NANDTB 01 / DOCUMENT CONTROL

The Board Secretariat is responsible from the publication and control of the documentation which is approved by the Board. The following statements are the basics of the documentation methodology:

1. The Secretariat prepares new/revised publication according to Board's decision.
2. Drafts are reviewed, finalized and approved by the Board
3. All of the publications shall be signed by the Chairman on behalf of the Board.
4. Documents are published in Board website and kept in Board archive as a hard copy.

All documents shall include separate revision history including procedure number, issue number, revision summary, revision date.

Item No	Document No	Document Name	Issue/ Revision No	Initial Issue Date	Issue/ Revision Date
1	NANDTB 01	Document Control	04 / 00	23.01.2009	10.04.2025
2	NANDTB 02	Aims and Objectives	04 / 00	23.01.2009	10.04.2025
3	NANDTB 03	Constitution	04 / 00	23.01.2009	10.04.2025
4	NANDTB 04	Terms of Reference	03 / 00	23.01.2009	05.05.2022
5	NANDTB 05	Recognition	03 / 00	23.01.2009	05.05.2022
6	NANDTB 06	List of Board Members	03 / 00	23.01.2009	05.05.2022
7	NANDTB 07	Qualifications Requirements for NDT Personnel	03 / 00	23.01.2009	05.05.2022
8	NANDTB 08	Requirements for Approved Training and Examination Centers	04 / 00	23.01.2009	10.04.2025
9	NANDTB 08.A	Recommended Content for Training and Examination Centers Manual	03 / 00	23.01.2009	05.05.2022
10	NANDTB 08.B	NDT Training Syllabus	03 / 00	23.01.2009	05.05.2022
11	NANDTB 09	Audit Procedure of Training and Examination Centers	04 / 00	23.01.2009	10.04.2025
12	NANDTB 09.A	Application Form for Audit and Approval Procedure of Training and Examination Centers	04 / 00	23.01.2009	10.04.2025
13	NANDTB 09.B	Audit Criteria to be used on Audits of the Training and Examination Centers	04 / 00	23.01.2009	10.04.2025

Item No	Document No	Document Name	Issue/ Revision No	Initial Issue Date	Issue/ Revision Date
14	NANDTB 09.C	Sample of Certificate	03 / 00	23.01.2009	05.05.2022
15	NANDTB 10	Recognition of Examination Certificates	03 / 00	23.01.2009	05.05.2022
16	NANDTB 10.A	Application Form for Certification Equivalency	04 / 00	23.01.2009	10.04.2025
17	NANDTB 11	Relations between Turkish CAA and the Board	03 / 00	23.01.2009	05.05.2022
18	NANDTB 12	Audit Criteria to Be Used on Audits of the NANDTB-TR	04 / 00	23.01.2009	10.04.2025
19	NANDTB 12.A	NANDTB-TR Audit NCRs and Corrective Actions	03 / 00	23.01.2009	05.05.2022
20	NANDTB 13	List of Approved Training and Examination Centers	03 / 00	23.01.2009	11.11.2022

NANDTB 02 / THE AIMS AND OBJECTIVES

1. Satisfy the Turkish Aviation Authority requirement for a National Aerospace NDT Board as defined in EN 4179, **SHY-CA** and SHY-21.
2. Establish a system for recognition of organizations providing NDT trainings and qualification examinations according to EN 4179.
3. Audit, monitoring and authorizing the NDT Training and Examination Centers.
4. Be a member of the Aerospace NDT Board Forum and comply with ANDTBF/08.
5. Provide guidance to the National Aerospace Industry in the scope of NDT personnel certification.

NANDTB 03 / CONSTITUTION

1. Rules of the Board

a. The Board is composed of leading companies from national aerospace industry and military organizations.

b. The Board is recognized by the Turkish CAA.

c. The Board is consisting of minimum 5 member companies and limited to 10 member companies.

d. The Turkish CAA can nominate a person or persons to attend meetings of the Board with observer status.

e. The Board shall elect a suitably qualified person as Chairman.

f. The Board shall elect a suitably qualified person as Secretary.

g. The Board shall be operated in according to the Board documentation.

2. Rules of Membership

a. The Board members will be suitably qualified nominees from design, manufacturing or maintenance companies from aerospace industries as company representative.

b. The Board shall be limited to 10 members. Maximum 4 members from Prime Contractor, maximum 4 members from MROs and maximum 2 members from Training Centers. At least half of the current members shall be NDT Level 3, however all members shall have relevant aerospace knowledge.

c. The Board positions are open to the Turkish aerospace industry. Nominees are to be proposed by their employer by direct application to the Board Secretary. Application of a membership shall be agreed by the majority of the existing voting members. After the approval the new member, Member List is updated.

d. These member representatives shall be technically qualified individuals (Level 2 & Level 3 certification) with a minimum 5 years aerospace experience within last 10 years.

e. Membership of a company may be terminated where an organization no longer fulfils Membership criteria. Also, a member representative whose behavior is detrimental to the Board may be dismissed with a majority of not less than two-thirds of all the voting members. In this situation, a new member representative shall be requested from the member company.

f. The membership in the Board is free. The member companies shall carry the expenses for their collaboration on the Board.

g List of Board Members is given in NANDTB 06.

3. Organization and Responsibilities

3.1. Chairman

Only a voting member shall be elected as the Chairman. The members of the Board elect a Chairman by voting, for the duration of maximum 5 years. Re-election is possible. The Chairman;

a. Provide to carry out the scheduled actions of the Board.

b. Confirm the agenda and manages the meetings.

c. Sign the Training and Examination Centers' Certificates.

d. Responsible for the contacts with all authorities and other organizations.

3.2. Vice-Chairman

Only a voting member shall be elected as the Vice-Chairman. The members of the Board elect a Vice-Chairman by voting, for the duration of maximum 5 years. Re-election is possible. The Vice-Chairman;

a. Acts as a Chairman during absence of him/her.

b. Supports the Chairman in his/her activities.

3.3. Secretary

Secretary shall be elected and approved by the Board. Secretary may not be a voting member. The Secretary;

a. Send to all members the documents to be discussed and prepare the meeting agenda including the feedback from the members.

b. Arrange the meetings and announce to the members.

c. During the meeting take the necessary notes for minutes of meeting (MoM).

d. Prepare the MoM including decision and action. Distribute the MoM to all members.

e. Distribute the MoM to Turkish CAA to be issued in their website.

3.4. Members

a. The Board consists of members from the aerospace industry including manufacturing, MROs, NDT service providers, NDT training providers, and Turkish CAA.

b. The Board shall be limited to 10 members. Max. 4 members from Prime Contractor, max. 4 members from MROs and max. 2 members from Training Centers. At least half of the current members shall be NDT Level 3, however all members shall have relevant aerospace knowledge.

c. The Board positions are open to the Turkish aerospace industry. Nominees are to be proposed by their employer. Self-employed persons may be nominated by one of their contracting organizations. Members shall be elected and approved by the Board.

d. Only the members holding Level 3 certificate shall be a voting member.

e. **If a member company has not attended 2 consecutive meetings, then loses the voting member rights.**

3.5. Working Groups

Working Groups established to conduct work address actions on behalf of the Board shall be led by a Convenor or Chairperson. The Working Group will only remain in effect until the required work or action has been completed via a report to the Board. The duties and responsibilities of the Convenor are detailed in following paragraph.

Duties and Responsibilities of a Working Group Chairperson or Convenor

1. Call the meeting or meetings as required (face to face, telephone conference, WebEx etc.).
2. Prepare the agenda or discussion points for the meeting and send to Working Group members beforehand.
3. Make sure the deliverable is clear to all.
4. Designate a person to take notes if not one's self.
5. Capture the agreed outcome of the working Group, e.g. a PowerPoint presentation, document etc.
6. Present to agreed outcome of the Working Group to the Board Members at the next available meeting.

4. Rules for Meetings and Voting

a. The Board will meet at least twice per year.

b. Statements to be decided at a meeting shall be recorded by written documentation and distributed to the members by the secretary.

c. Only representatives of member organization qualified as Level 3 have a voting right as one vote. Observers do not have a voting right.

d. Approval of changes to the constitution (including the chairman election), working procedures, qualification and examination procedure shall be decided by a majority of not less than 2/3 those present at a meeting. Other matters shall be decided by a simple majority.

e. In the case of a tie, the Chairman will have the casting vote.

f. The execution of discussions and voting by email, telephone-conference or comparable media is allowed if it is guaranteed that all members get the same information.

5. Rules for Documentation

a. Secretariat publishes and controls the documentation approved by the Board for publication. All the documents shall be kept minimum 5 years by the Secretariat.

b. Minutes of Meetings shall be documented and issued by the secretary. All members attending the meeting shall sign the Minutes of Meeting.

c. Documents approved by the Board may be posted on the Board webpage.

6. Audit and Monitoring of the Board

a. The Board has obligations under the recognition by Turkish CAA to monitor and report on its the Schedule Functions described in the Board documentation.

b. The Board shall be audited by CAA in accordance with Audit Criteria to Be Used on Audits of the NANDTB-TR (NANDTB-12) which covers AFNDT Board Checklist (ANDTBF-14). Audit period shall be 2 years.

c. The Auditor will provide a written audit report of findings and observations to the Chairman as soon as practicable after its completion, not later than 10 days.

NANDTB 04 / TERMS OF REFERENCE

1. The concern of Turkish National Aerospace NDT Board (NANDTB) is to establish a system for authorization of organizations providing NDT trainings and qualification examinations in aerospace industry. In this scope, the main responsibilities of the Board can be stated as:

a. Auditing, monitoring, approving and authorizing the NDT Training and Examination Centers in line with EN 4179.

b. Be a member of the Aerospace NDT Board Forum and comply with ANDTBF/08 requirements.

c. Provide guidance to the National Aerospace Industry in the scope of NDT personnel certification.

2. The rational beyond the necessity of a board withstands to EASA AMC145. A.30(f)4. Turkish Civil Aviation Authority (CAA) recognizes Turkish Board with SHT-NDT procedure and audits the activities of the board periodically. Administrative rules such as membership, organization, responsibilities and voting rules are defined in NANDTB 03.

3. The Board is a nonprofit volunteer organization. Neither the Board nor the members shall carry any financial liability for activities performed for the Board. In addition, the members shall not be liable for any damages resulting, or claimed to have resulted, from board the activities.

NANDTB 05 / RECOGNITION

The Board is recognized by the Directorate General of Civil Aviation (DGCA) (within SHT-NDT para 1-(3)) and is a member of the Forum of National Aerospace NDT Boards (ANDTBF).

NATIONAL AEROSPACE NDT BOARD

NANDTB 06 / LIST OF BOARD MEMBERS

Web Page : www.ndtboard-tr.org

Member Organisation	Representative's Information					
	Name, Surname	Status	Vote	Title	e-mail	Telephone

NANDTB 07 / QUALIFICATIONS REQUIREMENTS FOR NDT PERSONNEL

1. QUALIFICATION

a. Qualification of NDT personnel shall be fulfilled according to EN 4179.

b. Formal Trainings of NDT personnel shall be given by an Approved Training Center.

c. NDT qualifications shall be based on a NDT syllabus acceptable to the Board, and this applies to all levels of qualification subject to recognition by the Board.

d. NDT personnel who can't satisfy the requirements of the training and examination performed by the Approved Training Center can't be involved in any NDT activities defined in EN 4179.

e. Qualification administered by Outside Agencies in other countries is recognized if the outside agency has the formal approval of an NANDTB which is recognized by EASA and a full member of European Aerospace NDT Board Forum and provides the compliances with the minimum requirements of EN 4179. This is applicable only if the qualification is performed at the approved facility of the Outside Agency. When an Outside Agency from other countries provides qualification service in Turkey it shall be evaluated by the Board.

2. EXAMINATIONS

2.1. Introduction

a. All qualification examination shall satisfy the EN 4179. The Board uses EN 4179 as the standard for the examination of NDT personnel. The Turkish Civil Aviation Authority recognizes EN 4179 and will consider other standards on application.

b. The Turkish Civil Aviation Regulations permit the Approved Training organization to train and examine the NDT personnel who work in Turkish Aviation Industry, provided it is under the control of Approved Training organization's Responsible NDT Level 3. This procedure includes guidance for Training organizations that provide examinations and have them endorsed by the Board.

c. If the examination result is to be recognized by the Board, examination process must be in according with this procedure. Also, NDT examinations shall be based on a NDT syllabus acceptable to the Board, and this applies to all levels of examinations subject to recognition by the Board.

d. Even if the Qualification examination of the NDT personnel is performed by the Approved Training Center, certification is under the responsibility of the Employer.

2.2. Recognized Examination Centers

a. Organizations which are approved by the Board as Approved Training Center will have been audited and have administrative controls in place which will satisfy this procedure.

b. Recognition as an Approved Training Center includes recognition to administer examinations.

c. The Board requires examinations to contain at least 50% relevant aerospace specific NDT questions as well as general method questions.

2.3. Employer' Provided Examinations

Recognition of examinations by the Board is mandatory. Turkish CAA doesn't permit the Employer's Responsible Level 3 to carry out NDT training and examinations without Recognition of Training and Examination Center, except the conditions described in document NANDTB 10. In case of using this privilege employer's Responsible Level 3 shall provide all specific and practical examination requirements which are described in Application Form for Certification Equivalency (NANDTB 10.A) to the Board.

2.4. Candidates

Candidates should have completed the NDT training requirements of EN 4179, and the employer's Written Practice before undertaking examinations.

2.5. Examiners

Examiners grading the examination shall be Level 3 qualified in the method(s) examined. The examiner must be familiar with the governing regulations, the employer's written practice, procedures, inspection methods and products relevant to the candidate's work. Level 3 examiner services may be contracted provided they meet the above requirements.

2.6. Examination Procedure

Examination procedure shall minimum fulfill the EN 4179 requirements.

2.6.1. Questions

Examination format and questions shall conform to EN 4179.

2.6.2. Duration

The duration of the examination shall be determined by the examination source and stated on the examination paper.

2.6.3. Permitted Aids

The permitted aids shall be determined by the examination source and stated on the examination paper.

2.6.4. Invigilation

All examinations shall be taken under supervision to ensure candidates have fair access to approved aids and are not subject to interference of any kind.

2.6.5. Cheating

Candidates who use prohibited aids, cheat or attempt to cheat shall be recorded a failure result.

2.7. Security of Examination Material

Prepared examinations shall be securely stored before use and candidates may not review examination questions outside the time allocated for the examination. Practical samples used during training shall not be used for examination.

2.8. Assessment of Examinations

Assessment, scoring and reporting of results shall be carried out in accordance with EN 4179.

2.9. Re-Examinations

2.9.1. Additional Training

Candidates who have failed an examination may only repeat the examination after documented additional training which addresses the deficiency.

2.9.2. Second Failure

If an examination has been repeated and failed a second time, the Responsible Level 3 shall stipulate conditions or training which must be satisfied before the examination may be undertaken again.

2.10. Examination Results

a. Examination results and/or certificates shall be issued by the Examining Organization to every candidate who has passed the examination. The certificate shall contain the following:

(1) Name of the Examining Organization,

(2) Name of the candidate,

(3) Statement that the examination meets EN 4179 requirements,

(4) NDT method and level (or specific inspection technique),

(5) Date of issue of the certificate,

(6) Signature of the examiner or the organization's authorizing person.

b. No certificate will be issued for parts of an examination.

c. Announcement of the training and examination results is under the responsibility of Approved Training and Examination Centers in duration of 15 calendar days after the exam(s).

2.11. Withdrawal during the Examination

If a candidate withdraws during the examination, a failure result shall be recorded.

2.12. Withdrawal before the Examination

If a candidate is unable to start the examination because of illness or for some other unavoidable circumstance, the candidate shall be recorded no result. The examiner will assess the circumstance using fairness and good judgment.

2.13. Examination Records

a. For each candidate, a record shall be kept of the examination result by the Responsible Level 3/Examiner of the Approved Training Center.

b. The examination record shall include all written papers, marking, examiner comments and results. These shall be retained by the Approved Training Center for a minimum of 10 years and protected against unauthorized access. Results of examinations may only be released by permission of the candidate.

c. Results of all examinations and the examination documents,

d. Details of the test samples, plant and equipment used by the participant in the practical examination shall be recorded.

NANDTB 08 / REQUIREMENTS FOR APPROVED TRAINING AND EXAMINATION CENTERS

1. Definitions of Training and Examination Center

Outside Agency

An independent company or organization outside the employer who provides NDT services to implement the requirements of this standard, such as training and examination of NDT personnel. Consultants and self-employed individuals are included in this definition.

Inside Agency

Internal Training Department of a company. An Inside Agency cannot provide initial formal method training unless NANDTB Approved Training Organization approval is held.

2. Management and Personnel

2.1. Organization

There shall be a clear organizational structure showing lines of responsibility and communication, including identification of personnel in management and other relevant positions. The level of decision making and management is understood and implemented at all levels of the organization. The training provider shall have documents showing that it is a legal entity.

2.2. Responsible Level 3

a. The training provider shall state the Responsible Level 3 for the qualification and re-qualification of NDT personnel.

b. Stated The Responsible Level 3 shall fulfills the requirements of EN 4179 and this Manual.

2.3. Training Coordinator

Providers of training and/or examinations shall appoint a coordinator to be responsible for the conduct, supervision and administration of the NDT training courses and continued education in NDT. The Training Coordinator shall be Level 3 per EN 4179 and have an appropriate level of knowledge of the inspection techniques, materials, types of construction, manufacturing processes, products etc. specific to the aerospace industry. The Training Coordinator shall be the point of contact for the Board and have overall responsibility for ensuring compliance with Board requirements. The Training Coordinator may also be substituted for the Responsible Level 3.

2.4. Quality System Manager

Quality System Manager is responsible for preparing the Quality System Documents and Procedures. Each Approved Training Center shall maintain a Quality System Manager who has a minimum 2 years' experience in quality systems. Also, Quality System Manager shall be familiar with NDT methods and Human Factors.

2.5. Number of Instructors

The Training Organization shall have enough instructors to ensure that at least one instructor is presented during the training.

All instructors shall be designated by the Responsible Level 3 and the scope of their authorization shall be specified in the manual.

2.6. Qualification and Experience of Instructors

Instructors shall be qualified as minimum Level 2 under the authority of Responsible Level 3. Instructors shall have at least 5 years' experience and an appropriate level of knowledge of inspection techniques in the aerospace industry. The personnel giving practical instruction shall have experience of testing in the aerospace industry and be well informed of technical progress in the field. All training personnel shall be recognized/reported/informed to the Board. Instructors shall be well informed in Human Factors and new training technologies, etc.

3. Requirements for the Conduct of Courses

Training shall include general, specific and practical instruction in the methods and procedures for which application has been made. The specific training may be the responsibility of the employer. The subject matter shall include the relevant inspection procedures, instruction sheets, specifications, standards etc. The depth of knowledge shall be appropriate for the level of personnel and conform to the NDT syllabus recognized by the Board, including sufficient time in practical application.

4. Training and Examination Center NDT Manual

a. Each Training and Examination Center shall prepare an NDT Manual according to the minimum requirements stated in NANDTB 08.A. **The manual shall be approved by Responsible Level 3.**

b. Training and Examination Center NDT Manual shall be evaluated and approved by the Board.

5. Requirements for Training

5.1. NDT Syllabus

Approved Training and Examination Centers shall provide the NDT syllabus on which each course is based. Training Outlines shall minimum fulfill the EN 4179 requirements. The training program shall cover at least the NDT syllabus recognized by the Board. The NDT syllabus recognized by the Board is the baselines for a general training course in the methods (NANDTB 08.B). The content of training courses shall take the specific requirements of the aerospace industry into account and be made available to the participants in the form of a detailed course document. International and manufacturer's own aeronautical standards and specifications shall be taken into account.

5.2. Control of Training Specimens

There shall be a system to ensure that specimens used during examination have not been used during the training. The test specimens used during training shall not be used during examination. Specimens shall be stored safely.

5.3. Control of Course Documents

The Training Organization shall keep a "control" on the set of course documents. These are to be revised as necessary, with revision dates clearly identified on the material.

5.4. Revision of Documents

Employees who prepare NDT course documents shall be competent for such work. The Training Coordinator shall ensure that they are appropriately qualified.

6. Facilities

6.1. Training Facility

Training Center facility shall minimum fulfill the EN 4179's requirements. The facilities used for training shall conform to all the relevant legal provisions (OH&S, Radiation Safety, Hazardous Substances etc.). Additionally, the classrooms used for the course and those in which practical work takes place, shall have adequate lighting and ventilation. They shall be suitably equipped with teaching materials such as board, flip charts, projectors etc.

6.2. NDT Plant and Equipment

NDT Plant and Equipment shall minimum fulfill the EN 4179's requirements. Sufficient NDT plant and equipment shall be available, including instruments and accessories and reference pieces to cover the range of inspection techniques within the procedures taught, and to occupy all the participants in the course. The type of NDT plant and equipment provided shall reflect the nature of the equipment used by the participants in their normal working environment and shall also be in keeping with the type of product concerned. Suitable PPE shall be available as required The Training Organization shall have a system of inspecting and calibrating NDT plant and equipment.

6.3. Test Samples

Samples used for training shall be available in sufficient number and complexity to cover the whole range of applications within the curriculum. There shall be a sufficient number of representative test samples specific to the aerospace industry and containing natural or artificial faults to cover the whole range of testing. Examples of the airframe are the skin joints, parts of the landing gear and typical composite structures. Examples of the power plant include turbine blades, rotor discs, castings, gear box parts etc.

6.4. Certificates

Participants who have satisfactorily completed a training course by passing the theoretical and practical examinations shall be issued with a certificate confirming that they have completed their NDT training successfully. Certificates shall minimum include:

- Name Surname
- Applicable Standard and/or Written Practice
- Method, Technique (If any)
- Level
- Examination Date
- Expiration Date
- Certificate Number
- Certificate Issue Date
- Approval of Responsible Level 3
- Notice stating the Approval of the Board

Also, separate documents shall be issued for Training including;

- Name Surname
- Applicable Standard and/or Written Practice
- Method, Technique (If any)

- Level

- Training Date(s)
- Certificate Number
- Certificate Issue Date
- Approval of Responsible Level 3
- Notice stating the Approval of the Board

Also, separate documents shall be issued for Exams (General, Specific and Practical) including;

- Name Surname
- Applicable Standard and/or Written Practice
- Method, Technique (If any)
- Level
- Exam Date(s)
- Exam Grades
- Certificate Number
- Certificate Issue Date
- Approval of Responsible Level 3
- Notice stating the Approval of the Board

7. Training Records

7.1. Participant Training Records

The records of every participant in the courses shall be kept in a safe place and considered confidential for at least 10 years and be updated if required. They shall contain as a minimum;

a. Dates of training and completion of training,
b. Name of the course in which the candidate took part,
c. Instructors delivering the training,

7.2. Training Personnel Records

Records of instructors shall be kept whilst employed and for at least 10 years following. There shall be a system for updating and checking the status of all records with respect to the individual's.

a. Experience,
b. Qualifications,
c. Approvals,
d. Special training and continued education.

NANDTB 08.A / RECOMMENDED CONTENT FOR TRAINING AND EXAMINATION CENTERS MANUAL

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1.1. Penetrant Testing (PT)

1.1.1. PT General

PT - General (1/3)		
Principles	Physical principles	Surface tension
		Wetting
		Capillarity
	Penetrant systems	Penetrants
		Remover
		Developer
		Classification of penetrants
Cleaning	Precleaning Procedure	Types of precleaning
	Mechanical precleaning	Abrasive Blast
		Grinding, Sanding, Brushing
		Impact of the mechanical precleaning
		Removal of Material Smearing
		Impact on the figures after grinding
		Impact on the figures after shot peening
	Chemical precleaning	Acid cleaning
		Watery degreasing
		Solvent Cleaning
		Vapor Degreasing
		Electrolytic cleaning
		Ultrasonic Cleaning
		Paint stripping agent
Process of testing	Penetration procedure	Temperature requirements as per standards
		Penetrant application
		Wetting
		Dwell time
		Factors influencing penetrant dwell time
		Dipping time, drain time
	Penetrant removal	Factors influencing penetrant removal
		Water
		Lipophilic emulsifier
		Solvent
		Hydrophilic remover
	Drying	Drying process after precleaning
		Drying process after penetrant removal

PT - General (2/3)		
Process of testing (continue)	Developing	Dry developer
		Water soluble developer
		Water suspended developer
		Solvent based developer
		Special developer
		Developer Dwell
		Comparison of Developers
	Radiation facilities	UV-A lamp
		Examination conditions
		Measuring tools for illumination and radiation
Viewing	Characteristic of human eye	Acuity performance
		Ability to discriminate colour
		Contrast sensitivity
		Brightness adaptation
		Astigmatism
Selection of penetrant	Classification of penetrant	Very low
		Low
		Medium
		High
		Ultra high
Control of penetrant characteristics	Penetrant testing as per EN ISO 3452-2	Sample test
		Batch testing
		Monitoring by the user
	Characteristics to be tested	Density
		Wetting/ marginal angles
		Viscosity
		Flashpoint
		Vapour pressure
		Color
		Brightness
		Water tolerance
		Removability
		UV-Resistance
		Corrosive components
		Characteristics of developer

PT - General (3/3)		
Control of penetrant process	System performance check	Reference test block EN ISO 3452-3
		PSM star burst panel
		Storage of reference test block
	Additional testing of penetrant materials	Inspection booth checks
		Surface wetting test
		Penetrant rapid brightness test
		Lipophilic emulsifier removability test
		Hydrophilic remover refractometer test
		Hydrophilic remover hydrometer test
		Remover quick test for penetrant contamination
		Hydrophilic remover performance check
		Dry developer contamination test
		Water-suspended developer concentration test
		Water pressure and temperature check
		Measurement of black light intensity
Evaluation and reporting of testing instructions	Detectable defects on different materials	Related and non-related indication
		Inspection of non-metallic material
		Inspection of ceramic materials
		Inspection of composite
Safety	Product related risks	
	UV-related risks	
	Environmental waste water management	
Quality assessment	Procedures and standards	National and international standards
	Construction concept	Safe live
		Fail safe
		Damage tolerance
	Comparison to other NDT methods	Limits of PT inspections
		Detectable flaw size
		Other NDT procedures
	Documentation	Issue of inspection procedures
		Inspection reports
	Personnel requirements	

1.1.2. PT Specific

PT - Specific		
Airframe	Crack and corrosion detection in	Fittings and lugs
		Bolts
		Landing gear
		Rods
		Links
		Structure
		Skin
Engine	Crack detection in	Pins
		Gears
		Mounts
		Bolts
		Shafts
		Cases
		Blades
		Discs
		Slots
		Bores
Components & Reworked parts	Crack detection in	Wheels
		Pins
		Gears
		Mounts
		Bolts
		Shafts
		Cases
		Blades
		Discs
		Slots
		Bores

1.2. Magnetic Particle Testing (MT)

1.2.1. MT General

MT - General (1/4)		
Principles	Basic Principles	
Physical principles of magnetic particle inspection	Electrical parameters	Volt
		Current
		Frequency
		Electrical resistance
		Phase
		Electrical resistance
		Effect of electrical current
		Ohm's Law
		Circuit diagrams
		Direct current
		Alternating current
	Magnetical parameters	Ferromagnetism
		Magnetic fields
		Magnetic lines of force
		Magnetic field strength
		Permeability
		Magnetic flux
		Magnetic flux density
		Hysteresis
		Required field strength
	Electromagnetic induction	Transformation
		Skin effect
	Magnetic fields on electrical conductors	Field strength
		Flux density in and around electrical conductors
	Ferromagnetic materials in magnetic fields	
	Evidence of adequate field strength	Hall-effect gauss meter
	Combined procedures	Combination of two constant magnetic fields
		Combination of constant and alternating magnetic fields
		Combination of two alternating magnetic fields
		Phase shifted alternating magnetic fields
	Demagnetization	

MT - General (2/4)		
Magnetization	Principles of magnetization technique	Field Direction
		Field strength
		Magnetic field orientation and flaw
		Detectability
		Yoke magnetization
		Coil magnetization
		Circular magnetization with prods
		Circular magnetization with direct contact
		Circular magnetization with induced current
		Circular magnetic fields distribution and intensity
		Current amperage for the direct contact
		Longitudinal magnetization
		Cable wrap technique
		Current amperage for the longitudinal magnetization
		Method of current application
		Continuous application technique
		Residual application technique
		Combined techniques
Testing equipment and utilities	Equipment	Portable equipment
		Stationary equipment
		Demagnetization coils
	Test products	Wet-Bath method
		Dry particles
		Dry method or wet method
		Fluorescent and colored test products
		Visible particles or fluorescent particles
		Preparation of testing suspension
	Test blocks and tools	Test block for systems performance
		Test block for equipment performance

MT - General (3/4)		
Testing equipment and utilities (continue)	Tangential field strength measurement	Field strength measuring instrument
		Field indicators
		Hall-effect (gauss/tesla) meter
		Quantitative quality indicator
		Pie gage
		Berthold test block
		Test block for magnetization control
	Radiation facilities	UV-A lamp
		Examination conditions
		Measuring tools for illumination and radiation
Procedure monitoring	Illumination and radiation measurement	UV-A radiation measurement
		White light measurement
Viewing	Characteristic of human eye	Acuity performance
		Ability to discriminate color
		Contrast sensitivity
		Brightness adaptation
		Astigmatism
Evaluation and reporting of testing instructions	Evaluation	
	Assessment	
	Producing an indication	
	Interpreting the indication	
	Evaluating the indication	
	Non-relevant indications	
	Magnetic writing	
	Cold working	
	Abrupt changes of section	
	Elimination of non-relevant indications	
	Inspection protocol	
	Structure of inspection procedure	
	Case studies	
	Standards	
	Inspection instructions	
	Company internal regulations	
Material science	Defects during manufacturing process	Inclusion
		Porosity
		Cracks
		Pipe
		Blowholes
		Segregation

MT - General (4/4)		
Material science (continue)	Defects during machining process	Roll and forging flaws
		Turning and grinding flaws
		Flaws through hardening process
	Flaws through operation	Cracks
		Corrosion
Safety	Electrical hazards	
	Product related risks	
	UV-related risks	
Process Control	General description	
	System effectiveness check	
	Ammeter check	
	Quick break test	
	Dead weight check	
	Particle concentration test	
	Particle contamination tests	
	Lighting requirements	
Quality assessment	Construction concept	Safe live
		Fail safe
		Damage tolerance
	Comparison to other NDT methods	Limits of MT inspections
		Detectable flaw size
		Other NDT procedures
	Documentation	National and international standards
		Issue of inspection procedures
	Personnel requirements	

1.2.2. MT Specific

MT - Specific		
Airframe	Crack and corrosion detection in	Fittings and lugs
		Bolts
		Landing gear
		Rods
		Links
Engine	Crack detection in	Pins
		Gears
		Mounts
		Bolts
		Shafts
		Cases
Components & Reworked parts	Crack detection in	Tubes
		Welded parts
		Bolts
		Gears
		Shafts
		Cases

1.3. Eddy Current Testing (ET)

1.3.1. ET General

ET - General (1/3)		
Physic and fundamentals of eddy current	Electricity	Direct current; current and voltage
		Resistance
		Conductance
		Ohm's law
		Resistivity
		Conductivity
		Conductivity values for some metals
		Alternating current; sinusoidal current and voltage
		Amplitude
		Frequency
		Period
		Phase
		Vector representation
		Other periodic currents
	Magnetism	Magnetic field
		Lines of force
		Magnetic field strength
		Permeability
		Flux density (Induction)
		Flux, hysteresis loop
		Reluctance
		Magneto-motive force
		Diamagnetism
		Paramagnetism
		Ferromagnetism
	Electromagnetism	Magnetic field created by a current (wire, coil)
		Electromagnetic induction phenomenon
		Inductance
		Self inductance
		Inductive reactance
		Mutual induction
		Electromagnetic coupling
		Induced currents and secondary field
		Lenz's law
		Eddy current distribution in conducting materials
		Planar wave; standard depth of penetration
		Amplitude, phase

ET - General (2/3)		
Physic and fundamentals of eddy current (continue)	Electromagnetism (continue)	Cylindrical conductors; characteristic frequency
		Skin effect
		Penetration depth
	Impedance plane diagrams	Impedance
		Complex plane representation
		Influence of conductivity
		Influence of frequency
		Influence of permeability
		Influence of probe clearance
		Influence of thickness
		Influence of an on-conductive coating on conductive material
		Influence of a through defect
		Influence of internal defects
Eddy current equipment	ET Probes	Design of probes (Mechanical and electrical)
		Operation of probes (Absolute, differential)
		Use of probes (Pencil, borehole, sliding, etc.)
		Connections of probes with ET unit
	ET instruments	Display modes; needle, digital display
		Instrument modules
		Operating principle
		Signal excitation, reception, processing
		Compensation
		Wheatstone bridge
		Filtering; LPF, HPF, BPF
		Single frequency
		Multi frequency
	Reference standards	Design
		Production
		Storage
		Difference to real defects
Eddy current applications	ET Testing	Conductivity
		Material sorting
		Overheat damage
		Material identification
		Thickness of an on-conductive coating on conductive material
		Influence of temperature
		Influence of inspection speed
		Manual inspections
		Automated inspections
		External influence during ET testing
		Crack inspection

ET - General (3/3)		
Eddy current applications (continue)	ET Testing (continue)	Corrosion inspection
		Sliding probes
		Array applications
Quality assessment	Construction concept	Safe live
		Fail safe
		Damage tolerance
	Comparison to other NDT methods	Limits of ET inspections
		Detectable flaw size
		Other NDT procedures
	Procedures and standards	National and international standards
	Documentation	Issue of inspection procedures
		Inspection reports
	Personnel requirements	

1.3.2. ET Specific

ET - Specific		
Airframe	Paint thickness measurement	On metallic structure
	Cracks	Surface (HFEC)
		Subsurface (LFEC)
		Array applications
		Cracks in multilayered structure
		Cracks in riveted structure
		Bolt hole
	Material Characteristics	Conductivity
		Material sorting
		Overheat damage
		Material identification
	Corrosion detection	Single layer
		Multilayered structure
		Bolt holes
		Array applications
	Crack and discontinuous detection in	Fittings and lugs
		Fastener holes
		Riveted structures
		Bolts
		Tubes
		Multilayered structure
		Welded structure
		Wrought materials
		Forged materials
Engine	Crack detection in	Blades
		High energy rotating hardware (disc, shafts, blade slots)
		Stators
		Welded parts
		Wrought materials
		Forged materials
		Cast materials
		Automated systems
Components	Crack detection in	Wheels
		Tubes
		Welded parts
		Bolts
		Gears
		Automated systems
	Conductivity	Heat treatment
		Overheat damage

1.4. Ultrasonic Testing (UT)

1.4.1. UT General

UT - General (1/4)		
Basic principles of acoustics	Mathematic basics	
	Frequency, velocity and wavelength	
	Different acoustic waves	Long-waves
		Shear-waves
		Surface-waves
		Plate-waves
Generation of UT-waves	Generation	Piezoelectricity and types of crystals
		Frequency-crystal thickness relationships
		Conversion efficiencies of various crystals
	Characteristics of search units	Construction of ultrasonic search units
		Damping and resolution
	Sound beam	Sound beam characteristics
		Beam intensity characteristics
	Ultrasonic equipment	Broadband/Small band signal
		Beam divergence
		Near and far zones
		Attenuation
		Impulse form and repetitions Frequency
Propagation of UT-waves	Acoustic impedance	
	Reflection/Transmission	
	Phase inversion	
	Angle beam	
	Refraction	
	Wave transformation	
	Critical angle	
Propagation of UT-waves (continue)	Wave propagation in material and gas	
	Wave propagation in liquids	
UT methods	Contact testing	
	Immersion testing	
	Through transmission	
	Pulse-echo	
	Dual transducer	
	Angle beam	
	Phased arrays	

UT - General (2/4)		
UT Systems	Equipment	Analogue
		Digital
		Phased array (PAUT)
		Thickness gages
	Transducer	Straight beam transducers
		Dual transducers
		Angle beam transducer
		Phased array transducers
		Focused transducers
	Wedges	
	Couplants	
	Reference standards	Standardized reference standards
		Specific reference standards
	Cables	
Displays	A-scan	
	B-scan	
	C-scan	
	D-scan	
	Sector-scan	
Influence of part	Influence of surface/geometry	Surface roughness
		Concave/Convex surfaces
		Object geometry
		Wave transformation
		Triangle reflection
		Angle reflection
	Influence of material properties	Sound absorption
		Acoustic noise
		Diffusion
		Signal to noise ratio (SNR)
		Improvement of SNR
Calibration	Artificial defects	Flat bottom holes
		Cross holes
		Groove
		Ball reflector
		Variation of sound distance
		Variation of artificial defect
		Different defects
	Calibration and functional tests	Calibration standards
		Sensitivity
		Depth compensation
		Functional tests
		Analysis of probe data
		Redundancy checks

UT - General (3/4)		
Evaluation	Evaluation of indication	Display indications (True/false)
		Defects dependency
		Location of defects
		Depth of defects
		Half-value methods
		Loss of back wall signal
		Composition with artificial defects
		Evaluation with tables
		Detectable flaw size
		Discontinuity orientation
		Discontinuity spacing
		Types of discontinuity indications
		Delaminations
Quality assessment	Construction concept	Safe live
		Fail safe
		Damage tolerance
	Comparison to other NDT methods	Limits of UT inspections
		Detectable flaw size
		Other NDT procedures
	Procedures and standards	National and international standards
	Documentation	Issue of inspection procedures
		Inspection reports
	Personnel requirements	
UT applications	Castings	
	Forgings	
	Bars	
	Rolled sheet and plate	
	Testing pipe and tubing	
	Welds	
	Determining discontinuity location	
	Thickness measurement	
	Use of shear wave	
	Use of surface waves (Rayleigh waves)	
	Use of plate waves (Lamb waves)	

UT - General (4/4)		
Ultrasonic inspection process controls	Needs for process controls	
	System (Equipment) checks	Vertical linearity
		Inspection system sensitivity check
		Horizontal linearity
		Entry surface resolution
		Back surface resolution
	Angle Beam Checks	Angle beam point-of-incidence
		Angle beam point-of-incidence
		Angle beam angle determination
		Angle beam misalignment

1.4.2. UT Specific

UT - Specific (1/2)		
Airframe	Thickness measurement	Corrosion measurement
		Wall thickness measurement
		On metallic structure
		On composite structure
	Delamination	CFRP
		GFRP
		Glare
	Water ingress in honeycomb structures	
	Debonding	Honeycomb structure
		Glare
		Metallic structure
	Imperfections in composites	Blowholes
		Porosity
		Inclusions
	Crack and discontinuous detection in	Fittings and lugs
		Fastener holes
		Riveted structures
		Bolts
		Tubes
		Multilayered structure
		Welded structure
		Wrought materials
		Forged materials
		Other applications (glass, plastics)
Engine	Crack detection in	Blades
		High energy rotating hard ware (disc, shafts, blade slots)
		Stators
Engine (continue)	Crack detection in (continue)	Welded parts
		Wrought materials
		Forged materials
		Cast materials
	Thickness measurements	
	Delamination	Composite blades

UT - Specific (2/2)		
Composite	Delamination	CFRP
		GFRP
		Glare
	Water ingress in honeycomb structures	
	Debonding	Honeycomb structure
		Clare
	Imperfections in composites	Blowholes
		Porosity
		Inclusions
Components	Crack detection in	Wheels
		Tubes
		Welded parts
		Bolts
		Gears
	Delamination	CFRP
		GFRP
		Glare
	Water ingress in honeycomb structures	
	Debonding	Honeycomb structure
		Clare
	Imperfections in composites	Blowholes
		Porosity
		Inclusions

1.5. Radiographic Testing (RT)

1.5.1. RT General

RT - General (1/6)		
Theory, Physics	Introduction	History
		Philosophy
		Capabilities
		Process of radiography
		Types of electromagnetic radiation sources
		Electromagnetic spectrum
		Penetration ability or quality of x-rays and gamma rays
		X-ray tube
	Principles of radiography	Electromagnetic spectrum
		Significance of wavelength
		Theory, physics
		Characteristics and key properties
		Interaction; absorption and scatter
		Nature and properties of x-rays
		Interaction x-rays/materials
		X-rays absorption, attenuation coefficient
		Radiography principle
	X-rays generation	Generation principles, spectrum of radiation
		X-ray tubes up-to 420kV
		X-rays accelerator
	Gammagraph	Energy spectra
		Isotope source strength
		Isotope source focal spot size
		Isotope source decay characteristics
		Isotope source sensitivity
		Energy and equivalent energy
		Isotope requirements
		Characteristics and merits of isotopes
		Half-value layer
	Image formation	Rectilinear propagation
		Affecting factors
		Inverse square law consideration
		Types and choice of film
		Types and uses of screens

RT - General (2/6)		
Theory, Physics (continue)	Radiographic film	Radiation quality
		Effect of changing kV
		Significance and effect of type of x-ray source
		Effect of time
		Milliamperage and FFD on exposure
		Exposure charts
		Identification, marking out and sitting up
		Intensifying screens role and use
		Filters
Equipment	X-ray machine	
	Types of equipment	Selection of equipment
		X-ray control panel
		Isotope equipment
	Auxiliary equipment	
Exposure techniques	General principles	Geometric unsharpness
		Contrast; object, image, average gradient
		Radiation energy
		Scattered radiation, limitations
		Source-to-film distance
	Exposure	Focal-spot size
		Determination of focal spot size
		Exposure parameters determination
		RT-techniques, with constant exposure
		Defects position, triangulation
		Enlargement and projection
		Contrast
		Object, image, average gradient
		Heel effect
	Single-wall radiography	Specimen configuration
	Double-wall radiography	Double-wall exposure, single-wall viewing
		Offset double-wall exposure, single-wall viewing
		Elliptical projections
		Panoramic radiography
		Specimen configuration
		Discontinuity location radiographic configurations

RT - General (3/6)		
Exposure techniques (continue)	Multiple-film techniques	Use of multiple-film loading
		Thickness-variation parameters
		Film speed
		Film latitude
	Penetrameters or image quality indicators (IQI's)	Types of penetrameters or IQI's
		Use rules
		Standards
		Calculation of IQI sensitivity
Basic principles	Geometric exposure principles	Shadow formation and distortion
		Shadow enlargement calculation
		Shadow sharpness
		Geometric unsharpness
		Scattered radiation, limitations
	Radiographic screens	Lead intensifying screens
		Fluorescent intensifying screens
		Intensifying factors
		Importance of screen-to film contact
Radiographs	General	Film packing
		Film material and classification systems
		Formation of the latent image on film
		Inherent unsharpness
	Arithmetic of radiographic exposure	Milliamperage-distance-time relationship
		Reciprocity law
		Photographic density
		Inverse-square-law considerations
Radiographic image quality	Radiographic sensitivity	
	Radiographic contrast	
	Film contrast	
	Subject contrast	
	Film graininess and screen mottle effects	
	Penetrameters or image-quality indicators	
	Improving radiographic sensitivity	
Darkroom facilities, film processing	Photographic emulsion chemistry	
	Facilities and equipment	Automatic film processor versus manual processing

RT - General (4/6)		
Darkroom facilities, film processing (continue)	Processing of film-manual	Developer and replenishment
		Stopbath
		Fixer and replenishment
		Washing
		Prevention of water spots
		Drying
		Temperature control
	Film filing and storage	Retention-life measurements
		Long-term storage
		Filing and separation techniques
	Unsatisfactory radiographs-causes and cures	High film density
		Insufficient film density
		High contrast
		Low contrast
		Poor definition
		Fog
		Light leaks
		Handling faults, artifacts
	Film density	Step-wedge comparison film
		Densitometers
Forgings, castings	Metallurgy knowledge and manufacturing techniques	
	Defects met	Cavities, gasholes, shrinkage, foreign material
	Application of standards	Castings NDT inspection
		NDT technique instructions
		Shooting use of the IQI and interpretation/evaluation
		Disposition and NDT report
Assemblies, welding, brazing, riveting	Welding processes	
	Defects met	Cracks, lack of penetration or brazing, inclusions
	Application of standards	
	Welding NDT inspection	Examination of circumferential in pipes welding/butt-welds
		NDT technique instructions
		Disposition and NDT report
Composite materials	Concepts of development	
	Defects met	Cavities
	Application of standards	

RT - General (5/6)		
Composite materials (continue)	Composite NDT inspection	Tangential shooting
		NDT technique instructions
		Shooting use of the IQI and interpretation/evaluation
		Disposition and NDT report
Indications, discontinuities and defects	Indications	Adventitious images
		Causes and effects
	Discontinuities	Inherent
		Processing
		Service
	Defects	
Manufacturing processes and associated discontinuities	Casting processes and associated discontinuities	Ingots, blooms and billets
		Sand casting
		Centrifugal casting
		Investment casting
	Wrought processes and associated discontinuities	Forgings
		Rolled products
		Extruded products
	Welding processes and associated discontinuities	Submerged arc welding
		Shielded metal arc welding
		Gas metal arc welding
		Flux corded arc welding
		Gas tungsten arc welding
Evaluation	Radiographic standards	
	Radiographic viewing	Film-illuminator requirements
		Background lighting
		Multiple-composite viewing
		Penetrameter placement
		Personnel dark adaptation and visual acuity
		Film identification
		Location markers
		Film-density measurement
		Film artifacts
		Viewing conditions
		Illuminator requirements
	Evaluation of casting images	Casting-method review
		Casting discontinuities
		Origin and typical orientation of discontinuities
		Radiographic appearance

RT - General (6/6)		
Evaluation (continue)	Evaluation of casting images (continue)	Castings codes/standards-applicable acceptance criteria
		Reference radiographs
	Evaluation of welding images	Welding-method review
		Welding discontinuities
		Origin and typical orientation of discontinuities
		Radiographic appearance
		Welding codes/standards-applicable Acceptance criteria
		Reference radiographs or pictograms
Safety	Radiation safety principles	Controlling personnel exposure
		Time, distance, shielding concepts
		ALARA concepts
		Radiation-device operation characteristics
Quality assessment	Standards, codes and procedures for radiography	Acceptable radiographic techniques and setups
		Applicable employer procedures
		Procedure for radiograph parameter verification
		Radiographic reports
Quality assessment (continue)	Construction concept	Safe live
		Fail safe
		Damage tolerance
	Comparison to other NDT methods	Limits of RT inspections
		Detectable flaw size
		Other NDT procedures
	Documentation	Issue of inspection procedures
		Inspection reports
	Personnel requirements	

1.5.2. RT Specific

RT - Specific (1/2)		
Airframe	Water ingress in honeycomb structures	
	Imperfections in composites	Blowholes
		Porosity
		Inclusions
	Crack and corrosion, porosity detection in	Fittings and lugs
		Fastener holes
		Riveted structures
		Bolts
		Tubes
		Multilayered structure
		Welded structure
		Wrought materials
		Forged materials
Engine	Crack detection in	Blades
		Stators
		Welded parts
		Wrought materials
		Forged materials
		Cast materials
	General overview	Foreign objects
		Blocked gas passes
		Misalignments of parts
Composites	Water ingress in honeycomb structures	
	Imperfections in composites	Blowholes
		Porosity
		Inclusions
		Layer orientation
		Distribution of glass fibers
Components	Crack detection in	Tubes
		Welded parts
		Bolts
	Water ingress in honeycomb structures	
	Imperfections in composites	Blowholes
		Porosity
		Inclusions
		Foreign objects
		Blocked gas passes
		Misalignments of parts

RT - Specific (2/2)		
Process controls	Scope	
	Ventilation in darkroom	
	Safelights	
	Why test safelights	
	Individual safelight testing	
	Collective safelight testing	
	Safelight fog evaluation	
	Controlling the manual development process	
	Controlling the automatic development process	

1.6. Digital Radiography Testing (Digital RT)

Digital RT (1/2)		
Radiation contrast, noise	Signal-to-noise ratio (SNR)	
	Contrast-to-noise ratio	
	Basic spatial resolution	
	Pixel Size	
	Normalised SNR (SNRN)	
Optimization of image quality	Compensation principles	Contrast vs. SNR
		Basic spatial resolution s. SNR
		Local unsharpness vs. SNR
Geometrical projection conditions	Effect of magnification	
	Optimum magnification	
	Difference between radiography and radioscopy	
Image quality indicators	Measurement of basic spatial resolution	
	Converging line pairs	
	Line pair gauges (MTF)	
Computer-Radiography (CR), Imagine plates	Phosphor imaging plates	Introduction
		Design
	Imaging plate and CR-scanner	
	CR system and classification	
	Quality assurance (phantom)	
	Exposure conditions	
	Working with exposure charts	
	Handling	
	System selection	
DDA's	Digital Detector Arrays (DDA)	Introduction
		Design
	Indirect converting	
	Direct converting	
	Indirect converting	
	Direct converting	
	CCED, amporph. SI, CMOS	
	Detector calibration	
	Quality assurance	
	Exposure conditions	
	Handling	
	System selection	
LDA's	Line Detector Arrays (LDA)	Introduction
		Design
	Application areas	
	Comparison to DDA's	
	LDA's (continue) Quality assurance (phantom)	

Digital RT (2/2)		
LDA's (continue)	Exposure conditions and Diagrams	
	Handling	
	System Selection	
Intensifiers, fluoroscope	Introduction	
	Design	
	Application areas	
	Quality assurance (phantom)	
	Exposure conditions and diagrams	
	Handling	
	System Selection	
	Comparison to DDA's	
Date acquisition, detector calibration	A/D interface	
	Computer Structure	Processor
		Memory
		Bus
		Disk
	Load and safe of digital images	Image Formats
	Image integration	On chip integration/frame time
		In memory integration/frame number
	Optimum gain and latitude settings	Accumulation vs. integration
Digital Image Processing	Image structure, quantization (bit and Bytes)	
	Basic operations	Picture element (pixel)
		Gray value
	Point operations	Contrast
		Brightness
		Gamma correction
		Histogram
	Matrix operations, filters	Look up table (LUT)
		Smoothing, improvement of SNR
		High pass, gradient
		Edge enhancement, line extraction
		Median
	Measurement tools	Calibration
		Line profile
		Measurement of flaw length
		Measurement of areas
		Measurement of depth
	Correction of raw data	Linearization, LUT
		Bad pixel interpolation
Automated image interpretation	Principles	
	Binarization	
	Measurement of dimensions	

1.7. Thermographic Testing (TT)

1.7.1. TT General

TT - General		
Fundamentals of Thermography	Qualitative imagery	
	Quantitative thermography	
	Heat transfer theory	
Principles	Thermal radiation principles	
	Transmittance	
Applications	Infrared Thermography	Equipment overview
		Basic camera setup and operation
		Thermal measurement
		Moisture detection in honeycomb
		Heater blanket and hot air gun methods as outlined by producer
		Defining difference between excessive resin and fluid ingress
Safety	Thermography safety principles	
Quality assessment	Standards, codes and procedures for thermography	Acceptable thermographic techniques and setups
		Applicable employer procedures
		Procedure for thermograph parameter verification
		Thermographic reports
	Construction concept	Safe live
		Fail safe
		Damage tolerance
	Comparison to other NDT methods	Limits of TT inspections
		Detectable flaw size
		Other NDT procedures
	Documentation	Issue of inspection procedures
		Inspection reports
	Personnel requirements	

1.7.2. TT Specific

TT - Specific		
Composites	Water ingress in honeycomb structures	
	Imperfections in composites	Blowholes
		Porosity
		Inclusions
		Layer orientation
		Distribution of glass fibers

1.8. Barkhausen Noise Inspection (BNI)

1.8.1. BNI General

BNI - General	
Introduction Atoms & Bonds	Principles of method, applications, advantages/disadvantages, atoms & bonds, atomic structures
The Crystal Structure of Steels	Crystal structure of metals
	Steels & alloying elements, types of steel, grain structures, phases in steel
Stress and Strain	Definitions of stiffness, elasticity, strength, ductility, plasticity, yield point
	Hooke's Law, Young's Modulus, Axial, compressive and shear stress.
	Pre-stress and stress concentration, elastic stability and equilibrium
Magnetization	Magnetic field and induction, permeability and susceptibility, demagnetisation factor, ferromagnetism, hysteresis, magnetic domains/walls, reversible/irreversible domains, rotation of magnetism within domains, domain growth
Barkhausen Effect	Barkhausen effect, magneto acoustic emission, magneto striction
Using Barkhausen Noise	Relationship between Barkhausen noise and microstructure of steel
	Application of Barkhausen noise
	Stress, residual stress, decarburisation, heat treatmen

1.8.2. BNI Specific

BNI - Specific	
Stresscan Equipment	Manufacturers data
Specifications	
Practical Applications	Demonstration of and use of equipment to locate grinding abuse

1.9. Acid Etch Inspection (AEI)

1.9.1. AEI General

AEI - General	
Introduction Atoms & Bonds	Principles of method, applications, advantages/disadvantages, atoms & bonds, atomic structures
The Crystal Structure of Metals	Crystal structure of metals
	Steels & Alloying elements, types of steel, grain structures, phases in steel
Equilibrium Diagrams and The Iron Carbon Diagram	Equilibrium diagrams and the freezing of metals Iron carbon diagram, eutectoid steels,
Heat Treatment Processes and Machining Processes	Post-heat treatment, stress relief, annealing, hardening, tempering, normalizing, hydrogen release, grinding cracks, hydrogen cracking
Metallurgical Surface Conditions	Metallurgical surface conditions including re-hardening burn, tempering burn, carburizing, nit riding, low alloy martensitic steels, maraging steels
The Etched Structure	Etched structure appearance (abused & un-abused) & viewing conditions
Acid Etch Inspection	Applicability, equipment & materials, etch procedures, intermediate proof etching, etching of stainless steel parts

1.9.2. AEI Specific

AEI - Specific	
Solutions & Process Controls	Control checks, and recording
Inspection	Inspection & interpretation
Safety Precautions	
Practical Applications	Demonstration of immersion and swabbing techniques

NANDTB 09 / AUDIT PROCEDURE OF TRAINING AND EXAMINATION CENTERS

1. Introduction

A Training and Examination Center is a NDT Training Provider. This procedure describes the process for the Board recognition of Training and Examination Centers and the training courses and examinations they provide. This procedure shall be followed by the applicant Training and Examination Center, and the Board.

2. Application Procedure

2.1. Recognition of Training and Examination Centers

NDT Training Organizations requesting recognition as Training and Examination Centers shall complete the written application in Application Form for Audit and Approval Procedure of Training and Examination Centers (NANDTB 09.A) and send it to the Board Secretary. Before making application, the applicant should be familiar with Section 3 & 4 of this procedure. All information requested on the form is to be supplied or indicated N/A if not applicable.

The following information shall be submitted with the Application Form:

a. **Company name and address of the organization**
b. **Scope of the NDT Training and Examination Center**
c. **Information about the facilities to be used for the training**
d. **NDT Training and Examination Manual**
e. **Names, CVs and copy of the certificates of the responsible executive staff**
f. **Names, CVs, training documents and copy of the certificates of all trainers and examiners**

2.2. Evaluation of Application

The Board will assess the application once all the information requested in the application form has been received. A response to each assessable item will be provided. The Board may request access to conduct an audit of the training provider's facilities as part of the assessment. The assessable elements are:

a. Application documentation completed in full.
b. Training materials/syllabus for suitability to the training outcomes.
c. Quality Control of training materials and candidate information.
d. Source and control of examinations.
e. Training personnel qualifications and experience.

f. Training and examination facilities.

2.3. Notification to Applicants

a. The Board shall notify the applicant of acceptance or otherwise as soon as practicable. Recognition of a Training and Examination Center may be conditional on certain action(s) being undertaken before recognition is granted. Reports to the applicant shall follow the form shown in the Board document (NANDTB 09.A), regardless of outcome.

b. Recognized Training and Examination Centers shall receive a Certificate from the Board.

2.4. Audit of Training and Examination Center

If the Board determines that a site audit of the training provider is required it shall request audit access, and appoint an auditor(s) to perform the audit in accordance with Audit Criteria to be used on Audits of the Training and Examination Centers (NANDTB 09.B). The audit team is composed of board members. The team shall submit a report and recommendations to the Board.

2.5. Audit Findings and Reports

The audit team shall submit a report in 10 days after the audit. If recognition is not granted, based on adverse audit findings, the applicant has 3 months, or as otherwise agreed to by the Board, to provide evidence of root cause, corrective and preventative action. If the corrective action is not taken within the agreed time, a new application is to be made.

Audit findings shall be recorded on the Audit Results section of the NANDTB 09-B checklist by the auditor team. Root cause analysis and corrective actions shall be provided to the Board by the Training and Examination Center by using NANDTB 12-A form.

Findings shall be evaluated as Level 1 (Major) or Level 2 (Minor). Level 1 (major) finding identifies any significant noncompliance that does not comply with the requirements of this manual, reduces the safety standard and seriously endangers the flight safety. Level 2 (minor) finding identifies any significant noncompliance that does not comply with the requirements of this manual, may reduce the safety standard and endanger the flight safety.

If the auditor observes a finding which have implications for safety or product integrity, the auditor should notify the Board to inform CAA.

3. Conditions of Recognition

3.1. Approval of Training and Examination Centers

Initial approval, re-approval and approval of change in the scope of the Training and Examination Centers is performed by the Board with a Training and Examination Center Approval Certification (NANDTB 09.C).

3.2. Period of Validity

a. The period of validity is maximum 3 years. The recognition remains valid so long as the training organization maintains compliance with all the requirements of the original assessment. However, if these requirements change during the period of validity, the Board will notify Training and Examination Center to ensure they are aware of the changes, and request that they provide to the Board evidence of compliance with the new requirements as soon as practicable.

b. It is the responsibility of the Training and Examination Center's Training Coordinator to apply for a renewal assessment before the expiration of the recognition. For planning purposes, allow about 6 months for the reassessment to be completed. It is also the responsibility of the Training Coordinator to advise the Board of any changes in personnel or other aspects of the organization which would impact on the scope of the recognition.

3.3. Withdrawal of Recognition

a. Training organization recognition may be withdrawn if the Board becomes aware that:

(1) The conditions on which recognition was granted are no longer fulfilled.

(2) Changes to the organization as noted in Section 2.1 of this procedure have not been conveyed to the Board.

(3) The Training organization has acted unethically.

b. Recognition will not be withdrawn until the Board has contacted the Training and Examination Center seeking an explanation, and is satisfied that withdrawal of recognition is warranted. A Training and Examination Center may re-apply once it demonstrates that the conditions leading to the withdrawal of recognition have been corrected, and measures are in place to reduce the likelihood of its recurrence.

4. Variation to Training Courses

Variations to the Training and Examination Center's scope, or training courses including additional courses and new training locations, will follow the same format as for first applications but reduced to the extent of the variation. Recognition of the new scope must be granted before the training is conducted. The request for the variation should include a copy of the NDT syllabus and description of the course documents, a list of the equipment, test specimens and qualifications of the instructors, and any changes to the facilities.

NATIONAL AEROSPACE NDT BOARD

NANDTB 09.A / APPLICATION FORM FOR AUDIT AND APPROVAL PROCEDURE OF TRAINING AND EXAMINATION CENTERS

TYPE OF APPLICATION	☐ Initial	☐ Renewal	☐ Corrective Action	☐ Scope Change

APPLICANT TRAINING AND EXAMINATION CENTER	
Company Name	
Business Activity	
Address	
City	
Postcode	
Telephone	
Fax	
e-mail	
Web address	
Contact Person(s)	

RESPONSIBLE LEVEL 3 INFORMATION	
Name, Surname	
Organization (If not the applicant)	
Address	
City	
Postcode	
Telephone	
Fax	
e-mail	

NDT METHOD(S)				
Indicate the NDT method(s) below for which recognition is sought; ☐				
Liquid Penetrant Testing (PT) ☐	Magnetic Particle Testing (MT) ☐	Eddy Current Testing (ET) ☐	Ultrasonic Testing (UT) ☐	Radiographic Testing (RT) ☐
Thermographic Testing (TT) ☐	Barkhausuen Noise Inspection (BNI) ☐	Acid Etch Inspection (AEI) ☐	Other Methods/Specify ----------	Other Methods/Specify ----------

TRAINING LEVEL(S)				
Indicate the training level(s) for which recognition is sought; ☐				
NDT METHODS	**TRAINING LEVELS**			
	L 1 Limited	L 1	L 2	L 3
Liquid Penetrant Testing (PT)				
Magnetic Particle Testing (MT)				
Eddy Current Testing (ET)				
Ultrasonic Testing (UT)				
Radiographic Testing (RT)				
Thermographic Testing (TT)				
Barkhausen Noise Inspection (BNI)				
Acid Etch Inspection (AEI)				
Other(s)				

In regard to the scope of recognition identified above, provide evidence or substantive statements which show that the training offered meets the minimum standard outlined in the NANDTB 08.A.

Indicate with a check mark what information is included with this application.

- ✓ Description of training organizational structure showing responsibilities
- ✓ Complaints procedure
- ✓ Internal or external audit results
- ✓ Training coordinator
- ✓ Qualified instructor(s)
- ✓ Training and examination materials and their control
- ✓ Training facilities
- ✓ Test equipment, consumables, instruments and samples
- ✓ Examinations
- ✓ Records

The following information shall be submitted with the Application Form:

a. Company name and address of the organization
b. Scope of the NDT Training and Examination Center
c. Information about the facilities to be used for the training
d. NDT Training and Examination Manual
e. Names, CVs and copy of the certificates of the responsible executive staff
f. Names, CVs, training documents and copy of the certificates of all trainers and examiners

NANDTB 09.B / AUDIT CRITERIA TO BE USED ON AUDITS OF TRAINING AND EXAMINATION CENTERS

The Board (NANDTB-TR) aims that all Training and Examination Centers activities shall be subject to periodic audit as part of an initial and continuous improvement strategy.

1. INTRODUCTION

Training and Examination Center has obligations under the recognition by Turkish CAA and Turkish National Aerospace NDT Board (NANDTB-TR). This scope of audit is to monitor and report the requirements of The Training and Examination Centers described in SHT-NDT and the Board documentation. This procedure describes the Board's audit of the Training and Examination Centers processes.

2. AUDITORS

The Chairman will appoint a competent Board member(s) as auditor or use an external auditor if appropriate. The audit is both administrative and technical. Accordingly, it needs be undertaken by an NDT Level 3.

3. AUDIT REPORT

The Auditor(s) will provide a written audit report of findings and observations to the Board as soon as practicable after its completion, not later than 30 days. The audit report shall identify each element of the audit guide below.

a. Findings of non-compliance and **finding levels**,
b. Observations of potential non-compliance,
c. Opportunities for improvement.

The final audit report is sent to the Training and Examination Center.

4. REMEDIAL, CORRECTIVE and PREVENTATIVE ACTIONS

The Training and Examination Center's Coordinator will prepare a preliminary response for remedial, corrective and preventative actions for non-compliance(s), **by using the form in the document NANDTB 12-A**, and any actions to be taken on observations. The Secretary's final audit report is presented to the Board at the next scheduled meeting and retained along with the audit report as part of the agenda documents.

5. RESPONSIBILITIES

a. Chairman appoints the auditor(s), reviews the Training and Examination Center's response for corrective and preventative actions.

b. Auditor(s) conducts the audit in accordance with these guidelines (Part 6 Audit Guide) and reports to the Chairman within 30 days of completion. Auditor(s) also reviews the Training and Examination Center's response for corrective and preventative actions.

c. Secretary receives copies of the audit, remedial, corrective and preventative action confirmation and audit response for tabling at the next Board meeting and retains on file as part of the meeting agenda documents.

6. AUDIT GUIDE

Audit date	
Audit number	
Organization Name	
Auditee Team	**1.**
	2.
	3.
Audit Team	**1.**
	2.
	3.

6.1. Part A

The auditor(s) will assess and provide a written report on each of the following organizational elements required by EN 4179, SHT-NDT and the Board documentation.

6.1.1. Type of Audit

6.1.1.1. Scheduled initial, renewal **or change** audit.	
6.1.1.2. Follow up audit.	

6.1.2. Organizational Structure, Quality and Documentation System

6.1.2.1. Does the organization have any Turkish CAA or EASA certificate(s) for Design, Production, and Maintenance or Training and Examination Center approval? YES NO
Evidenced by: _____

6.1.2.2. Does the organization have a written practice **which is approved by the Responsible Level 3** covering the minimum requirements of EN 4179 and Board Manual? YES NO
Evidenced by: _____

6.1.2.3. Is the written practice stating standards to which it is compliant? YES NO
Evidenced by: _____

6.1.2.4. Is the written practice covering the methods and each method related technique? YES NO
Evidenced by: _____

6.1.2.5 Is the written practice covering the levels of qualification? YES NO
Evidenced by: _____

6.1.2.6 Is the written practice covering personnel duties and responsibilities in the related methods? YES NO
Evidenced by: _____

6.1.2.7 Is the written practice covering the minimum requirements for training? YES NO
Evidenced by: _____

6.1.2.8 Is the written practice covering the minimum requirements related to experience? YES NO
Evidenced by: _____

6.1.2.9 Is the written practice covering the minimum requirements for examination? YES NO
Evidenced by: _____

6.1.2.10 Is the written practice covering the minimum requirements for keeping the records? YES NO
Evidenced by: _____

6.1.2.11 Is the written practice covering the minimum requirements for expiration, suspension and revocation of approvals? YES NO
Evidenced by: _____

6.1.2.12 Is the written practice covering the minimum requirements for certification and recertification requirements? YES NO
Evidenced by: _____

6.1.2.13 Is the written practice covering the minimum requirements for the re-certification option to be used for the Level 3, whether it was by examination and/or by a credit system? YES NO
Evidenced by: _____

6.1.2.14 Does the organization have Training and Examination Center NDT Manual? YES NO
Evidenced by: _____

6.1.2.15 Does the organization have organizational chart that shows the position of Training and Examination Center and is it appropriate? YES NO
Evidenced by: _____

6.1.2.16 Are the responsibilities of nominated people who are Quality Manager and Responsible Level 3 described clearly in the Training and Examination Center NDT Manual? YES NO
Evidenced by: _____

6.1.2.17 Does the Training and Examination Center NDT Manual contain a responsible person list for theory and practical exams? YES NO
Evidenced by: _____

6.1.2.18 Does the Training and Examination Center have adequate training personnel for planning and conducting training and exams according to its scope of work? YES NO
Evidenced by: _____

6.1.2.19 Does the Training and Examination Center NDT Manual have general information for places where the training and examination activities take place? YES NO
Evidenced by: _____

6.1.2.20 Does the Training and Examination Center NDT Manual have any control procedure for conducting trainings at the places not approved by the Turkish CAA and the Board? YES NO
Evidenced by: _____

6.1.2.21 Does the Training and Examination Center NDT Manual have revision record page and is it properly recorded? YES NO
Evidenced by: _____

6.1.2.22 Has the Training and Examination Center been audited for security of theory and practical exams and competency of training processes that is described in the scope of work by a Quality System with Independent auditing procedure? YES NO
Evidenced by: _____

6.1.2.23 Is there any revision on the Training and Examination Center NDT Manual since last audit? YES NO
Evidenced by: _____

6.1.2.24 Do the contracts between the clients and the center cover the clients' requirements for training an examination concept? YES NO
Evidenced by: _____

6.1.2.25 Is there a policy to protect the clients' confidentiality and security? YES NO
Evidenced by: _____

6.2. Part B

The auditor(s) will assess and provide a written report on each of the following qualification elements required by EN 4179, SHT-NDT and the Board documentation.

6.2.1. Training Personnel

6.2.1.1. Does the Responsible Level 3 have EN 4179 Level 3 certificates for the methods that is mentioned in Training and Examination Center scope of work and other required qualification that is described in EN 4179, SHT-NDT and the Board documentation? YES NO
Evidenced by: _____

6.2.1.2. Does the Responsible Level 3 who will approve the training activities have ten years practical experience in aerospace industry? YES NO
Evidenced by: _____

6.2.1.3. Do the training personnel have required qualification that is described in EN 4179, SHT-NDT and the Board documentation? YES NO
Evidenced by: _____

6.2.1.4. **Are the Level 2 and Level 3 training personnel designated by** Responsible Level 3? YES NO
Evidenced by: _____

6.2.1.5. **Do the designated training personnel have five years aerospace practical experience within the past ten years?** YES NO
Evidenced by: _____

6.2.1.6. Is the scope of work for Trainers described clearly? YES NO
Evidenced by: _____

6.2.1.7. Are the trainers, theory and practical exam personnel able to reach the documents that describe Training and Examination Center scope of works? YES NO
Evidenced by: _____

6.2.1.8. Does the Quality System Manager have at least two years' experience in aerospace industry? YES NO
Evidenced by: _____

6.2.1.9. Does the Quality System Manager have trainings about Quality Systems, Non-Destructive Testing Familiarization and Human Factors? YES NO
Evidenced by: _____

6.2.1.10. Do the Trainers and Examiners;

a. Have the skills and knowledge to interpret codes, standards, and specifications aerospace industry? YES NO
Evidenced by: _____

b. Have the skills and knowledge to selecting the method and technique for a specific inspection; YES NO
Evidenced by: _____

c. Have the skills and knowledge to verify the adequacy of procedures and work instructions; YES NO
Evidenced by: _____

d. Have a general knowledge of other NDT methods and product manufacturing and inspection technologies used by aerospace industry? YES NO
Evidenced by: _____

e. Have a basic knowledge of aircraft maintenance? YES NO
Evidenced by: _____

f. Have the skills and knowledge to provide or direct training, and examination? YES NO

Evidenced by: _____

6.3. Part C

The auditor(s) will assess and provide a written report on each of the following theory training materials elements required by EN 4179, SHT-NDT and the Board documentation.

6.3.1. Training Books and Auxiliary Training Materials

6.3.1.1. Have the training books been prepared to contain minimum requirements that are given by the Board approved syllabus? YES NO
Evidenced by: _____

6.3.1.2. Have the training books been prepared to meet the aviation industry requirements? YES NO
Evidenced by: _____

6.3.1.3. Have the training books been prepared well organized to facilitate learning of candidates? YES NO
Evidenced by: _____

6.3.1.4. Do the training books have simple language and colored figures to facilitate the learning? YES NO
Evidenced by: _____

6.3.1.5. Does the Training and Examination Center have enough number of books to conduct the trainings described in organization scope of work? YES NO
Evidenced by: _____

6.3.1.6. Are the auxiliary training documents that are aircraft, engine, component manufacturer's manuals and national/international standards, codes and specifications adequate to cover related training? YES NO
Evidenced by: _____

6.3.1.7. Are the visual and aural training materials that are presentations, films, video, figures, graphics, tables etc. adequate to cover related training and to facilitate the learning? YES NO
Evidenced by: _____

6.3.1.8. Are the auxiliary training materials that are computers, projectors, blackboards adequate to cover related training and positioned properly in the classroom? YES NO
Evidenced by: _____

6.4. Part D

The auditor(s) will assess and provide a written report on each of the following practical training materials elements required by EN 4179, SHT-NDT and the Board documentation.

6.4.1. Tool, Equipment and test pieces

Does the Training and Examination Center have adequate number of test pieces with natural or artificial discontinuities that is used for practical trainings to cover related training? YES NO
Evidenced by: _____

6.4.1.1. Liquid Penetrant Testing (PT)

6.4.1.1.1. Does the Training and Examination Center have adequate number of Liquid Penetrant Testing tool, equipment, consumable and test pieces with natural or artificial discontinuities that is used for Liquid Penetrant Testing practical trainings? YES NO
Evidenced by: _____

6.4.1.1.2. Does the Training and Examination Center have auxiliary materials (Magnifiers, lens etc.)? YES NO
Evidenced by: _____

6.4.1.1.3. Does the Training and Examination Center have tool and equipment that is capable of performing process controls that is described in ASTM E 1417? YES NO
Evidenced by: _____

6.4.1.2. Magnetic Particle Testing (MT)

6.4.1.2.1. Does the Training and Examination Center have adequate number of Magnetic Particle Testing tool, equipment, consumable and test pieces with natural or artificial discontinuities that is used for Magnetic Particle Testing practical trainings? YES NO
Evidenced by: _____

6.4.1.2.2. Does the Training and Examination Center have auxiliary materials (Magnifiers, lens etc.)? YES NO
Evidenced by: _____

6.4.1.2.3. Does the Training and Examination Center have tool and equipment that is capable of performing process controls that is described in ASTM E 1444? YES NO

Evidenced by: _____

6.4.1.3. Eddy Current Testing (ET)

6.4.1.3.1. Does the Training and Examination Center have adequate number of Eddy Current Testing tool, equipment, consumable and test pieces with natural or artificial discontinuities that are used for Eddy Current Testing practical trainings? YES NO
Evidenced by: _____

6.4.1.3.2. Does the Training and Examination Center have auxiliary materials (Magnifiers, lens etc.)? YES NO
Evidenced by: _____

6.4.1.3.3. Does the Training and Examination Center have tool and equipment that is capable of performing process controls that is described in related standards and manufacturer's instructions? YES NO
Evidenced by: _____

6.4.1.4. Ultrasonic Testing (UT)

6.4.1.4.1. Does the Training and Examination Center have adequate number of Ultrasonic Testing tool, equipment, consumable and test pieces with natural or artificial discontinuities that is used for Ultrasonic Testing practical trainings? YES NO
Evidenced by: _____

6.4.1.4.2. Does the Training and Examination Center have auxiliary materials (Calibration blocks, reference blocks etc.)? YES NO
Evidenced by: _____

6.4.1.4.3. Does the Training and Examination Center have tool and equipment that is capable of performing process controls that is described in related standards and manufacturer's instructions? YES NO
Evidenced by: _____

6.4.1.5. Radiographic Testing (RT)

6.4.1.5.1. Does the Training and Examination Center have adequate number of Radiographic Testing tool, equipment, consumable and test pieces with natural or artificial discontinuities that is used for Radiographic Testing practical trainings? YES NO
Evidenced by: _____

6.4.1.5.2. Does the Training and Examination Center have auxiliary materials (Lead screens, marking letters, step wedges, densitometers, IQIs, film viewers, magnifiers, lens etc.)? YES NO
Evidenced by: _____

6.4.1.5.3. Does the Training and Examination Center have tool and equipment that is capable of performing process controls that is described in related standards and manufacturer's instructions (Ref.: ASTM E 1742)? YES NO
Evidenced by: _____

6.4.1.5.4. Has the Radiographic Testing facility been established according to national regulations? YES NO
Evidenced by: _____

6.4.1.5.5. Has the Radiographic Testing Equipment (X-Ray Machine, Gamma Ray Sources) been licensed by **Turkish Energy Nuclear and Mineral Research Agency (TENMAK)**? YES NO
Evidenced by: _____

6.4.1.5.6. Does the Training and Examination Center have radiometer, survey meter that is used for measuring ionizing radiation level? YES NO
Evidenced by: _____

6.4.1.5.7. Does the radiometer or survey meter that is used for measuring ionizing radiation level have calibration tag that is current? YES NO
Evidenced by: _____

6.4.1.5.8. Does the Training and Examination Center have dangerous and emergency situation action plan? YES NO
Evidenced by: _____

6.4.1.5.9. Does the Training and Examination Center appointed a Radiation Protection Officer? YES NO
Evidenced by: _____

6.4.1.5.10. Does the Radiation Protection Officer get Radiation Protection Training for Industrial Radiography and its certificate from **TENMAK**? YES NO
Evidenced by: _____

6.4.1.5.11. Does the Radiographic Testing Trainers and Examiners get Radiation Protection Training for Industrial Radiography and its certificate from **TENMAK**? YES NO
Evidenced by: _____

6.4.1.5.12. Does the Training and Examination Center have a dark room that is furnished properly? YES NO

Evidenced by: _____

6.4.1.6. Thermographic Testing (TT)

6.4.1.6.1. Does the Training and Examination Center have adequate number of Thermographic Testing tool, equipment, consumable and test pieces with natural or artificial discontinuities that is used for Thermographic Testing practical trainings? YES NO
Evidenced by: _____

6.4.1.6.2. Does the Training and Examination Center have auxiliary materials (Heaters, Refrigerators, Viewers, Magnifiers, lens etc.)? YES NO
Evidenced by: _____

6.4.1.6.3. Does the Training and Examination Center have tool and equipment that is capable of performing process controls that is described in related standards and manufacturer's instructions? YES NO
Evidenced by: _____

6.5. Part E

The auditor(s) will assess and provide a written report on each of the following classroom and laboratories elements required by EN 4179, SHT-NDT and the Board documentation.

6.5.1. Training Environment (classroom, laboratory etc.)

6.5.1.1. Is the theoretical training area located within the facility appropriate? YES NO
Evidenced by: _____

6.5.1.2. Can theoretical training area provide enough space for the participants? YES NO
Evidenced by: _____

6.5.1.3. Is the condition; "Classroom size cannot exceed 15 trainees for each teacher/instructor/assessor", met for each individual class? YES NO
Evidenced by: _____

6.5.1.4. Does the theoretical training area have sufficient lighting? YES NO
Evidenced by: _____

6.5.1.5. Does the theoretical training area have sufficient air conditioning? YES NO
Evidenced by: _____

6.5.1.6. Does the theoretical training area have sufficient sound isolation? YES NO
Evidenced by: _____

6.5.1.7. Does theoretical training area has suitable/adequate training equipment (such as desks, chairs etc.)? YES NO
Evidenced by: _____

6.5.1.8. Does the Practical Training tool and environment (such as shops, laboratories, furnishings, etc.) have suitable/adequate for the training? YES NO
Evidenced by: _____

6.5.1.9. Does the Training and Examination Center provide a workable and comfortable office/working area for the training instructors and practical examiners? YES NO
Evidenced by: _____

6.5.1.10 Does the the Training and Examination Center provide adequate safety instructions for the training? YES NO
Evidenced by: _____

6.6. Part F

The auditor(s) will assess and provide a written report on each of the following Privacy, Objectivity and Security elements required by EN 4179, SHT-NDT and the Board documentation.

6.6.1. Privacy, Objectivity and Security

6.6.1.1. Are the test pieces and exam questions kept in a secured area via controlled access? YES NO
Evidenced by: _____

6.6.1.2. Are the sample parts that used for practical training and test pieces that used for the exam kept in separated areas? YES NO
Evidenced by: _____

6.6.1.3. Are the training and examination processes objectively and confidentially carried out by the Training and Examination Center? YES NO
Evidenced by: _____

6.7. Part G

The auditor(s) will assess and provide a written report on each of the following Examination elements required by EN 4179, SHT-NDT and the Board documentation.

6.7.1. Examinations

6.7.1.1. Does the Training and Examination Center request Eye Examination Reports according to EN 4179 from each examinee? YES NO
Evidenced by: _____

6.7.1.2. Does the Training and Examination Center prepare Level 1 and Level 2 General, Specific, and Practical exams and also Level 3 Basic, Method, and Specific examinations according to EN 4179? YES NO
Evidenced by: _____

6.7.1.3. Are the exam questions approved by the Responsible Level 3? YES NO
Evidenced by: _____

6.7.1.4. Is the number of questions to be asked in the exams enough to meet the requirements of the EN 4179 and company written practice? YES NO
Evidenced by: _____

6.7.1.5. Is the success/ Pass criteria meets requirements of the EN 4179 which is minimum of 70% for each examination and 80% overall for each method YES NO
Evidenced by: _____

6.7.1.6. Are the examination and grading processes performed by NDT Level 3 or assigned examiner? YES NO
Evidenced by: _____

General Examination

6.7.1.7. Are the general examinations performed as closed book? YES NO
Evidenced by: _____

6.7.1.8. Are the number of questions in the general examination in lined with EN 4179 which are *Minimum of 10 questions for level 1 limited and 40 questions for level 1, 2 and 3* ? YES NO
Evidenced by: _____

6.7.1.9. Does the general examination involve basic principles of the related method? YES NO
Evidenced by: _____

6.7.1.10 Are the examination questions prepared complying with the company written practice? YES NO

Evidenced by: _____

Specific Examination

6.7.1.11 Are the Specific Examinations performed as open book? YES NO
Evidenced by: _____

6.7.1.12 Are the questions for Specific Exam prepared according to the company written practice and the related maintenance documents? YES NO
Evidenced by: _____

6.7.1.13 Are the number of questions in the specific examination in lined with EN 4179 which are *Minimum of 8 questions for level 1 limited and 30 questions for level 1, 2 and 3* ? YES NO
Evidenced by: _____

6.7.1.14 Is the scope of the specific examination enough to measure the candidates understanding of information contained within the reference documents? YES NO
Evidenced by: _____

6.7.1.15 Are the reference materials available to the candidate during the specific exam? YES NO
Evidenced by: _____

Practical Examination

6.7.1.15 Are the practical exam parts approved by responsible Level 3? YES NO
Evidenced by: _____

6.7.1.16. Do the practical exams contain the description of at least two exam parts, related NDT procedures, the documents that contain inspection steps, and results of the exams? YES NO
Evidenced by: _____

6.7.1.17. Do the parts used in practical exams meet the requirements of the candidates work environment? YES NO
Evidenced by: _____

6.7.1.18. Do the parts used in practical exams contain known artificial defects? YES NO
Evidenced by: _____

6.7.1.19. Do the parts used in practical exams have drawings stating the locations of artificial defects? YES NO
Evidenced by: _____

6.7.1.20. Is there a checklist available to evaluate the pratical examination results? YES NO
Evidenced by: _____

6.7.1.21. Do any additional explanations like maps, sketch, descriptions use during practical examination? YES NO
Evidenced by: _____

6.7.1.22. Does the Practical Examination include Work Instruction or Procedure development? YES NO
Evidenced by: _____

6.8. Part H

The auditor(s) will assess and provide a written report on each of the following Record System elements required by EN 4179, SHT-NDT and the Board documentation.

6.8.1. Record System (Training and Examination Records)

6.8.1.1. Does the Training and Examination Center have a specific and reliable system for recording and keeping the training and examination records? YES NO
Evidenced by: _____

6.8.1.2. Does the Training and Examination Center keep the entire records of each individual student's training, examination and evaluation/assessment data, for following 10 years after the training? YES NO
Evidenced by: _____

6.8.1.3. Does the Training and Examination Center keep the entire records of each instructor's personal experiences/qualifications, training-education backgrounds and on-going trainings? YES NO
Evidenced by: _____

6.8.1.4. Are the training and examination records kept in accordance with SHT-NDT and the Board documentation? YES NO
Evidenced by: _____

6.8.1.5. Does the organization have enough space/conditions for keeping the training and examination records? YES NO
Evidenced by: _____

6.8.1.6. Does Quality system manager meet the requirements stated in SHT-NDT? YES NO
Evidenced by: _____

6.8.1.7. Does the Training and Examination Center NDT Manual have internal audit and evaluation procedures? YES NO
Evidenced by: _____

6.8.1.8. Are the audit and evaluation records existed? YES NO
Evidenced by: _____

Additional questions may be asked by the audit team:

AUDIT SUMMARY

Audit Date	
Audit Scope	
Audit Number	
Auditor Team of NANDTB	**1.**
	2.
	3.
Auditee Team of the Organization	**1.**
	2.
	3.

AUDIT RESULTS:

Finding ☐ **No Finding** ☐

Date:

If there are findings as a result of the audit, fill in the table below;

AUDIT RESULTS

Total Findings			
Finding No	**Related Question**	**Finding Description**	**Finding Level**

NANDTB-TR NATIONAL AEROSPACE NDT BOARD	**TÜRKİYE ULUSAL HAVACILIK TAHRİBATSIZ MUAYENE KURULU** **TURKISH NATIONAL AEROSPACE NDT BOARD**

TAHRİBATSIZ MUAYENE EĞİTİM KURULUŞU ONAY SERTİFİKASI

NON-DESTRUCTIVE TESTING TRAINING ORGANISATION APPROVAL CERTIFICATE

TR.NDT.xxx

Şirket Adı /*Organization Name*

Şirket Adresi / *Organization Address*

Tahribatsız Muayene Talimatı (SHT-NDT) 'na göre aşağıda belirtilen şartlar çerçevesinde yukarıdaki kuruluş Ulusal Havacılık Tahribatsız Muayene Kurulu tarafından sertifikalandırılmıştır.

Pursuant to Regulation SHT-NDT and subject to the conditions specified below, National Aerospace NDT Board hereby certifies above organization.

TAHRIBATSIZ MUAYENE METOTLARI *NDT Methods*	EĞİTİM SEVİYESİ *Level of Training*	SINAV SEVİYESİ *Level of Examination*

ŞARTLAR / *CONDITIONS:*

1. Bu onay, yukarıda belirtilen metotlarla sınırlıdır.
   This approval is limited to above mentioned methods
2. Bu onay, kuruluşun onaylı güncel Tahribatsız Muayene Eğitim Kuruluşu El Kitabı'nda belirtilen prosedürlere uyumu gerektirir.
   This approval requires compliance with the procedures specified in the Approved NDT Training Organization Exposition.
3. Bu onay, kuruluşun SHT-NDT'ye uyum sağladığı sürece aşağıda belirtilen tarihe kadar geçerlidir.
   This approval is valid until the expiry date mentioned below whilst the approved Nondestructive Training Organization remains in compliance with "SHT-NDT".
4. Yukarıdaki koşullara bağlı olarak, bu onay feshedilmediği, yenilenmediği ve askıya alınmadığı sürece aşağıda belirtilen tarihe kadar geçerlidir.
   Subject to compliance with the foregoing conditions, this approval shall remain valid until specified date of expiry unless the approval has previously been surrendered, superseded, suspended or revoked.

İlk Düzenlenme Tarihi :
Date of original Issue

Düzenlenme Tarihi : .....
Date of this revision İsim/*Name*

Geçerlilik Tarihi : Head of NANDTB-TR
Date of Expiration

NANDTB 10 / RECOGNITION OF EXAMINATION CERTIFICATES

A Responsible Level 3 can administrate internal qualification examinations as described in NANDTB 07 paragraph 2.3 when he/she is recognized by the Board. Recognition of Aerospace NDT Examination Certificates covers the evaluation of NDT personnel qualification. The certification is under the employer responsibility.

The recognition process is applied as defined below:

1. The personnel qualification is evaluated and recognized by the Board if the conditions are provided in NANDTB 07 para 1.e.
2. Candidate shall apply to the Board Secretariat by filling the Application Form for Certification Equivalency (NANDTB 10.A) with the following documents conforming to EN 4179;
    a. Level 2 qualification training and examination certificates prior to be Level 3,
    b. Level 3 examination certificates,
    c. On the job training documentation
3. Results will be reported to the applicant in 30 days period regarding to the evaluation of the Board.

NANDTB-TR
NATIONAL AEROSPACE NDT BOARD

NANDTB 10.A / APPLICATION FORM FOR CERTIFICATION EQUIVALENCY

CERTIFICATE HOLDER	
CERTIFICATE HOLDER NAME **Given Names (first names) :**	**Family Name (surname) :**
Position in Company :	
COMPANY NAME :	
Company Address :	
Phone :	**e-mail :**

CERTIFICATE EQUIVALENCY REQUEST	
NDT Method for Certificate Equivalency **……..** ***i.e. PT, MT, ET, UT, RT, TT, ST, BNI, AEI, others***	**Level:** ☐ **Level 1** ☐ **Level 2** ☐ **Level 3**

EMPLOYER / EMPLOYER REPRESENTATIVE:

Name : **Signature :**

Position : **Date :**

FORMAL EDUCATION(1)

☐ Two years of engineering or science study at a technical school, college or university

☐ 3–4-year science or engineering under graduate degree

☐ None / others

(1) If you do not have formal education in engineering or science, please check "None/others".

Latest graduated school and date:

CURRENT CERTIFICATES SUBJECT TO THE EQIVALENCY REQUEST

Method-Technique/Level	NDT Certification Standard	Issued By	Date of Issue

LAST FORMAL TRAINING(2)

Method Technique /Level	Training Body	Trainer	Date	Hours

(2) All trainings related to applied method shall be from a NANDTB approved training center. Please attach the training records and training outlines including documentation of previous trainings.

NATIONAL AEROSPACE NDT BOARD

1.) PRACTICAL EXPERIENCE[3]			
Method-Technique /Level	**Company**	**Date (from-to)**	**Hours**

(3) Practical experience (on the job training) hours before the certification. Please attach all documentation includes individual, date, task, hours and certified personnel providing direct observation.

2.) EXPERIENCE FOR LEVEL 3[4]		
Method	**Company**	**Date (from-to)**

(4) This section shall be filled by Level 3 individuals only.

3.) EXAMINATIONS[5][6]

3.1. General Examination ☐ Open book ☐ Closed book

Method Technique /Level	Examination Body	Examiner	Date	Number of Questions	Score

3.2. Specific Examination ☐ Open book ☐ Closed book

Method Technique /Level	Examination Body	Examiner	Date	Number of Questions	Score

Reference materials used at the specific examination:

3.3. Basic Examination ☐ Open book
For only Level 3 ☐ Closed book

Method /Level	Examination Body	Examiner	Date	Number of Questions	Score

3.4. Practical Examination

Method /Level	Examination Body	Examiner	Date	Number of Test Sample	Score

Inspection technic used at the practical examination :

Details about material/hardware/test samples :

Instruments /Inspection systems used at the examination :

3.5. Vision Examination[7]

Near Vision: ☐ Tumbling E in accordance with ISO 18490 ☐ 20/25 (Snellen) at 16" (40.64cm)) ± 1" (2.54cm) ☐ Jaeger No. 1 at not less than 12" (30.48 cm)	**Color Perception:**

(5) Please attach all documents about examination body and examiner including examiner's Level 3 certifications.
(6) For Level 1 and/or Level 2 applications, all examinations related to applied method shall be from other countries NANDTB's approved training center. For Level 3 applications, Level 3 candidate shall previously have EN 4179 Level 2 qualification from an approved training center and having Level 3 certificates for related method(s) from ASNT, ISO 9712, PCN Aero.
(7) Please attach the examination report.

1.) ADDITIONAL INFORMATION

4.1. Please write in the space below which standards/specifications your company uses when carrying out NDT Inspection in the NDT Method of certificate equivalency sought:

4.2. Please write in the space below which techniques your company uses when carrying out NDT Inspection in the NDT Method of certificate equivalency sought:

4.3. Please use this box to inform NANDTB-TR of any other information about the current certificate:

Please be informed that NANDTB-TR can evaluate if the administration of the qualification conforms to the EN 4179 standard. Only the employer can certify the personnel in accordance with the employer's written practice.

THE FOLLOWING SECTION WILL BE FILLED BY NANDTB-TR

2.) *EVALUATION*	
5.1. Is practical experience conforming to EN 4179 requirements? ☐ YES ☐ NO ☐ need more data	
5.2. Is experience for Level 3 conforming to EN 4179 requirements? ☐ YES ☐ NO ☐ N/A ☐ need more data	
5.3. Is formal training conforming to EN 4179 requirements? ☐ YES ☐ NO ☐ need more data	
5.4. Are examinations conforming to EN 4179 requirements? ☐ YES ☐ NO ☐ need more data	
5.5. Is vision test conforming to EN 4179 requirements? ☐ YES ☐ NO ☐ need more data	
5.6. Commends (if needed)	
EN 4179 QUALIFICATION EQUIVALENCY APPROVAL	
NANDTB-TR Approval: Approved ☐ Disapproved ☐	**Reason of disapproval:**
On behalf of NANDTB-TR : **Name:** **Phone:** **e-mail:**	**Signature:** **Date:**

NANDTB 11 / RELATIONS BETWEEN TURKISH CAA AND THE BOARD

1. Recognized by Turkish CAA

a. The Board is recognized by Turkish CAA.

b. The Board carries out its activities according to the Board documentation based on SHT-NDT, EN 4179 and AFNDTBF-08.

2. Attend Meetings of the Board

a. Turkish CAA can nominate a person or people to attend meetings of the Board with observer status.

b. If a country has a bilateral agreement with Turkish CAA, the related countries CAA representative or the prime contractor companies' representatives can involve in the Board meetings as an observer.

3. Audit of Training and Examination Center

a. Turkish CAA may also assign one or more observer for audit activities.

b. Additionally, the foreign countries auditors who audits Turkish CAA at the same time can also take part in the audit activities of the NDT Training and Examination Center's as an observer.

NANDTB 12 / AUDIT CRITERIA TO BE USED ON AUDITS OF THE NANDTB-TR

1.0 SCOPE

The purpose of this Audit Criteria is to provide a means to verify and document that systems are in place to ensure that National Aerospace NDT Boards are operated in accordance with EN4179 / NAS410, ANDTBF/08 and procedures that have been established to control the board. If non-compliance is identified the auditor will formally record non-conformances. In order to obtain and maintain approval as a Board all non-conformance must be addressed.

2.0 GENERAL INFORMATION

2.1 References:

Available from www.asd-stan.org

EN4179 Qualification and Approval of Personnel for Non-destructive Testing Personnel.

Available from www.aia-aerospace.org

NAS410 Certification & Qualification of Nondestructive Test Personnel.

Available from www.efndt.org

ANDTBF/08 Organization, Duties and Responsibilities of NANDTB's.

2.2 Instructions to Auditors

In completing this assessment, auditors are instructed to respond with a "Yes" or "No" to address compliance with each statement of requirement. For any negative responses, the auditor must clearly indicate in the NCR if the "No" reflects noncompliance with respect to existence, adequacy, and/or compliance. Existence relates to evidence of a documented procedure or policy, adequacy relates to the completeness of the procedure or policy, and compliance relates to evidence of effective implementation. This checklist includes the use of the word "shall" which indicates a clear requirement that must be met at all times. The word "may" indicates a possible resolution to a requirement or one recommended method to achieve a given requirement, but does not represent the only way to meet that requirement. In addition, the checklist includes the term "Compliance Assessment Guidance".

This term is used to reflect the expectation when answering the checklist question as YES or NA. The auditor must verify the list of procedures provided by the Board at the time of the audit. Any corrections or updates to the list must be identified using notes, inserted at the applicable criterion.

All negative responses require a Non-conformance Report (NCR). Not applicable (NA) responses do not require an explanation unless otherwise noted. There is only one plausible reason for an NA, which is, that a particular operation or issue is not being employed. There are no NA's simply for a lack of a requirement. If a system is in use, then all questions pertaining to that system are applicable. If verification of results require documentation it shall be so noted in this checklist.

The audit results shall not include any proprietary information. Technical information on parts which have been designated "Export Controlled – License Required" (EC-LR) should not be recorded. If auditors have any questions about this, they should contact the organization managing this audit.

The evidence, e.g. procedure reference, document reference, website address etc. that supports the response shall be captured in the 'Evidenced by' box.

2.3 Instructions to the Board

It is recommended that prior to the audit each Board should complete a self-audit and all internally identified non-conformances should be corrected prior to the actual audit. Non-conformances which could have an impact on existing personnel approval/certification may require a follow up audit to verify that any corrective action has been implemented and is effective.

Following the audit any non-conformance(s) will be agreed by the representative of the board and the auditor. The board has 21 calendar days from the issue of any non-conformance report to submit a closed out non-conformance or provide a corrective action plan (NANDTB 12.A - NANDTB-TR Audit NCRs and Corrective Actions). The close out of the non-conformance shall include but not be limited to:

1. Root cause analysis.
2. Immediate corrective action to resolve the discrepancy.
3. Actions taken to preclude recurrence.
4. Any relevant documentation to support the close out of the non-conformance.

3.0 GENERAL INFORMATION

During the audit, the representative of the Board shall provide verbal or written translations as required to assure the Auditor's understanding and proper assessment for all technical data.

NANDTB Country	: Türkiye
NANDTB Representative contact	: Mehmet SAYGIOĞLU
Address where the audit is conducted	: Türk Hava Kurumu Kampüsü Bahçekapı Mah. Okul Sok. No:11, PK: 06790, Etimesgut – Ankara / TÜRKİYE
Telephone	: 0090 312 303 48 20
E-mail	: mehmet.saygioglu@thkteknik.com
Date of Audit	:
Auditor Name	:

3.1 For re-approval audits, were corrective actions from the previous audit implemented? YES NO NA

Compliance Assessment Guidance: Verification of corrective actions taken as a result of non-conformances identified during the previous audit will be conducted by the auditor. In addition, the auditor shall verify corrective actions associated with a previous audit that resulted in "failure". The auditor shall use investigative means to assure these are implemented. NA if this is the initial audit or there were no non-conformances identified during the previous audit.

Evidenced by:

3.2 Requirements – Structure of the NANDTB

3.2.1 Is there evidence to show that the NANDTB is chartered by the participating prime contractors? YES NO

Compliance Assessment Guidance: Prime contractor is an organization having overall responsibility for design, control and delivery of a system, component or product.

Evidenced by:

3.2.2 Is there evidence to show that the NANDTB is recognized by the nation's regulatory agency? YES NO

Compliance Assessment Guidance: The national Regulatory Agencies are termed the Competent Authority (CA) or National Aviation Authority (NAA).

Evidenced by:

3.2.3 Is there evidence to show that the voting members from participating Primes or type certificate holders are NDT level 3 personnel? YES NO

Compliance Assessment Guidance: There may be co-opted members who are allowed to vote however the deciding entity shall be level 3 personnel from participating prime contractors or type certificate holders.

Evidenced by:

3.2.4 Is there evidence to show that the National Regulatory agencies for civilian and / or defense are included as observer members? YES NO

Evidenced by:

3.2.5 Does the NANDTB have a website (webpage) where it is able to disclose information? YES NO

Compliance Assessment Guidance: Information such as written constitution, terms of reference, recognition by authority, NANDTB members, approved training and examination bodies, published procedures and specifications and requirements for qualification certificates.

Evidenced by:

3.2.6 Is the audit of examination bodies performed by the NANDTB? YES NO NA

Compliance Assessment Guidance: NA is applicable if the audit is performed by a national NDT society.

Evidenced by:

3.2.7 Is the audit of examination bodies performed by a national NDT society? YES NO NA

Compliance Assessment Guidance: NA is applicable if the audit is performed by the NANDTB.

Evidenced by:

3.2.8 Does the NANDTB employ the services of an auditor to audit examination bodies? YES NO NA

Compliance Assessment Guidance: NA is applicable when a national NDT society performs the audit.

Evidenced by:

3.2.9 Does the national NDT society employ the services of an auditor to audit examination bodies? YES NO NA

Compliance Assessment Guidance: NA is applicable when the NANDTB performs the audit.

Evidenced by:

3.2.10 Is there evidence to show that the auditor satisfies the requirements of EN4179 / NAS410? YES NO

Compliance Assessment Guidance: Personnel performing technical NDT audits shall have the training, skills and knowledge to understand the processes and procedures utilised in the application of NDT processes.

Evidenced by:

3.2.11 Does the NANDTB have access to the audits conducted by the national NDT society? YES NO NA

Compliance Assessment Guidance: NA is applicable when audits are performed by the NANDTB.

Evidenced by:

4.0 QUALITY REQUIREMENTS (PROCEDURES)

4.1 Has the NANDTB published a constitution, terms of reference and methods of the working of the Board? YES NO

Evidenced by:

4.2 Has the NANDTB published its aims and objectives? YES NO

Evidenced by:

4.3 Has the NANDTB published its rules of procedure for voting and agreeing resolutions? YES NO

Evidenced by:

4.4 Has the NANDTB published its criteria to be met by member organizations? YES NO

Evidenced by:

4.5	Has the NANDTB published a procedure for applying for membership and election of member organizations?	YES	NO
	Evidenced by:		
4.6	Has the NANDTB published a procedure for termination of membership?	YES	NO
	Evidenced by:		
4.7	Has the NANDTB published the names and status of organizations presently in membership of the Board? *Compliance Assessment Guidance: This shall include prime contractors, national NDT society, competent or national aviation authority, operators, maintenance organizations, etc.*	YES	NO
	Evidenced by:		
4.8	Has the NANDTB published the duties, responsibilities and tenure of appointed offices? *Compliance Assessment Guidance: This should include chairman, secretary, convener of working groups.*	YES	NO
	Evidenced by:		
4.9	Has the NANDTB published the method(s) by which it controls qualification examinations administered by internal and external examination bodies?	YES	NO
	Evidenced by:		
4.10	Has the NANDTB published criteria for examination bodies including how these bodies are to be audited and approved?	YES	NO
	Evidenced by:		

4.11	Has the NANDTB published guidance to examination bodies on the content of certificates of qualification (training and examinations)?	YES	NO	
	Evidenced by:			
4.12	Has the NANDTB published a policy on the recognition of examination body approvals issued under the control of other National Boards?	YES	NO	
	Evidenced by:			
4.13	Does the NANDTB have a process for qualifying a Level 3 in a new or emerging method? *Compliance Assessment Guidance: NA is applicable where the NANDTB has elected to follow the default requirements for emerging NDT methods per EN4179 / NAS410.*	YES	NO	NA
	Evidenced by:			
4.14	Where the NANDTB is required to provide services to a Responsible Level 3, is there evidence that the board has developed processes and procedures that ensures full compliance with the requirements of EN4179 / NAS410? *Compliance Assessment Guidance: The Responsible 3 may use an NANDTB to:* • *Develop training course outlines and training material* • *Create examination questions and administer examinations* • *Approve outside and/or internal organisations providing training and or examination services* • *Define requirements for qualification of NDT personnel in emerging NDT methods* • *Retain written and practical examinations* • *Designate Examiners and/or instructors at outside or internal organisations providing training and examination services.* *NA is applicable when the NANDTB does not provide any of the above services.*	YES	NO	NA
	Evidenced by:			

4.15 Does the NANDTB have a procedure detailing the actions necessary in the event that a finding had implications for safety or product integrity? YES NO

Compliance Assessment Guidance: The auditor should notify the NANDTB of the finding and the corrective action taken?

Evidenced by:

5.0 COMPLIANCE

The NANDTB and/or the national NDT society shall make available three representative audit reports conducted at approved Outside / Inside Agencies which have been approved by the NANDTB. These audit reports shall be evaluated to determine compliance with EN4179 and ANDTBF/08

These audit reports should be selected to represent a variety of Outside /Inside Agencies and should also represent different methods and levels used by the Outside / Inside Agency.

The NANDTB or national NDT society must provide objective evidence that all non-conformances have been successfully closed.

It is expected that the auditor shall review:

1. Root cause analysis.
2. Immediate corrective action to resolve the discrepancy.
3. Actions taken to preclude recurrence.
4. Any relevant documentation to support the close out of the non-conformance.

5.1 Review of Audit Packages

5.1.A.1 Name of Outside/Inside Agency:

_____

5.1.A.2 Name of Auditor:

_____

5.1.A.3 Date of Audit:

_____

5.1.A.4 Initial or Re-approval:

_____

5.1.A.5 Methods: _____ Levels:

_____

5.1.B.1	Name of Outside/Inside Agency: _____
5.1.B.2	Name of Auditor: _____
5.1.B.3	Date of Audit: _____
5.1.B.4	Initial or Re-approval: _____
5.1.B.5	Methods: _____ Levels: _____

5.1.C.1	Name of Outside/Inside Agency: _____
5.1.C.2	Name of Auditor: _____
5.1.C.3	Date of Audit: _____
5.1.C.4	Initial or Re-approval: _____
5.1.C.5	Methods: _____ Levels: _____

5.2	If the audit is performed by a national NDT society, is there evidence to show that the audit activity is overseen by the NANDTB?	YES	NO	NA

Compliance Assessment Guidance: NA should be used when the NANDTB performs the audits.

Evidenced by:

5.3	Does the audit criteria include a review of the Outside/Inside Agency's quality system documents and procedures as defined by the NANDTB?	YES	NO
	Evidenced by:		
5.4	Does the audit verify that the Outside/Inside Agency had a written practice based upon EN4179 and was approved by the Outside/Inside Agency's Responsible Level 3?	YES	NO
	Evidenced by:		
5.4.1	Does the audit verify that the written practice has identified the standard(s) to which it is compliant?	YES	NO
	Evidenced by:		
5.4.2	Does the audit verify that the written practice has identified each method and each specific technique within the method(s) used by the Outside/Inside Agency?	YES	NO
	Evidenced by:		
5.4.3	Does the audit verify that the written practice has addressed the levels of qualification and certification as used by the Outside/Inside Agency?	YES	NO
	Evidenced by:		
5.4.4	Does the audit verify that the written practice has addressed personnel duties and responsibilities in the applicable levels / methods used by the Outside/Inside Agency?	YES	NO
	Evidenced by:		
5.4.5	Does the audit verify that the written practice has addressed the required training requirements?	YES	NO
	Evidenced by:		

5.4.6	Does the audit verify that the written practice addressed the experience requirements?	YES	NO
	Evidenced by:		
5.4.7	Does the audit verify that the written practice addressed the examination requirements?	YES	NO
	Evidenced by:		
5.4.8	Does the audit verify that the written practice addressed the required records to be maintained?	YES	NO
	Evidenced by:		
5.4.9	Does the audit verify that the written practice addressed expiration, suspension and revocation of approvals?	YES	NO
	Evidenced by:		
5.4.10	Does the audit verify that the written practice addressed certification and recertification requirements?	YES	NO
	Evidenced by:		
5.4.11	Does the audit verify that written practice addressed the re-certification option to be used for the Level 3, whether it was by examination and/or by a credit system?	YES	NO
	Evidenced by:		
5.5	Does the audit verify that the Outside/Inside Agency had designated a Responsible Level 3?	YES	NO
	Evidenced by:		

5.6	Does the audit verify that any instructors and/or examiners employed by the Outside/Inside Agency were designated and approved by the Responsible Level 3 or NANDTB? Evidenced by:	YES	NO
5.7	Does the audit verify that the examiners used by the Outside/Inside Agency were Level 3 approved in the method(s)? *Compliance Assessment Guidance: NA should be used were there are no exams administered.* Evidenced by:	YES	NO
5.8	Does the audit verify that the Outside/Inside Agency had sufficient instructors and/or examiners to cover all methods employed by the agency? Evidenced by:	YES	NO
5.9	Does the audit verify that instructors and/or examiners were approved in writing by the Responsible Level 3 or the NANDTB? Evidenced by:	YES	NO
5.10	Does the audit criteria ensure that the relevant codes, standards and specifications were available? Evidenced by:	YES	NO
5.11	Does the audit criteria include an evaluation of contract review to ensure that clients' requirements were fully specified, recorded and understood by the examination body? Evidenced by:	YES	NO

5.12 Does the audit criteria include an evaluation that the examination body had appointed appropriately qualified and experienced examination staff? YES NO

Evidenced by:

5.13 Does the audit criteria include an evaluation that the Outside/Inside Agency ensured confidentiality, impartiality and security? YES NO

Evidenced by:

5.14 Formal Training

5.14.1 Does the audit verify that training facilities and classrooms provided an environment that was conducive to learning? YES NO

Evidenced by:

5.14.2 Does the audit verify that training facilities and classrooms were sufficiently well equipped with equipment and training aids, models, samples etc? YES NO

Evidenced by:

5.14.3 Does the audit verify that sufficient number of representative test samples containing natural or artificial features and / or flaws were available to cover the range of testing to be conducted by the candidate? YES NO

Compliance Assessment Guidance: Test samples used for training practical examinations shall not be used for training purposes.

Evidenced by:

5.14.4 Does the audit verify that the equipment used for practical training purposes was sufficiently compatible to that which the candidate would use in the performance of their job? YES NO

Compliance Assessment Guidance: NDT techniques within the method used for training are the similar techniques to those used by the candidates employer.

Evidenced by:

5.14.5 Does the audit verify that where appropriate safety related training was provided? YES NO

Evidenced by:

5.14.6 Is there evidence to show that all required records of training, qualification and certification were available during the audit? YES NO

Evidenced by:

5.15 Administration of Examinations

5.15.1 Does the audit criteria include the compilation of written specific and practical examinations which were appropriate to scope? YES NO

Compliance Assessment Guidance: These examinations shall be relevant to products, NDT procedures and processes.

Evidenced by:

5.15.2 Does the audit verify that the examinations were checked and verified against a client's requirements? YES NO

Evidenced by:

5.15.3 Does the audit verify that the content of the examinations were balanced and appropriate to the approval level? YES NO

Evidenced by:

5.15.4 Does the audit verify that the marks awarded to a successful candidate achieved a minimum of 70% for each examination and 80% overall for each method? YES NO

Evidenced by:

5.15.5 Does the audit verify that latest results for written and practical examinations are on file? YES NO

Compliance Assessment Guidance: The Outside Agency shall maintain the results of all qualification examinations.

Evidenced by:

5.16 General Examinations

5.16.1 Does the audit verify that General examinations were closed book? YES NO

Evidenced by:

5.16.2 Does the audit verify the minimum numbers of questions were administered? YES NO

Compliance Assessment Guidance: Minimum of 10 questions for level 1 limited and 40 questions for level 1, 2 and 3

Evidenced by:

5.17 Specific Examinations

5.17.1 Does the audit verify that Specific examinations were open book? YES NO

Evidenced by:

5.17.2 Does the audit verify the minimum numbers of questions were administered? YES NO

Compliance Assessment Guidance: Minimum of 8 questions for level 1 limited and 30 questions for level 1, 2 and 3.

Evidenced by:

5.17.3 Does the audit verify what reference material was made available to the candidate? YES NO

Compliance Assessment Guidance: reference material can be specifications, tables formulas etc.

Evidenced by:

5.17.4 Does the audit verify that answers to specific examination questions demonstrated the candidates understanding of information contained within the reference documents rather than merely its location? YES NO

Evidenced by:

5.17.5 Does the audit verify were the specific examination covered a wider scope within the method used? YES NO NA

Compliance Assessment Guidance: NA is to be used were wider scope examinations are not used.

Evidenced by:

5.18 Practical Examinations

5.18.1 Does the audit verify that test samples used for the practical examination contained known discontinuities or conditions? YES NO

Evidenced by:

5.18.2 Does the audit verify that a written checklist had been developed for the practical examination? YES NO

Compliance Assessment Guidance: The checklist shall be developed by the Outside Agency to assure adequate coverage and assist in the administration and grading of the examination?

Evidenced by:

5.18.3 Does the audit verify that in addition to a written checklist, the Outside Agency had determined how the examination results obtained by the candidate were to be documented? YES NO

Compliance Assessment Guidance: This can be part maps, drawings, sketches, written descriptions etc.

Evidenced by:

5.18.4 Does the audit verify were the practical examination covered a wider scope within the method? YES NO NA

Compliance Assessment Guidance: NA is to be used were wider scope examinations are not used.

Evidenced by:

5.18.5 Does the audit verify that all discontinuities, flaws or conditions as specified were detected? YES NO

Evidenced by:

5.18.6 Does the audit verify that test pieces, used for practical examinations, were identified, documented and held securely? YES NO

Evidenced by:

5.18.7 Does the audit verify that for level 3 candidates the practical examination involved the preparation of a NDT procedure or work instruction appropriate to the client's current requirements for the method? YES NO

Evidenced by:

5.18.8 Does the audit verify that the NDT procedure or work instruction was developed in conjunction with the general and/or specific examination(s)? YES NO

Evidenced by:

5.19 Training Outlines and Material

5.19.1 Does the audit verify that all training was conducted in accordance with a detailed course outline? YES NO

Evidenced by:

5.19.2 Does the audit verify that, as a minimum, training included: YES NO

- Basic theory
- Test principles, including choice of NDT methods, relevance to different materials and part and test variables
- Product forms and materials: defect formation and characterization
- Equipment operation and standardization
- The importance of appropriate processing steps and parameters
- Safety
- Applicable techniques and the advantages and disadvantages of each method and technique
- Limitations and capabilities of each method and technique
- Applicable specifications, codes, operating procedures and work instructions
- If applicable, evaluation, interpretation and documentation of inspection results

Evidenced by:

5.19.3 Does the audit verify that the Outside Agencies Responsible Level 3 had verified that all training met the client's requirements? YES NO

Evidenced by:

AUDIT SUMMARY

Audit Date		
Audit Scope		
Audit Number		
Auditor Team of DGCA	**1.**	
	2.	
	3.	
	4.	
Auditee Team of NANDTB-TR	**1.**	
	2.	
	3.	
	4.	

AUDIT RESULTS:

Finding ☐ **No Finding** ☐

Date:

If there are findings as a result of the audit, fill in the table below;

AUDIT RESULTS

Total Findings			
Finding No	**Related Question**	**Finding Description**	**Finding Level**

NANDTB 12.A / NANDTB-TR AUDIT NCRs AND CORRECTIVE ACTIONS

Audit Date	
Audit Scope	
Audit Number	
..... Major Finding(s)	..... Minor Finding(s)

Finding 1	
Checklist	
Paragraph	
Finding Description:	
Immediate Corrective Action:	
Root Cause:	
Action Taken to Prevent Recurrance:	
Objective Evidence:	

Finding 2	
Checklist	
Paragraph	
Finding Description:	
Immediate Corrective Action:	
Root Cause:	
Action Taken to Prevent Recurrance:	
Objective Evidence:	

Finding 3	
Checklist	
Paragraph	
Finding Description:	
Immediate Corrective Action:	
Root Cause:	
Action Taken to Prevent Recurrance:	
Objective Evidence:	

NANDTB-TR
NATIONAL AEROSPACE NDT BOARD

NANDTB 13 / LIST OF APPROVED TRAINING AND EXAMINATION CENTERS

Organization Name	Related Method(s) and Level(s)								Representative's Information		
	PT	MT	ET	UT	RT	TT	BNI	AEI	Name, Surname	Telephone Number	Address
	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③			