



MARITIME HELICOPTERS

3520 FAA Road
Homer, AK 99603

Telephone: (907) 235-7771

**Written Practice and Procedures Manual
For
Non-Destructive Testing
(NDT)**

PT Method Level III

MT Method Level III

Written Practice Level III



Published by:

Maritime Helicopters, Inc.

3520 FAA Road

Homer, AK 99603

(907) 235-7771

Copyright © 2014 Maritime Helicopters, Inc.

All Rights Reserved. No part of the contents of this document may be reproduced or transmitted in any form by any means without the written permission of Maritime Helicopters, Inc



Non-Destructive Testing Manual Foreword

Rev 1: 09/30/14

It is recognized that the effectiveness of non-destructive testing (NDT) applications depend on the capabilities of the personnel who are responsible for and perform NDT. This manual serves two purposes as follows;

1. Provides a written Practice for the qualifications and certification of (NDT) personnel Maritime Helicopters Inc.
2. Includes procedures for inspection of aircraft airframe, power plant and component parts by the following methods;
 - a. Liquid Penetrant testing (PT)
 - b. Magnetic Particle testing (MT)

The written practice and procedures covered in this NDT Manual are approved by a qualified and certified Level III, in house Level III or contracted outside agency, in the above named methods.

A copy of this manual signed by the Level III will be kept on file in the Director of Maintenance office of Maritime Helicopters Inc. as a minimum.

Revisions

The Director of Maintenance oversees the creation and revision of MHI controlled documents. Department Managers and Supervisors may submit suggestions and corrections for incorporation into this manual. Changes made to this manual will be summarized in the change summary table and indicated throughout the manual by change bars. A vertical bar (change bar) in the right margin indicates a change, addition, or deletion in the adjacent text for the current revision of that page only. The change bar is dropped at the next revision of that page. The effected paged will also be annotated by updating the revision level and date in the top right hand corner. The list of effected pages will also be updated.

This NDT Manual is broken down into six different chapters.

Chapter I	Written Practice
Chapter II	Liquid Penetrant Testing (PT)
Chapter III	Magnetic Particle Testing (MT)
Chapter IV	Chapter Intentionally Left Blank
Chapter V	Chapter Intentionally Left Blank
Chapter V	NDT Forms



Record of Revisions

<u>Revision #</u>	<u>Date Issued</u>	<u>Date Inserted</u>	<u>Initials</u>
Original			



List of Effective Pages

This is a complete re-write of the NDT Written Practice and Inspection Procedures Manual. Future revisions numbering will begin with “REV. 1” and subsequent.

PAGE	STATUS	DATE	PAGE	STATUS	DATE	PAGE	STATUS	DATE
1	Revision 1	09/30/13	31	Revision 1		61	Revision 1	
2	Revision 1	09/30/13	32	Revision 1		62	Revision 1	
3	Revision 1	09/30/13	33	Revision 1		63	Revision 1	
4	Revision 1	09/30/13	34	Revision 1		64	Revision 1	
5	Revision 1	09/30/13	35	Revision 1		65	Revision 1	
6	Revision 1	09/30/13	36	Revision 1		66	Revision 1	
7	Revision 1	09/30/13	37	Revision 1		67	Revision 1	
8	Revision 1	09/30/13	38	Revision 1		68	Revision 1	
9	Revision 1	09/30/13	39	Revision 1		69	Revision 1	
10	Revision 1	09/30/13	40	Revision 1		70	Revision 1	
11	Revision 1	09/30/13	41	Revision 1		71	Revision 1	
12	Revision 1	09/30/13	42	Revision 1		72	Revision 1	
13	Revision 1	09/30/13	43	Revision 1		73	Revision 1	
14	Revision 1	09/30/13	44	Revision 1				
15	Revision 1	09/30/13	45	Revision 1				
16	Revision 1	09/30/13	46	Revision 1				
17	Revision 1	09/30/13	47	Revision 1				
18	Revision 1	09/30/13	48	Revision 1				
19	Revision 1	09/30/13	49	Revision 1				
20	Revision 1	09/30/13	50	Revision 1				
21	Revision 1	09/30/13	51	Revision 1				
22	Revision 1	09/30/13	52	Revision 1				
23	Revision 1	09/30/13	53	Revision 1				
24	Revision 1	09/30/13	54	Revision 1				
25	Revision 1	09/30/13	55	Revision 1				
26	Revision 1	09/30/13	56	Revision 1				
27	Revision 1	09/30/13	57	Revision 1				
28	Revision 1	09/30/13	58	Revision 1				
29	Revision 1	09/30/13	59	Revision 1				
30	Revision 1	09/30/13	60	Revision 1				

	100933	09/30/14
Don Millar		

Approval Signature

Cert#

Date



Table of Contents

Record of Revisions.....	4
List of Effective Pages.....	5
Chapter I Written Practice.....	8
Section 1.1 Scope.....	8
Section 1.2 References.....	8
Section 1.3 Definitions	9
Section 1.4 Levels of Qualification	10
Qualification Requirements for Level I Special:	10
Qualification Requirements for Level I:.....	10
Qualification Requirements for Level III:	11
Section 1.5 Education, Training & Experience Requirements	12
Section 1.6 Examinations	12
Vision Examinations.....	12
Written Examination Requirements	13
General Examination for Level I Special	13
General Examination for Level I and Level II.....	13
Specific Examination for Level I Special.....	14
Specific Examination for Level I and Level II	14
Practical Examination for Level I special.....	15
Practical Examination for Level I and Level II	15
Number of Questions for Level I special, Level I and Level II Examinations.....	15
Administration and Grading of Written and Practical Examinations for Level I special, Level I and Level II.....	16
Reexamination for Level I special, Level I and Level II.....	16
Section 1.7 Requirements for Level III Qualification & Examination.....	16
Level III Qualification Requirements.....	16
Level III Examination Requirements.....	17
Reexamination for Level III	18
Section 1.8 Certification	18
Technical Performance Evaluation.....	20
Recertification.....	20
Termination of Certification	21
Reinstatement of Certification.....	21
NDT related paper work.	22
Section 1.9 Sample Forms	22
Table I.....	23
Level I Special, Level I and Level II Initial Training and Experience Levels	23
Table II.....	24
Minimum Number of Level I Special, Level I and Level II Written Examination Questions	24
Chapter II Liquid Penetrant Inspection Procedure.....	25
Section 2.1 Scope.....	25
Section 2.2 General.....	26
Section 2.3 References.....	26



Non-Destructive Testing Manual

Rev 1: 09/30/14

Section 2.4 Personnel.....	28
Section 2.5 Equipment.....	28
Materials	28
Dryer	29
Black Light & Ambient Light.....	29
Equipment & Material Quality Control.....	30
Section 2.6 Process	31
Application	31
Surface Preparation.....	31
Penetrant Removal.....	33
Drying.....	35
Developing.....	35
Inspection.....	36
Section 2.7 Reports.....	38
Section 2.9 in use Materials and Equipment	39
Chapter III Magnetic Particle Inspection.....	41
Section 3.1 Scope.....	41
Section 3.2 General.....	41
Section 3.3 References.....	42
Section 3.4 Personnel.....	43
Section 3.5 Equipment.....	44
Other Equipment.....	44
Materials	44
Ambient White Visible Light for Inspection Area	44
Black Light & Ambient Light for Fluorescent Inspection Area.....	45
Light Meters.....	45
Equipment & Material Quality Control.....	45
Section 3.6 Process	46
Application	46
Surface Preparation.....	46
Particle Application	47
Amperage Determination.....	47
Inspection.....	49
Section 3.7 Reports.....	50
Section 3.8 Acceptance Standards.....	51
Section 3.9 in use Materials & Equipment	51
Chapter IV (intentionally left blank)	52
Chapter V (intentionally left blank)	52
Chapter VI Forms.....	53
Section 6.1 Scope.....	53
Section 6.2 Certification Forms.....	55
Section 6.3 Performance Check Forms	55
Section 6.4 Shop Log Forms	56
Certification Record.....	59
Annual Performance Check – Level.....	60
Vision Examinations Record	61



Non-Destructive Testing Manual

Rev 1: 09/30/14

Training: NDT-Related.....	62
Written and Practical Examinations – Level I and Level II	63
Written and Practical Examinations – Level III	64
Equipment Performance Check	65
NDT Shop Inspection Log.....	70

Chapter I Written Practice

In Accordance with *Recommended Practice No. SNT-TC-1A*, 2001 edition Personnel Qualification and Certification in Nondestructive Testing

Section 1.1 Scope

This written practice establishes the minimum requirements for education, training, experience, examination and certification of Maritime Helicopters Inc. personnel responsible for conducting nondestructive tests while in the employ of Maritime Helicopters Inc. It applies to all persons, conducting nondestructive tests that are required to be certified to the provisions of *recommended Practice No. SNT-TC-1A*, 2001. The methods of nondestructive testing covered by this written practice are Liquid Penetrant testing (PT), Magnetic Particle testing (MT) and Ultrasonic testing (UT) as used in accordance with the applicable codes, standards, specifications and regulations referenced below. Some *SNT-TC-1A*, 2001 recommendations have been modified to meet the needs of Maritime Helicopters Inc.

Section 1.2 References

1. *Recommended Practice No. SNT-TC-1A*, Personnel Qualification and Certification in Nondestructive Testing, 2001 edition.*
2. Applicable Supplements to *Recommended Practice No. SNT-TC-1A*.*
3. Interpreting *SNT-TC-1A*, current edition. (Contains inquiries to and responses from ASNT's *SNT-TC-1A* Interpretation Panel.)*

*References available from the American Society for Nondestructive Testing (ASNT).

Applicable Employer NDT and Administrative Procedures

Liquid Penetrant testing (PT)

Magnetic Particle testing (MT)

Applicable Codes, Standards, Specifications or Regulations

Written Practice and Procedures Manual, Maritime Helicopters Inc.,



1. Manufacturers Maintenance and Overhaul Manuals.
2. Manufacturers and FAA bulletins.

Section 1.3 Definitions

1. **Certification**- written testimony of qualification.
2. **Certifying Authority**- the person or persons properly designated in the written practice to sign certifications on behalf of the employer.
3. **Certifying Agency** - the employer of the personnel being certified; specifically Maritime Helicopters Inc.
4. **Closed Book Examination** - an examination administered without access to reference material except for materials supplied with or in the examination.
5. **Comparable** - being at an equivalent or similar level of NDT responsibility and difficulty as determined by the employer.
6. **Documented** - the condition of being in written form.
7. **Employer** - the corporate, private, or public entity which employs personnel for wages, salary, fees or other considerations; specifically, Maritime Helicopters Inc.
8. **Experience** - work activities accomplished in a specific NDT method under the direction of qualified supervision, including the performance of the NDT method and related activities, but not including time spent in organized training programs.
9. **FAA** - Federal Aviation Administration
10. **Nondestructive Testing** - a process that involves the inspection, testing, or evaluation of materials, components, and assemblies for materials' discontinuities, properties and machine problems without further impairing or destroying the parts' serviceability. Throughout this document the term NDT applies equally to the NDT inspection methods used for material inspection, flaw detection or predictive maintenance (PdM) applications.
11. **Outside Agency** - a company or individual who provides Level III services and whose qualifications to provide these services have been reviewed and approved by the employer engaging the company or individual.
12. **Qualification** - demonstrated skill and knowledge, along with documented training and experience required for personnel to properly perform the duties of a specific job.
13. **Recommended Practice** - a set of guidelines to assist the employer in developing uniform procedures for the qualification and certification of NDT personnel to satisfy the employer's specific requirements.
14. **Training** - an organized program developed to impart the knowledge and skills necessary for qualification.
15. **Written Practice** - a written procedure developed by the employer that details the requirements for qualification and certification of their employees.



Section 1.4 Levels of Qualification

There are four basic levels of qualification applied to NDT personnel employed by Maritime Helicopters, Inc.

Level I Special, Level I, Level II and Level III.

An individual in the process of becoming qualified and/or certified to Level I is considered a trainee. A Level I Special is not to be considered a trainee prior to certification, unless manufacturer requires it. A trainee shall not independently conduct tests or interpret, evaluate, or report test results of any NDT. A trainee shall work under the direct guidance of certified individuals.

Qualification Requirements for Level I Special:

Level I Special personnel shall be qualified and/or required to:

1. Perform specific calibrations, specific nondestructive tests and specific evaluations for determining the acceptance or rejection of test item in accordance with specific written instructions only with specific company Level III and/or manufacturer approval and training on one specific inspection item.
2. Record test results and sign-off on the acceptance and completion of the nondestructive test as per specific training and per clearly written instructions only. Performs testing independently unless otherwise stated.

Qualification Requirements for Level I:

Level I personnel shall be qualified and/or required to:

1. Perform specific calibrations, specific nondestructive tests and specific evaluations for determining the acceptance or rejection of tested items in accordance with specific written instructions.
2. Record test results. Normally the Level I do not have the authority to sign-off on the acceptance and completion of the nondestructive test unless specifically trained to do so per clearly written instructions.
3. Perform NDT job activities in accordance with written instructions and direct supervision from a Level II or Level III individual.



Qualification Requirements for Level II:

Level II personnel shall be qualified and/or required to:

1. Be thoroughly familiar with the scope and limitations of each method for which the individual is certified.
2. Set up and calibrate equipment.
3. Interpret and evaluate results with respect to applicable codes, standards and specifications.
4. Organize and report the results of nondestructive tests.
5. Exercise assigned responsibility for on-the-job training and guidance of Level I, Level I Special and trainee personnel.

Qualification Requirements for Level III:

Level III personnel shall be qualified and/or required to:

1. Be responsible for NDT operations to which assigned and for which certified.
2. Develop, qualify and approve procedures; establish and approve NDT methods and test techniques to be used by Trainee, Level I, Level I Special and Level II personnel.
3. Interpret and evaluate test results in terms of applicable codes, standards, specifications and procedures.
4. Assist in establishing acceptance criteria where none are available, based on a practical background in applicable materials, fabrication and product technology.
5. Be generally familiar with appropriate NDT methods other than those for which specifically certified, as demonstrated by passing an ASNT Level III Basic examination or equivalent.
6. In the methods for which certified, be responsible for, and capable of, training and examination of Trainee, Level I, Level I Special and Level II personnel for certification in those methods.



Section 1.5 Education, Training & Experience Requirements

Level I and II personnel initially certified to conduct NDT covered by this written practice shall have received at least the minimum classroom training hours shown in Table I (pg. 1.10.1), depending upon each candidate's formal educational background. The training program shall include sufficient examinations to ensure that the course material has been understood. Educational attainment, completed training and experience shall be documented on the following Maritime Helicopters Inc. forms located in Chapter VI of this written practice;

- (a) Nondestructive Testing Personnel Qualification Record
(For initial Qualification, one per Level)
- (b) NDT Work Accomplished Log
- (c) NDT –Related Training Record (class Room)
- (d) Certification Record

Documented prior certification is considered by Maritime Helicopters Inc. in determining evidence of qualification for comparable levels of certification. Documented training and/or experience in positions and activities comparable to those of Levels I, II or III prior to the establishment of this written practice is considered to satisfy the requirements of training and/or experience.

Organized NDT training shall be conducted either by employer-certified Level III individual(s) or by an outside agency or other certified individual designated and approved by a responsible Level III or other Level III authorized official of Maritime Helicopters Inc.

Procedures and test techniques that individuals will encounter in their specific assignments, and the applicable instructions, specifications and codes used shall be part of each candidate's informal on-the-job training under the coordination of the Level III individual(s).

The training program shall follow the "Recommended Training Course" for each test method as shown in *SNT-TC-1A*, 2001 edition, unless otherwise modified to meet specific needs or course approval from Maritime Helicopters Inc. Level III or Level III authorized official.

Section 1.6 Examinations

Vision Examinations

All Level I Special, Level I, II and III personnel shall be given an annual vision examination to ensure natural or corrected near-distance acuity exists in at least one eye. The individual shall be capable of reading a Jaeger Number 2 or equivalent type and size letters at a distance of not less than 12 in.



Where differentiation of colors is critical to job performance, the capability to distinguish and differentiate contrast among colors or shades of gray used in the method shall be demonstrated. This examination shall be administered upon initial certification and every three years thereafter.

Vision examinations are to be administered by Optometrists acceptable to Maritime Helicopters Inc. Chief Inspector or company Level III and listed as such on "Record of Authorizations and Designations" form in Chapter VI, Page 6.2.1 and maintained in employee training folder.

Written Examination Requirements

All Level I Special, Level I, II and III written examinations shall be closed book except that necessary data such as graphs, tables, specifications, procedures, codes, etc., may be provided with or in the examination. Questions utilizing such reference materials shall require an understanding of the information rather than merely locating the appropriate answer. All questions used for Level I Special, Level I and Level II examinations shall be approved by the responsible Level III or Approved outside agency.

General Examination for Level I Special

Each Level I Special candidate shall be given a general, objective type (for example, multiple choice) written examination addressed to the basic principles of each method and appropriate to the level for which certification is sought.

This examination shall be administered as follows:

As part of a specific training program based on a specific method inspection with specific written procedures as required by Manufacturer, Maritime Helicopters Inc. Level III or Approved outside agency.

General Examination for Level I and Level II

Each Level I and II candidate shall be given a general, objective type (for example, multiple choice) written examination addressed to the basic principles of each method and appropriate to the level for which certification is sought.

This examination shall be administered as follows:

1. As part of an organized training program when feasible;
2. Given separately when experienced personnel are being examined for recertification, or;
3. Given separately for initial certification of personnel coming from a former employer and otherwise complying with this written practice.



Non-Destructive Testing Manual

Rev 1: 09/30/14

The general examination questions shall be approved by the Level III or outside agency. The qualification level, content and format of the examination questions shall be similar to the example questions in the applicable *SNT-TC-1A* supplement. The supplement questions are intended only as examples. They shall not be used verbatim for qualification examinations. Candidates shall have access to questions only at the time of the examination.

A valid endorsement on an ACCP Level I or Level II certificate fulfills the criteria for Level I or Level II general examinations for each applicable NDT method.

Specific Examination for Level I Special

Each Level I Special candidate shall be given a specific, objective type (for example, multiple choice) written examination addressing the specific equipment, specific operating procedures, specific test techniques and specific product forms that the personnel may encounter in their specific job assignments.

This examination shall be administered as follows:

1. As part of a specific training program based on a specific method inspection with specific written procedures as required by Manufacturer, Maritime Helicopters Inc. Level III or Approved outside agency.

Specific Examination for Level I and Level II

Each Level I and II candidate shall be given a specific, objective type (for example, multiple choice) written examination addressing the equipment, operating procedures, test techniques and product forms that the personnel may encounter in their specific job assignments.

This examination shall be administered as follows:

1. As part of an organized training program when feasible;
2. Given separately when experienced personnel are being examined for recertification, or;
3. Given separately for initial certification of personnel coming from a former employer and otherwise complying with this written practice.

The examination shall be approved by the Level III or Approved outside agency and shall address the specifications, codes and acceptance criteria as listed in the references, to the extent they are in routine use and apply to the particular method(s) for which the candidate is being examined. The content of the specific examination shall be constructed to evaluate the ability of the candidate to effectively use the applicable specifications, codes, etc., to perform the required tests and/or evaluate the results to the degree necessitated by the anticipated qualification level.

A valid endorsement on an ACCP Level I or Level II certificate fulfills the criteria for Level I or Level II specific examinations for each applicable NDT method, provided documented experience exists to fulfill the Maritime Helicopters Inc. specific examination criteria.



Practical Examination for Level I special

Level I Special – Each Level I Special candidate shall be given a practical “hands-on” examination that demonstrates the candidate’s proficiency to perform specific calibrations, specific tests using the specific equipment available on the job, and specific evaluations for acceptance or rejection determinations in accordance with detailed instructions and specific procedures as required by Manufacturer or Maritime Helicopters Inc. At least one flawed specimen shall be tested and the results analyzed by the person being considered for certification. Selection of the specimen(s) shall be made by the Level III or Approved outside agency and performance shall be measured based on at least 10 performance checkpoints selected to demonstrate understanding of test variables and procedural requirements.

Practical Examination for Level I and Level II

Level I – Each Level I candidate shall be given a practical “hands-on” examination that demonstrates the candidate’s proficiency to perform specific calibrations, specific tests using the equipment normally available on the job, and specific evaluations for acceptance or rejection determinations in accordance with detailed instructions and procedures as listed in the references. At least one flawed specimen shall be tested and the results analyzed by the person being considered for certification. Selection of the specimen(s) shall be made by the Level III or Approved outside agency and performance shall be measured based on at least 10 performance checkpoints selected to demonstrate understanding of test variables and procedural requirements.

Level II – Each Level II candidate shall be given a practical “hands-on” examination that demonstrates the candidate’s ability to select and perform the applicable NDT technique, set up and perform calibrations using equipment normally available on the job, interpret and evaluate results in accordance with applicable specifications, codes, standards, etc., as listed in the references, and organize and report the results of the test. At least one flawed specimen shall be tested, and the results analyzed by the person being considered for certification. Selection of the specimens shall be made by the Level III or Approved outside agency and performance shall be measured based on at least 10 performance checkpoints selected to demonstrate understanding of test variables and procedural requirements.

A valid endorsement on an ACCP Level I or Level II certificate fulfills the criteria for Level I or Level II practical examinations for each applicable NDT method.

Number of Questions for Level I special, Level I and Level II Examinations

Table II summarizes the minimum number of examination questions to be included in each Level I Special, Level I and Level II written examination.



Administration and Grading of Written and Practical Examinations for Level I special, Level I and Level II

The security, grading and administration of the examinations shall be the responsibility of the designated Level III or Approved outside agency, certified in the method(s) for which the examinations are to be administered. The Level III or Approved outside agency shall approve the use of all Level I and II questions, the selection of the practical test sample(s), and the performance checkpoints. However, administration, monitoring, and scoring of examinations may be delegated to a suitably qualified representative of the Level III or Approved outside agency.

[**NOTE:** IF DELEGATED, THE REPRESENTATIVE OF THE LEVEL III MUST BE RECORDED. THIS MAY TAKE THE FORM OF A FORMAL LETTER SIGNED BY THE LEVEL III DESIGNATING AN INDIVIDUAL, OR SIMPLY AN ENTRY ON THE COVER PAGE OF THE EXAMINATION.]

The results of each Level I special, Level I and Level II candidate's three examinations (general, specific and practical) are to be combined into a composite score for which a score of 80 percent is the minimum required for qualification. The composite score is obtained by simple averaging of the scores achieved in each of the three examinations. In addition, the score for each of the individual examinations shall be 70 percent or higher.

Reexamination for Level I special, Level I and Level II

Level I special, Level I or Level II candidates failing to attain a composite score of 80 percent or higher, or a score of 70 percent or higher in any individual examination, shall be reexamined after sufficient method refreshment as determined by the Level III or Approved outside agency.

Section 1.7 Requirements for Level III Qualification & Examination

Level III Qualification Requirements

Provided the Level III examination requirements are fulfilled, as set forth in the following section, an individual can qualify as a Level III by satisfying one of the following criteria:

1. Have obtained a degree in engineering or science from a college or university (four-year curriculum, minimum), plus one additional year of experience beyond the Level II requirements in an assignment comparable to that of a Level II in the method(s) for which being certified, or;
2. Have satisfactorily completed at least two years of technical training (engineering or science at a university, college or technical school), plus two additional years of experience beyond the Level II requirements in an



Non-Destructive Testing Manual

Rev 1: 09/30/14

assignment at least comparable to that of a Level II in the method(s) for which being certified, or;

3. Have four years of NDT experience beyond the Level II requirements in assignments at least comparable to that of a Level II in the method(s) for which certification is sought.
4. For Level III qualification, required experience shall consist of the sum of the times required for Level I and Level II, and the required formal training shall also consist of the training required for Level I and Level II plus any additional formal training as defined in this written practice.
5. Experience requirements for NDT Level III will be satisfied if the individual holds a current ASNT NDT Level III or ACCP NDT Level III certificate in the specific NDT method.

Level III Examination Requirements

There shall be three separate examinations administered to Level III candidates:

1. Basic Examination (required only once when more than one method examination is taken). The minimum number of questions shall be as follows:
 - a. 15 questions related to understanding *SNT-TC-1A*, 2001 edition;
 - b. 20 questions relating to applicable materials, fabrication, and product technology, and
 - c. 20 questions similar to those used for Level II examinations relating to applicable NDT methods.
2. Method Examination (required for each different method). The minimum number of questions shall be as follows:
 - a. 30 questions relating to fundamentals and principles that are similar to published ASNT NDT Level III questions for each method;
 - b. 15 questions relating to application and establishment of techniques that are similar to published ASNT NDT Level III questions for each method, and;
 - c. 20 questions relating to capability for interpreting codes, standards and specifications relating to the method.
3. Specific Examination (required for each different method). The minimum number of questions shall be as follows:
 - a. 20 questions relating to specifications, equipment, techniques and procedures applicable to Maritime Helicopters Inc. products and NDT methods used, and to the administration of this written practice.



4. Except as provided in 6 and 7 of this section, a Level III candidate must pass a Basic, Method and Specific Level III examination, to be administered and scored outside agency approved by Maritime Helicopters Inc. Level III or Approved outside agency.
5. The results of each Level III candidate's three examinations (Basic, Method and Specific) are to be combined into a composite score for which a score of 80 percent is the minimum required for qualification. The composite score is obtained by simple averaging of the scores achieved in each of the three examinations. In addition, the score for each of the individual examinations shall be 70 percent or higher.
6. The Level III Basic and Method Examinations are not required if the candidate has a current, valid ASNT NDT Level III certificate and endorsements in the method(s) for which certification is sought. A valid endorsement on an ACCP Professional Level III certificate fulfills the criteria for Level III Basic and Methods Examinations.
7. The Level III Specific Examination is not required if the candidate has a current valid ASNT NDT Level III certificate or a valid endorsement on an ACCP Professional Level III certificate in the method(s) for which certification is sought. However, the candidate must also produce documented evidence of experience, including the preparation of NDT procedures related to codes, standards, and/or specifications, and evidence of evaluation of test results in accordance with codes, standards and/or specifications.

Reexamination for Level III

Level III candidates failing to attain a composite score of 80 percent or higher, or a score of 70 percent or higher in any individual examination, shall be prohibited from being reexamined for 30 calendar days from the time of the failed examination, unless evidence of having received suitable additional training is presented, as determined by the Maritime Helicopters Inc. Level III or Approved outside agency.

Section 1.8 Certification

Level III individuals employed by Maritime Helicopters Inc. are certified by Maritime Helicopters Inc. company Level III or Approved outside agency upon satisfactory presentation of documentation showing evidence of qualification in accordance with this written practice, in the method(s) for which certification is being sought.



When outside agencies supply Level III services, the responsibility for ensuring that these organizations or individuals satisfy the requirements of this written practice on a continuing basis remains with the designated staff employee official of Maritime Helicopters Inc.

If outside agencies are used, the responsibility for certification shall be retained by Maritime Helicopters Inc.

The Maritime Helicopters Inc. Level III or Approved outside agency shall certify Level I special, Level I and Level II individuals, upon their satisfactory completion of the training, experience and examinations required by this written practice.

Personnel certification records shall be maintained in active files by Maritime Helicopters Inc. during the employment of certified individuals. Following separation of employment, the affected personnel certification records shall be removed from active records, but maintained for at least 12 months following separation. Active records shall include:

- a. This written practice;
- b. Names and certification records of NDT personnel, including;
 - (1) Applicable NDT experience, status of current and past level(s) of certification and methods in which certified, results of examinations (including vision), and training received, during employment at Maritime Helicopters Inc.;
 - (2) Documentary evidence of training and experience in NDT during prior employment, as applicable;
 - (3) Documentary evidence of educational attainment, as applicable;
 - (4) Documentary evidence of satisfactory qualifications when such qualifications are used in lieu of any specific examination(s);
 - (5) Copies of current examinations;
 - (6) Authorizations for designating and certifying Level III individual(s);
 - (7) Authorizations for certifying Level I and II individual(s);
 - (8) Authorizations designating outside agencies providing Level III services.



For the case where a new employee who held an equivalent certification with a previous employer, is a candidate for certification in any NDT method by Maritime Helicopters Inc., such certification shall be granted:

- a. Upon presentation to, and acceptance by, the Level III of documentation verifying the scope of the prior certification;
- b. Upon presentation of evidence that the candidate was working in the capacity to which certified, prior to separation, within six months of separation; and,
- c. Provided the candidate is being recertified within six months of separation.

If a new employee does not meet the above requirements, additional training, experience and examination(s) shall be required as deemed appropriate by the Level III.

Technical Performance Evaluation

1. At the discretion of Maritime Helicopters Inc. Level III any NDT personnel may be reexamined at any time during the stated period of certification in any or all of the examination parts and have their certifications extended or revoked. Supplemental training may also be required.
2. At least annually, the technical performance of Level I special, Level I and II personnel shall be evaluated and documented by the appropriate Maritime Helicopters Inc. Level III, Approved outside agency or company Level III authorized official. This evaluation shall be conducted using the procedures for the practical examinations for Level I and Level II or equivalent.

Recertification

1. Level I Special, Level I and Level II NDT personnel shall be recertified every three (3) years or, based upon one of the following:
 - a. Evidence of continuing satisfactory technical performance as judged and documented by the Maritime Helicopters Inc. Level III, Approved outside agency or Level III authorized official.
 - b. Or by reexamination in any or all parts of the examinations for the applicable method(s) as deemed necessary by the applicable Maritime Helicopters Inc. Level III or Approved outside agency.
2. Level III personnel shall be recertified every five (5) years OR, based upon one of the following:



- a. Evidence of continuing satisfactory technical performance as judged by Maritime Helicopters Inc. Level III or Approved outside agency.
 - b. By reexamination in any or all parts of the examinations for the applicable method(s) as deemed necessary by Maritime Helicopters Inc. Level III or Approved outside agency.
3. Unless otherwise required by contract or governing provisions of applicable codes, standards, specifications, or regulations, reexamination and recertification of certified NDT personnel shall be required if a certified individual has not performed job duties in the method(s) for which certified:
 - a. During a contiguous period of one (1) year or more, or;
 - b. For a total of one (1) year or more during any period of three (3) years or more.

Termination of Certification

1. All NDT certifications of personnel leaving the employment of Maritime Helicopters Inc. are revoked at the time of the employee's separation.
2. Certification(s) shall be revoked if a certified individual fails to qualify for recertification.

Reinstatement of Certification

A previously certified individual whose certification has been terminated may be reinstated to the former Level without further examinations provided:

1. The certification records have been maintained in accordance with this written practice; and,
2. The employee's certification did not expire during the period of termination; and,
3. The employee's certification is reinstated within six months of certification termination.



NDT related paper work.

All NDT related paper work (or copies of) required by this manual shall be kept in Specified files by the company Level III or Approved outside agency or Director of Maintenance. In addition Maritime Helicopters Inc shall include this paper work in appropriate company training folders for each employee associated with NDT. Each employee shall also maintain a personal folder as per this manual. The Director of Maintenance for Maritime Helicopters Inc. is responsible to insure that the locations of these files are annotated in the proper Maritime Helicopters Inc. publication listings and maintained accordingly. It is the responsibility of the employee to provide required paper work to the company and to maintain their personal folder. It is the responsibility of the Chief Inspector or Level III authorized official to insure employee personal folder(s) and the company files are maintained as per Maritime Helicopters Inc. Repair Station requirements and this Manual requirement as appropriate. The Chief Inspector or Level III authorized official shall inform the company Level III or Approved outside agency of any discrepancies and work with the Level III or Approved outside agency to correct any and all discrepancies.

The company Level III or Approved outside agency shall inform the Chief Inspector or Level III authorized official of his/her duties and responsibilities.

Section 1.9 Sample Forms

The Forms located in Chapter VI of this written practice will be used from date of issue of this manual forward by Maritime Helicopters Inc. in the control and administration of the NDT personnel qualification and certification program. Forms used prior to issue date of this manual will be used until new qualifications or certifications are obtained.



Table I
Level I Special, Level I and Level II Initial Training and Experience Levels

NDT METHOD	NDT LEVEL	INITIAL TRAINING HOURS		EXPERIENCE LEVEL (Months/Hours) ***
		HIGH SCHOOL GRADUATE*	POST-HIGH SCHOOL**	
MT	I	12	8	1/70
	II	8	4	3/210
PT	I	4	4	1/70
	II	8	4	2/140
UT	I	40	30	3/210
	II	40	40	9/630
ET	I	40	24	3/210
	II	40	40	9/630
MT, PT, UT, ET	Level I Special	****	****	****

* GED certificate is acceptable.

** Defined as completion of at least two years of engineering or science study in a university, college or technical school, with passing grades.

*** If hours are used, work time experience per level shall be required over the time frame in one-half to three times the months shown and shall include a minimum of the hours shown in the specific method for which certification is sought.

**** Level I Special training and experience will be determined by Manufactures requirement and/or approved by Maritime Helicopters Inc. Level III or Approved Outside Agency.

NOTES:

- For Level II certification, the experience shall consist of time at Level I or equivalent. If a person is being qualified directly to Level II with no time at Level I, both the required experience times and the required training hours shall consist of the sum of the times required for Level I and Level II.
- If the Experience Level is shown in months, initial experience may be gained simultaneously in two or more methods if the candidate spends a minimum of 25 percent of work time on each method for which certification is sought, and the remainder of work time claimed as experience is spent in NDT-related activities.
- Experience levels for Level I and Level II shall be considered complied with if candidate has proof of passing a military NDT/NDI or equivalent military school and has worked at that job for a minimum of 3 years in the military and be approved by the Maritime Helicopters Inc. Level III or Approved Outside Agency.



Table II

Minimum Number of Level I Special, Level I and Level II Written Examination Questions

NDT METHOD	GENERAL EXAMINATION		SPECIFIC EXAMINATION	
	LEVEL I	LEVEL II	LEVEL I	LEVEL II
MT	40	40	20	20
PT	40	40	20	20
UT	40	40	20	20
ET	40	40	20	20
Level I Special	*	*	*	*

*** Number of Level I Special question will be determined by Manufactures requirement and/or approved by Maritime Helicopters Inc. Level III or Approved Outside Agency.**



Chapter II Liquid Penetrant Inspection Procedure

Section 2.1 Scope

- (1) This procedure covers inspection by the liquid penetrant method of the surface of aircraft airframe and component parts maintained by Maritime Helicopters Inc.
- (2) The inspection shall be of the following types and methods as applicable.

Type I - Fluorescent Dye.

 Method B --Post Emulsified, Lipophilic

 Method C --Solvent Removable

 Method D -- Post Emulsified, Hydrophilic

Type II- Visible Dye

 Method C-- Solvent Removable

NOTE

Type II Penetrant examination shall not be used for final acceptance examination of aircraft parts. In addition, Type II penetrant examination shall not be used prior to a type I penetrant examination of the same surface.

- (3) This document is intended to meet the requirements of SNT-TC-1A.



Section 2.2 General

In order to perform liquid penetrant examination of aircraft component parts and airframe surfaces, the manufacturers overhaul and inspection procedures manual, technical bulletins or certified Level III written procedure shall be consulted for the following information.

- (1) Identify the material of items to be tested.
- (2) Designate the surface area to be tested.
- (3) Sensitivity level and type of penetrant and method of inspection.
- (4) Determine the acceptance and rejection standard to be used.
- (5) Required Report

Section 2.3 References

The following documents and manuals have been referenced in the preparation of this written procedure and are considered a part of this written procedure as applicable. Due to the broad range of applications in Liquid penetrant testing this list should only be taken as a minimum and further applicable references should be added as needed by company Level III or Approved outside Agency by written letter inserted opposite this page for immediate action in the Maritime Helicopters Inc. Non-Destructive Testing Manual.

- (1) Maritime Helicopters Inc. Non-Destructive Testing Manual
- (2) SNT-TC-1A, 2001 Edition
- (3)
 - (a) MIL-I-25135
 - (b) ASTM E 1417
- (4) ASNT NDT Handbook Vol. 2, Liquid Penetrant Testing
- (5) Manufactures Maintenance and Overhaul Manuals
- (6) Manufactures or FAA issued Bulletin



Maritime Helicopters Inc. may utilize the following groups as pertaining to MIL-I-25135. Maritime Helicopters Inc. certified Level III may add or remove a specific group as required by specific needs.

- Group I Solvent-Removed Visible Dye Penetrant
- Group V Post-Emulsified Fluorescent Dye Penetrant (medium sensitivity)
- Group VI Post-Emulsified Fluorescent Dye Penetrant (high sensitivity)
- Group VII Solvent-Removed Fluorescent Dye Penetrant Kit
(consisting of Group VI penetrant, solvent and non-aqueous wet developer)

Specification ASTM E 1417 list applications and methods for penetrant and emulsifiers. The following is a list as pertaining to Maritime Helicopters Inc.;

- Type I - Fluorescent
 - Method B – Post-Emulsified (lipophilic)
 - Method C – Solvent-Removed (spray can)
 - Method D – Post-Emulsified (hydrophilic)
- Type II - Visible Dye
 - Method C – Solvent-Removed (spray can)

NOTE

Type II Penetrant examination shall not be used for final acceptance examination of aircraft parts. In addition, Type II penetrant examination shall not be used prior to a type I penetrant examination of the same surface.



Section 2.4 Personnel

Personnel performing liquid penetrant examination to this procedure shall be qualified and certified in accordance with Maritime Helicopters Inc. Written Practice in Chapter I of this Manual.

Note

Due to the ever changing and technical nature of NDT and its methods, continuing education, refresher courses and/or conferences should be part of the training program.

Section 2.5 Equipment

Selection of penetrant and emulsifier materials from Group V, Group VI post emulsified dye penetrant and group VII solvent-removed fluorescent penetrant kit of the Type I(Fluorescent) will be utilized, Unless otherwise stated by manufacture or Maritime Helicopters Inc. Level III. Intermixing of penetrant materials from one family with a different family is not permitted(use same brand name and insure capability).

Selection of penetrant and emulsifier materials used in examining nickel-based alloy or titanium parts must be based on penetrant sulfur, chlorine and fluorine content to ensure penetrant materials are not detrimental to part under subsequent high temperature processing or service. Type I, Method D penetrant inspection will be used unless otherwise stated by manufacturer or Maritime Helicopters Inc. Level III or outside agency.

Materials

Penetrant material shall be controlled by Level II in charge of NDT shop. Only approved materials shall be used. A list of in use penetrants, emulsifiers, developers and cleaners will be kept in the NDT shop.



The list will include:

- (1) Part number
- (2) Brand name
- (3) Expiration date and shelf life (if applicable)

Dryer

A thermostatic controlled forced-air recirculation type dryer will be used where applicable with a calibrated device capable of maintaining the oven temperature at $\pm 15^{\circ}$ Fahrenheit for which oven is set and the temperature indicator must be accurate within $\pm 10^{\circ}$ Fahrenheit of actual oven temperature. The oven temperature shall never exceed 140° Fahrenheit. Calibration shall be done quarterly and/or after any maintenance that would affect oven temperature. Calibration records will be maintained and tracked by Maritime Helicopters Inc.

Black Light & Ambient Light

An ultraviolet light that meets the requirements of Maritime Helicopters Inc. NDT Manual, Sec.2.3, References will be used in all fluorescent penetrant inspections.

Black lights shall be allowed to warm up for 5 minutes prior to use or intensity checks. Intensity check will be done daily, prior to use or after bulb replacement. Black light intensity will be at least $1000 \mu\text{W}/\text{cm}^2$ at 15 inches from face of light unless otherwise specified by written procedure and approved by a Level III or called out for by a manufacturer.

Ambient light in inspection area shall not be more than 2 ft candles for in shop inspections. Ambient light of the lowest level possible is needed for field inspections. The use of tarps, boxes or night time are sample ways of lowering ambient light. The Level II or Level III performing the field inspection must use their training and experience in determining if level of ambient light will allow for an acceptable inspection.

Ultraviolet and ambient white visible light meters calibrated to known standards and at time specified by this NDT Manual, Sec.2.3, References shall be used to check light intensities on a daily basis, prior to use or after bulb replacement. Result of check will be logged on appropriate form located in Sec.VI of this manual. Records for the current year and the previous year are retained in the NDT shop and is the responsibility of the shop Level II.



Black light and ambient light meters calibration records will be maintained and tracked by Maritime Helicopters Inc. Calibration intervals shall be every 6 months by qualified person or company approved by Maritime Helicopters Inc..

Black lights and all associated equipment are the responsibility of the technician using the equipment. Technician shall insure proper operation, proper calibration stickers, and proper maintenance and all necessary care for the proper operation of light equipment.

Equipment & Material Quality Control

Quality control steps for equipment and materials is necessary to ensure that the penetrant system provides an acceptable level of performance. The type and frequency of the quality control steps will be as specified in Reference ASTM E 1417 unless otherwise noted.

To insure quality checks, Samples of sufficient quantity of unused penetrant, unused Lipophilic emulsifier and/or unused Hydrophilic emulsifier will be kept in a cool darkened area to be used as reference material for system quality performance checks.

Quality control checks will be performed as per Table 1, ASTM E 1417.

Quality control checks will be annotated on appropriate forms found in Sec. VI, Maritime Helicopters Inc. NDT Manual.

In addition to ASTM E 1417 Quality checks the liquid penetrant, emulsifier and developer baths shall be removed from tanks, tanks cleaned and baths refilled with appropriate materials approximately every 5 years or date of manufacture expiration whichever comes first. The date of this action, the next due date and technicians name shall be annotated on the penetrant line check form in sec. VI of this manual. This is in addition to and does not replace any required replacement due to a failure of ASTM E 1417 quality checks. The 5 years or date of manufacture expiration whichever comes first time change can be zeroed out if early replacement is necessary.

NDT shop Level II is responsible to insure proper system checks are preformed and appropriate action taken dependant on the results of the system checks. Any equipment or material found not to be in compliance with system check minimums or for safety concerns will be locked out or tagged out IAW Maritime Helicopters Inc. Lock-out, tag-out procedures until compliance is met. Maritime Helicopters Inc. Level III will be notified in all such incidents by Verbal communication or by written message if deemed necessary.



Section 2.6 Process

Application

The item under examination shall be segregated by the use of pans and baskets and shall be examined for discontinuity as specified by the manufacturer or written procedure approved by a Level III. The examination shall be accomplished by Type I (fluorescent), Method B, C, or D.

NOTE

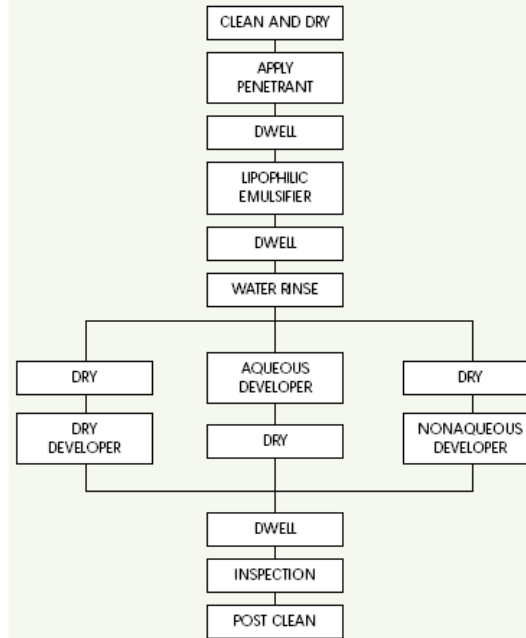
Type II Penetrant examination shall not be used for final acceptance examination of aircraft parts. In addition, Type II penetrant examination shall not be used prior to a type I penetrant examination of the same surface.

Surface Preparation

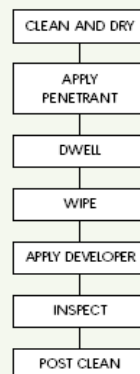
Surface to be inspected shall be cleaned and free of dirt, grease, oil, paint, corrosion and other foreign material. Corrosion will be cleaned as per manufacturer's manuals prior to penetrant testing. Cleaning methods may include, but are not limited to detergent, solvents, paint remover, steam cleaning, ultrasonic and vapor degreasing. Cleaning methods shall be done in accordance with manufacturer manuals or Level III approved procedure. The shop of part origin is responsible for pre-cleaning and post cleaning of all parts.



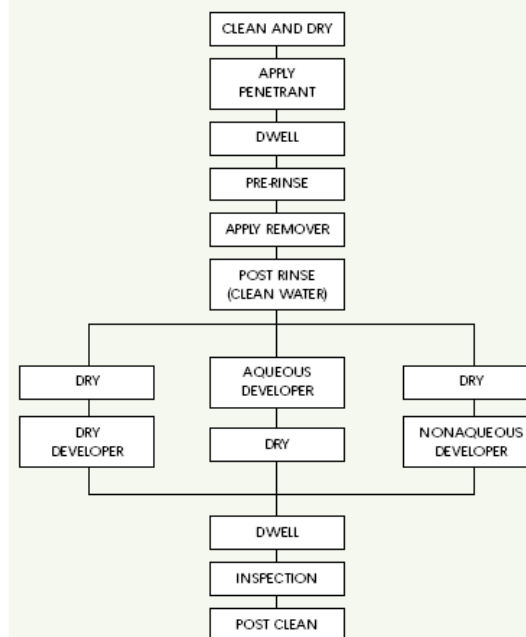
METHOD B LIPOPHILIC



METHOD C SOLVENT REMOVABLE



METHOD D HYDROPHILIC





Penetrant Application and Dwell

Unless otherwise specified the entire surface of the component shall be covered with penetrant. Those areas not to be covered with penetrant shall be masked off or otherwise protected. Penetrant shall be applied by spraying, dipping or brushing to provide coverage as required. The component, penetrant and ambient temperatures shall be in the range of 40°F to 120°F unless otherwise specified by manufacturer or Maritime Helicopters Inc. Level III. When the temperature is below 50°F dwell time shall be increased 2 times in order to compensate for higher viscosity of penetrant. No inspection is to be done below 40°F without written approval from manufacturer or Level III.

Dwell time unless otherwise specified shall be a minimum of 10 minutes. Rotation or other movement of the test part is required during dwell to prevent pooling or drying of the penetrant due to dwell time or environmental conditions. If test part is dipped/immersed in penetrant no more than ½ the dwell time can be spent submerged.

If any condition occurs that would adversely affect the outcome of the inspection, the part will be cleaned and reprocessed.

Penetrant Removal

- (1) Method B Process – Lipophilic post-emulsified penetrant systems shall be removed by water immersion or water spray rinse after application of an emulsifier and a dwell time.
 - (a) Lipophilic application and dwell – Lipophilic emulsifier shall be applied by immersion or flowing. Lipophilic emulsifiers shall not be applied by spray or brush and shall not be agitated while on the surface of the component.

Maximum dwell times, unless otherwise specified, shall be 3 minutes for a Type I system or as recommend by manufacturer.

- (2) Method C Process - Solvent removable penetrants are removed by first wiping the excess penetrant with a clean, lint free, dry cloth or absorbent towel. The remainder of the surface penetrant is then removed with solvent dampened lint free cloth or towel.

NOTE

The surface of the test part shall not be flushed with solvent cleaner and the cloth or towel shall not be saturated with solvent cleaner.



The test part and cloth or towel shall be observed under black light illumination to assure adequate removal of the surface penetrant. Over removal of the penetrant shall require test part to be cleaned and reprocessed. The surface shall be dried by blotting or by evaporation.

(3) Method D Process - Hydrophilic post-emulsifiable Penetrant shall be removed with a water pre-rinse, application of the hydrophilic emulsifier and then a post rinse.

(a) Pre-rinse – Remove bulk surface penetrant with a coarse water spray. Water spray parameters shall be the same as Rinsing below. The water pre-rinse shall be applied for the minimum amount of time required to achieve removal of bulk surface pen.

(b) Hydrophilic application and dwell – Hydrophilic emulsifiers shall be applied by immersion, flowing, foaming or spraying. Emulsifier concentration is dependent on type of application. Technician is responsible for proper concentration IAW manufactures manuals. Also for immersion application emulsifier must be mildly agitated. Dwell time shall be the minimum required for adequate surface penetrant removal, but not to exceed 2 minutes unless otherwise noted.

(4) Water rinsing for Method B and Method D – After the appropriate dwell time rinsing will be used to stop emulsification. Rinsing will be of the following types;

(a) Manual Spray – Maximum water pressure shall be no more than 40psi. Water temperature shall be between 50°F to 100°F. A course spray shall be used at a minimum of 12 inches from test part when possible. Washing shall be done under black light illumination and spray time kept to a minimum to assure that over washing does not occur. If over washing does happen test part will be dried and reprocessed. When part is removed from washing care must be taken so pooling does not occur.

Pressure and temperature gauge calibration records will be maintained and tracked under Sec. 13.0 (Calibration of Measuring and Test Equipment).

It is the NDT shop Level II's responsibility to insure cal. sticker on gauges are within calibration.

(b) Automated Spray – For automated spray systems the wash parameters shall be the same as Manual Spray.



Drying

Method B and Method D

Test part shall be dried after rinsing if Dry or Non-aqueous developers are to be used. Normal evaporation or dryer oven may be used while insuring no pooling occurs. If using an oven previously stated dryer oven parameters must be met. Test part should only stay in oven long enough for part to adequately dry.

There is no need to dry test part when aqueous developers are to be used.

Method C

Test part shall be dried by blotting with lint free towel or natural evaporation.

Developing

Unless otherwise specified developers shall be utilized for penetrant inspection in accordance with the requirements of this procedure. The following are developer types;

- (1) **Dry Developers** – Test parts shall be dry before the developer is applied. Dry developer shall be applied in a manner as to contact all surfaces to be inspected. Minimum dry developer dwell shall be ten minutes. 2 hours maximum dwell time. Excess dry developer may be removed after the dwell time by light tapping. Dry developers shall not be used with Type II penetrants.
- (2) **Non-aqueous Developers** – Components shall be dry before application of developer. Non-aqueous developer can only be applied by spraying. Spray can should be agitated before application and often during application. For Type I penetrants the developer shall be applied in a thin uniform coating over the entire surface of test part.

Note

The uniformity and thickness of the developer coating is important. if coating is so thick that it hides background completely. Part will be reprocessed.

The minimum dwell time is 10 minutes and the maximum dwell time is 1 hour.

- (3) **Aqueous Developers** – There are 2 types of aqueous developers. They are water soluble (mixes with water) and water suspendible (is suspended in the



Non-Destructive Testing Manual

Rev 1: 09/30/14

water). Aqueous developers can be applied with test part wet or dry. Soluble developers will not be used with Type II penetrants or Type I, Method A penetrants unless otherwise specified.

Suspendible developers may be used with both Type I and Type II penetrants, but must be continuously agitated or prior to use. Do not allow pooling. Developers can be applied by spray, flowing or immersion. Air dry or use drying oven that meets above said parameters. Minimum dwell time is 10 minutes after dry and maximum is 2 hours after dry, unless otherwise specified.

NDT shop Level II is responsible for developer concentration, proper quality checks and log results of all developers in use IAW ASTM E 1417 unless stated otherwise.

Inspection

Viewing area shall be kept clean at all times and free of excessive fluorescent contamination for Type I processes in shop inspection area and should not have more than 2 foot-candles of ambient light. For field penetrant inspection ambient white light will be kept to a minimum by the use of tarps, boxes or night time to keep ambient light as low as possible. A black light that provides a minimum of $1000\mu\text{W}/\text{cm}^2$ at 15 inches will be used in shop and field inspections. A record of black light and ambient light checks will kept in shop or in the field kit with appropriate forms as provided in chapter IV of this manual.

If a Type II process is called for, 100 foot-candles of white light at surface of test part is required. The following are general guidelines to follow during penetrant inspections due to the variety of parts inspected. The technician performing inspection shall insure manufacturer's guidelines are met.

(1) Type I Process – Personnel shall be dark adapted for a minimum of 1 minute prior to inspecting components and shall not wear photo chromatic or permanent darkened lenses. Black lights shall meet standard output requirements and results will be logged as required. All area of fluorescence shall be interpreted. All indication shall be evaluated by appropriate criteria as relevant, non-relevant, acceptable or rejectable. Test parts with excessive fluorescence will be cleaned and reprocessed.

(1a) Type II Process – All indication shall be evaluated by appropriate criteria as relevant, non-relevant, acceptable or rejectable. Test parts with excessive background will be cleaned and reprocessed.



NOTE

Type II Penetrant examination shall not be used for final acceptance examination of aircraft parts. In addition, Type II penetrant examination shall not be used prior to a type I penetrant examination of the same surface.

(2) Evaluation – After proper process dwell times all indications will be Evaluated. Unless specified otherwise indication will be wiped with a solvent dampened swab, allowed to dry and developer re-applied. Dwell time shall be the same as original dwell time, except non-aqueous developer time shall be 3 minutes minimum. If no indication reappears, the original indication is considered to have been false. This process can be done no more than twice for each indication. Unless specified by a procedure, indications of cracks, corrosion or any indication the technician considers relevant will be reason for rejection and noted on appropriate paper work. Test part will then be evaluated by responsible shop or manufacture for serviceability. All evaluation results will be reported on appropriate paper work.

(2a) Mechanical Evaluation – When allowed by a specific procedure, indication may be removed by an approved procedure such as sanding or grinding to determine extent of defect. If this is done the part must be etched and then reprocessed. This process will be done by responsible shop or manufacture.

(3) Post Cleaning – Components will be cleaned after inspection to remove developers and other materials if they are detrimental to subsequent operation or intended function by NDT shop technician or by responsible shop.

(4) Marking - Parts may be marked in a manner that is harmless to the usefulness of the part with a red or maroon colored dye, when a passing 100% inspection has been performed, to help identify inspected parts from non-inspected parts. Other means of identifying parts is by tagging, marked bags or pans.

It is the responsibility of the NDT shop technician to keep parts segregated by awaiting work, in progress and completed work statuses. Also segregate failed parts from passing parts.



Section 2.7 Reports

A record of the penetrant examination shall be reported on the accompanying Repair Tag and/or tear down reports and retained as required by Maritime Helicopters Inc.

The report and/or tear down sheet shall include;

- (1) Part nomenclature
- (2) Part Number(if applicable)
- (3) Part s/n(if applicable)
- (4) Procedure(standard)
- (5) Penetrant test type and method
- (6) Test results and date
- (7) Technician name and level of certification

All relevant indication(s) shall be marked with grease marker or by a means not harmful to part. Type, general description and location of indication annotated on report and sent back to shop of origin or costumer for evaluation and disposition.

Procedures that call for a final decision on serviceability to be made by NDT technician will be processed as per that procedure.

Section 2.8 Acceptance Standards

Acceptance standards shall be determined by Maritime Helicopters Inc., Manufacturers manuals or Manufacturers and FAA Bulletins. The NDT certified Level II performing the inspection, using at hand requirements shall decided if part under inspection is acceptable or rejectable. If the certified Level II cannot make this determination the company Level III or Approved Outside Agency will be notified and become responsible for the acceptance or rejection of the part.

NOTE

Type II Penetrant examination shall not be used for final acceptance examination of aircraft parts. In addition, Type II penetrant examination shall not be used prior to a type I penetrant examination of the same surface.



Section 2.9 in use Materials and Equipment

* Alternate materials of equivalent type may be used. In this type of instance the material or equipment will be added to this manual at next revision.*

Penetrant Type	Method	MFG. Quantity	P/N	Notes
Penetrants				
Type I	Post-emulsifiable Method B & D	Magnaflux, ZYGLO® Bulk	ZL-37	Level 4 sensitivity
Type I	Post-emulsifiable Method C	Magnaflux, ZYLGO® 16oz. aerosol can	ZL-27A	Level 3 sensitivity
Type II	Visible Dye Red	Magnaflux, Spotcheck® 16oz. aerosol can	SKL-SP1	
Emulsifier				
Type I	Lipophilic	Magnaflux, ZYGLO® Bulk	ZE-4B	
Type I	Hydrophilic	Magnaflux, ZYGLO® Bulk	ZR-10B	
Developer				
Type I	Dry	Magnaflux, ZYGLO® Bulk	ZP-4P	
Type I	Water Soluble	Magnaflux, ZYGLO® Bulk	ZP-14A	
Type I or II	Non-Aqueous	Magnaflux, ZYGLO® 16oz. aerosol can	ZP-9F	



Cleaner/Remover

Type I or II	Solvent	Magnaflux, Spotcheck® 16oz. aerosol can	SKC-S
--------------	---------	--	-------

Black Lights

Magnaflux, Black Light	ZB-23A
Magnaflux, Black Light	ZB-100F

Ultraviolet / White Light Meters

DLM-1000
DLM-750
J-221

Refractometer

Hydrometer

Test Panels

Tesco, test panel	Ni-Cr, 32	system check
Magnaflux, test panel	Z5	system check

Dryer

TPS Lunaire
Model # CE 228 S/N 33485



Chapter III Magnetic Particle Inspection

Section 3.1 Scope

- (1) This procedure covers inspection by the fluorescent magnetic particle inspection with AC or DC current of the surface and sub surface of ferromagnetic aircraft airframe and component parts maintained by Maritime Helicopters Inc.
- (2) The inspection shall be of the following types as applicable.
 - A. Fluorescent Magnetic Particle
 - 1) AC Current
 - 2) DC Current (Full-Wave Rectified AC)
 - B. Direct Magnetization
 - 1) Head Shot
 - C. Indirect Magnetization
 - 1) Coil Shot
 - 2) Central Bar Conductor (CBC)
- (3) This document is intended to meet the requirements of SNT-TC-1A.

Section 3.2 General

In order to perform fluorescent magnetic particle examination of ferromagnetic aircraft component parts and airframe surfaces, the manufacturer's overhaul and inspection procedures manual, technical bulletins or certified Level III written procedure shall be consulted for the following information:

- (1) Identify the material of items to be tested.
- (2) Designate the surface area to be tested.
- (3) Determine the procedures to be used.
- (4) Determine the acceptance and rejection standard to be used.
- (5) Required Report

Section 3.3 References

The following documents and manuals have been referenced in the preparation of this written procedure and are considered a part of this written procedure as applicable. Due to the broad range of applications in magnetic particle testing this list should only be taken as a minimum and further applicable references should be added as needed by company Level III or Approved Outside Agency by written letter inserted opposite this page for immediate action and the NDT Manual be revised as per Maritime Helicopters Inc. revision procedures.

- (1) Chapter I of Maritime Helicopters Inc. Non-Destructive Testing Procedures Manual.
- (2) SNT-TC-1A, 2001 Edition
- (3) E1444
- (4) ASNT NDT Handbook, Second Edition, Vol. 6, Magnetic Particle Testing
- (5) Manufactures Maintenance and Overhaul Manuals
- (6) Manufactures or FAA issued Bulletin
- (7) Operating Instruction for Magnaflux® ARQ - 1446



Section 3.4 Personnel

Personnel performing magnetic particle examination to this procedure shall be qualified and certified in accordance with Maritime Helicopters Inc. Written Practice in Chapter I of this Manual and must hold an FAA Airframe and Powerplant License.

Note

Due to the ever changing and technical nature of NDT and its methods, continuing education, refresher courses and/or conferences should be part of the training program.



Section 3.5 Equipment

Magnaflux®, Model ARQ - 1446

This unit is designed for general purpose wet method magnetic particle inspection providing low voltage, high amperage, 3-Phase DC (Full-Wave Rectified AC) for magnetization and demagnetization. The rated output by Mfg is 6,000 amperes for DC currents.

NOTE

All personnel shall completely read and understand the operating manual for the ARQ - 1446 and observe all safety precautions before operating.

Other Equipment

The use of other equipment in the performance of fluorescent magnetic particle inspection is acceptable if required by manufacturer, FAA or Maritime Helicopters Inc. to perform specific inspection with such equipment. In this type of instance the equipment will be added to this manual at next revision.

Materials

Magnetic particle materials shall be controlled by Level II in charge of NDT shop. Only approved materials shall be used. A list of in use fluorescent particle and Petroleum Carrier will be kept in the NDT shop. The list will include:

- (1) part number
- (2) brand name
- (3) expiration date(if applicable)

Ambient White Visible Light for Inspection Area

A visible light source that meets the requirements of Maritime Helicopters Inc. NDT Manual, Sec.3.3, References will be used for the interpretation of indications found with fluorescent magnetic particle inspections. An intensity of 100 foot-candles (1000 lux) minimum at part surface. Intensity checks shall be done weekly, at initial installation or when changes occur that would affect light output.



Black Light & Ambient Light for Fluorescent Inspection Area

An ultraviolet light that meets the requirements of Maritime Helicopters Inc. NDT Manual, Sec.3.3, References will be used in fluorescent magnetic particle inspections. Black lights shall be allowed to warm up for 5 minutes prior to use or intensity checks. Intensity check will be done daily, prior to use or after bulb replacement. Black light intensity will be at least 1000 $\mu\text{W}/\text{cm}^2$ at 15 inches from face of light unless otherwise specified by written procedure and approved by a Level III or called out for by a manufacturer.

Ambient light in inspection area shall not be more than 2 ft candles for in shop inspections. Ambient light of the lowest level possible is needed for field inspections. The use of tarps, boxes or night time are sample ways of lowering ambient light. The Level II or Level III performing the field inspection must use their training and experience in determining if level of ambient light will allow for an acceptable inspection.

Light Meters

Ultraviolet and ambient white visible light meters calibrated to known standards and at times specified by Manual, Sec.3.3, References shall be used to check light intensities on a daily or weekly basis, prior to use or after bulb replacement as appropriate. Results of checks will be logged on appropriate form located in Sec.VI of this manual. Records for the current year and the previous year are retained in the NDT shop and is the responsibility of the shop Level II.

Black light and ambient white light meter calibration records will be maintained and tracked by Maritime Helicopters Inc. Calibration intervals shall be every 6 months by qualified person or company approved by Maritime Helicopters Inc.

Black lights, White lights and all associated equipment are the responsibility of the technician using the equipment. Technician shall insure proper operation, proper calibration stickers, and proper maintenance and all necessary care for the proper operation of light equipment.

Equipment & Material Quality Control

Quality control steps for equipment and materials are necessary to ensure that the fluorescent magnetic particle system provides an acceptable level of performance. The type and frequency of the quality control steps will be as specified in Reference E 1444, Table 1 and Manual X1, unless otherwise noted.

Quality control checks will be annotated on appropriate forms found in Sec. VI, Maritime Helicopters Inc. NDT Manual.



In addition to ASTM E 1444 Quality checks the bath shall be discarded, tank cleaned and bath refilled with new materials approximately every 2 year. The date of this action, the next due date and technicians name shall be annotated on the magnetic particle check form in sec. VI of this manual. This is in addition to and does not replace any required replacement due to a failure of ASTM E 1444 quality checks. The 2 year time change can be zeroed out if early replacement is necessary.

NDT shop Level II is responsible to insure proper system checks are preformed and appropriate action taken dependant on the results of the system checks. Any equipment or material found not to be in compliance with system check minimums or for safety concerns will be locked out or tagged out IAW Maritime Helicopters Inc. lock-out, tag-out procedures until compliance is met. Maritime Helicopters Inc. Level III or Chief Inspector will be notified in all such incidents by Verbal communication or by written message if deemed necessary.

Section 3.6 Process

Application

The item under examination shall be segregated by the use of pans and baskets and shall be examined for discontinuity as specified by the manufacturer or written procedure approved by a Level III. The examination shall be accomplished by fluorescent magnetic particle.

NOTE

It is the responsibility of the technician to insure all quality control checks have been done IAW E 1444-01 prior to any inspections.

Surface Preparation

Surface to be inspected shall be cleaned and free of dirt, grease, oil, paint, corrosion, scale, machine marks and other foreign material or conditions which might interfere with the effectiveness of the inspection. Corrosion will be cleaned as per manufacturer's manuals prior to magnetic particle inspection. Magnetic particle inspection shall not be performed with coatings in place that could prevent detection of surface defects in the base metal. This includes paint or chrome plating greater than .003" inches or ferromagnetic coatings such as electroplated nickel greater than .001" inches thick. When coatings are non-conductive and a head shot is to be performed the coating at the ends where electrical contact will be made must be removed to prevent arcing.



Cleaning methods may include, but are not limited to detergent, solvents, paint remover, steam cleaning, ultrasonic and vapor degreasing. Cleaning methods shall be done in accordance with manufacturer manuals or Level III approved procedure. The shop of part origin is responsible for pre-cleaning and post cleaning of all parts.

Particle Application

- (1) Continuous Method – The magnetizing current shall be applied simultaneously with or immediately after diverting suspension from the test part.
- (2) Residual Method – The magnetic particles are applied to test part after the magnetizing current discontinued.

Amperage Determination

- (1) Circular Magnetization – Head Shot - Current required is determined by manufacturer's specifications or by a general rule determined by part diameter multiplied by an amperage. The general rule of thumb is as such; 300 to 800 amperes-per-inch of part diameter.
- (2) Circular Magnetization – Central Bar Conductor(CBC)- Current required is determined by manufacturer's specifications or by a general rule determined by part diameter multiplied by an amperage as per general rule stated above only if CBC is located centrally in the part. If the CBC is offset the above rule of thumb amperes stay the same, but the part diameter is now figured as the diameter of the CBC plus 2 times the thickness of the part.
- (3) Longitudinal Magnetization – Coil Shot - Current required is determined by manufacturer's specifications or by math formulas that uses part length and diameter and a constant to figure out amperage. Formula for parts positioned to side of with low fill factor;

$$NI = \frac{45,000}{L / D} (\pm 10\%)$$

NI = ampere-turns (coil turns x current)

L = Length

D = Diameter

45,000 = Constant



This is only one of several formulas that should be used in ampere determination. Current ASTM E 1444 should be utilized for other formulas that are dependent on part size and part geometry in relation to coil size.

- (4) Flux Field Direction - A pie gauge will be used to help determine approximate flux direction.
- (5) Flux Density - A Gauss gauge or Hall Effect Probe will be used to help determine adequate magnetic field strength.

NOTE

Complicated shapes may require experimentation and separate shots to insure there is proper field strength and direction at all locations. When more than one ampere is to be used, the lowest is to be shot first then move up the scale. This is so saturation is avoided.

NOTE

If procedure calls for both a head shot and a coil shot, the head shot will be accomplished first followed by the coil. This is due to the circular field produced by a head shot remains mainly inside of part and a true reading for demagnetization is not possible.



Inspection

Viewing area shall be kept clean at all times and free of excessive fluorescent contamination for fluorescent magnetic particle in shop inspection area and should not have more than 2 foot-candles of ambient light. For field fluorescent magnetic particle ambient white light will be kept to a minimum by the use of tarps, boxes or night time to keep ambient light as low as possible. A black light that provides a minimum of $1000\mu\text{W}/\text{cm}^2$ at 15 inches will be used in shop and field inspections. A record of black light and ambient light checks will be kept in shop or in the field kit with appropriate forms as provided in chapter IV of this manual.

The following are general guidelines to follow during fluorescent magnetic particle due to the variety of parts inspected. The technician performing inspection shall insure manufacturer's guidelines are met.

(1) Fluorescent magnetic particle – Personnel shall be dark adapted for a minimum of 5 minutes prior to inspecting components and shall not wear photo chromatic or permanent darkened lenses. Black lights shall meet standard output requirements and results will be logged as required. Magnetize test part with required shot.

(2) Evaluation - All areas of fluorescence shall be interpreted and this will be done between each shot if more than one shot is done. All indication shall be evaluated by appropriate criteria as relevant, non-relevant, acceptable or rejectable. A white light that meets above mentioned criteria shall be utilized in interpretation of indications. Test parts with excessive fluorescence, magnetic writing or any undistinguishable indication will be demagnetized and reprocessed.

(3) Demagnetization - All parts shall be demagnetized after inspection. This is accomplished by one of the following;

(a) AC current equal to or slightly higher than magnetizing force initially used, Part is placed approximately 1 foot in front of coil and move slowly and steadily through coil while current is flowing until about 3 feet pass coil. Do this as many times as it takes to reach less than 3 gauss.

(b) AC current equal to or slightly higher than magnetizing force initially used, Depress and hold demagnetization button and wait for a zero indication on ammeter. Then release button. Do this as many times as it takes to reach less than 3 gauss.

(c) DC current equal to or slightly higher than magnetizing force initially used, Depress and hold demagnetization button and wait for a zero indication on ammeter. Then release button. Do this as many times as it takes to reach less than 3 gauss.



NOTE

If procedure calls for both a head shot and a coil shot, the head shot will be accomplished first followed by the coil. This is due to the circular field produced by a head shot remains mainly inside of part and a true reading for demagnetization is not possible. Whenever possible, parts that have been magnetized circularly(head shot) shall be magnetized in the longitudinal(coil) direction before being demagnetized.

(4) Post Cleaning – Components will be cleaned after inspection to remove all articles from coolant holes, crevices and passageways. Insure parts are protected from any possible corrosion or damage during the cleaning process. The shop of part origin is responsible for pre-cleaning and post cleaning of all parts.

(5) Marking – Parts may be marked in a manner that is harmless to the usefulness of the part with a blue or predominantly blue dye, when a passing 100% inspection has been performed, to help identify inspected parts from non-inspected parts.

Other means of identifying parts is by tagging, marked bags or pans. It is the responsibly of the NDT shop technician to keep parts segregated by awaiting work, in progress and completed work statuses. Also segregate failed parts from passing parts.

Section 3.7 Reports

A record of the magnetic particle inspection shall be reported on the accompanying Repair Tag and/or tear down reports and retained as required by Maritime Helicopters Inc. for two (2) years.

The report and/or tear down sheet should include;

- (1) Part nomenclature
- (2) Part Number(if applicable)
- (3) Part s/n(if applicable)
- (4) Procedure(standard)
- (5) Test type and method
- (6) Test results and date
- (7) Technician name and level of certification

All relevant indication shall be marked with grease marker or by a means not harmful to part. Type, general description and location of indication shall be annotated on report and sent back to shop of origin or costumer for evaluation and disposition.

Procedures that call for a final decision on serviceability to be made by NDT technician will be process as per that procedure.



Section 3.8 Acceptance Standards

Acceptance standards shall be determined by Maritime Helicopters Inc., approved Non Destructive Testing Manual, Manufacturers Manuals, Manufacturers and FAA Bulletins or by level III written procedure. The NDT certified Level II performing the inspection, using at hand requirements shall decided if part under inspection is acceptable or rejectable. If the certified Level II cannot make this determination the company Level III or Approved Outside Agency will be notified and become responsible for the acceptance or rejection of part.

Section 3.9 in use Materials & Equipment

Type	<u>MFG.</u> Quantity	P/N	Notes
Carrier			
Solvent oil base	Magnaflux®/Magnaglo®Carrier II Bulk	01-2122-40	5 gallon pail
		01-2122-30	20 gallon drum
		01-2122-45	55 gallon drum

* Carrier of equivalent type may be used.

Magnetic Particles

Fluorescent Particles	Magnaflux®/Magnaglo®14A Bulk	01-0130-57	1 lb. container
		01-0130-71	6/1 lb. containers
		01-0130-69	10 lb. container
		01-0130-75	20 lb. container

* Particles of equivalent type may be used.

Black Lights

Magnaflux, Black Light	ZB-23A
Magnaflux, Black Light	ZB-100F

Ultraviolet / White Light Meters

DLM-1000
DLM-750
J-221



Chapter IV (intentionally left blank)

BLANK

Chapter V (intentionally left blank)

BLANK



Chapter VI Forms

Section 6.1 Scope

This chapter includes blank forms that Maritime Helicopters Inc., NDT written Practice and Procedures manual, NDT shop Personnel will use in the administration and performance of non-destructive testing.

Due to the ever changing nature of NDT or manufacturer requirements, other forms may be used and will be added at next revision if required.



CHAPTER VI

BLANK FORMS

6.2



Section 6.2 Certification Forms

The following forms shall be completed by the company Level III or Approved Outside Agency as required for each employee, individual or company associated with Maritime Helicopters Inc. Non-destructive Testing program as required by this Manual. Completed forms will be kept in Maritime Helicopters Inc. NDT files and employee personal file as required by this Manual and shall be revised as per Maritime Helicopters Inc. Manual revision procedures.

Form	Page
Record of Authorizations and designations	71
Certification/Recertification Authorization	73
Certification Record	74
Annual Performance Check	75
Vision Exam Record	76
Training: NDT Related	77
Exam Record for Level I and Level II	78
Exam Record for Level III	79

Section 6.3 Performance Check Forms

The following forms shall be completed by the company Level I Special, Level II or Level III that is certified in the specific method addressed by the form and is performing the inspection for Maritime Helicopters, Inc. or shall insure that a appropriately certified person has completed the form prior to performing any inspection in a particular method. The forms address equipment quality control checks and shall be accomplished at intervals specified on forms. The only exception is daily equipment checks which can be done on a “before use” basis if not done on a daily basis. In this case the initial and date box will be left blank. All other checks shall be done as required by each specific form.

The certified person performing the specific check shall initial and date the appropriate block on the form. Any question that may arise concerning any form shall be directed to the company Level III or Approved Outside Agency for clarification.



The company Level III or Approved outside Agency is responsible for insuring that each certified employee has a complete understanding of the “Equipment Performance Check” forms. Forms shall be revised as per Maritime Helicopters Inc. Manual revision procedures.

<u>Form</u>	<u>Page</u>
Equipment Performance Check	80
Field Kit Light Checks (front)	87
Field Kit Light Checks (back)	88

Section 6.4 Shop Log Forms

The following forms shall be completed by the company Level I Special, Level II or Level III that has completed an NDT inspection on a part or group of parts.

<u>Form</u>	<u>Page</u>
NDT Shop Inspection Log	85
NDT Shop Work Accomplished	86

The NDT shop inspection log shall be used to log every inspection done by Maritime Helicopters Inc. NDT certified personnel and shall be kept in shop for a minimum of one year.

The NDT shop work accomplished form shall be utilize by the certified NDT inspector to record his/her NDT work time. This form will be kept in the employee’s personal NDT file for a minimum of one year. The company Level III, Approved Outside Agency or Level III authorized official hall occasionally review the form and put his/her initials or company issued stamp to show authenticity of work accomplished.

The company Level III or Approved outside Agency is responsible for insuring that each certified employee has a complete understanding of the these forms. Forms shall be revised as per Maritime Helicopters Inc. Manual revision procedures.



Record of Authorizations and Designations

Employee Name: _____

Training

- ☐ Outside Agency or Individual Used: **[INSERT IDENTIFICATION OF AGENCY OR INDIVIDUAL]**
Course(s): **[INSERT COURSE TITLE(S)]**

Designated/Approved By: **[INSERT THE IDENTITY OF THE LEVEL III OR OTHER COMPANY OFFICIAL]**

Effective: **[Insert appropriate date(s)]**

Examinations

Vision Examination

- ☐ Vision Examination(s): Performed By: **[INSERT THE IDENTITY OF THE EMPLOYER'S MEDICAL STAFF OR OTHER DESIGNATED FUNCTION]**

Designated/Authorized By: **[INSERT THE IDENTITY OF THE LEVEL III OR OTHER COMPANY OFFICIAL]**

Effective: **[INSERT APPROPRIATE DATE(S)]**

Written and Practical Examinations

- ☐ General Written Exam (Levels I/II): **[INSERT APPROPRIATE LEVEL(S) AND METHOD(S)]**
Delegated To: **[INSERT IDENTITY OF DELEGATE]** By: **[INSERT IDENTITY OF DELEGATING AUTHORITY]**

For: ☐ Administration ☐ Monitoring ☐ Scoring ☐ All

Effective: **[INSERT APPROPRIATE DATE(S)]**

- ☐ Basic Written Exam (Level III): **[INSERT APPROPRIATE METHOD(S)]**

Delegated To: **[INSERT IDENTITY OF DELEGATE]** By: **[INSERT IDENTITY OF DELEGATING AUTHORITY]**

For: ☐ Administration ☐ Monitoring ☐ Scoring ☐ All

Effective: **[INSERT APPROPRIATE DATE(S)]**

- ☐ Specific Written Examination: **[INSERT APPROPRIATE LEVEL(S) AND METHOD(S)]**

Delegated To: **[INSERT IDENTITY OF DELEGATE]** By: **[INSERT IDENTITY OF DELEGATING AUTHORITY]**

For: ☐ Administration ☐ Monitoring ☐ Scoring ☐ All

Effective: **[INSERT APPROPRIATE DATE(S)]**

- ☐ Practical Examination: **[INSERT APPROPRIATE LEVEL(S) AND METHOD(S)]**

Delegated To: **[INSERT IDENTITY OF DELEGATE]** By: **[INSERT IDENTITY OF DELEGATING AUTHORITY]**

For: ☐ Administration ☐ Monitoring ☐ Scoring ☐ All

Effective: **[INSERT APPROPRIATE DATE(S)]**

Certifications

- ☐ Level I and Level II Certifications Authorized By: **[INSERT IDENTITY OF THE DESIGNATED LEVEL III OR OTHER COMPANY OFFICIAL]** Effective: **[INSERT APPROPRIATE DATE(S)]**

- ☐ Level III Certifications Authorized By: **[INSERT IDENTITY OF THE DESIGNATED COMPANY OFFICIAL]** Effective: **[INSERT APPROPRIATE DATE(S)]**



Maritime Helicopters

Non- Destructive Testing Certification / Recertification

Method and Level Inspector

Employee Name

This employee has fulfilled the requirements of Maritime Helicopters Inc. Approved Written Practice and Procedures Manual for Certification or recertification based on SNT-TC-1A, 2001.

Steven D. Slade - Director of Maintenance
Maritime Helicopters Inc.

Date



Rev 1: 09/30/14

[illegible]



Annual Performance Check – Level

Employees Name _____

	Practical
Method and Date	
Number of Specimens	
Administered By	
Pass / Fail	
Approved By	
Date	
Method and Date	
Number of Specimens	
Administered By	
Pass / Fail	
Approved By	
Date	
Method and Date	
Number of Specimens	
Administered By	
Pass / Fail	
Approved By	
Date	
Method and Date	
Number of Specimens	
Administered By	
Pass / Fail	
Approved By	
Date	



Employees Name_____

61



Rev 1: 09/30/14

[illegible]

62



Written and Practical Examinations – Level I and Level II

Employees Name _____

	General	Specific	Practical	Composite
Method and Date				
Number of Questions or Specimens (Practical)				
Administered By				
Graded By				
Approved By				
Score				
Method and Date				
Number of Questions or Specimens (Practical)				
Administered By				
Graded By				
Approved By				
Score				
Method and Date				
Number of Questions or Specimens (Practical)				
Administered By				
Graded By				
Approved By				
Score				
Method and Date				
Number of Questions or Specimens (Practical)				
Administered By				
Graded By				
Approved By				
Score				

*Examination Waived (Reason): _____



Written and Practical Examinations – Level III

Employees Name _____

	General	Specific	Practical	Composite
Method and Date			*	
Number of Questions or Specimens (Practical)			*	
Administered By				
Graded By				
Approved By				
Score				
Method and Date			*	
Number of Questions or Specimens (Practical)			*	
Administered By				
Graded By				
Approved By				
Score				
Method and Date			*	
Number of Questions or Specimens (Practical)			*	
Administered By				
Graded By				
Approved By				
Score				
Method and Date			*	
Number of Questions or Specimens (Practical)			*	
Administered By				
Graded By				
Approved By				
Score				

*Examination Waived (Reason): _____



Equipment Performance Check

Penetrant Line

MONTH OF _____ YEAR _____

Page 1 of 5

REF: ASTM E

DAILY	IF TO BE USED 1417
1	VIEW PENETRANT TANK FOR CONTAMINATION
2	CHECK WATER PRESSURE. NOT MORE THAN 40 PSI
3	CHECK WATER TEMP. 50° F TO 100° F
4	CHECK BLACK LIGHT OUTPUT IN INSPECTION BOOTH. MINIMUM 1000 MICROWATTS/ CM2 AT 15" (LOG RESULT ON DAILY BLACK LIGHT FORM)
5	AMBIENT LIGHT INTENSITY CAN BE NO MORE THAN 2 FT CANDLES.(LOG RESULTS ON AMBIENT LIGHT FORM)
6	CHECK DEVELOPER CONTAMINATION OR CONDITION AS PER: E 1417
7	CHECK SYSTEM PERFORMANCE – Process test panels (TESCO Ni-Cr Test Panels) with in-use materials and un-used materials. Compare Test results. When performance or sensitivity of in-use materials falls below that of unused materials the in-use materials shall be checked IAW appropriate sec of ASTM E 1417.
8	INSPECTION AREA CLEANLINESS – Clean and free of excessive fluorescent contamination

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Developer																															
Sys. Per.																															
TECH																															



Non-Destructive Testing Manual

Rev 1: 09/30/14

Equipment Performance Check: Penetrant Line

Page 2 of 5

Weekly	
1	CHECK DEVELOPER CONCENTRATION WITH HYDROMETER (IF IN USE) IAW E 1417 (7.8.2.6) Mfg. recommended con. Level is 1.04 to 1.0775 Hydrometer reading.
2	CHECK EMULSIFIER CONCENTRATION (HYDROPHILIC) WITH REFRACTOMETER. Results should be between. 18 and 29.2 ON REFRACTOMETER

DAY				
TECH				

MONTHLY	
1	CHECK EMULSIFIER WATER CONTENT (LIPOPHILIC) SENT OUT TO LAB. LOG RESULTS ON MONTHLY CHECK BOX.

DATE	TECH			CONT	CONTAMINATION
				AVL	AMBIENT VISIBILE LIGHT
		WATER CONTENT	RESULTS: _____	TECH	TECHNICIAN

QUARTERLY	TEMP. NOT TO EXCEED 140 DEG. F.		
OVEN TEMP. GAUGE CALIBRATION © AS PER E1417	DATE	TECH.	Next Calibration due:

QUARTERLY	FLUORESCENT BRIGHTNESS Sample will be sent to lab for	DATE / TECH	
	TEST METHOD E1135 AND LOG RESULT _____, as per. E 1417		

Penetrant	Emulsifier (Lipophilic)	Emulsifier (Hydrophilic)	Developer
P/N :	P/N :	P/N :	P/N :
Brand Name :	Brand Name:	Brand Name:	Brand Name:
Expiration Date : Shelf Life:	Expiration Date : Shelf Life:	Expiration Date : Shelf Life:	Expiration Date : Shelf Life:
Refill Date: Next Due:	Refill Date: Next Due:	Refill Date: Next Due:	Refill Date: Next Due:
Technician:	Technician:	Technician:	Technician:



Non-Destructive Testing Manual

Rev 1: 09/30/14

Equipment Performance Check: Magnetic Particle Inspection Unit

Page 3 of 5

REF: ASTM E 1444

DAILY	IF TO BE USED
1	TURN UNIT ON AND ALLOW TO CIRCULATE FOR MIN. OF 30 MIN
2	TAKE A 100ML SAMPLE OF BATH IN PEAR-SHAPED CENTRIFUGE TUBE THAT IS GRADUATED TO 1ML IN .05 ML INCREMENTS. DEMAG SAMPLE & ALLOW TO SIT FOR 60 MIN.
3	PARTICLE CONCENTRATION SHOULD BE .1ML TO .4ML -This check is done every 8 hours or at shift change-
4	BLACK LIGHT OUTPUT AT 15" IS A MINIMUM OF 1000 MICROWATTS/ CM2 AFTER 5 MIN WARM UP. (Log on Daily Black Light Check Form)
5	AMBIENT LIGHT INTENSITY CAN BE NO MORE THAN 2 FT. CANDLES. (log on Daily Ambient Light Check Form)
6	USING tool steel ring s/n 1075 (IAW ASTM E 1444-01 app. X) CHECK SYSTEM PERFORMANCE

Technician initialing below shall log suspension concentration result and is assuring all of the above items are complied with.

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
SUS																															
TECH																															

WEEKLY	
1	OBSERVE CENTRIFUGE TUBE UNDER BLACK LIGHT FOR CONTAMINATION & FLUORESCENCE
2	OBSERVE CENTRIFUGE TUBE IN VISIBLE LIGHT FOR CONTAMINATION/ 30% MAX CONTAMINATION

	WEEKLY
DAY	
TECH	

Equipment Performance Check Magnetic Particle Inspection Unit

Page 4 of 5

BIANNUALLY	CAL. RECORD FOR TIMER CONTROL & AMPMETER MAINTAINED and TRACKED UNDER SEC. IV (PRECISION EQUIPMENT)Maritime Helicopters Inc.
------------	---

ANNUALLY	1. DISCARD BATH. 2. CLEAN BATH AREA AND ASSOCIATED AREA. 3. REFILL BATH AND ADJUST PARTICLE CONCENTRATION AS REQUIRED.	DATE:	NEXT DUE:
		TECHNICIAN:	

MAGNAFLUX MODEL – D-2060LR
PARTICLE: MAGNAGIO 14A - Expiration / Shelf Life Date:
VEHICLE: MAGNAFLUX CARRIER II - Expiration / Shelf Life Date:

LEGEND	
SUS	SUSPENSION
AVL	AMBIENT VISIBLE LIGHT
TECH	TECHNICIAN



Equipment Performance Check Black Light Output & Ambient Visible Light

Page 5 of 5

MONTH OF _____ YEAR _____

DAILY	IF TO BE USED	REF:ASTM E 1417 & ASTM E 1444
1	AMBIENT VISIBLE LIGHT CAN BE NO MORE THAN 2 FT. CANDLES	
2	BLACK LIGHT OUTPUT UNLESS SPECIFIED BY MFG. SHALL BE 1000 MICOWATTS AT 15" AS A MINIMUM RESULT; Where Special UV lighting is used 1000 microwatts/cm ² at part surface is required.	
3	BLACK LIGHT INTEGRITY & CLEANLINESS	

Note

Insure Light Meters are Within Calibration

MAINTAINED and TRACKED under SEC. 13.0 (Calibration of Measuring and Test Equipment), Maritime Helicopters Inc. 145 Repair Station Manual. Light Meter shall have CAL. sticker affixed to meter.

AREA 1	MAGNETIC PARTICLE INSPECTION AREA. Technician shall initial block below only if above checks are within limits.
AREA 2	LIQUID PENETRANT INSPECTION AREA. Technician shall initial block below only if above checks are within limits.

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
AREA 1																															
AREA 2																															

WEEKLY – Ambient Visible White Light Intensity at Part Surface – 100 foot-candles – Light used to aid in interpretation of indications after MPI NOT during MPI.

DAY				
TECH				



Rev 1: 09/30/14

[illegible]



NDT WORK ACCOMPLISHED

TECHNICIAN: _____

	<u>DATE</u>	<u>W/O#</u>	<u>INSPECTION METHOD</u>	<u>NOMENCLATURE</u>	<u>HRS</u>	<u>Initial or Stamp</u>
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
				PT		
				MT		
				UT		
				ET		
				Total Time		



Front Side

Date	Tech. Signature	Reading @ 15"

NDT Black Light Kit # _____
Black Light Type & Model _____
S/N _____ Next Calibration Due _____
Radiometer/ Pyrometer: P/N _____ S/N _____
Visible Light Sensor: P/N _____ S/N _____
UV-A Sensor: P/N _____ S/N _____

Notes:

- (1) Meter & Sensors Due Calibration every Six Months.
- (2) Black Light Intensity Check: Daily or Before Each Use.
- (3) Minimum Intensity unless otherwise specified:
1000 μ W/cm² at 15" Inches.

Date	Tech. Signature	Reading @ 15"



Rev 1: 09/30/14

[illegible][illegible]