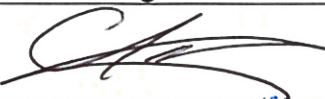
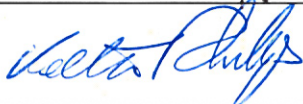


**ETCH INSPECTION - STEEL
EN4179 LEVEL 2 SYLLABUS**

DOCUMENT APPROVAL			
Function	Name	Signature	Date
Senior NDT Instructor	GRAYSON JONES		08/05/2019
MD Testia Ltd	KEITH PHILLIPS		08/05/2019

General Theory

Instruction shall be given in the principles, limitations and theoretical aspects of the following:

- Introduction – Brief history of the development of etch inspection. Philosophy of NDT and etch inspection testing capabilities in relation to other methods. Basic aerospace product technology.
- Principles of etch inspection – Atoms and bonds, melting points, unit cells, space lattices. Steel alloys, elemental additives, grain structures, δ Ferrite, Austenite, Cementite, Ferrite, Pearlite, Martensite. Equilibrium diagrams, Cooling curves, dendritic growth.
- The heat treatment of steel – The iron carbon diagram, stress relieving, annealing, hardening of steel, tempering, de-embrittling.
- Surface conditioning – Carburisation, Nitriding, Plasma. Surface conditions, the etched structure, cracking, grinding cracks, heat treatment cracking, hydrogen cracking.
- The etching process – Equipment. Pre-cleaning. Nitric etching, immersion etching, swab etching, etch times. Anti-smut/De-smut. Neutralisation. Protection from corrosion. Inspection. Post etch thermal treatments.
- Health and safety and Control – Chemical usage, ventilation, first aid. Mixing of solutions. System controls, system checks.
- Inspection and detection of indications – Inspection and interpretation. Rejection and re-working..

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Specific Theory

Instruction shall be given in the following:

- Preparation for etch inspection – Surface preparation, cleaning methods, effects of surface finish and contaminants.
- Safety precautions – Fire hazards, electrical safety, ventilation, toxic materials.
- Processing of parts – Component handling, component jigging, immersion of parts. Rinsing methods, drying methods, processing times.
- Detectability of defects – General advantages and limitations of the test method with regards to defect detection; Characteristics of indications; Factors affecting indications: Surface preparation, detecting medium and application.
- Interpretation and reporting – Types of discontinuity and their identification; Relevant, non-relevant and false indications and their causes.
- Post test procedures – Handling of components.

Reference material

- ASNT – Study guide
- Metals Handbook Volume 17 Non-destructive evaluation of quality control
- The Canning handbook – Surface Finishing Technologies
- Inspection of metals: Visual Examination. - R Anderson
- Basic Metallurgy for NDT - JL Taylor