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Superseded by AS7114

National Aerospace and Defense Contractors
Accreditation Program (NADCAP)
Survey Checklists for the
NDT Suppliers Accreditation Program

RATIONALE

AS7100/1B is being cancelled and superseded by AS7114.

CANCELLATION NOTICE

This document has been declared "CANCELLED" as of August 2008 and has been superseded by AS7114. By this action, this document will remain listed in the Numerical Section of the Aerospace Standards Index noting that it is superseded by AS7114.

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1. SCOPE:

- 1.1** This standard includes the forms to be used by a third party to survey a nondestructive test facility with respect to penetrant, magnetic particle, ultrasonic, and/or radiographic methods.

2. REFERENCES:**2.1 Applicable Documents:**

- 2.1.1** SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001

AS7001 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Program Description

AS7002 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Rules for Implementation

AS7003A National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Program Operation

AMS 2641 Vehicle, Magnetic Particle Inspection, Petroleum Base

- 2.1.2** ASNT Publications: Available from The American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller #28518, Columbus, OH 43228-0518.

Recommended Practice No. SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing

- 2.1.3** ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation

ASTM E 155 Reference Radiographs for Inspection of Aluminum and Magnesium Castings

2.1.3 (Continued):

- ASTM E 186** Reference Radiographs for Heavy-Walled (2 - 4-1/2 in) (51 - 114 mm) Steel Castings
- ASTM E 192** Reference Radiographs of Investment Steel Castings for Aerospace Applications
- ASTM E 317** Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Systems Without the Use of Electronic Measurement Instruments
- ASTM E 428** Practice for Fabrication and Control of Steel Reference Blocks Used in Ultrasonic Inspection
- ASTM E 446** Reference Radiographs of Steel Castings Up to 2 in (51 mm) in Thickness

2.1.4 Military Publications: Available from Naval Publications and Forms Center, Attn: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

- MIL-STD-410** Nondestructive Personnel Qualification and Certification
- MIL-STD-453** Inspection, Radiographic
- MIL-STD-2154** Inspection, Ultrasonic, Wrought Metals, Process for
- MIL-STD-6866** Inspection, Liquid Penetrant
- MIL-STD-45662** Calibration Systems Requirements
- DOD-F-87935** Fluid, Magnetic Particle Inspection, Suspension Medium (Metric)
- MIL-I-25135** Inspection Materials, Penetrants

3. REQUIREMENTS:**3.1 Survey information has been divided into parts as follows:****Appendix A SURVEY OF NONDESTRUCTIVE TEST FACILITY**

This part contains general information that would be collected for a survey of any company for any of the four basic NDT methods:

Appendix B PENETRANT SURVEY**Appendix C MAGNETIC PARTICLE SURVEY****Appendix D ULTRASONIC SURVEY****Appendix E RADIOGRAPHY SURVEY**

These survey forms cover information not included in Appendix A required for completion of a survey for the particular method being accredited. These forms shall be used in conjunction with and become part of the SURVEY OF NDT FACILITY form (Appendix A).

3.1.1 These forms are appended to this standard.

3.1.2 In completing these forms, surveyors are to be advised that

- a. Each question requires an answer.**
- b. The intended response shall be circled.**
- c. When a blank line is provided, the required data shall be shown.**
- d. If the answer references an attachment, it shall become a part of the survey record and shall show the survey identification number on each page.**
- e. Not applicable (N/A) responses are intended for items that are not required based on the materials/requirement in use at the facility. All other N/A responses must be explained.**
- f. All discrepancies shall be documented by completing the Supplier Corrective Action Request form (AS7100/1, Page A-2) during the exit interview.**

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APPENDIX A QUALITY SYSTEMS

SURVEY NO. _____

COMPANY: _____ SURVEY DATE: _____

DIVISION: _____ PHONE: _____

ADDRESS: _____ FACILITY: _____

CITY/STATE/ZIP: _____

NATURE OF BUSINESS: _____

IN-HOUSE PRODUCTS ONLY: _____ ACCEPTS OUTSIDE WORK: _____

TOTAL EMPLOYEES: _____ QA PERSONNEL: _____ NDT: _____

Exclude NDT Certified

SQUARE FEET OF WORK AREA: _____ NO. OF SHIFTS WORKED: _____

CONTACTS

POSITION

SCOPE OF SURVEY

METHOD

DATE

METHOD

DATE

PENETRANT _____ RADIOGRAPHY _____

MAGNETIC PARTICLE _____ ULTRASONIC _____

OTHER: _____

COMMENTS: _____

Attach additional sheets if required.

REASON FOR VISIT

INITIAL SURVEY: _____ FOLLOW-UP SURVEY: _____ REACCREDITATION SURVEY: _____

SURVEYOR'S SIGNATURE: _____ DATE: _____

CORRECTIVE ACTION VERIFIED: _____ DATE: _____

Surveyor

SURVEY NO. _____

SUPPLIER CORRECTIVE ACTION REQUEST

It Has Been Determined That The Following Items Are Not In Compliance:
Complete N-11 Forms and attach exhibits as applicable.

NCR/Para. #NON-COMPLIANCE

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Attach extra sheets as required.

SURVEYOR'S SIGNATURE: _____

DATE: _____

NON-COMPLIANCES HAVE BEEN REVIEWED WITH THE UNDERSIGNED SUPPLIER'S REPRESENTATIVE: _____

TITLE: _____

DATE: _____

CORRECTIVE ACTION RESPONSE

<u>NCR #</u>	<u>WILL COMPLETE BY</u>	<u>NCR #</u>	<u>WILL COMPLETE BY</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

THESE CORRECTIVE ACTIONS WILL BE ACCOMPLISHED AT NO EXPENSE TO THE U.S.
GOVERNMENT, CUSTOMER, SURVEYING ORGANIZATION, OR MEMBER ORGANIZATIONS

SURVEYOR'S SIGNATURE: _____

DATE: _____

SUPPLIER REPRESENTATIVE: _____

DATE: _____

TITLE: _____

(This page shall be completed by the surveyor and the supplier's representative as
part of the exit interview.)

The purpose of this appendix is to provide: 1) A standard format for the assessment of a facility quality assurance system as it relates to NDT. 2) Means to verify that systems are in place to control the processes and are being followed.

A.1 QUALITY SYSTEM:

A.1.1 Does the supplier have a quality assurance manual that details the system by which it intends to control the overall quality of its operations? YES NO

MANUAL TITLE _____

Number _____ Revision _____ Date _____

A.1.2 Has a documented quality system been established? YES NO

(a) Is the quality system reviewed periodically?
List Interval _____ YES NO

(b) Are records of such reviews maintained? YES NO

A.1.3 Are applicable specifications available?
(To include, but not limited to the following)

(a) Customer YES NO

(b) Industry specifications (ASTM, SAE, etc.) YES NO

(c) U.S. Government specifications YES NO

(d) Company specifications YES NO

(e) Other: _____ YES NO

A.1.4 Is there a procedure in place that assures the updating of specifications and removal of obsolete documents? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number: _____ Paragraph No. _____

A.1.4.1 Is there evidence of compliance to the procedure referenced in A.1.5? YES NO

A.1.5 Customer Requirements:

- (a) Is there a procedure to ensure that all customer requirements, are implemented? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

- (b) Who has the responsibility for identifying and implementing customer requirements?

(function and title)

- (c) Are customer requirements documented? Explain. YES NO

- (d) Are customer documents/requirements communicated to the inspectors? Explain. YES NO

- (e) Are customer documents/requirements kept up to date with respect to the revision specified by the customer? Explain. YES NO

- (f) Does this system appear to be adequate? YES NO

A.1.5.1 Unique Customer Requirements:

- (a) Is there a procedure to ensure that all unique requirements, are implemented? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

- (b) Who has the responsibility for identifying and implementing unique customer requirements?

(function and title)

- (c) Are unique customer requirements documented? Explain. YES NO

A.1.5.1 (Continued):

(d) Are unique customer documents/requirements communicated to the inspectors? Explain. YES NO

(e) Are unique customer documents/requirements kept up with respect to the revision specified by the customer? Explain. YES NO

(f) Does this system appear to be adequate? YES NO

A.1.6 Is there a procedure requiring periodic self-audit of the NDT system comprised of personnel, procedures, and equipment. YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

A.1.6.1 If certification of NDT personnel is based upon MIL-STD-410E, is the self audit performed by Level II minimum in the method being audited? YES NO

A.1.6.2 Does the periodic self-audit include review of inspection process and evaluation of material parts? YES NO

A.1.7 Is there a procedure requiring that all rejected parts be adequately identified and segregated until rework, reinspection and material /or disposition has been completed? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

Describe the system _____

A.1.7 (Continued):

- | | | | |
|----------------|--|------------|-----------|
| (a) | Is the inspection and test status of product(s) identified by using markings, authorized stamps, tags, labels, routing cards, inspection records, test software, physical location or other suitable means to indicate the conformance or nonconformance of product(s) with regard to inspection and tests performed? | YES | NO |
|
 | | | |
| A.1.7.1 | Have the responsibilities for review and authority for the disposition of nonconforming parts been defined? | YES | NO |
|
 | | | |
| A.1.7.2 | What dispositions for the following nonconforming parts are covered by the procedure? | | |
| (a) | Reworked to meet specified requirements? | YES | NO |
| (b) | Accepted with or without repair by concession? | YES | NO |
| (c) | Regraded for alternative applications? | YES | NO |
| (d) | Rejected or scrapped? | YES | NO |
| (e) | Return to customer for disposition of nonconforming products? | YES | NO |
|
 | | | |
| A.1.7.3 | Are descriptions of nonconformities and repairs that have been accepted recorded to denote actual conditions provided to the customer? | YES | NO |
|
 | | | |
| A.1.7.4 | Are repaired and reworked parts reinspected in accordance with documented procedures as evidenced by documentation records. | YES | NO |
|
 | | | |
| A.1.8 | Is there a procedure specifying symbol, method of application, and control of inspection stamps? | YES | NO |

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

- A.1.8.1** Does the procedure contain:
- | | | |
|---|-----|----|
| (a) Letter symbol for the method applied? | YES | NO |
| (b) The facility identifier? | YES | NO |
| (c) The inspector's identification number? | YES | NO |
| (d) Requirements for a record to be maintained for the issuance, recall, and traceability of all inspection stamps? | YES | NO |
- A.1.8.2** Is a record maintained showing stamps issued, date of issue, and the individual to whom the stamp was assigned? YES NO
- A.1.8.3** Are records of signatures and initials maintained for verification of approval/rejection sign-off authorization? YES NO
- A.1.8.4** Are appropriate actions included in the stamp and signature control procedure to deal with lost stamps, reassigned stamps, and removal of names of previously authorized but reassigned people? YES NO
- A.1.8.5** Are there provisions for stamp bond time before reassignment? YES NO
- A.1.9** Is there a procedure for identifying acceptable/rejectable parts that are too small for stamping, via packaging or tagging? YES NO
- Procedure Title _____
- Procedure Number _____ Revision _____ Date _____
- Page Number _____ Paragraph No. _____
- A.1.10** Is there a receiving inspection procedure that provides for acceptance, control, inspection, and return of purchased products and/or supplies per applicable purchase order? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

A.1.11 Is there a procurement procedure to insure that prime contractor requirements are adequately imposed on the sub-tier supplier, e.g., calibration services, cleaning/etching procedures as related to NDT? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

A.1.12 Is there a procedure to ensure that inspection records are maintained per purchase order or contractual requirements? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

(a) Do procedures establish and maintain the identification, collection, indexing, filing, storage, maintenance and disposition of quality records? YES NO

(b) Are quality records maintained to demonstrate achievement of the required quality and the effective operation of the quality system? YES NO

(c) Are pertinent sub-contractor quality records an element of these data? YES NO

(d) Are quality records legible and identifiable to the product involved? YES NO

(e) Are quality records stored and maintained in such a way that they are readily retrievable in a suitable environment that minimizes deterioration, damage, or loss? YES NO

(f) Have retention times of quality records been established and recorded? YES NO

(g) Where agreed contractually, are quality records made available for evaluation by the customer, or representative for an agreed period? YES NO

A.2 PERSONNEL RECORDS - MIL-STD-410E:

NOTE: Reference MIL-STD-410 for detailed requirements.

If MIL-STD-410E applies, complete items A.2.1 through A.2.9.

If MIL-STD-410D applies, complete items A.3.10 through A.3.17.

A.2.1 Is there a procedure detailing the training, qualification and certification requirements for NDT inspection and training personnel? **YES NO**

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

A.2.2 Are records of training qualification and certification of inspection personnel complete, and accurate, and are they available for review containing the following? **YES NO**

(a) Name of the individual certified? **YES NO**

(b) Level, method, and techniques for which individual is certified? **YES NO**

(c) Results of all qualification examinations, including the separate test scores, that the individual has taken? **YES NO**

(d) Date and expiration of current certification(s)? **YES NO**

(e) History of all previous NDT/NDI certifications with current employer? **YES NO**

(f) Training history which identifies source and dates of training, course hours and grades (if given after training), and instructor's name? **YES NO**

(g) Experience history, both with current and previous employers, sufficient to justify satisfaction of experience requirements for certification? **YES NO**

(h) Results of physical examinations? **YES NO**

(i) Extent and documentation of formal education? **YES NO**

A.2.2 (Continued):

- | | | | |
|-----|---|-----|----|
| (j) | Signature of qualifying examiner? | YES | NO |
| (k) | Signature of authorized representative of outside agency, if utilized? | YES | NO |
| (l) | Signature of authorized employer's representative attesting to certification if different from (j)? | YES | NO |

A.2.3 Have general, specific, and practical tests been given:

- | | | | |
|-----|---|-----|----|
| (a) | Within the last 3 years for Level I and II personnel. | YES | NO |
| (b) | Within the last 5 years for Level III personnel. | YES | NO |
| (c) | Does the grading system conform to the requirements of MIL-STD-410? Revision _____ | YES | NO |
| (d) | Do they have the minimum number of questions and does the question content adequately cover the subject material for the level and method being reviewed? | YES | NO |
| (e) | Are all tests periodically revised or changed? | YES | NO |
| | Frequency? Level I & II _____ Level III _____ | | |
| (f) | Do the "specific" examination questions reflect the equipment and procedures used within this facility? | YES | NO |
| (g) | Are personnel performing specific assigned tasks qualified on the basis of appropriate education, training, and/or experience as required? | YES | NO |
| (h) | Do the Level III practical tests reflect the type work being performed by the Level III? | YES | NO |
| (i) | Are these tests or representative tests on file and available for review? | YES | NO |

A.2.4 Are records of eye test results current for inspection personnel and available for review?

- | | | | |
|-----|---|-----|----|
| (a) | Near vision - Jaeger #1 @ not less than 12 inches, or equivalent with one eye, either natural or corrected? | YES | NO |
|-----|---|-----|----|

A.2.4 (Continued):

- | | | |
|--|-----|----|
| (b) Color vision normal for colors in applicable method? | YES | NO |
| (c) Are eye tests given annually? | YES | NO |
| (d) Has the Level III approved the person administering eye exams? | YES | NO |

A.2.5 Review of Supplier's Level III Personnel:

- | | | |
|---|-----|----|
| A.2.5.1 Does the supplier have Level III employees in all methods being surveyed/audited? | YES | NO |
|---|-----|----|

A.2.5.1.1 Level III(s) Certification Record:

<u>Method</u>	<u>Name</u>	<u>Cert Date</u>	<u>MIL-STD-410E</u>
Liquid Penetrant	_____	_____	YES NO
Magnetic Particle	_____	_____	YES NO
Ultrasonic	_____	_____	YES NO
Radiography	_____	_____	YES NO

- | | | |
|--|-----|----|
| A.2.5.2 Are outside agencies used to provide Level III services? If yes, identify organizations and services provided. | YES | NO |
|--|-----|----|

Name _____

Address _____

Phone # _____

Services Provided _____

- | | | |
|---|-----|----|
| A.2.5.2.1 Does facility have documentation on file to verify adequacy of outside Level III services provided? | YES | NO |
|---|-----|----|

- | | | |
|--|-----|----|
| A.2.5.4 Are Level III personnel certified by primes? | YES | NO |
|--|-----|----|

If Yes, by whom? _____

- | | | |
|--|-----|----|
| A.2.6 Do Level I personnel have written approval to perform specific tests, specific calibrations, and specific interpretations and evaluations for acceptance or rejection, and document the results in accordance with specific procedures from Level III? | YES | NO |
|--|-----|----|

- A.2.7** Is a training course outline for Level I and II in place, including those used by outside source, and does it address the following: YES NO
- (a) Adequate technical theory for the method? YES NO
- (b) Applicable techniques, specifications and procedures in use at the facility? YES NO
- (c) Inspection equipment, calibration requirements, materials and standards in use at the facility? YES NO
- (d) Training hours required for each subject? YES NO
- (e) Qualification requirements for the instructor? YES NO
- A.2.7.1** Does the training course outline conform to MIL-STD-410E? YES NO
- A.2.8** Does the certification procedure describe conditions under which certification will be revoked? YES NO
- A.2.9** Does the certification procedure describe requalification of personnel that fail the certification/recertification tests or have had their certifications revoked, and does it address the following: YES NO
- (a) Re-examination of personnel YES NO
- (b) Loss of certification YES NO
- A.3** PERSONNEL RECORDS - MIL-STD-410D:
- NOTE: Reference MIL-STD-410 for detailed requirements.
If MIL-STD-410E applies, complete items A.2.1 through A.2.9.
If MIL-STD-410D applies, complete items A.3.10 through A.3.17.
- A.3.1** Is there a procedure detailing the training, qualification and certification requirements for NDT inspection personnel? YES NO

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

A.3.2	Are records of training, qualification, and certification of inspection personnel complete, accurate, and available for review containing the following?	YES	NO
	(a) Name of the individual certified?	YES	NO
	(b) Level of certification?	YES	NO
	(c) Results of all qualification examinations, including the separate test scores, that the individual has taken?	YES	NO
	(d) Expiration date of current certification(s)?	YES	NO
	(e) Limitations?	YES	NO
	(f) Training history?	YES	NO
	(g) Experience history?	YES	NO
	(h) Results of physical examinations?	YES	NO
	(i) Date of certification or recertification.	YES	NO
	(j) Signature of qualifying examiner?	YES	NO
	(k) Signature of authorized representative of outside agency, if utilized?	YES	NO
	(l) Signature of authorized employer's representative attesting to certification if different from (j)?	YES	NO
A.3.3	Have general, specific, and practical tests been given within the last 3 years for Level I and II personnel, and are these tests on file and available for review?	YES	NO
	(a) Level I and Level II	YES	NO
	(b) Does the grading system conform to the requirements of MIL-STD-410?	YES	NO
	(c) Do they have the minimum number of questions and does the question content adequately cover the subject material for the level and method being reviewed?	YES	NO
	(d) Are all tests periodically revised or changed? Frequency? Level I & II _____	YES	NO
	(e) Do the "specific" examination questions reflect the equipment and procedures used within this facility?	YES	NO

A.3.3 (Continued):

(f) Are personnel performing specific assigned tasks qualified on the basis of appropriate education, training, and/or experience as required? YES NO

A.3.4 Are records of eye test results current for inspection personnel and available for review? YES NO

(a) Near vision - Jaeger # 2 at 12 inches, or Ortho-Rater 8 with one eye, either natural or corrected. YES NO

(b) Color vision normal for colors in applicable method. YES NO

(c) Are eye tests given annually? YES NO

A.3.5 Review of Supplier's Level III Personnel:

A.3.5.1 Does the supplier have a Level III employee in all methods being surveyed/audited? YES NO

A.3.5.1.1 Level III(s) Certification Record:

<u>Method</u>	<u>Name</u>	<u>Cert Date</u>	<u>MIL-STD-410D</u>	
Liquid Penetrant	_____	_____	YES	NO
Magnetic Particle	_____	_____	YES	NO
Ultrasonic	_____	_____	YES	NO
Radiography	_____	_____	YES	NO

A.3.5.2 Are outside agencies used to provide Level III services? YES NO
If yes, identify organizations and services provided.

Name _____

Address _____

Phone # _____

Services Provided _____

A.3.5.2.1 Does facility have documentation on file to verify adequacy of outside Level III services provided? YES NO

A.3.5.3 Are Level III personnel certified by primes? YES NO

If Yes, by whom? _____

- A.3.6 Do only Level I special personnel have written approval to perform specific tests, specific calibrations, and specific interpretations and evaluations for acceptance or rejection, and document the results in accordance with specific procedures from Level III? YES NO
- A.3.6.1 Is a training course outline for Level I and II in place, including those used by outside source, and does it address the following: YES NO
- (a) Adequate technical theory for the method? YES NO
- (b) Applicable techniques, specifications and procedures in use at the facility? YES NO
- (c) Inspection equipment, calibration requirements, materials and standards in use at the facility? YES NO
- (d) Training hours required for each subject? YES NO
- A.3.6.2 Does the training course outline conform to MIL-STD-410D? YES NO
- A.3.7 Does the certification procedure describe conditions under which certification will be revoked? YES NO
- A.3.8 Does the certification procedure describe requalification of personnel that fail the certification/recertification tests or have had their certifications revoked, and does it address the following: YES NO
- (a) Re-examination of personnel YES NO

A.4 PERSONNEL:

Identify personnel that are currently conducting NDT inspections.
(Attach list if necessary.)

<u>Name/Stamp #</u>	<u>Certification Date</u>	<u>Eye Exam Date</u>	<u>Years of Experience</u>	<u>Level</u>	<u>NDT Method</u>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Attach additional sheets if necessary.

A.5 INSPECTION REPORTS/RECORDS/PROCEDURES:

A.5.1 Is there any evidence of unauthorized specification, drawing, or procedure changes? YES NO

A.5.2 Is an inspection record maintained of all parts submitted for NDI? YES NO

Describe how the above information is recorded:

Attach additional sheets if required.

A.5.3 Do inspection reports contain or provide traceability to the following:

(a) NDT facility name? YES NO

(b) Date of inspection? YES NO

(c) Part number and serial number if applicable? YES NO

(d) Number of parts in lot, number inspected, number accepted? YES NO

(e) Applicable specification number and change letter acceptance criteria? YES NO

(f) Signature of authorized person? YES NO

(g) Identification of the inspector performing the inspection? YES NO

(h) Material description, if applicable? YES NO

(i) Nature of the discrepancy and rejection tag number, if applicable? YES NO

A.5.4 Is a work order or shop traveler in use that contains or provides traceability to the following:

- | | | |
|--|-----|----|
| (a) Product identification traceable to applicable purchase order number, part number, or product specification? | YES | NO |
| (b) Applicable specification and procedure? | YES | NO |
| (c) Inspection method? | YES | NO |
| (d) Inspection acceptance of operation performed? | YES | NO |
| (e) Quantity inspected, accepted/rejected? | YES | NO |
| (f) Correct sequence of fabrication and inspection operations? | YES | NO |

A.6 CORRECTIVE ACTION:

Have procedures been established, documented, and maintained for:

- | | | |
|--|-----|----|
| (a) Investigating the cause of nonconforming product and the corrective action needed to prevent recurrence? | YES | NO |
| (b) Analyzing processes, work operations, concessions, quality records, service reports and customer complaints to detect and eliminate potential causes of nonconforming product? | YES | NO |
| (c) Initiating preventative actions to deal with problems? | YES | NO |
| (d) Applying controls to ensure that corrective actions are taken and that they are effective? | YES | NO |
| (e) Implementing and recording changes in procedures resulting from corrective action? | YES | NO |

A.7 CALIBRATION:

- | | | |
|---|-----|----|
| A.7.1 Is there a procedure requiring calibration and control of equipment? | YES | NO |
|---|-----|----|

Procedure Title _____

Procedure Number _____ Revision _____ Date _____

Page Number _____ Paragraph No. _____

A.7.1.1

Does the calibration system/procedure address the following?

- | | | | |
|-----|--|-----|----|
| (a) | Are procedures established for approval of calibration processes and equipment as appropriate? | YES | NO |
| (b) | Have NDT inspection, measuring and test equipment and devices been identified, calibrated and adjusted prior to use and at prescribed intervals against certified equipment having a known valid relationship to National Institute of Standards and Technology (NIST) standards or other recognized standard? | YES | NO |
| (c) | Have calibration procedures been established, documented and maintained to include details of equipment type, identification number, location, frequency of checks, check method, acceptance criteria and action to be taken when results are unsatisfactory? | YES | NO |
| (d) | Do the procedures call for a periodic review of calibration history to determine the validity of the current calibration intervals? | YES | NO |
| (e) | Is the NDT inspection, measuring and test equipment capable of the necessary accuracy and precision? | YES | NO |
| (f) | Is NDT inspection, measuring and test equipment identified with a suitable indicator or approved identification record to show the calibration status and date for next calibration? | YES | NO |
| (g) | When NDT inspection, measuring or test equipment is found to be out of calibration, is the validity of previous inspection and test results assessed or documented? | YES | NO |
| (h) | Is the handling, preserving and storage of inspection, measuring and test equipment such that the accuracy and fitness for use is maintained? | YES | NO |

- A.7.2** **Is calibration performed in-house?** **YES** **NO**
- Is calibration performed by an outside service?** **YES** **NO**
- Who supplies the calibration service?**

Name _____

Address _____

Attach extra sheets as required.

- A.7.3** **Do calibration records include:**
- (a) **Inventory of NDT equipment requiring calibration?** **YES** **NO**
- (b) **Manufacturer's name, model, and serial number of each item in inventory?** **YES** **NO**
- (c) **Calibration frequency?** **YES** **NO**
- (d) **Reference to procedure and calibration standard used?** **YES** **NO**
- (e) **Date last calibrated and date of next calibration?** **YES** **NO**
- (f) **Name of individual performing the calibration?** **YES** **NO**

- A.7.3.1** **If inspection equipment has been found to be out of tolerance, what actions have been taken with equipment and product(s) inspected?**

Attach additional sheets if required.

A.8 **FACILITIES:**

- A.8.1** **Are facilities available for application of protective coatings?** **YES** **NO**
- A.8.2** **Have procedures been established, documented and maintained for handling, storage, packaging, and delivery of product?** **YES** **NO**

A.8.3 **Is there evidence of part damage due to handling?** **YES NO**

A.8.3.1 **Are methods and means of handling practices in place that prevent damage or deterioration?** **YES NO**

A.8.4 **Auditor's General Impression: (Attitude, behavior, are employees neat, busy, etc.)**

A.8.5 **Supplier's Comments:**

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APPENDIX B PENETRANT SURVEY

SURVEY NO. _____

Instructions to the surveyor:

This form shall be used in conjunction with Appendix A - Quality Systems of SAE AS7100/1 AUDIT CRITERIA FOR NONDESTRUCTIVE TEST FACILITY.

Parenthetical information is the reference paragraph from MIL-STD-6866.

B.1 MATERIALS AND EQUIPMENT:

B.1.1 List all penetrant materials/combinations used at this facility.

Level	Type/Method/Form	Manufacturer	Pen.	Emul.	Dev.	Listed on Latest OPL25135?
_____	_____	_____	_____	_____	_____	YES NO
_____	_____	_____	_____	_____	_____	YES NO
_____	_____	_____	_____	_____	_____	YES NO
_____	_____	_____	_____	_____	_____	YES NO
_____	_____	_____	_____	_____	_____	YES NO

Attach additional listing, if necessary.

B.1.2 Does the facility have traceability to manufacturer's certifications for each batch of penetrant, emulsifier, and developer in use? YES NO

B.1.3 List the tank sizes (length x width x depth, units in feet).

Level/Method	Penetrant	Emulsifier	Developer	Inspection Booth
_____	____x____x____	____x____x____	____x____x____	____x____x____
_____	____x____x____	____x____x____	____x____x____	____x____x____
_____	____x____x____	____x____x____	____x____x____	____x____x____
_____	____x____x____	____x____x____	____x____x____	____x____x____
_____	____x____x____	____x____x____	____x____x____	____x____x____
_____	____x____x____	____x____x____	____x____x____	____x____x____

B.1.4 Is spray penetrant application available? YES NO

B.1.5 Is automated equipment in use at this facility? YES NO

B.1.6 Is electrostatic spray utilized? YES NO

- B.1.7** List the generic types of parts that are penetrant inspected at this facility.

<u>Manual Processing Equipment</u>	<u>Automated Processing Equipment</u>

B.2 PROCEDURES:

B.2.1 NDT Facility Written Procedures:

B.2.1.1 Is there a statement in the procedure or quality manual stating that, as a minimum, MIL-STD-6866 is being met? YES NO

B.2.1.2 Is there a general procedure for processing and inspecting parts using the Liquid Penetrant Technique? YES NO

Procedure Title _____

Number _____ Revision _____ Date _____

B.2.1.3 Do the written inspection procedures, general or specific, contain the following information as applicable:

- | | | |
|--|-----|----|
| (a) The procedure I.D. number, applicable program, if program specific, and the date the procedure was approved? | YES | NO |
| (b) Date of approval? | YES | NO |
| (c) Approval by Level III? | YES | NO |
| (d) Listing of deviations and approval by customer? | YES | NO |
| (e) Requirement that all personnel are qualified and certified to appropriate level? | YES | NO |
| (f) The part number and material, to be examined? | YES | NO |
| (g) Equipment to be used including any unique requirements for automated vs. manual equipment? | YES | NO |
| (h) Requirements for precleaning and/or etching process including materials, processing times, metal removal, and drying parameters? | YES | NO |

B.2.1.3 (Continued):

- | | | | |
|-----|---|-----|----|
| (i) | Brand name and specific type of penetrant, sensitivity level, emulsifier, developer, and classifications in accordance with MIL-I-25135? | YES | NO |
| (j) | Complete processing parameters for the penetrant inspection materials including dwell times, application methods, drying times, concentrations of emulsifiers, temperatures, and controls to prevent excessive drying or overheating, as appropriate? | YES | NO |
| (k) | Methods of removing excess penetrant and drying the surface prior to applying the developer, spray water nozzle type, water pressure and water temperature, hydroair nozzles, and air pressure? | YES | NO |
| (l) | Method of developer applications? | YES | NO |
| (m) | Evaluation procedure including blacklight intensity, inspection booth ambient white light intensity, dark adaptation time, prohibition of photochromic lenses, acceptance criteria, and controls for mechanical evaluation and solvent cleaning evaluation? | YES | NO |
| (n) | Identification of the components or areas within a component to be inspected? | YES | NO |
| (o) | Applicable acceptance class and zone per engineering drawing specification? | YES | NO |
| (p) | Any special equipment required including type and intensity of light, if different from standard processing? | YES | NO |
| (q) | Part masking when required? | YES | NO |
| (r) | Complete post-cleaning procedures? | YES | NO |
| (s) | Method and location of marking parts? | YES | NO |
| (t) | Method for control of software or programming used for automated processing equipment as applicable? | YES | NO |
| (u) | A statement to the effect that quality assurance provisions will be met? | YES | NO |

B.2.1.3 (Continued):

- | | | | |
|-----|---|-----|----|
| (v) | Statement to the effect that the procedure complies with the applicable specification requirements? | YES | NO |
| (w) | Provisions for process control tests and checks to be performed? | YES | NO |
| (x) | Approved deviations are listed and validated? | YES | NO |

B.2.1.4 Are procedures for special material handling and processing of parts defined? YES NO

Procedure Title _____

Number _____ Revision _____ Date _____

Page(s) _____ Paragraph No. _____

B.2.1.5 Are technique cards prepared by the Level II or III and approved by the Level III in the applicable inspection method? YES NO

- | | | | |
|-----|--|-----|----|
| (a) | Do documented work instructions define the manner of inspection, type of inspection equipment, suitable work environment, and compliance with referenced standards, codes and quality plans? | YES | NO |
| (b) | Are the inspection processes that directly affect quality identified and are measures taken to ensure that these processes are carried out in controlled conditions? | YES | NO |

B.3 LABORATORY PROCESS CONTROLS:**B.3.1 Penetrant Brightness Test (5.8.4.1.1):**

- | | | | |
|-----|---|-----|----|
| (a) | Is the fluorescent brightness of in-use penetrant being tested and documented? | YES | NO |
| (b) | Is this test being performed quarterly? | YES | NO |
| (c) | Is the test procedure in accordance with MIL-I-25135, 4.5.7? | YES | NO |
| (d) | Is the minimum acceptance limit 90%? | YES | NO |
| (e) | Are records of this test on file and do they provide acceptable values for results? | YES | NO |
| (f) | Can the facility demonstrate this check? | YES | NO |

B.3.2 Water Content of Water-Washable Penetrants (5.8.4.1.2):

- | | | | |
|-----|--|-----|----|
| (a) | Is the water content or water tolerance of in-use Method A penetrants being tested and documented? | YES | NO |
| (b) | Is this test being performed monthly? | YES | NO |
| (c) | What test procedure is used?
ASTM D95 _____ Other _____ | | |
| (d) | What is the maximum acceptable limit used?
5 % _____ Other _____ | | |
| (e) | Are records of this test on file and do they indicate acceptable results? | YES | NO |
| (f) | Can the facility demonstrate this check? | YES | NO |

B.3.3 Water Content of Lipophilic Emulsifiers (5.8.4.2.2):

- | | | | |
|-----|--|-----|----|
| (a) | Is the water content of in-use Method B emulsifier being checked and documented? | YES | NO |
| (b) | Is this check being performed monthly? | YES | NO |
| (c) | Is the test procedure in accordance with ASTM D 95? | YES | NO |
| (d) | Is the maximum acceptable limit 5%? | YES | NO |
| (e) | Are records of this check on file and do they indicate acceptable results? | YES | NO |
| (f) | Can the facility properly demonstrate this check? | YES | NO |

B.3.4 Concentration of Hydrophilic Emulsifiers (5.8.4.2.3):

- | | | | |
|-----|---|-----|----|
| (a) | Is the concentration of in-use (Method D) hydrophilic emulsifiers being checked and documented? | YES | NO |
| (b) | Is this check being performed weekly? | Yes | NO |
| (c) | Is a refractometer used to perform this test? | YES | NO |
| (d) | What is the maximum variation allowed?
± 3% _____ Other _____ | | |

B.3.4 (Continued):**(e) Are concentrations kept below:****(1) 35% for application by immersion? YES NO****(2) 5% for application by spray application? YES NO****(f) Are records of this check on file and do they indicate acceptable results? YES NO****(g) Can the facility properly demonstrate this check? YES NO****B.3.5 Dry Developer Characteristics (5.8.4.3.1):****(a) Is the in-use dry developer being checked and test documented? YES NO****(b) Is this check being performed daily? YES NO****(c) Does this check ensure that the developer is not caked and that recycled dry developer has not picked up excessive fluorescent material? YES NO****(d) Are records of this check on file and do they indicate acceptable results? YES NO****(e) Can the facility properly demonstrate this check? YES NO****(f) Is there a procedure requirement to periodically add/replace developer? YES NO****B.3.6 Characteristics and Concentration of Aqueous Developer (Soluble & Suspended) (5.8.4.3.2):****(a) Is the concentration of in-use Form b and c developer being checked and documented? YES NO****(b) Is this test being performed weekly? YES NO****(c) Is a hydrometer being used for this test? YES NO****(d) What are the acceptance limits? _____****(e) Does the aqueous developer uniformly wet the test panel and not contain fluorescent material? YES NO****(f) Are records of this check on file and do they indicate acceptable results? YES NO****(g) Can the facility properly demonstrate this check? YES NO**

B.3.7 Penetrant System Performance (5.8.3):

(a) Is the penetrant system performance checked and documented? YES NO

(b) Is this test being performed daily? YES NO

(c) List the type of known defect standard and the acceptance criteria for each level or group.

(d) Are records of this check on file and do they indicate acceptable results? YES NO

(e) Can the facility properly demonstrate this check for each penetrant system in use? YES NO

(f) Is the known defect standard properly maintained and stored? YES NO

(g) Is the known defect standard checked at least monthly to detect degradation of its sensitivity? YES NO

B.3.8 Sensitivity of In-Use Penetrant (5.8.4.1.4):

(a) Is the sensitivity of in-use penetrants checked monthly against unused penetrants and are the results documented? YES NO

(b) List the type of known defect standard and the acceptance criteria for each level or group.

Note: For B3.7/B3.8 -- These requirements shall be checked in accordance with the procedures of MIL-STD-6866, Para 5.8.3. If not, then list frequency of check and type of known standard and acceptance criteria.

B.3.9 Removability of Water-Washable Penetrants (5.8.4.1.3):

- | | | | |
|-----|--|-----|----|
| (a) | Is the removability test for in-use water-washable penetrant performed and documented? | YES | NO |
| (b) | Is this test being performed monthly? | YES | NO |
| (c) | Is the test procedure in accordance with MIL-I-25135 (4.5.16.2)? | YES | NO |
| (d) | Are records of this test on file and do they indicate acceptable results? | YES | NO |
| (e) | Can the facility properly demonstrate this test? | YES | NO |

B.3.10 Removability of Emulsifiers (5.8.4.2.1):

- | | | | |
|-----|--|-----|----|
| (a) | Is the removability test for in-use emulsifier performed and documented? | YES | NO |
| (b) | Is this check being performed weekly? | YES | NO |
| (c) | Is the test procedure in accordance with MIL-I-25135? | YES | NO |
| (d) | Are records of this check on file and do they indicate acceptable results? | YES | NO |
| (e) | Can the facility properly demonstrate this check? | YES | NO |

B.3.11 Dryer Controls (5.4, 5.8.6):

- | | | | |
|-----|--|-----|----|
| (a) | Is a dryer oven in use at the facility? | YES | NO |
| (b) | Is the dryer oven thermostatically controlled? | YES | NO |
| (c) | Is the calibration current? | YES | NO |

- (d) List the date of the current and next scheduled calibration of the thermostat.

Current _____ Next _____

Identify the Frequency of Calibration: _____

- | | | | |
|-----|---|-----|----|
| (e) | Is there a temperature indicator for the dryer? | YES | NO |
|-----|---|-----|----|

Temperature reading _____
(160 maximum)

- | | | | |
|-----|-----------------------------|-----|----|
| (f) | Is the calibration current? | YES | NO |
|-----|-----------------------------|-----|----|

B.3.11 (Continued):

- (g) List the date of the current and next scheduled calibration.

Current _____ Next _____

Identify the frequency of calibration: _____

B.3.12 Black Light Meters and Measurements:

- (a) List the type and model of blacklight meter.

- (b) Is calibration of the meter being performed semi-annually? YES NO

- (c) List the tolerance for calibration. _____

- (d) List the procedure number for calibration.

- (e) Does the blacklight meter have a current calibration sticker? YES NO

- (f) Is the blacklight intensity checked? YES NO

- (g) Is this check being performed daily? YES NO

- (h) What is the minimum acceptable limit?

800 mW/cm² at 15 in _____ OTHER _____

- (i) Are records of this check on file and do they indicate acceptable results? YES NO

- (j) Can the facility properly demonstrate this check? YES NO

B.3.13 White Light Meters and Measurements:

- (a) List the type and model of white light meter.

- (b) Is calibration of the meter being performed semi-annually? YES NO

- (c) What is the tolerance for calibration? _____

B.3.13 (Continued):

(d) List the procedure number for calibration.

(e) Does the white light meter have a current calibration sticker?	YES	NO
--	-----	----

(f) Is a means documented to ensure that white light is controlled for Type I penetrants?	YES	NO
---	-----	----

2 ft-candles _____	Other _____
--------------------	-------------

(g) Is this check being performed weekly?	YES	NO
---	-----	----

(h) Are records of this check on file and do they indicate acceptable results?	YES	NO
--	-----	----

(i) Can the facility properly demonstrate this check?	YES	NO
---	-----	----

(j) Is a white light available in the undarkened inspection area for visual verification, and are 100 foot-candles or more at part surface for Type I and Type II penetrants?	YES	NO
---	-----	----

B.4 PENETRANT AREA PROCESS CONTROLS:

B.4.1 Precleaning (5.1):

(a) Is equipment in place to adequately clean parts to remove grease, oil, scale, rust, etc.?	YES	NO
---	-----	----

(b) List the alloy groups and precleaning methods utilized.

<u>Alloy Groups</u>	<u>Cleaning Method</u>
_____	_____
_____	_____
_____	_____
_____	_____

B.4.2 Pre-Penetrant Etching (5.1.4):

(a) Does the facility have the capability to perform pre-penetrant etching in-house?	YES	NO
--	-----	----

B.4.2 (Continued):

- (b) List the alloy groups (i.e., steel, stainless steel, aluminum, etc.) and etching solutions.

<u>Alloy</u>	<u>Etching Solution</u> (Specify Concentration)	<u>Acid</u>	<u>Caustic</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

- (c) Are process controls in place to ensure consistent etch rates (i.e., temperature solution activity, etc)? YES NO
- (d) Do operator instructions adequately address circumstances requiring pre-penetrant etching? YES NO
- (e) Do operator instructions adequately describe the etching process procedure? YES NO
- (f) How does supplier verify etching solution has been completely removed from the hardware?

- (g) List the name and address of subcontract etching facilities.

B.4.3 Penetrant Application (5.2):

- (a) Are components, penetrant, and ambient temperatures maintained between 40°F and 120°F? YES NO

Other range _____

- (b) Do the means exist for controlling penetrant dwell time? YES NO

List Method _____

B.4.3 (Continued):

- | | | | |
|-----|---|-----|----|
| (c) | If the temperature of the parts or penetrant material is below 50°F, is the penetrant dwell time doubled? | YES | NO |
| (d) | Are electrostatic spray operations controlled to ensure complete coverage of parts? | YES | NO |
| (e) | Are parts dry prior to penetrant application? | YES | NO |
| (f) | Are the contents of all tanks/drums labeled as to material and batch number, and are all tanks in a system arranged/covered to prevent mixing of materials? | YES | NO |

B.4.4 Use of Emulsifier (5.3.2.1 and 5.3.4.2):

- | | | | |
|-----|--|-----|----|
| (a) | Does a means exist for controlling emulsifier dwell time? | YES | NO |
| | List Method _____ | | |
| (b) | Are methods of emulsifiers properly controlled? Application/Removability | YES | NO |

B.4.5 Penetrant Removal (5.3, 5.8.6):

- | | | | |
|-----|--|-----|----|
| (a) | Is the rinse water controlled to provide a coarse, conical spray? | YES | NO |
| | List nozzle _____ (Mfg Type) | | |
| (b) | Is the rinse water temperature control range between 50 and 100°F? | YES | NO |
| (c) | How is the rinse water temperature monitored? | | |
| | _____ | | |
| (d) | At what frequency is calibration being performed on the temperature monitor? | | |
| | _____ | | |
| (e) | Is the rinse water pressure controlled to 40 psi maximum? | YES | NO |
| (f) | How is the water pressure monitored? | | |
| | _____ | | |

B.4.5 (Continued):

(g) At what frequency is calibration being performed on the pressure monitor?

(h) Are hydro-air nozzles used only for Level 1 and 2 sensitivity? YES NO

(i) Is the air pressure on the hydro-air nozzle controlled to 25 psi maximum? YES NO

(j) How is the air pressure for the hydro-air nozzle monitored?

(k) At what frequency is calibration being performed on the hydro-air nozzle air pressure monitor?

(l) If compressed air is used, is it filtered? YES NO

(m) Is penetrant removal verified under a black light? YES NO

(n) List the calibration dates for:

	Current	Next
- Water temperature monitor	_____	_____
- Water pressure monitor	_____	_____
- Air pressure monitor	_____	_____

(o) Are the temperature and pressure checked at the start of each shift? YES NO

B.4.6 Developer Application:

(a) Are all air agitated dry developer tanks equipped with dehumidifier filters and oil separators? YES NO

(b) Do means exist for controlling developer dwell time? YES NO

Minimum Dwell Time _____ Maximum Dwell Time _____

(c) Are parts properly dried prior to developer application? YES NO

(d) Are methods for applying and removing excess developer properly controlled? YES NO

B.4.7 Inspection Area:

- | | | |
|---|-----|----|
| (a) Is a magnifying glass available for evaluating indications? | YES | NO |
| (b) List magnifying power. (i.e., 3X, 10X) _____ | | |
| (c) Is a borescope available for evaluating indications? | YES | NO |
| White Light Borescope? | YES | NO |
| Black Light Borescope? | YES | NO |
| (d) Are calibrated measuring devices available for sizing indications? | YES | NO |
| (e) Is the area free of fluorescent material or other contamination that may interfere with the inspection process? | YES | NO |

B.4.8 Impression Stamps:

Provide impression stamp(s) of symbols used to denote final penetrant inspection.

(Symbol and Color)

100% Lot Accepted

Accept

Reject

Sample From Lot Inspected

Accept

Reject

B.5 COMPLIANCE:

Select a minimum of (3) lots of parts at random from current production to determine compliance with these requirements. These parts should be selected to represent a variety of customer requirements and several different types of processing equipment if more than one penetrant line is in use at this facility. Investigate the purchase order specifications to identify any unique acceptance, process control, or procedure requirements applicable to these parts. Witness the facility's ability to perform inspection of these parts in accordance with the requirements.

A.	<u>Part Description</u>	<u>Customer</u>	<u>Specification/Rev.</u>	<u>Compliance</u>
				YES NO
	<u>Penetrant Used</u>			
	<u>Emulsifier Used</u>			
	<u>Developer Used</u>			
	<u>Inspector</u>		<u>Level</u>	

B.	<u>Part Description</u>	<u>Customer</u>	<u>Specification/Rev.</u>	<u>Compliance</u>
				YES NO
	<u>Penetrant Used</u>			
	<u>Emulsifier Used</u>			
	<u>Developer Used</u>			
	<u>Inspector</u>		<u>Level</u>	

C.	<u>Part Description</u>	<u>Customer</u>	<u>Specification/Rev.</u>	<u>Compliance</u>
				YES NO
	<u>Penetrant Used</u>			
	<u>Emulsifier Used</u>			
	<u>Developer Used</u>			
	<u>Inspector</u>		<u>Level</u>	

B.5.1 Customer Specifications:

- | | | |
|---|-----|----|
| (a) Is the facility using the appropriate specifications and revisions as required by the purchase order? | YES | NO |
| (b) Are the unique requirements made available to the penetrant inspectors? | YES | NO |

B.5.2 Cleaning and Etching (5.1):

- | | | |
|--|-----|----|
| (a) Are parts properly cleaned and/or etched in accordance with customer requirements? | YES | NO |
| (b) Is acid removal verified prior to penetrant application? | YES | NO |
| (c) Are parts dry prior to penetrant application? | YES | NO |

B.5.3 Penetrant Application (5.2):

- | | | |
|---|-----|----|
| (a) Are parts properly masked, when required? | YES | NO |
| (b) Are precautions taken to ensure that parts are completely covered with the penetrant? | YES | NO |
| (c) Are parts properly drained? | YES | NO |
| (d) Is dwell time adequately controlled? | YES | NO |
| (e) If parts exceed maximum dwell time, is penetrant reapplied? | YES | NO |
| (f) Is the correct method/type and level of penetrant used? | YES | NO |

B.5.4 Penetrant Removal (5.3):

- | | | |
|---|-----|----|
| (a) Are parts washed under black light? | YES | NO |
| (b) Is the light adequate to verify proper washing? | YES | NO |
| (c) When washing a basket of parts, is over washing controlled? | YES | NO |
| (d) Was the correct emulsifier utilized? | YES | NO |
| (e) Is emulsifier dwell time adequately controlled? | YES | NO |

How? _____

List emulsifier dwell time _____

B.5.4 (Continued):

- | | | |
|--|-----|----|
| (f) If hydrophilic emulsifier is used, are the pre-rinse parameters (i.e., temperature, pressure, and time) documented and controlled? | YES | NO |
| (g) Is entire part flooded with water prior to reaching maximum dwell time? | YES | NO |
| (h) Are parts properly dried for the method utilized? | YES | NO |

B.5.5 Developer Application:

- | | | |
|---|-----|----|
| (a) Is the proper developer utilized? | YES | NO |
| (b) When aqueous developers are used, is excess water removed from the parts prior to developer application? | YES | NO |
| (c) When applying the developer, are the parts completely covered? | YES | NO |
| (d) Is air used to remove excess dry developer?
List the air pressure used. _____ psi | YES | NO |
| (e) Are parts thoroughly dry prior to application of dry or non-aqueous developer? | YES | NO |
| (f) If aqueous soluble developers are used in combination with Type I, Method A or any Type II penetrant, is specific customer documentation or approval on file? | YES | NO |
| (g) Is the developing time adequately controlled?
List the developing time. _____ minutes | YES | NO |

B.5.6 Evaluation (5.6):

- | | | |
|--|-----|----|
| (a) Did inspectors allow at least 1 minute to condition their eyes to the darkness? | YES | NO |
| (b) Did inspectors wear any photochromatic glasses? | YES | NO |
| (c) Is the background white light less than 2 foot-candles as measured at the inspection surface with the blacklight on? | YES | NO |

B.5.6 (Continued):

- (d) Does the black light provide illumination of at least 1200 $\mu\text{W}/\text{cm}^2$ at surface of components being inspected? (5.6.1) YES NO
- (e) List the blacklight intensity measured at the time of this survey. _____ $\mu\text{W}/\text{cm}^2$ @ _____ INCHES
- (f) Did the inspector properly evaluate every indication and reject parts containing relevant indications of defects that exceed the acceptance limits? YES NO
- (g) Are all rejectable indications marked on the part and recorded on the appropriate paperwork? YES NO
- (h) Is all pertinent paperwork traceable to the part? YES NO
- (i) Are the specific accept/reject criteria readily available to the inspector? YES NO
- (j) Do the accept/reject criteria properly reflect the customer criteria? YES NO

B.5.7 Post Cleaning (5.7):

- (a) Is an adequate post process cleaning operation performed? YES NO

B.5.8 Inspector Qualification (4.3):

- (a) Are the inspection personnel certified to the correct levels for the work they are performing? (review personnel records) YES NO
- (b) Were any non-certified or in-training personnel observed performing PT inspection operations without proper supervision? YES NO

B.5.9 Marking (5.9.5):

- (a) Are the parts marked in accordance with the specification? YES NO
- (b) Describe how and with what symbol parts were marked, or if ink stamped, provide an impression of stamp.
-
-

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B.7 SURVEY CRITIQUE:**B.7.1 NDT Facility:**

Please critique and comment on the survey form and survey procedure. Specific examples to illustrate your concerns and opinions would be appreciated. Your comments may be submitted anonymously, if you so desire. Send response to:

PRI
NADCAP Technical Division
402 Commonwealth Drive
Warrendale, PA 15086

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B.8**SURVEY OBSERVATIONS:**

Surveyor - Use this page to furnish additional information or data, when required.

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TABLE B1 - Periodic Test Requirements

<u>Test Requirement</u>	<u>Paragraph Number (MIL-STD-6866)</u>	<u>Frequency of Check Required</u>	<u>Other</u>	<u>List Current Test</u>	<u>Quality Value Recorded</u>
Penetrant Brightness	5.8.4.1.1	Quarterly	_____	_____	_____
Penetrant Systems	5.8.4.1.4/5.8.3	Daily	_____	_____	_____
Removability of W.W. Penetrant	5.8.4.1.3	Monthly	_____	_____	_____
Removability of Emulsifier	5.8.4.2.1	Weekly	_____	_____	_____
Water Content of W. W. Penetrant	5.8.4.1.2	Monthly	_____	_____	_____
Water Content of Lipophilic Emulsifier	5.8.4.2.2	Monthly	_____	_____	_____
Concentration of Hydrophilic Remover	5.8.4.2.3	Weekly	_____	_____	_____
Concentration of Aqueous Developer	5.8.4.3.2	Daily	_____	_____	_____
Fluorescent of Aqueous Developer	5.8.4.3.2	Daily	_____	_____	_____
Black Light Intensity	5.8.1	Daily	_____	_____	_____
Black Light Maintenance	5.8.1	Daily	_____	_____	_____
White Light Intensity	5.8.2	Weekly	_____	_____	_____
Exclusion of White Light	5.8.5	Weekly	_____	_____	_____
Dry Developer	5.8.4.3.1	Daily	_____	_____	_____
Dryer Temperature	5.8.6	Shift	_____	_____	_____
Water Control Pressure	5.8.6	Shift	_____	_____	_____
Water Temperature	5.8.6	Shift	_____	_____	_____

APPENDIX C MAGNETIC PARTICLE SURVEY

SURVEY NO. _____

Instructions to the Surveyor:

This form shall be used in conjunction with Appendix A - Quality Systems of SAE AS7100/1 AUDIT CRITERIA FOR NONDESTRUCTIVE TEST FACILITY.

Parenthetical information is the reference paragraph from MIL-STD-1949.

C.1 MATERIALS AND EQUIPMENT:

C.1.1 List all magnetic particles used at this facility.
Specify applicable AMS (4.9.1.1, 4.9.1.2)

<u>Manufacturer</u>	<u>Type</u>	<u>Conforms To AMS</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

C.1.2 Is a manufacturer's certification available? (4.9.1.1, 4.9.1.2) YES NO

C.1.3 Does the suspension vehicle used for carrying magnetic particles conform to the requirements of: (4.9.2)

AMS 2641 _____	YES	NO
DoD-F-87935 _____	YES	NO
Suitable conditioned water (4.9.4) _____	YES	NO
Other (CUSTOMER APPROVAL REQUIRED) _____		

C.1.4 Are certifications available for the suspension carrier? (4.9.2) YES NO

C.1.5 Complete EQUIPMENT LIST on page C-17 or attach separate list that defines magnetic particle inspection equipment. (4.6)

C.1.6 Does all equipment include a control to vary the current from 10% to 100% of full rated output? YES NO

C.2 PROCEDURES:

C.2.1 Is there a statement in the procedure or quality manual requiring that as a minimum MIL-STD-1949 is being met? YES NO

C.2.2 Is there a general procedure for processing and inspecting parts using the Magnetic Particle Technique? YES NO

Procedure Title _____

Number _____ Revision _____ Date _____

C.2.3 Does the written procedure, general or specific, contain the following information as a minimum: (4.4.1)

- | | | |
|--|-----|----|
| (a) Procedure I. D. number, applicable program, if program specific, and the date the procedure was approved. | YES | NO |
| (b) Identification part number, material and alloy type, shape and dimensions significant to the part to be examined. | YES | NO |
| (c) Equipment to be used for magnetization, including manufacturer and model number. | YES | NO |
| (d) Type of current used (e.g., single phase, half wave rectified, three phase, single phase AC, etc.). Number of turns in the coil. | YES | NO |
| (e) Type and direction of magnetizations to be used, the order in which they are applied, and any demagnetization between shots. | YES | NO |
| (f) Pulse duration, type (AC, DC), and Quantity (pulses/shot). | YES | NO |
| (g) Magnitude of current, direction of all magnetic fields, the magnetic field strengths and the types of magnetic field strength indicators, ampere turns, etc. | YES | NO |
| (h) Sketches or a chart indicating coverage and/or orientation of the part with respect to current conductors and/or contact points. | YES | NO |
| (i) Duration or cycles/sec for multidirectional systems. | YES | NO |
| (j) Statement that the equipment has a variable current control. | YES | NO |
| (k) Details of demagnetization procedure including use of magnetic field indicator. | YES | NO |
| (l) Area of parts to be examined and acceptance classes or requirements for evaluating indications. | YES | NO |

C.2.3 (Continued):

- | | | | |
|-----|--|-----|----|
| (m) | Type of records and method of marking parts after inspection. | YES | NO |
| (n) | Surface preparation required for before and after testing. | YES | NO |
| (o) | Identification of test parts used for system performance. | YES | NO |
| (p) | Sequence of the magnetic particle inspection the other manufacturing operations. | YES | NO |
| (q) | Certified limits of the magnetizing unit. | YES | NO |
| (r) | Ferromagnetic particles to be used by manufacturer, color, wet or dry, fluorescent or nonfluorescent, and suspension vehicle. | YES | NO |
| (s) | A statement to the effect that Quality Assurance provisions will be met. | YES | NO |
| (t) | Contrast media or other special materials used. | YES | NO |
| (u) | A statement to the effect that the procedure complies with applicable specification requirement. | YES | NO |
| (v) | A statement to the effect that all personnel are qualified and certified to MIL-STD-410 or the applicable contract requirements. | YES | NO |
| (w) | A statement that personnel performing inspections are prohibited from wearing glasses with photo-chromatic lenses? (5.9) | YES | NO |
| (x) | Approved deviations listed and validated by the customer and the supplier's Level III. | YES | NO |

C.2.4 Are technique cards prepared by the Level II or III and approved by the Level III in magnetic particle inspection?

- | | | | |
|-----|--|-----|----|
| (a) | Do documented work instructions define the manner of inspection, type of inspection equipment, suitable work environment, and compliance with referenced standards, codes and quality plans? | YES | NO |
| (b) | Are the inspection processes that directly affect quality identified and are measures taken to ensure that these processes are carried out in controlled conditions? | YES | NO |

- C.2.5 Have written procedures been prepared for all parts by Level II or III and have they been approved by a Level III in magnetic particle inspection? (4.4) YES NO
- C.2.6 Does the procedure provide a means to ensure that the appropriate work instructions (including sequence of operations, processing parameters, technique information, unique requirements) are made available to inspection personnel on the shop floor? YES NO
- C.2.7 Are miscellaneous small parts to be inspected such as bolts, washers, pins, etc. controlled by a general written procedure? (4.4) YES NO
- Procedure Number _____
- C.2.8 If coating or plating is permitted prior to inspection, does the procedure define how the minimum allowable defects are detected through the maximum coating thickness. (5.1.3) YES NO
- C.2.9 When coatings are nonconductive, does the procedure require removal where electrical contact is made. YES NO
- C.3 LABORATORY PROCESS CONTROLS: (5.7)
- C.3.1 Suspension Concentration/Contamination Checks: (5.7.4)
- (a) At what frequency is the suspension wet particle concentration tested and recorded?
- 8 hr/prior to each shift _____ Other _____
- (b) Is the sample demagnetized and allowed to settle for at least 60 minutes for petroleum based suspension or 30 minutes for conditioned water suspension? YES NO
- (c) What are the allowable particle concentration limits?
- Fluorescent _____ per 100 mL sample
- Nonfluorescent _____ per 100 mL sample
- (d) Is the brilliance of fluorescent suspensions checked by comparison with a fresh suspension? YES NO
- Prior to each shift _____ Other _____
- (e) Is the discoloration of the suspension checked? YES NO
- Weekly _____ Other _____

C.3.1 (Continued):

- (f) If the samples show reduced fluorescence and/or loose agglomeration rather than a solid layer of particles, is the suspension drained, machine cleaned and refilled with fresh suspension? YES NO
- (g) Are records of tests on file which provide acceptance results? YES NO
- (h) Can the facility demonstrate the test? YES NO
- (i) At what frequency is the suspension tested for contamination?
Weekly _____ Other _____
- (j) Is the fluorescent sample examined with a black light for background fluorescence of the suspension liquid above the particle precipitate? YES NO
- (k) Is the sample compared with a sample of fresh suspension? YES NO
Start of Shift _____ Other _____
- (l) What is the maximum acceptable volume of contaminate?
_____ % of the volume of magnetic particles
- (m) If the suspension shows background fluorescence and/or bands or striations of contamination is the suspension drained, machine cleaned and refilled? YES NO
- (n) Are records of tests on file which provide acceptance results? YES NO
- (o) Can the facility demonstrate the test? YES NO

C.3.2 Water Break Test (Water Based Vehicles):

- (a) Is the water break test for water based vehicles in use being performed and documented? YES NO
- (b) At what frequency is this test being performed?
8 hrs. _____ Other _____
- (c) Is the test procedure in accordance with MIL-STD-1949A? YES NO

C.3.2 (Continued):

(d) What is the acceptance criteria?

Explain _____

(e) Are records of this test on file and do they provide acceptance results? YES NO

(f) Can the facility demonstrate this check? YES NO

C.3.3 Viscosity Check:

(a) Is the viscosity of in use nonaqueous inspection suspensions being tested and documented? YES NO

(b) At what frequency is this test being performed?

Monthly _____ Other _____

(c) What test procedure is used?

ASTM D 445 _____ Other _____

(d) What is the maximum acceptance limit?

5 centistokes _____ Other _____

(e) Are records of this test on file and do they provide acceptance results? YES NO

(f) Can the facility demonstrate this test? YES NO

C.3.4 Black Light Measurements:

(a) Are records of black light meter calibration available for review? (5.7.1) YES NO

Calibration Frequency: Semi-annual _____ Other _____

(b) Does the black light meter have a current and proper calibration sticker? YES NO

(c) Is the black light intensity checked with a light meter? (4.8.2) YES NO

Type & model _____

C.3.4 (Continued):

- (d) Do the black lights exhibit intensity greater than or equal to 1000 mW/cm² when measured 15 inches from the black light source? (4.8.2) YES NO

Measured Intensity _____

Frequency of Test _____

Distance from light source: _____ inches

- (e) Are records of this test on file and do they provide acceptance results? YES NO

C.3.5 White Light Measurements:

- (a) Is the ambient light in the darkened area a maximum of 20 lux (2 foot-candles) (4.8.1)? YES NO

Measured Intensity _____

Test Frequency _____

- (b) Are records of this test on file and do they provide acceptance results? YES NO

- (c) Are records of white light meter calibration available for review? (5.7.1) YES NO

Calibration Frequency: Semi-annual _____ Other _____

- (d) Does the white light meter have a current and proper calibration sticker? YES NO

- (e) Is white light intensity checked with a light meter? (4.8.1) YES NO

Type & model _____

- (f) When testing with nonfluorescent particles, is the intensity of the visible light at the surface of the parts maintained at a minimum of 1000 lux (100ft-candles)? YES NO

Measured Intensity _____

Frequency of Test _____

- (g) Are records of this test on file and do they provide acceptance results? YES NO

C.3.6	Is the Ketos ring available and certified? (5.7.3)	YES	NO
	If not available, list device being used		
C.3.6.1	Does the Ketos Ring certification specify:		
	(a) Material is AISI-01 annealed round stock	YES	NO
	(b) Rockwell Hardness "B" scale is 90-95	YES	NO
	(c) Dimensions of the steel ring	YES	NO
	(d) Steel ring is serialized for identification	YES	NO
	(e) Serial Number(s) _____		
C.3.7	Are all Hall Effect Gauss meters calibrated? (5.7.1)	YES	NO
	(a) Interval _____		
	(b) Accuracy Requirement _____		
	(c) Last Calibration Date _____		
	(d) Do they have proper calibration stickers?	YES	NO
C.3.7.1	Are field indicators used to verify demagnetization calibrated?	YES	NO
	(a) Calibration Frequency _____		
	(b) Accuracy _____		
	(c) Range (in Gauss or Oersteds) _____		
C.3.7.2	Are flux density measurements taken with field strength meters as required? (5.3)	YES	NO
C.3.7.3	Are calibrated field indicators used to verify demagnetization?	YES	NO
C.3.8	Is an ammeter shunt combination available for calibrating the ampere meters of magnetizing equipment?	YES	NO
	Manufacturer: _____ Model: _____		

- C.3.9 At what interval is the ammeter shunt calibrated? (5.7.1)
- (a) Interval _____
- (b) Traceable to NIST? YES NO
- (c) Are records of this test on file and do they provide acceptance results? YES NO
- C.3.10 At what interval is an internal shorting test performed? (Set machine at maximum current and activate with no conductor between heads. There should be no deflection of the meter.)
- (a) Interval _____
- (b) Are records of this test on file and do they provide acceptance results? YES NO
- C.3.11 At what interval is the magnetic particle machine ammeter checked? (The ammeter/shunt combination and magnetic particle machine ammeter shall not differ by more than 10% of the unit's output.) (5.7.5.1)
- (a) Interval _____
- (b) Are records of this test on file and do they provide acceptance results? YES NO
- C.3.12 At what interval is the maximum certified output of the machine, head and coil being checked?
- (a) Interval _____
- C.3.13 Is the pulse duration of the magnetization current flow controlled from 0.5 to 1.0 second? (5.4.4 & 5.4.5) YES NO
- (a) Duration _____
- C.3.14 Is the pulse timer checked to within ± 0.1 second? (Timer control check (5.7.5.2)) YES NO
- (a) Interval _____

- C.3.15** At what interval is the timing device that is used to measure the pulse timer calibrated?
- (a) Interval _____
- (b) Traceable to NIST? YES NO
- (c) Manufacturer _____ Model _____
- C.3.16** At what interval is the quick-break feature being checked? (5.7-5.3)
- (a) Interval _____
- (b) Are records of this test on file and do they provide acceptable results per manufacturer's guidelines? YES NO
- C.4** PROCESSING AREA:
- C.4.1** Is the inspection performed following all processes that could adversely affect the part (Heat Treat, Forming, Machining, Welding, etc)? (4.7) YES NO
- C.4.2** Are all parts cleaned prior to inspection as applicable to remove paint, scale, oil, dirt and other foreign materials that may interfere with the inspection process? (5.1.2) YES NO
- C.4.3** Are parts masked as required to protect faying and/or bearing surfaces? (5.1.4) YES NO
- C.4.4** When required, are small openings leading to internal cavities properly plugged? (5.1.4) YES NO
- C.4.5** Are technique cards (written procedures) for all parts to be inspected available to inspectors? (4.4.1) YES NO
- C.4.6** Are solutions agitated prior to inspections and are checks made to assure that magnetic particles are in suspension? (5.7.4.1.1) YES NO
- C.4.7** Magnetization Process - Circular: (5.3.1.3)
- (a) Are central conductors available? YES NO
- (b) Is a central conductor used in all cases where inspection of inside surfaces is required? YES NO
- (c) When current is passed through the part itself, is care exercised to prevent burning at the contact areas? YES NO

C.4.8	Are flexible cables used to induce circular magnetic fields?	YES	NO
	If "Yes", is a specific written procedure available and approved by authorized customer personnel?	YES	NO
C.4.9	Magnetization Process - Longitudinal: (5.3.1.4)		
	(a) Are the parts properly positioned against the inside or at the center of the coil?	YES	NO
C.4.10	Is yoke equipment used only when applicable and in accordance with approved written procedures?	YES	NO
C.4.11	Are clamps, leaches and other similar devices, when used according to approved written procedures, equipped with copper braid to prevent arcing of part surfaces?	YES	NO
C.4.12	Are aids such as magnifiers, mirrors, borescopes and high intensity lights available for evaluating indications in interior areas of parts not readily accessible with standard lighting equipment? (Table C17)	YES	NO
C.4.12.1	Do borescopes have black/white light capabilities?	YES	NO
	Indicate capabilities: Black _____ White _____		
C.4.13	Demagnetization: (5.6.1)		
	(a) Are coil and/or box type demag units AC operated? (Table C1)	YES	NO
C.4.14	Are all parts cleaned after magnetic particle inspection? (5.6)	YES	NO
	(a) Method _____		
C.4.15	After inspection and appropriate cleaning, are all parts coated with preservative oil (or anti-seize compound as required) to prevent rusting? (5.6.2)	YES	NO
C.5	EQUIPMENT AND MATERIALS PERFORMANCE:		
C.5.1	Will AC yokes lift a minimum of 10 pounds with yoke spacing of 2 to 4 inches? (Table C1)	YES	NO
	(a) How often are they tested? _____		
	(b) Are records of this test on file and do they provide acceptance results?	YES	NO

C.5.2 Will DC yokes or permanent magnet yokes lift 30 pounds with yoke spacing of 2 to 4 inches, or 50 pounds with spacing of 4 to 6 inches? (Table C1) YES NO

(a) How often are they tested? _____

(b) Are records of this test on file and do they provide acceptance results? YES NO

C.5.3 Is the magnetic particle system effectiveness checked by testing the Ketos ring (or equivalent) showing the required holes per amperage setting for the particular type of particles being used? (Table 1) (4.9.1.2) YES NO

		Results	
Wet Method	Dry Method	Amperage	# of Holes Indicated
#3 Hole @ 1400 Amps	#4 Hole @ 1400 Amps	_____	_____
#5 Hole @ 2500 Amps	#6 Hole @ 2500 Amps	_____	_____
#6 Hole @ 3400 Amps	#7 Hole @ 3400 Amps	_____	_____

(a) Interval _____

(b) Are records of this test on file and do they provide acceptance results? YES NO

C.5.4 If another device is used to verify the system effectiveness on a daily basis, describe method and specify results.

(a) Method _____

(b) Results

Amperage	Number of Defects
----------	-------------------

_____	_____
_____	_____
_____	_____

(c) Are records of this test on file and do they provide acceptance results? YES NO

C.5.5 Is a sample of new solution saved each time a new batch is made up? YES NO

C.6 COMPLIANCE:

Supplier shall perform three representative inspections from current production to determine compliance with these requirements. Parts should be selected to represent a variety of customer requirements and several different types of processing equipment if more than one magnetic particle line is in use at this facility. Investigate the purchase order specifications to identify any unique acceptance, process control, or procedure requirements applicable to these parts. Witness the facility's ability to perform these inspections in accordance with the requirements.

**C.6.1 Provide the following forms for parts being tested:
(Copies for one part only)**

- (a) Copy of completed traveler or work order?
- (b) Copy of completed technique card?
- (c) Copy of completed NDT Report?

A. Part Description Customer Specification & Revision Compliance

YES NO

Inspector _____ Level _____

B. Part Description Customer Specification & Revision Compliance

YES NO

Inspector _____ Level _____

C. Part Description Customer Specification & Revision Compliance

YES NO

Inspector _____ Level _____

D. Observations noted during performance of inspection:

C.6.2 Customer Specifications:

- | | | |
|---|-----|----|
| (a) Is the facility using the appropriate specification and revision as required by the purchase order? | YES | NO |
| (b) Are unique requirements made available to the inspectors? | YES | NO |

C.6.3 Inspection:

- | | | |
|--|-----|----|
| (a) Were the applicable work orders/shop travelers and technique cards or procedures readily available to the inspectors? | YES | NO |
| (b) Did inspector review specification, technique sheet, and procedures prior to inspecting the part? | YES | NO |
| (c) Were the parts properly cleaned prior to inspection? | YES | NO |
| (d) Were the parts magnetized in accordance with technique sheet? | YES | NO |
| (e) Did the inspectors accustom their eyes to darkness for at least one minute before performing any inspections requiring the use of black light? (5.13) | YES | NO |
| (f) Was inspector wearing permanently tinted or photo-chromatic eye glasses? | YES | NO |
| (g) Was the inspector qualified to perform the inspection and evaluate the results? | YES | NO |
| (h) Were parts demagnetized between each operation? | YES | NO |
| (i) Were parts demagnetized between successive operations if residual magnetism might interfere with the interpretation of indications? | YES | NO |
| (j) After demagnetization, were all parts tested for residual magnetism with a field indicator? | YES | NO |
| (k) Were all parts demagnetized following magnetic particle inspection and exhibit no more than 3 Gauss or per customer specification as determined by the use of a field meter? | YES | NO |
| (l) Were parts de-magnetized after inspection? | YES | NO |

C.6.3 (Continued):

- | | | | |
|-----|--|-----|----|
| (m) | After demagnetization, were parts tested with a calibrated field indicator at several locations? (including all significant changes in geometry and the ends of rods, bars or protrusions) | YES | NO |
| (n) | Was demagnetization repeated if the maximum deflection at any place exceeded ± 3 Gauss? | YES | NO |
| (o) | Was magnetic particle solution properly agitated? | YES | NO |
| (p) | Was solution properly applied to the parts? | YES | NO |
| (q) | Were the UV lights in the inspection booth properly used? | YES | NO |
| (r) | Was the inspection booth adequately controlled to allow proper inspection? | YES | NO |
| (s) | Do applicable work orders/shop travelers and cards contain the following information? | | |
| | (1) Part number | YES | NO |
| | (2) Specification reference | YES | NO |
| | (3) Inspection acceptance requirements | YES | NO |
| | (4) Correct sequence of operations | YES | NO |

C.6.4 Evaluation Process:

- | | | | |
|-----|--|-----|----|
| (a) | Did the inspector evaluate every relevant indication? | YES | NO |
| (b) | Did the inspector compare relevant indications with acceptance criteria? | YES | NO |
| (c) | Were precautions taken when parts are handled during inspection not to smear or obliterate indications? | YES | NO |
| (d) | Were indications not meeting the acceptance criteria marked on the part and recorded on the appropriate paperwork? | YES | NO |
| (e) | Are all inspection results recorded and traceable to the parts? (5.5) | YES | NO |

C.6.5 Marking:

(a) Are the parts marked in accordance with the applicable specification? YES NO

(b) Mark with the appropriate ink stamp (symbol and color) below:

100% of Lot inspected

Accept

Reject

Sample from Lot Inspected

Accept

Reject

C.6.6 Were any non-certified or in-training personnel observed performing MT operations without proper supervision? YES NO

C.6.7 Was there any evidence of unauthorized specification, drawing, or procedure changes? YES NO

C.7 SURVEY CRITIQUE:**C.7.1 NDT Facility:**

Please critique and comment on the survey form and survey procedure. Specific examples to illustrate your concerns and opinions would be appreciated. Your comments may be submitted anonymously, if you so desire. Send response to:

PRI
NADCAP Technical Division
402 Commonwealth Drive
Warrendale, PA 15086

C.7.2 Survey Observations:

Surveyor - Use this page to furnish additional information or data, when required.

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TABLE C1 - Equipment List

1. Magnetic Particle Inspection Units (Stationary)						
Manufacturer	Model	Length (*)	Type of		Quick Break	Condition
			Current Control	Certified Output (Max) Head / Coil		

2. Magnetic Particle Inspection Units (Portable)

Manufacturer	Model	Type	Output (Max)	Iap Switch	Condition	NOTE: 1. For variable current controls, list number of steps to vary output from 0 to 100%.	

3. Yoke

Manufacturer	Model	Perm or AC	Output (Max)	Opening	Size of Condition

4. Demagnetizing Units

Manufacturer	Model	Perm or AC	Condition

5. Inspection Aids

APPENDIX D ULTRASONIC SURVEY

SURVEY NO. _____

Instructions to the Surveyor: This form shall be used in conjunction with Appendix A of SAE AS7100\1 AUDIT CRITERIA FOR NONDESTRUCTIVE TEST FACILITY.

Parenthetical information is the reference paragraph from MIL-STD-2154.

D.1 RECORDS:

- | | | | |
|-------|---|-----|----|
| D.1.1 | Are verification records available to verify correctness of reference standards per MIL-STD-2154? (5.3.3) | YES | NO |
| | (a) Are dimensional or lay up inspection data and/or radiographic data verifying that holes are in proper alignment, as required, for all reference standards in use? (5.3.3.1) | YES | NO |
| | (b) Are comparison amplitude plots of all holes or notches showing amplitude linearity to class size (indicate linear amplifier or linear dB presentation) available? (5.3.3.2) | YES | NO |
| | (c) For cylindrical standards, is there a listing of angle of incidence or offset distance "d" for maximum amplitude responses for all grades. (5.3.3.3) | YES | NO |
| | (d) Are measured surface finishes (RMS, AA or RHR) of ultrasonic test standards available? (5.3.3.4) | YES | NO |
| | (e) Is there certification that standards material is of proper alloy and type (heat treat), and free of discontinuities detrimental to reliable response from reference standards? (5.3.3.5) | YES | NO |
| | (f) Is there a chart available with dimensions showing location of all reference holes or notches? (5.3.3.6) | YES | NO |
| D.1.2 | Are verification records available for standards manufactured to specifications other than MIL-STD-2154? | YES | NO |
| D.1.3 | Provide the following information for standard reference blocks: | | |
| | (a) For ASTM E-127 and ASTM E 428 straight beam reference blocks, identify the materials and range of metal travel distances available, in Enclosure II. | | |
| | (b) Are special straight beam standards available for inspecting square or rectangular billets with short and/or long transverse dimensions greater than 6 inches? | YES | NO |

D.1.3

(Continued):

- | | | | |
|-----|---|-----|----|
| (c) | Are angle beam standards for inspecting plate, square or rectangular billet available? | YES | NO |
| (d) | Are special straight beam standards available for inspecting round bar stock? | YES | NO |
| (e) | Are special standards for circumferential shear wave inspection of round bar stock available? | YES | NO |
| (f) | Are special standards for circumferential shear wave inspection of cylindrical stock available? | YES | NO |
| (g) | Are reference standards for inspecting metal tubing available? | YES | NO |
| (h) | Are angle beam reference standards for contact testing of finish machined parts available? | YES | NO |
| (i) | Is an International Institute of Welding (IIW) block available? | YES | NO |
| (j) | Are surface wave reference standards for contact testing of finish machined parts available? | YES | NO |
| (k) | Are curved or other reference standards for contact testing of finish machined parts available? | YES | NO |

D.1.4

Are calibration records per MIL-STD-2154 and ASTM E 317 (5.2.1) available for ultrasonic equipment in use? YES NO

Calibration interval _____

- | | | | |
|-----|---|-----|----|
| (a) | If instrument calibration is performed in-house, do procedures exist defining calibration requirements? | YES | NO |
| (1) | If equipment calibration is performed in house, does the processor have the following blocks: | YES | NO |
| | ASTM Reference Block - 1-0300 | YES | NO |
| | ASTM Reference Block - 2-0300 | YES | NO |
| | ASTM Reference Block - 3-0150 | YES | NO |
| | Vertical and Horizontal Linearity Test Blocks | YES | NO |

D.1.4 (Continued):

- (b) If instrument calibration is not performed in-house, identify calibration source.

Name _____

Address _____

Phone Number _____

- (c) Do records indicate compliance to the requirements of Table II of MIL-STD-2154? YES NO

- (d) Are checks being made on the coarse and fine attenuator switches? (5.2.2) YES NO

Interval _____

- (e) Are records of this check on file and indicate acceptable results? YES NO

- D.1.5 Are transducer evaluation records available and maintained? (5.2.5) YES NO

- (a) Are all transducers serialized? YES NO

- (b) Are beam profiles made for all immersion transducers? YES NO

- (c) Evaluation interval _____

- D.1.6 Are inspection records kept on file? (5.5.3) YES NO

- D.1.6.1 Do records show which instrument, transducer combination was used for inspection of each part? YES NO

- D.1.6.2 Is the following identification reported on the inspection record:

- (a) Serial number of reference standards YES NO

- (b) Material lot or identification numbers YES NO

- (c) Inspection class YES NO

- (d) Applicable specification YES NO

D.1.6.2 (Continued):

(e) Written procedure number YES NO

(f) Other (list additional items below):

D.2 PROCEDURES:

D.2.1 Is there a statement in the procedure or quality manual stating that, as a minimum, MIL-STD-2154 is being met? YES NO

D.2.2 Is a detailed UT procedure or technique sheet prepared for each part and type of inspection to be performed? YES NO

D.2.3 Is there a general ultrasonic inspection procedure for common product forms such as plate, bar stock, extrusions, and forgings? (4.3) YES NO

D.2.4 Are procedures for special material handling and processing of parts defined. (e.g., for beryllium and titanium, etc.?) YES NO

Procedure Title _____

Number _____ Revision _____ Date _____

Page(s) _____ Paragraph No. _____

D.2.5 Do the written inspection procedures for ultrasonics contain the following information as applicable:

(a) Name and address of testing facility YES NO

(b) Number of the procedure including latest revision letter, if applicable, and date YES NO

(c) Number of the applicable process specification including latest revision letter, if applicable, and date. YES NO

D.2.5 (Continued):

- | | | | |
|-----|---|-----|----|
| (d) | Inspection method, type, and acceptance classes to be applied | YES | NO |
| (e) | The procedure I.D. number, applicable program, if program specific, and the date the procedure was approved. | YES | NO |
| (f) | Equipment to be used. | YES | NO |
| (g) | Materials to be used. | YES | NO |
| (h) | Surface preparation (finishing, cleaning, pickling). | YES | NO |
| (i) | Applicable acceptance class and zone per engineering drawing specification. | YES | NO |
| (j) | A statement to the effect that quality assurance provisions will be met. | YES | NO |
| (k) | A statement to the effect that the procedure complies with all applicable specification requirements. | YES | NO |
| (l) | A statement to the effect that all personnel are qualified and certified to the applicable contract requirements. | YES | NO |
| (m) | Records and methods of marking parts after inspection.

Stamp _____ Tag _____ Dye _____ Other _____ | YES | NO |
| (n) | Approved deviations are listed and validated. | YES | NO |
| (o) | Inspection zones, if applicable. | YES | NO |
| (p) | Specific material and form for which the procedure is being prepared. | YES | NO |
| (q) | Specific part number and configuration to be tested. | YES | NO |
| (r) | Manufacturer and model numbers of the instrument to be used in the test, including any recording equipment, alarm equipment, and electronic distance-amplitude correction equipment. | YES | NO |
| (s) | Type and size of transducer, including frequency, transducer element materials, sound beam angle, and description of wedges, shoes, saddles, stand-off attachments, bubblers, or squirters. | YES | NO |

D.2.5 (Continued):

- | | | |
|--|-----|----|
| (t) Description of manipulating and scanning equipment. | YES | NO |
| (u) Couplant. | YES | NO |
| (v) Scanning plan. Description of surfaces from which the test will be performed and the ultrasonic beam paths to be used. | YES | NO |
| (w) Method for determining transfer and applying correction, if necessary. | YES | NO |
| (x) Test blocks, water path, and methods of standardization and index determination. | YES | NO |
| (y) Method of establishing scan sensitivity. | YES | NO |
| (z) Discontinuity evaluation procedure. | YES | NO |
| (aa) Any other pertinent data. Describe: _____

_____ | | |

D.2.6	Are all technique cards and procedures, prepared by the Level II or III and approved by the Level III in the applicable inspection method?	YES	NO
--------------	--	-----	----

- | | | |
|--|-----|----|
| (a) Do documented work instructions define the manner of inspection, type of inspection equipment, suitable work environment, and compliance with referenced standards, codes and quality plans? | YES | NO |
| (b) Are the inspection processes that directly affect quality identified and are measures taken to ensure that these processes are carried out in controlled conditions? | YES | NO |

D.3 INSPECTION METHODS:

D.3.1	Is the couplant (water) free of visible air bubbles and other foreign materials which could interfere with the ultrasonic tests? (5.1.1.1)	YES	NO
--------------	--	-----	----

(a) Is corrosion inhibiting agent added?	YES	NO
Mfgr: _____ NAME _____		

(b) Is wetting agent added?	YES	NO
Mfgr: _____ NAME _____		

D.3.1	(Continued):		
	(c) Is the filtering system adequate?	YES	NO
D.3.2	Identify the brand name and other appropriate identification for the couplant used during contact testing.		

D.3.3	Is glycerin used for contact testing?	YES	NO
D.3.4	If through transmission is employed, are transducers properly aligned?	YES	NO
D.3.5	Are amplitude/distance response curves plotted for all transducer and instrument combinations, (DAC)?	YES	NO
D.4	PROCESSING CONTROLS:		
D.4.1	Are applicable detailed procedures and techniques and/or scan plans available to inspectors in inspection area?	YES	NO
	(a) Have procedures been reviewed and approved by the contracting agency, when such approval is required?	YES	NO
D.4.2	Do some customers require approval of test standards for the parts to be inspected?	YES	NO
D.4.3	Is there a procedure in place for obtaining customer approval (If Required)?	YES	NO
D.4.4	Are reference standards representative of the material and part configuration being tested? (5.1.2)	YES	NO
	(a) If no, what method is used to compensate for dB attenuation differences between the standard and the part? _____		

D.4.5	Are all standards and/or drawings of standards clearly identified as to material type, hole or notch size, angle and depth of hole?	YES	NO

D.4.6 Are system standardizations checks being performed prior to and immediately after each inspection, after any change in instrument settings or modules, and at 2 hour intervals during continuous operation? (5.5.2) YES NO

Other _____

(a) Are dynamic system checks performed per the requirements? YES NO

D.4.7 Are audible/visual alarms and/or recorders being used along with visual monitoring of ultrasonic unit? (5.2.3) YES NO

D.4.8 Are all parts dried and coated with corrosion protective material per customer requirements, before they are stacked, nested or placed in contact with one another in any way? (5.4.17) YES NO

D.4.9 Are controls available, addressing requirements for visual inspection and surface preparation, to assure that material being tested has an adequate surface condition? YES NO

D.5 EQUIPMENT/FACILITIES:

D.5.1 Instruments:

(a) Complete Enclosure I Equipment List

(b) Is the test system equipped with the following:

- | | check |
|---|--------------------------|
| • Recorder? | ☐ |
| • Automatic Marking? | ☐ |
| • Tachometer? | ☐ |
| • Gating System? | ☐ |
| • Water System Filter and/or deaerating system? | ☐ |
| • Automatic line shutdown? | ☐ |
| • Automatic tube sorting? | ☐ |
| • Audible Alarm? | ☐ |
| • Electronic Distance Amplitude Correction? | ☐ |
| • Electronic Distance Amplitude Gate? | ☐ |

D.5.1 (Continued):

- Back Echo Attenuator? []
- Stop on Defect? []
- Other _____ []

(c) Testing System Capability: (check all applicable)

- () auto operation
- () manual operation

(d) The following methods are utilized:

Contact _____ Squirter _____

Immersion _____ Bubbler _____

(e) General Capabilities:

"A" Scan _____ Pulse Echo _____

"B" Scan _____ Resonance _____

"C" Scan _____ Thru-Transmission _____

- (f) Does recorder have sufficient accuracy to allow location of a defect to within the required accuracy? YES NO

What is the accuracy? _____

- D.5.2 Are voltage regulators/surge protectors used to control fluctuations? (5.2.4) YES NO
- D.5.3 Are handling fixtures, turntables, etc., adequate for parts being processed? YES NO
- D.5.4 Are curved surface shoes and standards available for contact inspection? (5.3.1.2) YES NO
- D.5.5 Does manipulating equipment provide for measurable angular control of search units to within 1 degree in two mutually perpendicular directions? (5.2.9) YES NO
- D.5.6 Are immersion tanks of sufficient size to permit proper placement of parts with relationship to search unit? (5.2.8) YES NO

D.5.7	Is scanning and indexing equipment adequate to ensure complete coverage of part? (5.2.9)	YES	NO
	(a) Does scanning and indexing equipment permit measurement of both the scan and index distances within ± 0.1 inch?	YES	NO
D.5.8	Is scanning equipment controlled and maintained to preclude backlash, wobble, etc.?	YES	NO
D.5.9	Is round bar inspection equipment available?	YES	NO
	(a) Is rotating device synchronized with scan motion?	YES	NO
D.5.10	Is inspection equipment available to inspect tubing? Size Limitation _____	YES	NO
D.5.11	Is the system for recording tubing inspections checked semi-annually?	YES	NO
	(a) Is the system for recording tubing inspections such that it is impossible for more than one pulse from the pulser/receiver to remain unrecorded?	YES	NO
D.5.12	Is the pulse repetition rate of the pulser receiver used for inspection of tubing calibrated periodically? Specify calibration frequency _____	YES	NO
D.5.13	After any adjustment, is the mechanical tube rotating and traversing system checked to insure the off-axis excursion of the tube is less than 0.005 inches?	YES	NO
D.5.14	If required, are facilities available for drying parts after inspection?	YES	NO
D.5.15	Are adequate materials handling systems available?	YES	NO
	Forklifts _____	YES	NO
	Overhead Capacity: _____ pounds	YES	NO
D.5.16	Is storage area of reference standards adequate?	YES	NO
D.5.17	Is there evidence of mishandling of reference standards, (corrosion, pitting, etc.)?	YES	NO

D.5.18 Transducers (5.2.5)

- (a) Complete enclosure III transducer list.
- (b) Are transducers stored in a protected area? YES NO
- (c) Are transducers and wedges (shoes) checked initially for resulting beam angle? YES NO
- (d) Are they periodically rechecked for wear? YES NO

Interval _____

- (e) Are tests for center frequency, bandwidth, damping factor half cycles, focal distance, and focal zone conducted semi-annually on transducers used for tubing inspection? YES NO
- (f) Are rectangular paintbrush transducers being used for straight beam immersion inspection of wrought materials? YES NO
- (1) Is a procedure available which shows how standardization, inspection, and evaluation of defects are conducted? YES NO

Procedure Title _____

Number _____ Revision _____ Date _____

- (g) Are linear array transducers being used for for straight beam immersion inspection of wrought materials? YES NO
- (1) Is a procedure available which shows how standardization, inspection, and evaluation of defects are conducted? YES NO

Procedure Title _____

Number _____ Revision _____ Date _____

D.5.19 Is computer controlled equipment utilized? YES NO

D.5.19.1 List Equipment

D.5.19.2 How is computer software controlled?

D.6 COMPLIANCE:

Supplier shall perform three representative inspections from current production to determine compliance with these requirements. Parts should be selected to represent a variety of customer requirements and several different types of ultrasonic techniques, if more than one ultrasonic system is in use at this facility. Investigate the purchase order specifications to identify any unique acceptance, process control, or procedure requirements applicable to these parts. Witness the facility's ability to perform these inspections in accordance with the requirements.

Provide the following forms for parts being tested:
(Copies for one part only)

- (a) Copy of completed traveler or work order.
- (b) Copy of completed technique card.
- (c) Copy of completed NDT report.

A.	<u>Part Description</u>	<u>Customer</u>	<u>Specification and Revision</u>	<u>Compliance</u>
	_____	_____	_____	YES NO
	Inspector: _____		Level: _____	

B.	<u>Part Description</u>	<u>Customer</u>	<u>Specification and Revision</u>	<u>Compliance</u>
	_____	_____	_____	YES NO
	Inspector: _____		Level: _____	

C.	<u>Part Description</u>	<u>Customer</u>	<u>Specification and Revision</u>	<u>Compliance</u>
	_____	_____	_____	YES NO
	Inspector: _____		Level: _____	

D.6.1	When parts are serialized or heat coded, are the serial numbers or heat codes recorded on all shop paperwork and inspection records?	YES NO
-------	--	--------

D.6.2	Do work instructions indicate correct procedure references?	YES	NO
D.6.3	Do inspectors follow the planning and other procedures?	YES	NO
D.6.4	Did the applicable work orders/shop travelers correctly contain the information as defined in D.2.5?	YES	NO
D.6.5	Are the surfaces of parts to be inspected free from scale, dirt, oil, or other contaminants that would interfere with the inspection operations? (5.4.7)	YES	NO
D.6.6	Is the surface roughness of the parts to be inspected adequate for the level of inspection to be performed? (5.4.6)	YES	NO
D.6.7	Is water adequately circulated and filtered?	YES	NO
D.6.8	Customer Specifications: (4.1)		
	(a) Is the facility using the appropriate specification and revision as required by the purchase order?	YES	NO
	(b) Are the unique requirements appropriately made available to the ultrasonic inspectors?	YES	NO
D.6.9	Set-ups:		
	(a) Did inspector use correct technique sheet/scan plan?	YES	NO
	(b) Were set-ups made according to technique sheet/scan plan?	YES	NO
	(c) Was attenuation checked?	YES	NO
	(d) Were proper standards used?	YES	NO
	(e) Transducers used were serialized and met technique sheet/scan plan?	YES	NO
	(f) Are gates, alarms and recorders properly used?	YES	NO
	(g) Technique sheet/scan plan and procedures approved by Level III and customer, if required?	YES	NO
D.6.10	Is calibration sticker on ultrasonic inspection units current?	YES	NO

- D.6.11 Inspection:**
- | | | |
|---|-----|----|
| (a) Hardware scanned according to technique sheet/scan plan? | YES | NO |
| (b) When indications are located, are they evaluated individually to determine maximum response? (5.4.16) | YES | NO |
| (c) Was a loss of back reflection inspection performed? | YES | NO |
| (d) Was a system standardization check performed before and after inspection? | YES | NO |
- D.6.12 Marking:**
- | | | |
|--|-----|----|
| (a) Are the parts marked in accordance with the specification? | YES | NO |
| (b) Mark with appropriate ink stamp(s) below. | | |
- 100% of Lot Inspected
- | | |
|---------------|---------------|
| <u>Accept</u> | <u>Reject</u> |
|---------------|---------------|
- Sample of Lot Inspected
- | | |
|---------------|---------------|
| <u>Accept</u> | <u>Reject</u> |
|---------------|---------------|
- D.6.13 Personnel:**
- | | | |
|---|-----|----|
| (a) Were inspection personnel certified to the correct levels for the work being performed? | YES | NO |
| (b) Were any non-certified or in-training personnel observed performing inspection operations without proper supervision? | YES | NO |
- D.6.14 Was there any evidence of unauthorized specification, drawing, or procedure changes?**
- | | | |
|--|-----|----|
| | YES | NO |
|--|-----|----|

D.7 SURVEY CRITIQUE:**D.7.1 NDT Facility:**

Please critique and comment on the survey form and survey procedure. Specific examples to illustrate your concerns and opinions would be appreciated. Your comments may be submitted anonymously, if you so desire. Send response to:

PRI
NADCAP Technical Division
402 Commonwealth Drive
Warrendale, PA 15086

D.7.2 Survey Observations:

Surveyor - Use this page to furnish additional information or data, when required.

TABLE D1 - List of Equipment

1. INSTRUMENTATION:

	<u>Manufacturer</u>	<u>Model/Type</u>	<u>Alarm System</u>	<u>Frequency Range</u>	<u>Calibration Due Date</u>
(a)	_____	_____	_____	_____	_____
(b)	_____	_____	_____	_____	_____
(c)	_____	_____	_____	_____	_____
(d)	_____	_____	_____	_____	_____
(e)	_____	_____	_____	_____	_____
(f)	_____	_____	_____	_____	_____

2. IMMERSION TANKS:

	<u>Length</u>	<u>Width</u>	<u>Depth</u>
(a)	_____	_____	_____
(b)	_____	_____	_____
(c)	_____	_____	_____
(d)	_____	_____	_____
(e)	_____	_____	_____

3. BRIDGES:

	<u>Manufacturer</u>	<u>Model</u>	<u>Type</u>	<u>Axis of Movement</u> <u>X. Y. Z</u>
(a)	_____	_____	_____	_____
(b)	_____	_____	_____	_____
(c)	_____	_____	_____	_____
(d)	_____	_____	_____	_____
(e)	_____	_____	_____	_____

4. RECORDERS (C-Scan):

<u>Manufacturer</u>	<u>Model</u>	<u>Type</u>	<u>Paper Width</u>	<u>Drum/Platen Dimensions</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

5. TURNTABLE:

<u>Diameter</u>	<u>Run Out To Bridge</u>	<u>Flatness To Bridge</u>	<u>Perpendicularity To Search Tube</u>
_____	_____	_____	_____