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**REQUIREMENTS FOR NDT PERSONNEL REQUIRING CERTIFICATION FOR  
INSPECTION OF COMPOSITE MATERIALS**

Status

Approved for publication at the 38th meeting of the UK NANDTB.  
Reference to EN4179:2009(Issued 2009-11-27, Published January 2010) approved at 23rd meeting of the UK NANDTB.

Requirement

The requirement for NDT personnel training and certification is defined by EN4179, but the standard does not clearly define that the training and subsequent certification should be relevant to the materials being inspected.

Background

The Composites Task Group at a meeting on 22nd January 2009, agreed the principle such that under EN4179 the Responsible Level 3 should determine any additional training and certification for inspections on composite materials/structures. In agreeing this principle, the group acknowledged that many Responsible Level 3's may not hold the management authority to specify additional training and examinations, even though they may determine them as necessary.

Experience within the group has shown, that unless the Responsible Level 3 can show management specific regulatory requirements, then often requests for additional training/certification and the associated financial support are denied.

Applicability

Where NDT personnel have not had the relevant training, the UK NANDTB issues this document, which defines the requirements for Responsible Level 3s, to determine the appropriate levels of additional training and certification for inspections on composite materials/structures. This document is to be read in conjunction with NANDTB/014.

## Scope for Responsible Level 3s

1. Composite Material Definitions. Responsible Level 3's should be aware that although the following list of composite materials covers the types commonly in use within the aerospace environment, it should not be considered exhaustive.

a. Composite Material - A combination of two or more materials, differing in form or composition on a macro scale. The constituents retain their identities; that is, they do not dissolve or merge completely into one another although they act in concert. Normally, the components can be physically identified and exhibit an interface between one another - see definitions in ISO 472. Composite materials are usually man-made and created to obtain properties that cannot be achieved by any of the components acting alone.

b. Organic-Matrix Polymers - Generally organic-matrix polymers in aerospace applications have glass or carbon fibres with an epoxy matrix. However, other fibre reinforcing materials such as boron and Kevlar are available as are other types of matrix polymers for example polyester, phenolic, polyimide, polyamide and PEEK.

c. Fibre Metal Laminates - Materials consisting of alternating layers of unidirectional continuous fibre and thin metal sheets bonded together with a polymer. Examples of FML's are GLARE (Glass fibres, aluminium alloy sheets bonded with an epoxy) and ARALL (Aramid fibres, aluminium alloy sheets bonded with an epoxy).

d. Sandwich Structures - Metallic or monolithic composite skins/faces adhesively bonded to a core material, which may be honeycomb, foam, or balsa. Honeycomb cores can be metallic, paper, or resin impregnated paper (Nomex). There are also various polymer based foam core materials in use.

e. Metal Matrix Composites - A dispersion of reinforcing material, which may be short or long fibres or particulate in nature, in a metallic matrix. Examples; long fibre reinforcing materials include boron, graphite (carbon), alumina, and silicon carbide; short fibre materials are alumina, alumina-silica, silicon carbide and boron carbide; particulate reinforcing materials include alumina, tungsten carbide and yttria.

f. Ceramic Matrix Composites - A dispersion of reinforcing material, which may be short or long fibres or particulate in nature, in a ceramic matrix.

g. Bonded Structures - An assembly of a number of individual elements adhesively bonded, excluding sandwich structures. These include metal to metal, composite to composite, or combinations thereof.

2. Applicable NDT Methods and Techniques The NDT methods/techniques listed in Table 1 below are commonly applied to composite and bonded structures. The list is not all inclusive and training and qualification of NDT personnel using other methods/techniques must be considered by the Responsible Level 3 and incorporated in to the employers' written practice.

METHOD	TECHNIQUE
Ultrasonic Testing	<u>Automated immersion or modified immersion (Jet Rigs)</u> Reflector Plate C-Scan Through Transmission C-Scan Pulse echo (Phased Array) C-Scan Array probe (paintbrush) Pulse Echo C-Scan Pulse Echo B-Scan Pulse Echo Full Waveform Capture <u>Manual Contact</u> Pulse Echo A-Scan Through Transmission A-Scan (Air, dry & water coupled) Pulse Echo B-Scan Pulse Echo C-Scan Phased Array Array probe (paintbrush) <u>Non-linear techniques</u>
Low Frequency Acoustic Testing	Manual or instrumented Tap Testing Instrumented bond testers Resonance Pitch/Catch Mechanical impedance analysis (acoustic flaw detection) Eddy Sonic
Radiographic Testing	Film Computed Tomography Digital Radiography Computer Radiography Real Time In Motion Capture
Thermography	Flash Lock in Thermosonic/Vibro Pulsed/Passive LCD
Laser Shearography	Thermal activation (heat simulated) Vacuum activation (vacuum hood) Sonic activation
Laser Ultrasound	Techniques yet to be defined
Microwave	Techniques yet to be defined
Eddy Current Testing	Techniques yet to be defined

Table 1 – NDT Methods/Techniques

3. Requirements for Responsible Level 3s in NDT Training and Approval of Personnel  
UKNANDTB requirements for Responsible Level 3s for determining the required levels of additional training and certification is contained within the flowchart at Figure 1 below and the individual training needs scenarios within Figures 2 to 4.

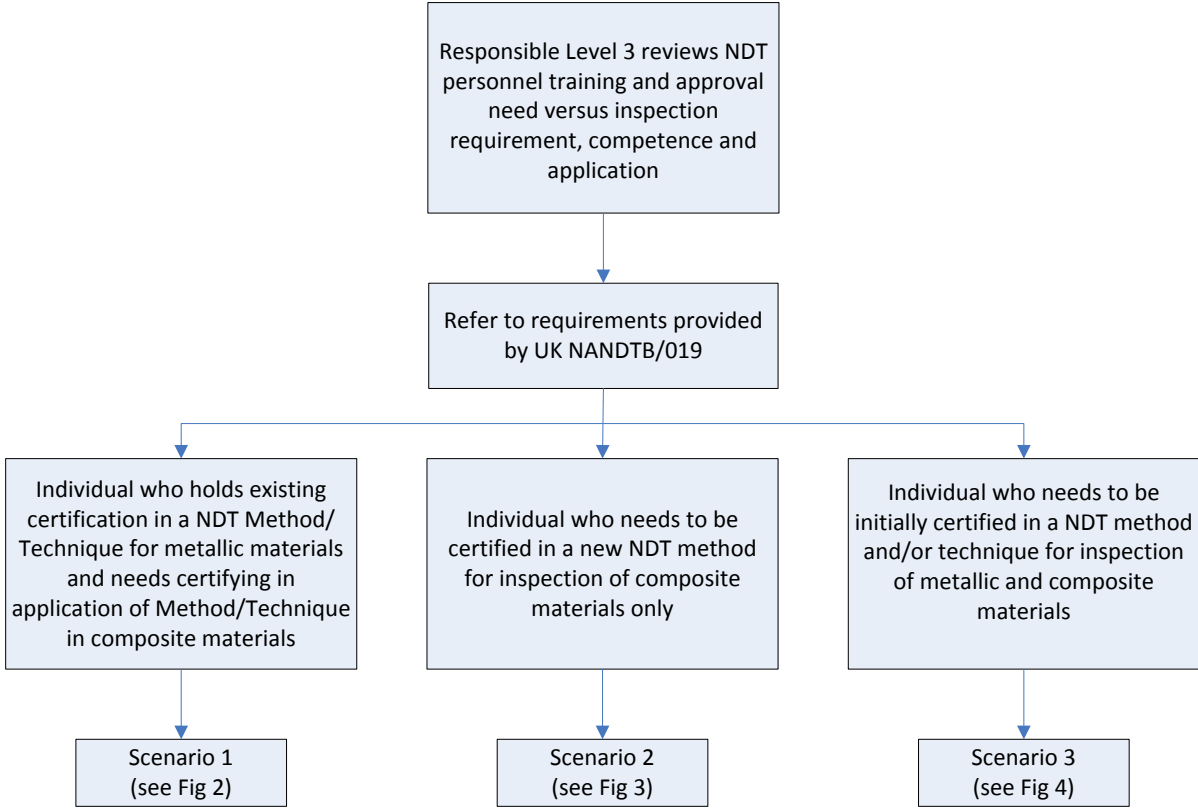


Figure 1 – RL3 Flowchart

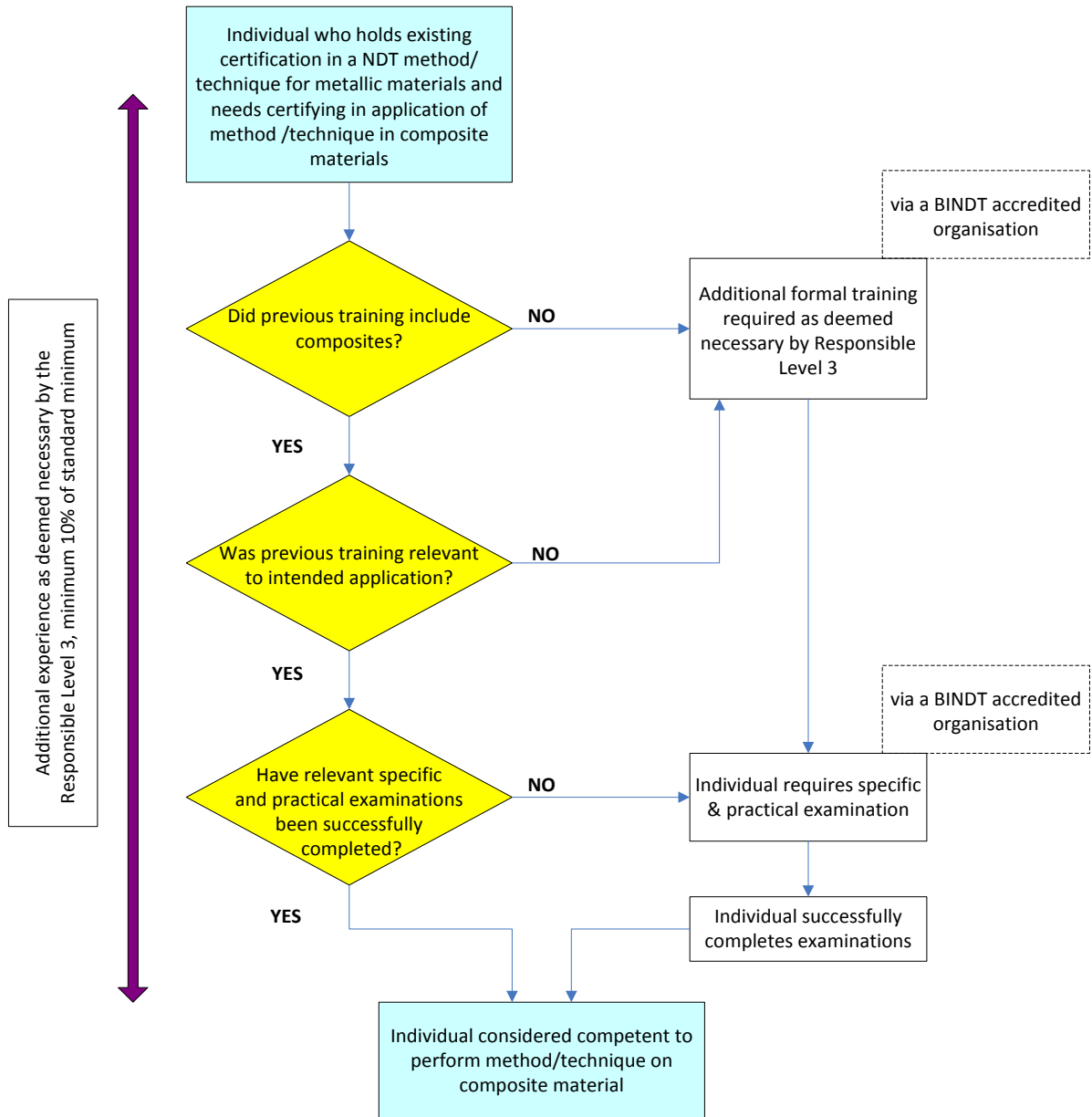


Figure 2 – Scenario 1

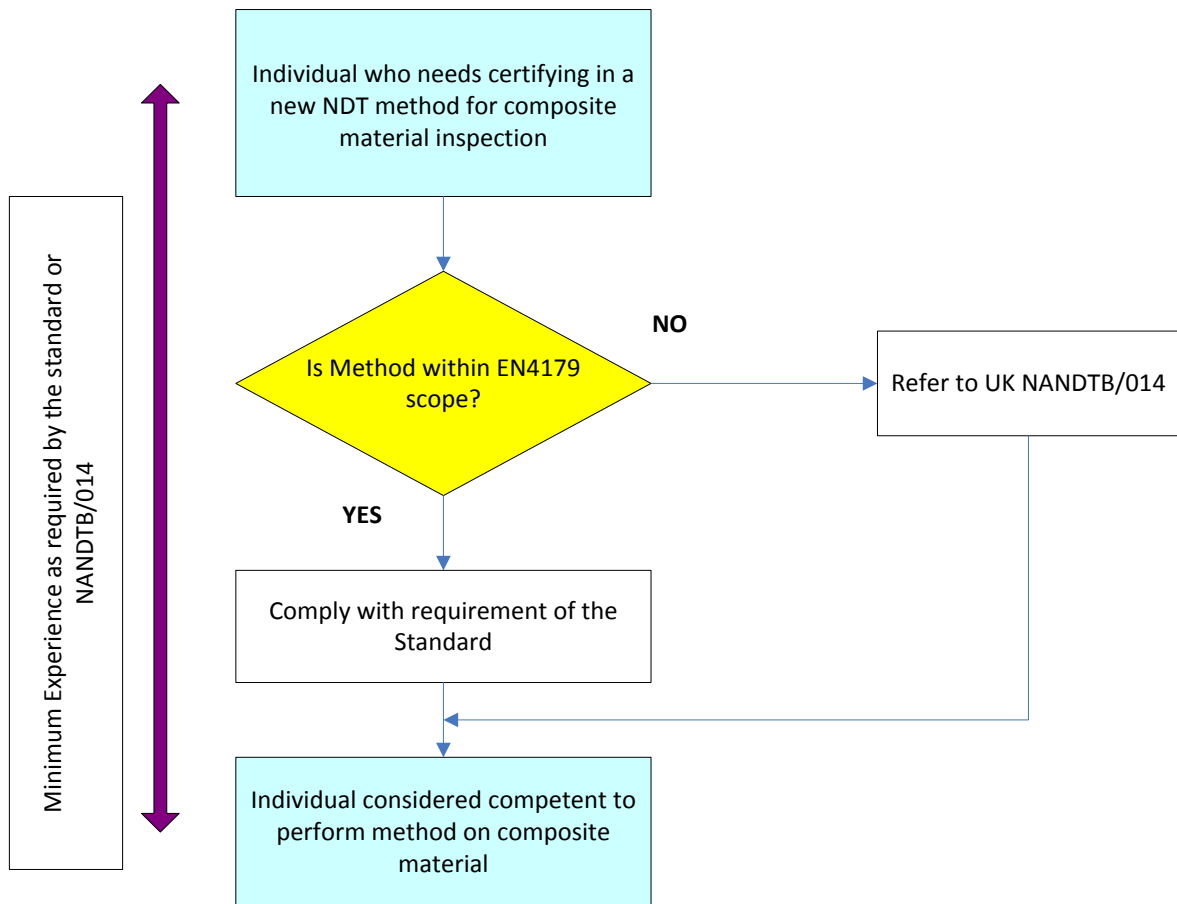


Figure 3 – Scenario 2

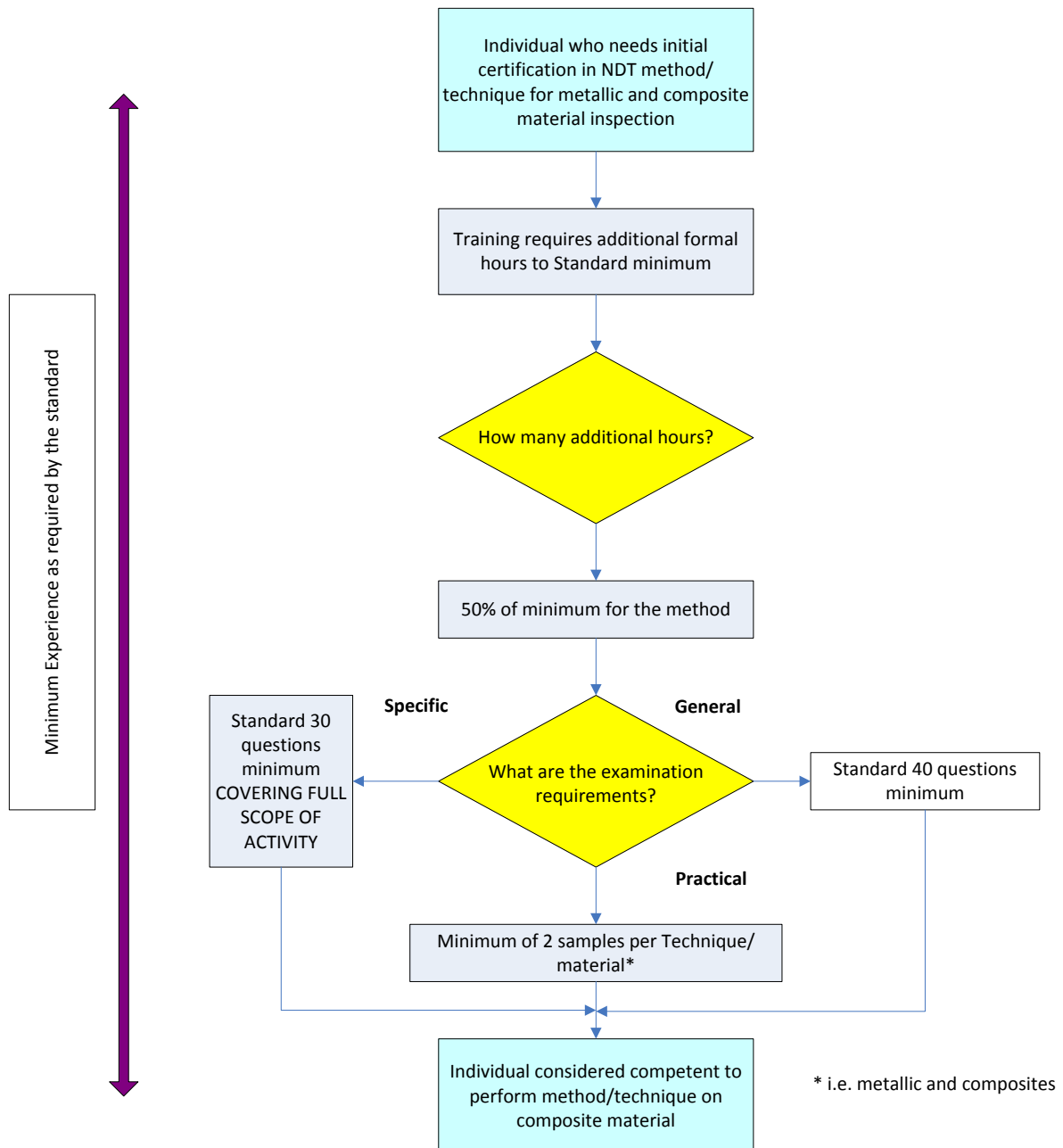


Figure 4 – Scenario 3

Signed for the Board



Jon Biddulph

Chairman of the NAndtB

Owner	Issue	Change Summary	Date
NANDTB	Issue 2	Added in re employer's written practice – paragraph 2	02-10-2012
NANDTB	Issue 3	Removal of the last paragraph referring to "supporting material" as the PP has now been withdrawn	15-03-2016