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APPROVED TRAINING ORGANISATION

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# NASA 212

# Liquid Penetrant Testing Curriculum

Revision control sheet:

| Rev No: | Date: | Compiled by: | Reviewed by: | Revision Description: |
|---|---|---|---|---|
| 1 | 09-Jan-2018 | Meyuri Moodley | Nish Kanhaye | Revised toward improvement.<br>Name change.<br>Aligned to BINDT approved course notes. |
| 2 | 02-Apr-2025 | Acacia Sureschandra | Nish Kanhaye | The document format was updated. |

**1.0 Course Duration:**

1.1 Level 1 and 2 Combined:

a) The minimum training hours administered in Level 1 shall be 16.

b) The minimum training hours administered in Level 2 shall be 24.

c) For Level 1 and 2 combined courses the total training hours shall be a minimum of 40.

1.2 In all cases, level 1, level 2 or combined level 1 and 2, NASA shall administer the full theory content of Level 1 and 2.

**2.0 Course Content:**

2.1 Theory: The table below shows theory aspects covered:

| Chapter Reference: | Level 1 and 2 combined: |
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| Chapter 1:<br>Qualification, Certification and Authorisation | SNT-TC-1A and ISO 9712<br>Levels of Qualification |

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| Chapter 2:<br>Basic Principles | SNT-TC-1A and ISO 9712<br>Levels of Qualification<br>Introduction<br>Penetrant Principles<br>Viscosity<br>Cohesion and Adhesion<br>Surface Tension<br>Wetting Ability<br>Capillary action (capillarity)<br>Penetrant Properties<br>Flash Point<br>Volatility<br>Chemical Inertness<br>Toxicity<br>Solvent Ability<br>Removability<br>Water Tolerance<br>Density<br>Penetrant Sensitivity<br>History<br>Test Procedures<br>Test Objective<br>Advantages<br>Disadvantages<br>*Chapter 2: Basic Principles continued:*<br>Basic Penetrant Testing Process<br>Classification of Penetrant Materials and Processes |

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| Chapter 3:<br>Pre-Cleaning Methods | Pre-Cleaning<br>Solvent Cleaning<br>Detergent Cleaning<br>Vapour Degreasing<br>Steam Cleaning<br>Ultrasonic Cleaning<br>Chemical Cleaning<br>Acid Pickling<br>Pre-Cleaning Processes to Be Avoided<br>Cleanliness Check |

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| Chapter 4:<br>Adequate Illumination | Lighting condition in test area<br>Light Intensities for The Fluorescent Method<br>Light Intensities for The Visible Method |

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| Chapter 5:<br>Visible Methods | Pre-Requisites for Inspection<br>Visible Water Washable Process<br>Visible Solvent Removable Process<br>Visible Post Emulsification Process<br>Drying Prior to Penetrant Application<br>Penetrant Application<br>Penetrant Dwell Time<br>Removal of Excess Penetrant<br>Solvent Wipe Method<br>Post Emulsification – Hydrophilic (Water Based)<br>Post Emulsification – Lipophilic (Oil Based)<br>Water Wash Method<br>Drying After Excess Penetrant Removal<br>Developer Application<br>Dry Powder Developer<br>Water Soluble Developer<br>Water Suspendable Developer<br>Non-Aqueous Wet Developer<br>Developer Dwell Time<br>Viewing Conditions<br>Interpretation<br>False Indications<br>Non-Relevant Indications<br>Relevant Indications<br>Evaluation<br>Post Cleaning<br>Reporting |

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| Chapter 6:<br>Fluorescent Methods | Pre-Requisites for Inspection<br>Fluorescent Solvent Removable Process<br>Fluorescent Post Emulsification Process<br>Fluorescent Water Washable Process<br>Drying Prior To Penetrant Application<br>Penetrant Application<br>Penetrant Dwell Time<br>Removal of Excess Penetrant<br>Solvent Wipe Method<br>Post Emulsification – Hydrophilic (Water Based)<br>Post Emulsification – Lipophilic (Oil Based)<br>Water Wash Method<br>Cleanliness Check<br>Drying After Excess Penetrant Removal<br>Developer Application<br>Dry Powder Developer<br>Water Soluble Developer<br>Water Suspendable Developer<br>Non-Aqueous Wet Developer<br>Developer Dwell Time<br>Viewing Conditions<br>Interpretation<br>False Indications<br>Non-Relevant Indications<br>Relevant Indications<br>Evaluation<br>Post Cleaning<br>Cleanliness Check<br>Reporting |

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| Chapter 7:<br>Special Purpose Chemicals | Filtered particle testing<br>Food compatible<br>Liquid oxygen (lox) compatible penetrants<br>Low temperature applications<br>High temperature penetrant materials<br>Low sulphur and chloride<br>Reversed fluorescence method<br>Plastic-film developers<br>Fingerprints' detection |

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| Chapter 8:<br>Inline Penetrant Systems | Inline penetrant systems pictures depicting process |

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| Chapter 9:<br>Control Checks | Liquid penetrant materials<br>Contamination of penetrant, emulsifier and developers<br>Concentration of hydrophilic emulsifiers<br>Concentration of developers<br>Water washability test<br>Sensitivity comparison test<br>Water content test<br>Corrosive properties of penetrants<br>Fluorescent luminance test<br>Ultraviolet light |

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| Chapter 10:<br>Health and Safety | Example of a typical MSDS |

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| Chapter 11:<br>Classification of Discontinuities | Discontinuity categories<br>Inherent discontinuities<br>Processing discontinuities<br>Service discontinuities<br>Crack indications<br>Solidification cracks<br>Processing cracks<br>Service cracks<br>Porosity indications<br>Indications from specific material forms<br>Forgings<br>Castings<br>Plate<br>Welds<br>Typical welding type discontinuities<br>Extrusions<br>Grinding cracks<br>Heat treatment cracks<br>Fatigue cracks |

2.2 Practical: The table below shows practical aspects covered:

| Level 1 and Level 2 Combined: |
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| Pre-test checks<br>Visible penetrant techniques<br>Visible light intensity measurement and verification at test area<br>Pre-cleaning of test specimens<br>Penetrant application, dwell periods and removal techniques.<br>Developer application and dwell periods<br>Viewing and interpretation of detected indications<br>Recording and reporting according to written instructions<br>Post cleaning<br>Fluorescent penetrant techniques<br>Ultraviolet light intensity measurement and verification at test area<br>Selection of testing techniques<br>Evaluation of indications according to codes, specifications or procedures |

**3.0 Learning outcomes:**

3.1 Upon completion of training, students should be able to carry out and understand the following regarding visual testing:

| Level 1 and Level 2 Combined: |
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| Basic principles |
| General advantages and limitations |
| Discontinuity associated with manufacturing processes, categories and types |
| Differences between visible and fluorescent methods |
| Select test technique to be used based on specimen type, material, surface finish, etc. |
| Interpret codes, specifications and procedures. |
| Compile instructions according to specifications, codes or procedures |
| Carry out pre-test checks, set up equipment, perform tests and report results |
| Interpret and evaluate test results according to specifications, codes or procedures |

**4.0 Course Outcome:**

4.1 Successful Completion of Training:

Upon successful completion of the course, a successful completion of training certificate at the level attempted will be issued which meets eligibility to undertake the external PCN examination.