to a range of emergency situations. It includes training in emergency first aid.

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**Activities & Assessment:**

- 1. Determine the likely emergency situations that may arise at a turf facility.**  
Examine a range of case studies (at least 8 cases) involving fire, chemical spill, medical situations, accident and trauma situations (eg: snakebite, heart attack, burns, electrocution, falls, drowning, poisoning etc) and situations that may require evacuation. In each case, study the most effective responses, both pro-active and reactive. Provide details of the appropriate emergency services organisation for each case.  
Assessment: group practical work, conduct a sample workplace audit to assess emergency response strategies. Individual students will then submit an assignment on their own workplace emergency response readiness, including recommendations.
- 2. Undertake First Aid training:** participants will be trained in the standard first aid procedures. This may be done in conjunction with St John's or Red Cross training, or with the Level 2 First Aid competency.
- 3. Investigate relevant legislation:** participants will access relevant legislation, regulations and codes of practice from websites and written material, and develop a general understanding of the regulatory requirements for emergency prevention and responses for a turf workplace.  
Assessment by written examination.
- 4. Select personal protection equipment:** participants will investigate the range of PPE available and appropriate for their workplace.  
Assessed by group practical work.
- 5. Select appropriate fire extinguishers:** participants will be trained in the basic types of fire situations and the appropriate method of dealing with each.  
Assessment by written exam.
- 6. Undertake emergency procedures drills:** participants will demonstrate by drills the appropriate emergency responses to a range of situations such as fire, chemical spill, electrocution, heart attack, bomb threat, accidents involving injury and others.  
Assessed by group practical work.
- 7. Evaluate emergency situations and respond:** participants will undertake a written examination to assess their understanding of the essential and appropriate responses to a range of workplace emergencies.

**Key Terms:**

PPE, Risk Assessment, Risk Control, Hazardous Substances, Dangerous Goods, MSDS, Hazchem, CPR, Oxidising Agents, Flammable Liquids, Pesticides, bunding, activated charcoal, Poisons Information Centre, Biological Hazards, SES.

**Resources:**

**Internet**

[www.msds.com.au](http://www.msds.com.au)

[www.safetyline.com.au](http://www.safetyline.com.au)

**Certificate III in Horticulture.**

**RTC3805A CO-ORDINATE WORK SITE ACTIVITIES**

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This competency assesses the participant's ability to organize and complete a work activity or small project under limited supervision. It would normally be linked to a project underway at work or at the training Institute.

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**Activities & Assessment:**

1. **Written Project Brief:** Given a small group turf project, (eg: irrigation, drainage, landscaping project) students must prepare a project brief, which lists the materials, equipment and other resources required, the environmental and OH&S risks and methods to minimise these risks, a time and materials estimation, and any potential permit or service location issues.  
Assessment by written report.
2. **Undertake a small turf project:** this would normally be linked with some other training activity (eg: greens construction, irrigation installation, turf establishment etc).  
Assessment by group activity.
3. **Report on project:** a simple report containing as built plans and dimensions is prepared, noting contingency requirements and alterations to the original brief.  
Assessment by written report.

**Key Terms:.**

Resources: as relevant to the training project.

**Resources:**

As relevant to the training project.

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**Certificate III in Horticulture**

**RTE3713A CARRY OUT WORKPLACE OHS PROCEDURES**

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This competency standard covers the process of carrying out enterprise Occupational Health and Safety (OHS) policies and procedures. Carrying out OHS policies and procedures requires knowledge of employee and employer responsibilities under the OHS Act enterprise procedures relating to hazards, fires, emergencies, accidents and risk control, and OHS signs and symbols relevant to area of work.

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**Activities and Assessment:**

- 1. Documented reports:** Discuss and research various relevant aspects of codes of practice, OHS regulations and the OHS Act.  
Assessment by project work including use of the internet.
- 2. Issues Analysis:** Analyse a minimum of five case studies dealing with relevant issues, as indicated. It is considered that relevant issues listed in the Competency Outline in the Training Package are relevant for use as examples in the turf industry.  
Assessment by group participation in an exercise.
- 3. Risk Assessment:** Travel to a turf facility and walk around and inspect OHS procedures and conduct a basic audit of OHS on the site.  
Assessment by individual project work that includes a written audit and risk assessment. (Refer to Australian Standards)
- 4. Theory understanding:** Achieve competency on OHS material relevant to the turf industry which provides good coverage of this unit.  
Assessment by written examination.
- 5. Work operations:** Observe safe practices during on-going routine operations including having and using Personal Protective Equipment for the operation.  
Assessed by on-going observation.

**Key Terms:**

**Emergencies:** electrocution, fire, flood, chemical spills, storms, gases in confined spaces, gas leaks, serious injury associated with tractors, machinery and equipment, animals, vehicles, firearms, and grain suffocation.

**Hazards:** operation and maintenance (including powered tools), vehicles, noise, chemicals, gases, dust, manual handling, solar radiation, animals, damaged or broken structures, damaged or worn equipment, items blocking exits, poor surfaces, spillage and breakage,

**Manual handling:** moving, lifting, shovelling, loading materials, pulling, pushing, up-ending materials, hand tool use, storing materials at heights too high or low, bending, repetitious tasks, handling animals and plants,

**Personal Protective Equipment:** ear, eye and chemical protection, protective clothing, sunscreen lotion, gloves, safety harness, headgear,

**Miscellaneous:** PTO accidents, chemical poisoning and environmental damage, tractor roll-over, skin protection, machinery practices in garden/turf, OHS Act and Regulations,

## Draft National Turf Industry Delivery Assessment Guides

Codes of Practice, audit, risk assessment, hazard policies and procedures, emergency policies and procedures, reporting procedures.

### Resources:

Andrew L. Brown, Brian Lawler, David Smith	Rural Safety: Chemicals and Dangerous Substances, NSW, Inkata Press 1995.
Andrew Brown, Brian Lawler	Rural Safety: Machinery, Stock & General Hazards, NSW, Inkata Press 1994.

### Internet:

State worksafe sites

National O H and S <http://www.nohsc.gov.au/>

National O H and S Regulations and Codes of Practice

<http://www.nohsc.gov.au/OHSLegalObligations/RegulatoryFramework/regulatoryframework.htm>

National O H and S Links (to individual state Workcover/Worksafe websites)

<http://www.nohsc.gov.au/OtherRelatedSites/>

National Library of Australia: Australian Law on the Internet (with links to individual state sites) <http://www.nla.gov.au/oz/law.html>

### Audio Visual:

The Easy guide to handling hazardous chemicals [videorecording] Published [Wantirna, Vic.] : Workplace Video Productions, c1992.

Working with herbicides and pesticides [videorecording] / Workplace Video Productions. Published Rowville, Vic.: Workplace Video Productions, c1990.

The Easy guide to eye safety in the workplace [videorecording] Published Rowville, Vic. : Workplace Video Productions, 1991.

An Easy guide to communication [videorecording] Published Wantirna, Vic.: Workplace Video, c1992.

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**Certificate III in Horticulture**

**RTE3714A MAINTAIN & MONITOR ENVIRONMENTAL WORK PRACTICES**

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This competency standard requires participants to show the ability to follow and give workplace directions and instructions by communicating accurately with supervisors and workplace colleagues, and to keep records.

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**Activities and Assessment:**

1. **Case Studies of Environment:** By project work, analyse a range contamination, nutrient pollution, planting of noxious plants, habitat destruction, pollution from wash-down bays, noise pollution (including to the public from machinery).  
Assessment by group project work.
2. **Environmental Auditing:** Identify opportunities for environment/enhancement improvement. Conduct an environmental audit on a turf workplace. Identify potential hazards as well as strengths.  
Assessment by group project work and also submission of an individual project audit.
3. **Environmental Practices:** Case studies of good environmental practices in a turf environment.  
Assessment by group participation.
4. **Workplace Environment:** Ongoing environmental recording of workplace practices in the student's workplace. These records should include chemical spray records.  
Assessment by individual project work examining records.
5. **Effluent:** Case study of the responsible use of effluent.  
Assessment by group activity.

**Key Terms:**

**Environmental Policies:** Waste minimisation and management, sustainability, weed and pest management, protection of land and habitat and the conservation of resources, energy use, greenhouse gas emissions, use of chemicals, and plant and equipment,

**Environmental Risks and Hazards:** spills, leaks, pollution, planned and unplanned emissions, soil compaction, disturbance and erosion, accidents and disposal of waste, fire risks and threats., inappropriate human interaction on the environment and damage to habitat resources

**Environmental Issues:** Sustainability, reduction and disposal of waste, water quality, energy efficiency, biodiversity and habitat protection, conservation of natural resources, air quality, land contamination, noise, soil and salinity management, and fire management,

**Resources:**

**Books:**

EPA Guidelines	Improving Environmental Management (NSW)
EPA Guidelines	Improving Eco Efficiency of Golf Courses (QLD)
EPA Guidelines	Safe Effluent Usage

**Internet**

Envirolink <http://www.envirolink.org/>

Environmental Portal (Australia) <http://kaos.erin.gov.au/index.html>

Australian Government Department of Environment and Heritage  
<http://www.deh.gov.au/index.html>

Department of Environment and Heritage – Legislation  
<http://www.deh.gov.au/about/legislation.html>

US Environmental Protection Agency <http://www.epa.gov/>

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**Certificate III in Horticulture**  
**RTF3010A ESTABLISH TURF**

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The competency covers the establishment of turfgrasses by a variety of methods, along with allied skills in soil preparation and the management of newly established turf to 'ready for play' status. The establishment tasks would be according to a landscape plan, so the species of turfgrass and the general method of establishment would be prescribed – however the practical steps of establishment would be under limited supervision. This is not a general turfgrass botany unit, but more simply a practical establishment competency.

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**Activities and Assessment**

1. **Prepare the site:** steps include the basic interpretation of pH, salinity and Available P tests, and the application of suitable amendments, decisions on soil cultivation, pre-plant weed control.  
Assessment by practical demonstration.
2. **Propagation principals with turfgrasses:** the biology of asexual vs sexual propagation, including the advantages and disadvantages of each, and the practical considerations of dealing with vegetative material vs seed.  
Assessment by examination.
3. **Establishment by seed:** a practical activity on seeding a turfgrass area.  
Assessment by practical demonstration, and includes pre and post establishment procedures.
4. **Establishment by sprigs:** a practical activity on sprigging a turfgrass area.  
Assessment by practical demonstration, including pre and post establishment.
5. **Establishment by turfing:** a practical activity on turfing (sodding) a turfgrass area.  
Assessment by practical demonstration, including harvesting and laying Turf, and pre and post establishment procedures.

**Key Terms:**

Hydro-seed, sod quality, shovels, level-lawn, rollers, rotary hoe, tiller, 3 point-linkage implements, basic grass structural terms, asexual propagation, sexual propagation, vegetative propagation, sprigging, sodcutter, compaction tests, pH, salinity, soil testing, soil texture, soil type, NPK, ameliorant and amendments, pre-emergent and post-emergent herbicides, soil cultivation, oversprigging/overplanting, overseeding, damping-off, pre and post-establishment procedures, seed dormancy, certified seed, seed drill, cool-season grasses, warm-season grasses.

**Resources:**

Kevin A. Handreck, Neil D. Black	Growing Media for Ornamental Plants and Turf, UNSW Press, 2002.
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**Certificate III in Horticulture**

**RTF3023A**

**MONITOR TURF HEALTH**

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This competency involves sampling for laboratory procedures and interpreting those results, and using visual assessment and other monitoring procedures to allow preventative and curative measures to maintain turf health.

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**Activities & Assessment:**

1. **Sample for nutrients:** representative soil and tissue samples are taken from a turf area, and submitted for laboratory analysis. The results are interpreted by comparison with known recommendations. Remedial nutritional strategies are prepared if required.  
Assessment by group practical work.
2. **Health Diagnosis:** the turf sward and rootzone plugs are scanned by eye for weed content, insect or disease presence, nutritional deficiency, heat and drought stress, root depth, thatch depth, soil profile layering, Black Layer and other readily recognizable health problems. Simple checks are done on canopy temperature, soil temperature, soil moisture content, soil water repellency and soil compaction, and a pyrethrum test for insects.  
Assessment by group activity.
3. **Program preventative and curative activities:** prepare a program to improve plant health, which may include the application of fertilizers, amendments, pesticides and other products to the turf. It may also include aeration and renovation treatments, or other improvements recommended for identified health problems.  
Assessment by individual assignment work.
4. **Implement health strategies:** depending on the health problems diagnosed, apply the required measures to improve turf health.  
Assessment by written examination.

**Key Terms:**

Aeration, Anaerobic, Black Layer, Compaction, Deficiency, Drainage, Dry Patch, Dusting, Saturation, Waterlogging. Participants will need to be competent in pest, disease and weed management and nutrition and fertilizer application.

**Resources:**

Toolbox RTF3023 Monitor Turf Health. ANTA 2002  
[www.westone.wa.gov.au/toolbox4/horticulture](http://www.westone.wa.gov.au/toolbox4/horticulture)

**Recommendation:**

Completion of other Level 3 competencies in pest, disease and weed control, plant nutrition, renovation and applying chemicals.

**Certificate III in Horticulture.**

**RTF3027A RENOVATE SPORTS TURF**

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This competency covers the application of principles and practices of turf renovation under limited supervision. Practical demonstration of renovation will be required on a variety of situations, on a range of different grasses and sports surfaces. Renovation may be a major exercise requiring the surface to be taken out of play, or could include less intrusive, ongoing procedures. The tasks require practical use of various pieces of equipment, so it can be done concurrently or after the main machinery operation competencies.

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**Activities and Assessment:**

1. **Assess the soil profile:** the profile is tested for infiltration, layering, drainage problems and various other physical attributes to determine the type of renovation required. The site is also sampled for standard nutrient analysis, and a suitable amendment program devised.  
Assessment by demonstration.
2. **Devise a suitable renovation program:** a suitable renovation program is devised having regard to the turf species, the site use and play commitments, the physical and chemical attributes of the profile. The program includes understanding why materials are used in a renovation program (eg: topdressing material, pH amendments, fertilizer), and estimation of the quantities required.  
Assessment by assignment.
3. **Assess renovation practices:** a study is made of the principles and practical implications of various renovation practices such as aeration, dethatching, dusting and leveling. The study includes information on the various pieces of equipment on the market and the role they play in the renovation program.  
Assessment by examination.
4. **Renovate a fine turf surface** (golf/bowling green/cricket wicket table):  
Assessed by practical demonstration, includes the profile analysis, determination of a suitable renovation plan, as well as the practical tasks in implementing the renovation procedure.
5. **Renovate a coarse turf area** (eg: sports field, lawn, fairway, tee):  
Assessed by practical demonstration, includes the profile analysis, determination of a suitable renovation plan, as well as the practical tasks in implementing the renovation procedure.

**Key Terms:**

**Soils:** Soil texture, Soil structure, Aggregation, Dispersion, Compaction, Infiltration rate, Drainage, Soil Textural Classification, Topsoil Amelioration, Liming Materials, Gypsum, Saturation, Waterlogging, Field Capacity, Aeration, Potassium, Available Water, Phosphorus, pH, Nitrogen, CEC, Organic matter, Sodic soils.

**Grass Terminology:** Cool season grass, Warm season grass, Turfgrass density, Turfgrass texture, Turfgrass uniformity, Monostand, Polystand, Thatch, Mat, Rootzone, Pre-germinated seed, Seed dormancy, Seed viability, Hydro seeding.

**Machinery:** Scarifier, Hollow tyne corer, Driller, Vertidrain, Hydroject, Topdresser.

**Resources:**

**Books:**

Adams, W. A. and Gibbs, R. J	<i>Natural Turf for Sport and Amenity: Science and Practice</i> , CAB International, Cambridge, 1994
Aldous, David E.	<i>International Turf Management Handbook</i> Australia, Inkata Press 1999.
Beard, James B	<i>Turf Management for Golf Courses</i> Minneapolis, MN, Burgess Pub., Co., 1982
Beard, James B	<i>Turfgrass Science and Culture</i> . New Jersey. Prentice Hall. 1973.
Daniel, William H.	<i>Turf Managers Handbook</i> Cleveland, Harvest, 1979.
Hope, Frank	<i>Turf Culture: a complete manual for groundsmen</i> . London, Blandford, 1978.
Kaapro, J.	<i>Turf Nutrition and Fertilizers</i> . Australian Turfgrass Research Institute. Sydney. 1994
Liffman	<i>Sports Grounds and Turf Wickets A Practical</i> 1986
Liffman	<i>Bowling Greens: A practical guide</i> 1986
Madison J H	<i>Principles of Turfgrass Culture</i> , N Y Prieger, 1983 (Repr of 1971 ed)

**Electronic**

Toolbox, RTF3027A Renovate Sports Turf, ANTA 2002  
 Toolbox, RTF2019A Renovate Grassed Areas, ANTA, 2002  
[www.westone.wa.gov.au/toolbox4/horticulture](http://www.westone.wa.gov.au/toolbox4/horticulture)

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**Certificate III in Horticulture.**

**RTF3503A SAMPLE SOILS AND ANALYSE RESULTS**

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This competency covers the process of carrying out soil sampling and interpretation of results of soil analysis. The sampling may be for the analysis of physical, chemical or biological properties. The analysis of the soil maybe performed on or off site by the person taking the sample or by a soil consultant.

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**Activities and Assessment:**

1. **Prepare for sampling:** Soil/Tissue sampling method is selected based on type of soil/tissue test and size of area, to ensure it is representative. Appropriate soil/tissue sampling tools are selected. Underground services are located to eliminate damage and danger to the individual.  
Assessment by practical demonstration.
  
2. **Perform sampling procedure:** Samples are taken to appropriate depth and number per area/volume of soil. Samples are prepared and appropriately labelled for future testing.  
Assessment by practical demonstration.
  
3. **Interpret results:** Results of analysis are understood and can be compared to published data. Interpretation and recommendations from soil consultants are evaluated and understood.  
Assessment by examination.

**Key Terms**

**Soils:** Soil texture, Soil structure, Aggregation, Dispersion, Moisture retention, Compaction, Infiltration rate, Drainage, Sub-surface drainage, Clay soil, Loamy soil, Sandy soil, Soil Textural Classification, Topsoil Amelioration, Liming materials, Gypsum, Particle size analysis (mechanical sieve analysis), Saturation, Waterlogging, Field Capacity, Aeration, Potassium, Wilting Point, Oven Dry, Capillary Pores, Non-capillary pores, Hygroscopic Water, Available Water, Phosphorus, pH, Nitrogen, CEC, EC, Nematodes, Black Lay.

**Tools:** Hole changer, core sampler, soil profiler, auger, sampling tube,

**Sampling methodology:** Random, representative, sub-sample.

**Resources:**

**Books**

Handreck, K & Black, N.	<i>Growing Media for Ornamental Plants and Turf.</i> 2002
Kaapro, J.	<i>Turf Nutrition and Fertilizers.</i> 1994
McIntyre, K & Jakobsen, B	<i>Drainage for sports turf and Horticulture.</i> 1998

**Electronic**

Toolbox RTF3012A Implement a plant nutrition Program. ANTA 2002

Toolbox RTF3023A Monitor Turf Health. ANTA 2002

CD Rom: The Paton Turf Nutrition Guide Patons fertilisers

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**Certificate III in Horticulture**

**BSBEBUS302A USE AND MAINTAIN ELECTRONIC MAIL SYSTEM**

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The competency covers the sending and receiving of email correspondence via the internet, intranets or extranets. Knowledge of computer hardware and software will need to be demonstrated through the effective use of the computer for communication. This is the primary computer use competency for level III turf management.

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**Activities and Assessment:**

1. **Computer hardware knowledge:** A basic knowledge of the components of a computer including commonly used terminology, startup and shut down procedures. Assessment by examination.
2. **Internet software knowledge:** A basic knowledge of common internet software. Show the ability to locate information from an internet site given an internet address. Show the ability to use an internet search engine to locate a known internet site. Show the ability to gather information on a given topic using Internet search engines. Knowledge of security and ethics issues. Assessment by practical demonstration.
3. **Electronic mail assessment:** Show a basic knowledge of common email software including the ability to detect and remove potentially dangerous emails, to reply and forward emails and set up and maintain a house keeping system to logically deal with emails. The ability to open and access email attachments. Assessment by practical demonstration.
4. **Word processing & spreadsheet software knowledge:** Show a basic knowledge of common word processing and spreadsheet software. Show the ability to produce and amend documents using common functions. Assessment by practical demonstration.

**Key Terms:**

**Computer hardware:** Screen, printer, CPU, hardware, CD Rom, disk, Rom, Ram, Modem

**Computer software:** Search engine, word, windows, excel, files, folders, viruses, compressed files, file size, Microsoft outlook, outlook express, internet explorer, Netscape.

**Email software:** Forward, URL, email address, files, folders, saving, spam, viruses, file extensions, attachments, file size, net ethics, electronic signature, bandwidth, group email, electronic address books, service provider, protocols for email addresses, inbox, mailing list, archives, help functions

**Resources:**

**Books:**

<i>Software Publications 2003</i>	Use Business Technology
Shea	Netiquette, 1994
<i>CIT Publication</i>	Develop Keyboard Skills

## Draft National Turf Industry Delivery Assessment Guides

Word 2000	Keyboarding Speed and Accuracy 2 & 3
<i>CIT Publication</i>	Student Learning Guide
<i>Holden</i>	KDP Building Skill in Keyboarding -
Excel 2000 - <i>Software Publications</i>	Create and Use Simple Spreadsheets
Access 2000 - <i>Software Publications</i>	Create and Use Database
Word 2000 - <i>Software Publications</i>	Produce Simple Wordprocessed Documents
Software Publications	Internet Explorer 6.0 Hotmail & Newsgroups

### Internet sites

www.google.com

[www.microsoft.com](http://www.microsoft.com)

www.anzwers.com

### Recommendation:

This unit may be taught in conjunction with RTE3907A – Use hand held business tools.

**Certificate III in Horticulture.**

**RTC3016A PROVIDE INFORMATION ON PLANTS AND THEIR CULTURE**

The competency covers the process of providing information about sports turf grasses and ornamental plants and their cultural requirements. This competency requires botanical and identification skills in relation to turfgrass species. This competency is the primary botanical competency.

**Activities and Assessment:**

1. **Turf Identification:** At least 15 locally important grasses including the collection of at least 10 and be named to common name, genus and species level.  
Assessment by assignment & examination.
2. **Ornamental plants:** At least 20 local important plants including the pressed collection of at least 10 to be identified by common name and its common use.  
Assessment by assignment & plant identification examination of live material.
3. **Botany:** Notes are compiled on plant external and internal structure to a cellular level. This includes basic plant chemical processes of respiration, photosynthesis, transpiration and plant growth.  
Assessment by examination.
4. **Plant selection:** The cultural requirements and sports surface qualities of at least 10 grasses will be understood and used as the basis for plant selection. Ornamental plants are selected on the basis of cultural requirements (light, water, warmth, etc) and aesthetic requirements (display bed, screening shrub, flowering tree).  
Assessment by examination.

**Key Terms:**

**Botany:** Monocotyledon, dicotyledon, roots, leaves, meristematic, respiration, photosynthesis, osmosis, transpiration, stomata, phloem, xylem, rhizomes, stolons, runners, tillers, crown, flowers, ligules, auricles, vernalization, cool season, warm season, Perennial, Annual, sexual propagation, asexual propagation, clones, hybrid, variety, selection, node,

**Resources:**

**Books:**

Adams, W. A. and Gibbs, R. J	<i>Natural Turf for Sport and Amenity: Science and Practice</i> , CAB International, Cambridge, 1994
Aldous D. & Chivers I	<i>Sports Turf and Amenity Grasses</i> , A manual for use and Identification. 2002
Aldous, David E.	<i>International Turf Management Handbook</i> Australia, Inkata Press 1999.
Beard, James B	<i>Turf Management for Golf Courses</i> Minneapolis, MN, Burgess Pub., Co., 1982
Beard. James B	<i>Turfgrass Science and Culture</i> . New Jersey. Prentice Hall. 1973.
Clarke I, and Lee H	<i>Name that Flower: The Identification of Flowering Plants</i> . National Library of Australia. 1993

## Draft National Turf Industry Delivery Assessment Guides

Debenham	The Penguin Dictionary of Botany
Hope, Frank	<i>Turf Culture: a complete manual for groundsmen.</i> London, Blandford, 1978.
Hubbard, C E	Grasses 3rd Ed, Harmondsworth, Middlesex, Penguin, 1984
Lambrechtsen N	What Grass is That? Wellington, NZ Govt Press, 1981
Langer R H M	How Grasses Grow 2nd Ed Lond. Arnold, 1979
Macoboy, S	<i>What Flower is That?</i> , Hamlyn, Dee Why West. 1969
Macoboy, S	<i>Annuals for all Seasons and Other Colourful Bedding Plants</i> , 1982 Landsdowne Press, Sydney.
Macoboy, S	<i>What Tree is That?</i> , Landsdowne Press, Sydney. 1979
Macoboy, S	<i>Trees for Warm and Temperate Climates</i> , Ure Smith, Sydney. 1979
Macoboy, S	<i>A-Z Gardening Series - Trees for Fruit and Foliage</i> , Angus and Robertson, North Ryde, New South Wales. 1989
Madison J H	Principles of Turfgrass Culture, N Y Prieger, 1983.
Rorison, I.H. & Hunt, R.	<i>Amenity Grassland. An Ecological Perspective</i> , NY., Wiley, 1980
Rowell, R.J	<i>Ornamental Flowering Trees in Australia</i> , Reed. 1991
Rowell, R.J	<i>Ornamental Flowering Shrubs in Australia</i> , Reed. 1991
Rowell, R.J	<i>Ornamental Plants in Australia</i> , NSW University Press. 1992
Sprague, Howard B.	<i>Turf Management Handbook</i> . 3rd ed. Deneilville, FL, Interstate, 1982.

### Video

Growing Awareness series. ABC TV 1995

### Internet

University of Guelph - <http://www.uoguelph.ca/>

Michigan state University - <http://www.turf.msu.edu/>

University of California - <http://www.ucdavis.edu/>

### Recommendation:

This unit builds on the recognition skills developed in Recognize plants (RTC2016A)

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**Certificate III in Horticulture.**

**RTC3704A      PREPARE AND APPLY CHEMICALS**

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**Introduction**

This competency covers the process of preparing and applying chemicals for the control of weeds, pests and diseases. It requires knowledge of the chemicals related to the workplace, the hazards and risks involved in their use, and the specific safety procedures prescribed for working unsupervised. It requires the ability to handle and apply chemicals ensuring minimum risk to self, others and the environment, then accurately record their use.

This competency is the primary chemical use unit for training in Turf Management. It should be incorporated into the training program along with the unit “Transport, Handle and Store Chemicals” (TRC3705A).

This unit should where possible be taught in conjunction with the chemical use licensing requirements for the appropriate state. For example “SMARTrain”, “Chemcert” enabling the student on completion to acquire this certification.

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**Activities and Assessment:**

1. **Determine the need for chemical use:** Identification of 30 Pests/Diseases/Weeds of turf to common name. Assess the level of Pests/Diseases/Weeds infestation and the need for control as outlined in Integrated Pest Management Programs. Identify all control options available including non-chemical controls. Select the best chemical for control, taking into account risks, hazards, efficacy and legality. Assessment by individual assignment work.
2. **Research appropriate chemical:** Chemical label and material Safety Data Sheets are read and understood. Legislation applicable to the application of pesticides (national, state, OH&S) is understood and followed. Hazards including environmental, OH&S, public, climatic and management are identified and assessed as part of chemical application. Chemical spills or accident and first aid procedures are followed in relation to chemical use and legislation. Assessment by examination.
3. **Prepare to use chemicals:** Refer to label recommendations regarding application. Select appropriate personal protective equipment and application equipment. Consider weather forecasts and site weather conditions including taking measurements, and assessed prior to application of chemical. Assessment by practical demonstration.
4. **Calibration:** A minimum of two types of chemical application equipment (boom, knapsack, fish mouth nozzle, wick applicator, CDA, wands) are calibrated, including the calculation volumes from application rates on labels. Assessment by practical demonstration.
5. **Apply chemicals:** Mixing and loading and then application of chemical is performed according to the label taking into consideration the legal, environmental and OH&S concerns. Assessment by practical demonstration.

6. **Clean up following chemical application:** Disposal of unused chemical according to the relevant legislation. Equipment is cleaned and/or decontaminated dependant on future use. Personal Protective Equipment is cleaned and serviced. Assessment by practical demonstration.
7. **Record application details:** Chemical application is recorded according to legal requirements. This should include application records, incident/accident reports and store inventories. Assessment by examination.

## Key Terms

Material Safety Data Sheets (MSDS), Chemical label, dangerous goods classification, poison schedule, calibration, OH&S, registration, Wind, humidity, rain, chemical spills, poisoning, health checks, insecticides, fungicides, herbicides, bactericides, algacides, nematicides, Personal Protective Equipment, Integrated Pest Management, Drift, knapsacks, booms, CDA, wick applicators, respirators, spot spraying, face shields, nozzles, drift, Modes of action, with holding periods, re-entry period, drench., EPA management systems, Industry Code of Practice, Workcover guidelines, OH&S procedures, Spray application log book/diary, Cultural practices log book/diary, Chemical Applicators Licenses, Risk assessments.

## Resources:

### Books

Smartrain, NSW Agriculture	<i>Chemical Application AQF 3 Assessment Guide. NSW Agriculture. YANCO</i>
Smartrain, NSW Agriculture	<i>Chemical Application AQF 3 Reference Manual. NSW Agriculture. YANCO</i>
Kerruish, R.M.	2001, <i>Plant Protection 2: Methods of Disease, Pest and Weed Control</i> . 3rd edn. Rootrot Press, Hughes, ACT.

### CD ROMS

Infopest	Department of Primary Industries, Queensland
Horticultural Tool Box. Chemical and Biological Agents	Australian National Training Authority.

### Internet

Australian Pesticides & Veterinary Medicines Authority	<a href="http://www.apvma.gov.au">www.apvma.gov.au</a>
Avcare:	<a href="http://www.avcare.org.au/">www.avcare.org.au/</a>
Environment Australia	<a href="http://www.environment.gov.au/epg/chemicals">www.environment.gov.au/epg/chemicals</a>
Goldacres	<a href="http://www.goldacres.com.au">www.goldacres.com.au</a>
International Chemical Safety Cards	<a href="http://www.ilo.org/public/english/protection/safework/cis/products/icsc/dtasht/intro.htm">www.ilo.org/public/english/protection/safework/cis/products/icsc/dtasht/intro.htm</a>
MSDS	<a href="http://www.msds.com.au/">www.msds.com.au/</a>
Pestgenie	<a href="http://www.pestgenie.com.au/">www.pestgenie.com.au/</a>
Pesticide Education Resources: USExtension services	<a href="http://www.unl.edu/ianr/pat/ephome">www.unl.edu/ianr/pat/ephome</a>
Silvan	<a href="http://www.silvanpumps.com.au">www.silvanpumps.com.au</a>
Teejet	<a href="http://www.teejet.com">www.teejet.com</a>

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**Certificate III in Horticulture.**

**RTC3705A**

**TRANSPORT, HANDLE AND STORE CHEMICALS**

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**Introduction**

This unit of competence covers the process of transporting, handling and storing chemicals relating to a Turf facility, safely and without supervision. Upon completion the operator should be competent to a standard that minimises risks, avoiding spillage and accidents, whilst following correct procedures and regulations required for safety, in order to protect the health and safety of everyone in the workplace and demonstrate environmental responsibility when handling chemicals. It requires knowledge of the chemicals used in a Turf environment and the hazards involved in their handling and storage.

NB: This competency standard may be deemed to have a time limit when used as part of an accreditation or licence to purchase or use chemicals.

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**Activities & Assessment:**

- 1. Transport and handle chemicals and biological agents:** Transport methods must be according to the label and the Material Safety Data Sheet (MSDSs). Assessment by label & MSDS reading task sheet.

Hazard risk assessment for transport and handling are identified, including the need for personal protective equipment and where necessary the risks are minimised.

Assessment written task sheet based on the label and MSDS.

A basic knowledge of the legislation and safe working procedures relating to transport of chemicals is followed, including control measures in the event of spills, an accident, injury or poisoning associated with transportation.

Assessment by written examination.
- 2. Store Chemicals in the workplace:** Storage methods are appropriate for the chemical as stated on the label and or MSDS. Assessment by label & MSDS reading task sheet.

Storage area is evaluated to identify OHS hazards and control risks, including the prevention of entry by unauthorised people or animals and contamination of the environment. Safe working procedures and maintenance of the area are defined.

Assessment is by an assignment, either based on the workplace or the specifications of a suitable Turf scenario.
- 3. Record storage details:** A chemical storage inventory is maintained as required by legislation. Records of poisoning or other OHS incidents are maintained. Assessment can be by authenticated evidence of workplace documentation or by an assignment whereby the student designs and uses a recording system.

**Key Terms:**

Material Safety Data Sheets, Spill response kits, Bunding, Ventilation, Fire extinguishers, Hazard Risk assessment, cross contamination, chemical trespass, Personal Protective equipment, Acute poisoning, Chronic poisoning, Secondary poisoning, off-target damage, container legislation, emergency showers and eye wash, soil residues, wash down areas, rinsate, waste sumps, dispensing units.

**Resources:**

**Books:**

Pesticide Application Manual	Qld Dept of Primary Industries
Sportsturf Protection Manual	AGCSA

[www.msds.com.au](http://www.msds.com.au)

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**Certificate III in Horticulture.**

**RTE3307A COORDINATE MACHINERY & EQUIPMENT MAINTENANCE & REPAIR**

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**Introduction**

This competency covers the essential machinery maintenance and repair tasks expected of a turf tradesperson, with emphasis on routine maintenance of engines and the particular maintenance needs of reel mowers.

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**Activities & Assessment:**

1. **Principles of operation:** underpinning knowledge on the operating principles and the maintenance requirements of various systems used on turf machinery - 2 stroke, 4 stroke and diesel engines, reel mowers, electrical systems, hydraulic systems, lubricating systems, bearings and other components.  
Assessment by written assignment (routine maintenance program prepared for a range of machines), and a written test on the mechanical principles covered.
2. **Maintenance practicals:** undertake routine maintenance tasks and adjustments on a range of turf equipment. Includes at least one practical session on the following: changing engine oil and filters, changing air and fuel filters, cleaning air filters, changing hydraulic fluid, greasing, the removal and replacement of reels and bedknives, backlapping reel mowers, adjusting height and cut on reel mowers, replacing bearings, and sharpening rotary mower blades.  
Assessment by participation in group practical work.
3. **Troubleshooting:** diagnose a range of machinery problems such as faults in the electrical and fuel systems.  
Assessment by participation in group practical work.
4. **Prepare a maintenance program:** for at least three machines, one of which will be a larger ride-on machine or a tractor, prepare a maintenance program setting out on a calendar basis the requirements for major and minor servicing, also giving a reasonable cost estimate for the servicing program, costing in the need for filters, lubricants etc.  
Assessment by individual written assignment.

**Key Terms:**

2 stroke, 4 stroke, diesel, reels, bedknives, backlapping, reel grinding, bearings, hydraulic systems terminology, electrical systems terminology.

**Resources:**

Operator service and maintenance manuals

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**Certificate III in Horticulture.**

**RTE3601A      INSTALL IRRIGATION SYSTEMS**

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**Introduction**

This competency standard covers the process of installing pressurised irrigation systems. It requires the ability to organize resources for instillation work, set out and prepare the site, install irrigation components, complete installation work, commission irrigation systems and communicate with work team members, supervisor's contractors and consultants. Installing irrigation systems requires knowledge of methods and techniques of irrigation, components of an irrigation system, and behaviour of water on varying terrain and soil types, soil water retention testing techniques and soil characteristics, and enterprise OHS procedures.

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**Activities & Assessment:**

- 1. Organise resources for installation** The site needs to be checked for OHS issues and construction plans checked to identify any problems with the site, parts delivered to the site need to be checked against a quantity list water supply needs to be checked to see if it matches the specifications  
Assessment should be by practical demonstration and oral questioning
- 2. Set out and prepare the site** Site needs to be measured and pegged consistent with the plan and trenches dug to the correct size and depth, thrust blocks need to be located in appropriate areas and installed to specifications students must demonstrate an ability to locate services in the area e.g. dial before you dig checking plans asking property owners etc  
Assessment should be by practical demonstration and oral questioning
- 3. Install irrigation components** Irrigation system is installed to the design specifications. Students are able to identify and correctly name the components of an irrigation system. Components are installed using the correct gluing techniques, operation of pumps including flow rates are checked. Soil water retention and infiltration rates are checked, calculations are carried out to determine if correct pipe sizing has been specified. Sprinkler flow rates and performance is checked to ensure uniform coverage.  
Assessment should be by practical demonstration and written test
- 4 Complete installation work** The site is restored to original levels and contours; care is taken when back filling trenches to ensure that there are no hollows left under the pipe. Sprinkler output is checked to ensure that the coverage is uniform. A co-efficiency of uniformity test is carried out to ensure that the system is operating satisfactorily  
Assessment should be by practical demonstration and written or oral testing.
- 5 Commission irrigation system** The system needs to be started or commissioned in the correct sequence with all components flushed and tested. Students need to be able to use a pitot tube to test the pressure at the nozzle, they also need to be able to read a pressure gauge and interpret the results. Student should then be able to check the results of the testing against the design specifications to ensure that the system is operating at the correct specifications  
Assessment by practical demonstration and written scenarios

**Resources:**

IAA learning guides  
ARTS learning books

**Certificate III in Horticulture.**

**RTE3603A      INSTALL DRAINAGE SYSTEMS**

This unit of competence covers the process of installing surface and /or sub surface drainage systems. It requires an understanding of the basic principles of drainage, and the ability to interpret and implement drainage system plans using appropriate equipment.

**Activities and Assessment:**

1. **Assess the drainage requirement for an area:** drainage assessment includes measuring profile and subsoil Infiltration Rate, mapping surface contours or interpreting an existing contour map, assessing compaction and thatch levels and diagnosing the cause of poor drainage.  
Assessment by group practical exercise.
2. **Underpinning knowledge on poor drainage:** students will study the effects of prolonged saturation of the profile on turf health and surface quality.  
Assessed by written test.
3. **Case Studies:** drainage problems are studied as case studies (eg: watertable in a push-up green, poor surface drainage due to surface compaction or high clay content profile, excessive water retention in thatch etc). The causes and drainage options (including various drainage materials) in each case are studied. In addition to this, students will be competent in the basic calculations associated with surface falls and levels.  
Assessed by written test.
4. **Prepare for drainage system installation:** activities including OH&S, cost estimates, time schedules, equipment and machinery required, coordination of work, location of services, basic survey and mark-out.  
Assessed by group practical work.
5. **Use surveying equipment:** students will be competent in the use of the automatic level for basic surveying to record Relative Levels, distance and azimuth of features on a site of limited size.  
Assessment by individual testing on competence with the automatic level, and individual mapping/contouring assignment.
6. **Install a drainage system:** includes set-out, excavation and earthworks required, installing pipework, site cleanup and any other tasks required to complete the project.  
Assessed by group practical work.

**Key Terms:** Saturation, Field Capacity, Compaction, Porosity, Infiltration Rate, Moisture Retention, Watertable, Black Layer, Anaerobic, Thatch, Surface Drainage, Sand Slit drainage.

**RESOURCES:**

**Books:**

K.Handrek; N.Black	Growing Media for Ornamental Plants & Turf, 2002
K.McIntyre; B.Jakobsen	Drainage for Sports Turf & Horticulture, 1998
S.W. Baker	Sands for Sports Turf Construction and Maintenance. UK

**Certificate III in Horticulture.**

**RTE3605A**

**TROUBLESHOOTING IRRIGATION SYSTEMS**

This unit covers the process of troubleshooting faults in irrigation systems. It requires skills and knowledge in measuring system performance, diagnosing faults and implementing the necessary repairs, replacements or modifications to improve performance of the system

**Activities and Assessment:**

1. **Check system performance:** students will run an irrigation system, checking for correct operation of the controller, solenoids and sprinkler heads. Note the number of heads operating on each station. Check the dynamic pressure at the sprinkler nozzles using a pitot gauge, and measure out sprinkler head spacings to see if they conform to the specifications for that sprinkler. Check for wiring integrity using a Multi-meter.  
Assessment by group practical work.
  
2. **Check system uniformity:** students will conduct a catch-can test and calculate the Coefficient of Uniformity, the Distribution Uniformity and the Scheduling Co-efficient for a particular zone (eg: a green). Identify excessively wet or dry zones.  
Assessment by group practical work.
  
3. **Identify components:** students will be able to name at least 30 common irrigation system components.  
Assessment by individual written test.
  
4. **Undertake component replacement and repair:** students will install repair couplings and repair/replace a range of components (eg: sprinkler nozzles and heads, solenoid valves) on an existing irrigation system or in a workshop.  
Assessment by group practical work.
  
5. **Solvent weld uPVC pipe:** students will demonstrate competent solvent weld joints on uPVC pipework.  
Assessment by individual practical work.
  
6. **Diagnose faults and implement improvements:** following system performance checks, students will implement a range of improvements and re-test the system to check for improvements to functioning and uniformity. These changes may include repairs to leaks, alterations to sprinkler setting, distances or stationing, installation of improved components such as new sprinkler heads, valves or nozzles, or other improvements. Re-test the uniformity to assess the improvements.  
Assessment by group practical work.

**RESOURCES:**

**Books:**

	Urban Irrigation Installers Manual, Irrigation Association of Australia, Hornsby, NSW.
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Manufacturers operating manuals

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**Certificate III in Horticulture.**

**RTE3611A**

**OPERATE PRESSURISED IRRIGATION SYSTEMS**

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This competency involves the ability of the participant to set up and operate an irrigation system to effectively irrigate turf. The system could be manual or automatic, and may include operation of a pump. The system will be scheduled to deliver a pre-determined amount of precipitation, as required for turf health, in a uniform and efficient manner.

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**Activities and Assessment**

1. **Activate the irrigation system**, which may include operating a pump, to check for malfunctions. Repair or correct any faults, which may include fitting new components such as nozzles, or repairing pipework.  
Assessment by individual practical demonstration and group work.
2. **Check the dynamic pressure** at the operating nozzle using a Pitot gauge, and measure the flow rate of the system. Check the arc and distance of throw. Relate these findings for conformance to sprinkler specification and the irrigation design.  
Assessment by group practical work.
3. **Run the irrigation system** for an appropriate time to deliver a pre-determined precipitation. This may involve setting station times on an automatic controller, or moving sprinklers to pre-determined locations if the system is a manual system. Check to ensure runoff or other problems don't reduce the efficiency of irrigation. Set up catch cans and measure the precipitation rate of the system. Assess the general uniformity of the system from these catch can results. At the conclusion of the irrigation cycle, check the rootzone to determine the depth of watering at various locations.  
Assessment by group practical work.
4. **Shut down the system:** if required, the system should be drained. Record running times and precipitation delivery using an appropriate record keeping system.  
Assessment by group practical work.
5. **Determine effective irrigation requirements:** participants will study underpinning knowledge in soil moisture stress, the nature of profile wetting, turf water requirements, irrigation uniformity, interpreting sprinkler head specifications, conversions/calculations involving precipitation rates and volumes, and water costing activities.  
Assessment by written examination.

**Key Terms:**

system types, backflow prevention, controller, soil Sensor, rain sensor, control system, pumps primed, valves, pressure and flow, pre-start system checks, start up sequence, head, filter, wastage and run-off, Field Capacity, Saturation, Wilting Point, Precipitation Rate, water costs per megalitre and kilolitre.

**Resources:**

Manufacturers operating manuals

**Certificate III in Horticulture.**

**RTE3612A IMPLEMENT A MAINTENANCE PROGRAM FOR AS IRRIGATION SYSTEM**

This competency standard covers the process of implementing a maintenance program for an irrigation system. It requires the ability to interpret an irrigation maintenance program, inspect the irrigation system, record and report maintenance activities, test irrigation equipment, record results, and undertake minor repairs of equipment and dispose of unused or waste material from the site in an environmentally safe manner.

This competency assumes prior knowledge in the operation and maintenance of irrigation systems and should be taught after or in conjunction with “Troubleshoot Irrigation Systems” RTE3605A and “Operate Pressurised Irrigation Systems” RTE3611A. It may also be taught in conjunction with “Install Irrigation Systems” RTE3601A.

**Activities and Assessment:**

1. **Interpret an irrigation maintenance program:** Develop a maintenance program for an irrigation system of such complexity that it contains at least the following components. Controller, remote control valves, 3 different types of sprinkler or emitter and a sensing device. The program should list ongoing maintenance requirements (seasonal) as well as the life expectancy of the components, making use of manufacturer’s specifications and/or recommendations.  
Assessment by written assignment.
2. **Inspect irrigation system:** Develop a checklist, to be used in the pre-growing season, to check the operational condition/effectiveness of the irrigation system.  
Assessment by written assignment.
3. **Record and report maintenance activities:** Develop a simple record system which details all maintenance performed on the irrigation system. This should include information related to parts used, date of service/repair, irrigation plan updating and man hours used.  
Assessment by written assignment.

**Key Terms:**

variable speed pumps, fixed drive pumps, duty cycle; screen, disc and sand/gravel filters; back flushing, scale formation; back flow prevention device; air bladders; pressure reduction valves; Peak flows, static pressure, operating pressure, , co-efficiency of uniformity, head-to-head coverage, Pitot Tube, sprinkler patterns; water bodies, gear driven sprinklers, impact sprinklers, solenoid valves, diaphragms, line maintenance; common wire, switching wire, multi-core wire

**Resources:**

**Books:**

Turf Irrigation Manual	Choate, R & Watkins J. Irrigation Assoc. of Aust.
Practical Irrigation	Seminar proceedings TGAA Canberra 1999.

**Internet / Electronic:**

CD rom, Irrigation learning guides	Irrigation Association of Australia.
Irrigation Association of Australia	<a href="http://www.irrigation.org.au">www.irrigation.org.au</a>

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**Certificate III in Horticulture.**

**RTE3907A**

**USE HAND HELD E BUSINESS TOOLS**

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This competency standard covers the use of held tools for e-business. The selection of hand held e-business tools to be discussed will be industry sector dependent, and may include:

- Global Positioning Systems (GPS)
- Personal Data Assistants (PDA's)
- Scanners – micro-chip scanners
- Mobile phone enabled email, SMS and video/image send and receipt.

The types of applications for the hand held e-business tools will vary depending on the industry sector, and the elements of production, to which the tools will be applied.

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**Activities and Assessment:**

1. The knowledge requirements for this competency will include:
  - Operating procedures of relevant hand held e-business tools, eg, basic start-up and shut-down procedures, navigation and operational sequences.
  - Relevant protocols for the operation of relevant hand held e-business tools eg passwords, security, language, and compatibility of devices.

Assessment will be by written/oral examination and practical demonstration on at least two (2) hand held e-business devices.

2. The following skills need to be demonstrated to satisfy the required performance criteria of this competency.
  - Use relevant workplace technology eg computers, personal data devices, scanners, and barcoding equipment.
  - Generate data in the format required to satisfy the enterprise guidelines eg download weather information, send and receive e-mails, download irrigation operational data, etc

Assessment will be by written/oral examination, and practical demonstration, on at least three (3) relevant e-business operational procedures.

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**Certificate III in Horticulture.**

**RTF3001A**

**CONSTRUCT TURF PLAYING SURFACES**

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The competency covers the process of constructing soil profiles designed for the establishment of high performance, highly maintained recreational turf surfaces. Extensive knowledge of relevant physical/chemical soil characteristics, associated construction profiles, and comparative environmental implications of constructed turf areas are discussed within the competency. The topics of associated surveying techniques and site planning are included within this competency. This competency is to be undertaken with limited supervision of the participant, but within the relevant OHS requirements.

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**Activities and Assessment:**

1. A range of physical and chemical root zone characteristics are tested.  
Assessment is practical exercise.
2. Specific surface requirements and dimensions of relevant turf playing areas including:
  - Bowling greens
  - Golf greens
  - Lawn Tennis courts
  - Football ovals
  - Cricket wickets
3. Undertake basic surveying and levelling techniques appropriate to the construction of turf playing surfaces.  
Assessment is by practical exercise.
4. Install sub-surface and/or surface drainage techniques.  
Assessment is by practical exercise.
5. Plan, schedule and prepare cost estimates for turf construction project.  
Assessment is by assignment.
6. Location of all boundaries and services in relation to site.
7. Students are made aware of the variety of turf construction profiles.
8. Students will examine at least three different landmark construction case studies and study the application of construction and soil science principles in each case.  
Assessment by assignment work.

**Key Terms:**

USGA, perched water table, California method, infiltration rate, porosity, moisture retention, sive analysis, capillary and non capillary.

**Resources:**

**Books:**

McIntyre & Jakobsen	Drainage for Sports Turf and Horticulture, ACT 1998
University of California	Specifications for a Californian Method green Construction.

**Internet**

[www.usga.org](http://www.usga.org)

**Video**

Constructing a USGA Green.

**Certificate III in Horticulture.**

**RTF3004A**

**IMPLEMENT A GRASSED AREA MAINTENANCE PROGRAM**

This competency covers the short term and longer term maintenance tasks in preparing a turf area for play. It assumes minimal or no supervision in the short term tasks (day to day marking out and preparing for play), and limited supervision in the preparation of an ongoing program for nutrition, mowing, irrigation, pest control etc.

**Activities and Assessment:**

1. **Turfgrass Quality:** Students gain an appreciation of turf quality by studying various high quality surfaces and measuring pace, density, texture, mowing height and profile hardness and moisture. The effect of cultural practices on quality, safety and turf health are covered. It is expected that input from Turf Managers experienced in the preparation of elite level surfaces will be used.  
Assessment by group practical exercises.
  
2. **Rules and Dimensions:** the basic rules (as they impact the Turf Manager's role) and dimensions of a range of sports played on natural turf are covered.  
Assessed by assignment work.
  
3. **Preparation practicals:** at least three different turf surfaces (eg: golf, bowls, cricket, football, horse racing) are prepared for day to day play, including any necessary mowing, rolling, raking, watering, line marking or equipment setup. Surface quality is measured and related to the requirements of the players.  
Assessment by group practical exercises.
  
4. **Maintenance Program:** students will prepare a longer term maintenance program for at least three surfaces (eg: golf greens, golf fairways, bowling greens, racetrack, sportsfield) that provides basic details on mowing frequency and height and requirements for irrigation, fertilising, renovation and expected pest control. The program will include a basic costing for labour, materials, contractors etc.  
Assessment by written assignment.

**Key Terms:** Stimpmeter, Clegg Impact Hammer, Penetrometer, Timing Ramp, Thatch, turfgrass quality, density and texture, reel mowing, rotary mowing, renovation, aeration, compaction, dethatching.

**Resources:**

**Books:**

J. B. Beard	Turf Management for Golf Courses, 1984
K Liffman	Bowling Greens – A Practical Guide, 1983
K Liffman	Sportsfields – A Practical Guide, 1985
K McIntyre & D McIntyre	Cricket Wickets – Science vs Fiction, 2001

**Internet**

Local dept of sport and recreation for all of the dimensions of playing surfaces

**Certificate III in Horticulture.**

**RTF3012A**

**IMPLEMENT A PLANT NUTRITION PROGRAM**

This competency covers the understanding of the nutritional requirements of turfgrasses, and the application of products to optimise turf nutrition.

**Activities and Assessment:**

1. **Demonstrate** an underpinning knowledge on plant nutrition incorporating the following
  - Knowledge on the relationship between soil characteristics and the availability and cycling of nutrients is required to complete this competency. Topics for this section will include. the physical properties of soil texture and structure, the chemical properties of soils pH, Buffer capacity, cation exchange capacity, salinity and base saturation. Includes discussions on soil ameliorants influencing these properties.
  - Methods of nutrient uptake by plants will be discussed within this competency. Topics to be discussed will include; root interception, mass flow, ion diffusion, and foliar uptake.
  - Macro and, Micro nutrients, relevant to plant/turfgrass growth will be discussed within this competency. Topics within this discussion will include: the role of each nutrient, deficiency symptoms, and toxicities.
  - Characteristics of plant/turfgrass fertilisers will be discussed within this competency. Topics for discussion include: analysis of fertilisers, fertiliser calculations, ratios, solubility, salt index, application rates and costs.
  - Knowledge of environmental implications of fertiliser applications is required for the successful completion of this competency. Topics for discussion in this section of the competency include: fertiliser leaching, over-spray, run-off, nutrient overload, toxicity, dust and noise.

Assessment by written examination

- 2 **Preparation and application** of specific fertilisers will be performed within this competency. Tools, equipment and machinery will be selected according to workplace and manufacturers specifications. Fertiliser applications will be programmed according to workplace, grass and play requirements.

Assessment by written practical demonstration.

- 3 **Formulate** a 12 month basic NPK plant nutrient and fertilisation program taking into account seasonal, grass type and play consideration, as well as the selection of suitable fertiliser materials.

Assessment by assignment

**Resources:**

**Books:**

K.Handrek; N.Black	Growing Media for Ornamental Plants & Turf, 2002
Beard. James B	<i>Turfgrass Science and Culture.</i> New Jersey. 1973.