



AFRICAN NDT CENTRE
COURSE CURRICULUM
VISUAL TESTING LEVEL 1, 2 and 3

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Syllabus reference number	Title	Module subcontent	Visual testing (VT)		
1	Terminology and history of VT		Level 1	Level 2	Level 3
1.0	History of VT	History of visual testing	X	X	X
1.1	Purpose of NDT	What is testing?	X	X	X
		What is the purpose of NDT?	X	X	X
		At what stage of life is NDT performed on a product?	X	X	X
		How does it add value?	X	X	X
		Who may carry out NDT?	X	X	X
		Main NDT methods	X	X	X
1.2	Purpose of VT	Definition	X	X	X
		Applicability and limitations	X	X	X
		Extended overview of visual testing applications	X	X	
		Use of visual testing as a complement to other NDT methods	X	X	
1.3	Terminology	Please refer to PCN24 standards document	X	X	X



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2	Physical principles and associated knowledge		Level 1	Level 2	Level 3
2.1	Fundamentals	Goals and principles of visual testing	X	X	
		Comprehensive knowledge and understanding of the physical principles and physics of light	X	X	X
		Optical performance:	X	X	
		● Polarisation of light	X	X	
		● Stroboscopic principles	X	X	
		● Dispersion	X	X	
		● Refraction and refractive index	X	X	
		● Reflection	X	X	
		● Fluorescence	X	X	
		● Advantages and disadvantages of different wavelengths of optical radiation (UV, infrared (IR)), including colour temperature	X	X	X



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2.2	Vision	The eye:	X	X	
		● Operation	X	X	
		● Construction	X	X	
		● Vision limitations	X	X	
		● Adaption and accommodation	X	X	
		● Disorders	X	X	
		● Vision ranges	X	X	X
		● Effects of disorders	X	X	X
2.3	Lighting	Transmission	X	X	
		Reflection	X	X	
		Absorption	X	X	
		Physics of light	X	X	
		Electromagnetic radiation	X	X	
		Visible wavelengths	X	X	
		Types of light source:	X	X	X
		● Natural	X	X	X
		● Artificial – including laser	X	X	X



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2.3 (continued)		LED light sources (advantages and disadvantages):	X	X	X
		● Different wavelengths of optical radiation (UV, IR)			X
		● Colour temperature		X	X
		● LED light sources	X	X	X
		Photometry	X	X	
		Light levels	X	X	
		Light measurement	X	X	
		Luminance:	X	X	
		● Lighting levels	X	X	
		● Lighting techniques	X	X	
		● Contrast	X	X	
2.4	Optical principles	Operation of lenses		X	
		Operation of magnifiers		X	
		Image construction		X	
		Virtual images		X	
		Chromatic aberration		X	
		Geometric distortion		X	
		Magnification principles		X	



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2.5	Camera and photo sensor operation and principles	Optical filters			X
		Construction of digital images and problems			X
		Image processing			X
		Image analysis			X
		Image compression and transmission			X
		Image storage			X
		Resolution			X
		Video monitors			X
		Other monitors			X
		Light meters and photometers			X
2.6	Principles of operation of fibre bundles and lenses	Coherent			X
		Incoherent			X
2.7	Photogrammetry				X
2.8	Visual perception	What the eye sees		X	
		What the mind sees		X	
		What others perceive		X	
		What the designer, engineer, etc, sees		X	



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2.9	Material attributes affecting the test	Colour	X	X	
		Surface condition	X	X	
		Surface preparation	X	X	
		Cleanliness	X	X	
		Shape	X	X	
		Size	X	X	
		Temperature	X	X	
		Texture	X	X	
		Type	X	X	
		Surface finish	X	X	



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2.10	Environmental and physiological factors	Atmosphere		X	
		Comfort		X	
		Perspective		X	
		Distance		X	
		Accessing		X	
		Fatigue		X	
		Health		X	
		Humidity		X	
		Mental attitude		X	
		Position		X	
		Safety		X	
		Temperature		X	
		Cleanliness		X	
2.11	Direct and remote methods		X	X	
2.12	Vision	Requirements	X	X	
		Employer's responsibility		X	



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3	Product knowledge and capabilities		Level 1	Level 2	Level 3
3.1	Product knowledge	Outline of basic flaws detected with visual testing as necessary to work in a specific sector	X		
		Evaluation of surfaces			X
		Test objects and flaws		X	X
		Basic production and degradation process		X	X
		Terms, origin, nature and appearance of flaws		X	X
		Product technology sectors		X	X
		Basic metallurgy of the process/component		X	X
		Welding/joining methods		X	X
		Cladding and buffering:		X	X
		● Wrought product production methods		X	X
		● Cold working processes		X	X
		● Heat treatment processes		X	X



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		Roughness and waviness			X
		Definition of shape and geometry of flaws			X
		Material composition:		X	X
		● Surface-finishing methods		X	X
		● Basic foundry technology		X	X
		● Machining and material removal processes		X	X
		● Polymers/composites		X	X
		In-service aspects:		X	X
		● Service-induced flaws		X	X
		● Mechanically		X	X
		● Thermally		X	X
		● Tribology		X	X
		● Wear		X	X
		● Chemical		X	X
		● Electrochemical		X	X



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3.2	Capability and limitations of visual testing	Overview/awareness	X		
		Detectability:	X	X	
		● Flaw size	X	X	
		● Shape	X	X	
		● Orientation/position	X	X	
		● Flaw types	X	X	
		● Surface condition effects	X	X	
		● Equipment limitations	X	X	
		● Lighting effects	X	X	
3.3	Associated techniques	Gauging		X	
		Comparators		X	
		Measurement		X	
		Thermographic imaging		X	
		Replication		X	



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4	Equipment		Level 1	Level 2	Level 3
4.1	Introduction and applications	Mirrors	X	X	X
		Magnifiers	X	X	X
		Borescopes	X	X	X
		Fibrescopes	X	X	X
4.2	Photographic and video	Imaging cameras	X	X	
		Video monitors	X	X	
		Light sources and special lighting	X	X	
		Gauges	X	X	
		Templates	X	X	
		Scales	X	X	
		Special tools			X
		Automated systems		X	X
		Computer-enhanced systems		X	X
		Demonstration test-piece	X	X	
		Resolution targets	X	X	X
		Graticules		X	X



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		Effect on test arrangement			X
		Evaluation of equipment to fulfil a particular task			X
		Development of verification for equipment performance:			X
		● Choice/design			X
		● Application of demonstration test-pieces			X
4.3	Image recording, transfer and storage equipment	Equipment selection		X	
		Equipment limitations		X	
		Verification of equipment	X	X	
		Procedure for control, maintenance and adjustment of equipment			X
4.4	Sizing of indications	Imaging systems		X	
		Special optical systems		X	
		Special equipment requirements (ie underwater, radiation resistant)	X	X	



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5	Information prior to testing		Level 1	Level 2	Level 3
5.1	Information about the test object	Identification or designation of material:		X	X
		● Object to be tested		X	X
		● Kind of manufacture		X	X
		● Catalogue of defects		X	X
		● Extent of test coverage		X	X
5.2	Test conditions and application of standard	Accessibility		X	X
		Infrastructure		X	X
		Particular test conditions		X	X
		Application of standard		X	X
		Stage of manufacture or service life when testing is to be carried out		X	X
		Standard and codes assigned to the test object		X	X
		Requirements of test personnel		X	X
		Acceptance criteria		X	X



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5.3	Technique and sequence of performing test	Surface condition		X	
		Surface preparation		X	
		The illumination (type, level and direction)		X	
		Post-test documentation		X	
		Visual testing equipment to be used		X	
		Demonstration test-piece and inspection checkpoints		X	
		Requirement for recorded images		X	
5.4	Instructions	Preparation of written procedure			X
		Preparation of written instruction		X	
		Performing inspection in accordance with written instruction	X		
		Documents		X	X
		Presentation of the standards, codes and procedures			X



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6	Testing		Level 1	Level 2	Level 3
6.1	Test set-up	Demonstration test-pieces	X	X	
		Resolution targets	X	X	
		Adjustment		X	
		Written instruction		X	X
		Written procedure		X	X
7	Evaluation and reporting		Level 1	Level 2	Level 3
7.1	Reporting results	Reference to test standards	X	X	
		Adjustment status	X	X	
		Reference points for location of indications	X	X	
		Classification of indications:	X	X	
		● Instructed acceptance criteria	X	X	
		● Reports and documentation	X	X	
		● Reporting verification results	X	X	



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7.2	Control and monitoring of test results	Interpretation		X	X
		Evaluation:		X	X
		● Objective		X	X
		● Subjective		X	X
		Reporting of results to specifications and standards		X	X
		Completion of adjustment forms		X	X
7.3	Developing report forms	Organisation of final forms			X
7.3 (continued)		Storage of final forms			X
		Distribution of final forms			X
		Investigation of suitable codes and product standards for each application			X
		Acting as a reference point for Level 2 advice for interpretation and evaluation			X



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8	Assessment		Level 1	Level 2	Level 3
8.1	Classification and assessment of observations	Acceptance criteria:		X	X
		● Codes		X	X
		● Standards		X	X
		● Written instructions		X	X
		● Level 3 reference where no codes or standards exist		X	X
		● Design specifications			X
		By comparison		X	X
		By measurement		X	
		Automated evaluation (for example pattern recognition)		X	
		Recording		X	
		Reporting		X	
		Analysing results			X
		Translation of codes, standards and design specifications, etc, into clear acceptance criteria to be written into procedures and instructions			X
		Finding information of assistance to investigate observations not covered by codes and standards, and develop acceptance criteria			X
		Training of Level 1 and 2 for acceptance criteria			X



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9	Quality aspects		Level 1	Level 2	Level 3
9.1	Personnel qualification	ISO 9712	X	X	X
		Other NDT qualification and certification systems			X
9.2	Documentation	Format and scope of working procedures			X
		Qualification of NDT procedures			X
		Authorisations (NDT instruction, procedures and personnel)			X
		Developing written instruction		X	
		Working correctly to written instructions	X		
		Traceability of documents		X	X
		Reliability of measurements		X	X
9.3	Knowledge of applicable NDT application and product standards	Correct technique selection		X	X
		Use of correct test parameters		X	X
		NDT method selection			X
		Job-specific training			X
		Equipment verification	X	X	X



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10	Developments	Level 1	Level 2	Level 3
10.1	Importance of investigating current and developing technology and methods of application			X
10.2	Summary of latest developments			X