

<b>1. Module Details</b>	
<b>Module name</b>	<b>LIQUID PENETRANT AND MAGNETIC PARTICLE TESTING METHODS</b>
<b>Nominal duration</b>	One module  It is anticipated that a learner holding the prescribed entry level skills will achieve the module purpose in 35 to 40 hours
<b>Module Codes</b>	EA606
<b>Discipline Code</b>	Non-destructive testing (Code to be allocated)
<b>2. Module Purpose</b>	To enable students to describe the principles and processes of liquid penetrant and magnetic particle testing, and apply these techniques to defective components. This module fulfills the training requirements for Level 1 Certification for both Liquid Penetrant Testing and Magnetic Particle Testing in accordance with AS 3998 - 1992 "Non-destructive Testing - Qualification and Certification for Personnel - General Engineering".
<b>3. Prerequisites</b>	Nil.
<b>4. Relationship to competency standards</b>	This module meets the training requirements for Level 1 qualifications in liquid penetrant and magnetic particle testing under AS3998 - 1992 - "Non-destructive Testing - Qualifications and Certification of Personnel - General Engineering".  Currently no competency standards have been established. However the learning outcomes in this module relate to ASF level 2-3.
<b>5. Content</b>	<p><b>Introduction to NDT</b>  Basic concepts of NDT  General terms relating to NDT  Purpose of NDT  Areas of application of NDT  Brief outline of the major NDT methods</p> <p><b>Penetrant Testing</b>  Penetrant test principles and media  Historical background  Scope and basic description of test  Capillarity  General properties of penetrants - penetrability, removability, visibility  Classification of penetrants by viewing - colour- contrast, fluorescent - and method of removal of excess penetrant - solvent-removable, water-washable , post-emulsifiable.  Emulsifier types - hydrophilic, lipophilic  Developer types - dry powder, water-based solvent-based  Use of standard test panels  Compatibility of different brands/systems.</p> <p><b>Penetrant test procedures</b>  Precleaning methods and their areas of use - solvents, vapour</p>

	<p>degrease, etching, detergents, paint removers, mechanical methods.  Penetrant application - spray, dip, brush, electrostatic.  Dwell times  Penetrant removal - methods for solvent- removable, water-washable, post-emulsifiable.  Drying after water-wash  Developer application - coating thickness, spray application.  Dry powder - dip, dust, electrostatic application  Development time  Inspection - lighting requirement for colour-contrast and fluorescent penetrants.  Factors affecting indications.  Non-relevant indications  Post-cleaning methods and their areas of use  Recording and reporting of results of simple tests  Safety precautions in testing - ultraviolet light, toxicity of media, flammability hazard.  Advantages - limitations of the various penetrant testing systems.</p> <p style="text-align: center;"><b>Penetrant test equipment</b></p> <p>Equipment used - aerosol cans, tank installations, electrostatic and spray application.  Black light sources</p> <p><b>Magnetic Particle Testing</b></p> <p style="text-align: center;"><b>Historical background to the magnetic particle test</b></p> <p>Scope and basic description of the test  Advantages/limitations of the test.</p> <p style="text-align: center;"><b>Magnetism and Test Principles</b></p> <p>Ferromagnetic materials  Magnetic fields, poles, magnetic flux and its characteristics, flux density and field strength, leakage fields  Permanent magnets  Electrically induced magnetic fields  Material properties - permeability and retentivity, Magnetically hard and soft materials.  Flux leakage at discontinuities, dependence on flux/discontinuity orientation, surface/near surface discontinuities  Principles of demagnetisation  <b>Methods of Magnetisation/Demagnetisation</b>  Permanent magnets  Electrically induced magnetic fields - current flow, induced current.  Demagnetisation coils, AC - DC demagnetisation  <b>Magnetising current and Test Media</b>  Types and properties of magnetisation currents - AC, HWAC, FWAC, DC  Comparison of current types.  Properties and application of wet, dry, visible, fluorescent particles.  Concentration of wet suspension.</p> <p style="text-align: center;"><b>Magnetic Particle test equipment</b></p>
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	<p>Types of equipment - portable, stationary, automated. Equipment features; advantages, limitations.</p> <p>Demagnetisation equipment</p> <p>Field meters, flux indicators</p> <p>Black light sources</p> <p><b>Magnetic particle test procedures</b></p> <p>Surface preparation - surface condition required, use of strippable lacquers for visible particles.</p> <p>Establishing suitable magnetic field.</p> <p>Circular vs longitudinal magnetisation methods.</p> <p>Surface vs near sub-surface discontinuities.</p> <p>Magnetic particle application - methods for wet, dry particles.</p> <p>Sustained and residual method.</p> <p>Inspection for indications - factors influencing indications.</p> <p>Lighting conditions. Test sensitivity.</p> <p>Non-relevant and false indications - typical causes</p> <p><b>Demagnetisation</b></p> <p>Situations requiring demagnetisation,</p> <p>Procedures.</p> <p>Tests for demagnetisation</p> <p style="text-align: center;"><b>Recording and reporting results of simple tests</b></p> <p style="text-align: center;"><b>Safety precautions in testing</b></p> <p style="text-align: center;">Ultraviolet light.</p> <p>Use of toxic, flammable materials, electrical hazard.</p>
<b>6. Assessment strategy</b>	Competency based assessment applies. Assessment should be carried out by gathering evidence using a variety of methods or instruments that have validity according to the learning being assessed.
<b>Assessment method</b>	<p>Multiple choice and short answer questions.</p> <p>Written assignments and demonstrated competence through assigned tasks.</p> <p>Final assessment will be by a written examination and practical examination as required by AS3998 for Level 1 Certification.</p>
<b>Conditions of assessment</b>	Assessment will be conducted by suitably qualified assessors, as required by AS3998. The candidate will have access to any equipment, materials and documentation as required for the assessment.
<b>7. Learning outcome details</b>	On completion of this module, the learner will be able to
<b>8. Learning outcome 1</b>	Describe the principles of the penetrant test and the media used.

<b>Assessment criteria</b>	.1 Explain the dependence of the penetrant test on capillarity. .2 .3 1.2 Classify penetrants in terms of method of viewing and methods of removal. .4 .5 1.3 Describe the media used in penetrant testing. .6
<b>Learning outcome 2</b>	Describe and apply penetrant testing processes.
<b>Assessment criteria</b>	2.1 Describe processing procedures for various testing systems. 2.2 Apply penetrant testing procedures to defective components. 2.3 Identify and describe the equipment used for penetrant testing.
<b>Learning outcome 3</b>	Explain the principles of the magnetic particle test.
<b>Assessment criteria</b>	3.1 Review the basic principles of magnetism. 3.2 Describe the principles of the magnetic particle test and demonstrate those principles in the laboratory.
<b>Learning outcome 4</b>	Describe test parameters used in magnetic particle testing.
<b>Assessment criteria</b>	4.1 Describe the magnetisation methods used for magnetic particle testing. 4.2 Outline the current types used for electrically induced magnetic fields. 4.3 Explain the properties of the different types of magnetic particle test media.
<b>Learning Outcome 5</b>	Describe and apply the techniques used in magnetic particle testing.
<b>Assessment criteria</b>	5.1 Identify and describe equipment used for magnetic particle testing. 5.2 Describe the processing procedures used in magnetic particle testing. 5.3 Apply magnetic particle test procedures to defective components.

<p><b>8. Delivery of the module</b></p>	<p>This module may be taught by active participation, illustration, demonstration and description. This module is practical in nature and theoretically integrated to complement the acquisition of practical skills.</p>
<p><b>Delivery strategy</b></p>	<p>This module may be taught and assessed on or off-the-job.</p> <p>The module has a high practical content. Theory and practice will be taught concurrently. There will be a range of learning activities including modified lectures, practical work and project work.</p>
<p><b>Resource requirements</b></p>	<p>Human resources</p> <ul style="list-style-type: none"> <li>• trainer/teacher/mentor</li> </ul> <p>Physical resources</p> <ul style="list-style-type: none"> <li>• appropriately equipped training room</li> <li>• relevant equipment and information</li> <li>• legislative and regulatory documents</li> <li>•</li> </ul>
<p><b>Major texts and references</b></p>	<p>General Non-Destructive Testing J. Lonie Pub NSW TAFE. Available Sydney Institute of Technology, Ultimo</p> <p>Penetrant Testing P.A. Sheedy (In preparation. Pub. Technical Secretarial Service)</p> <p>Magnetic Particle Testing P.A. Sheedy (In preparation - Pub. Technical Secretarial Service)</p> <p>Liquid Penetrant Testing Classroom Training Handbook ASNT/General Dynamics</p> <p>Principles of Penetrants C E Betz</p> <p>Magnetic Particle Testing Classroom Training Handbook ASNT/General Dynamics</p> <p>Principles of Magnetic Particle Testing C E Betz</p>
<p><b>Occupational health and safety requirements</b></p>	<p>Learners and/or employees undertaking this module should have demonstrated competencies as defined in the Metal &amp; Engineering Industry Standards Unit No 1.2F - Apply principles of OH&amp;S in the work environment. This would apply in the classroom, practical room or workplace.</p>