QUALIFICATION OF SNL PERSONNEL PERFORMING LEAK TESTING ACTIVITIES

Revision A

Effective Date: December 18, 1992

Reviewed by: G. Elder, Gary Elder & Assoc.
NDE Level III

Approved by: S. Y. Pickering, 6303
SNL WIPP QA Chief

Approved by: W. D. Weart, 6303
SNL WIPP Project Manager
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1.0 SCOPE

This Quality Assurance Procedure (QAP) defines the requirements for the qualification of Sandia National Laboratory (SNL) personnel performing leak testing activities.

2.0 APPLICABILITY

This QAP applies to all personnel controlling, performing or inspecting leak testing processes for the fabrication, inspection testing and acceptance of the Waste Isolation Pilot Plant hardware.

3.0 REFERENCES


4.0 IMPLEMENTATION

This procedure will be applied using a phased approach. The SNL WIPP Project Manager will oversee the implementation of this procedure.

5.0 LEVEL OF QUALIFICATION

5.1 A Nondestructive Examination (NDE) Level III shall be capable of writing, reviewing and/or approving procedures, interpreting specifications and codes for specified test methods and techniques, and interpreting test results in the area of certification. He shall be capable of evaluating results to existing codes or specifications. He shall have sufficient practical background in the applicable material technology to assist in establishing tests and acceptance criteria where none are available. It is also desirable to have general familiarity with all other commonly used NDE methods. He shall be capable of administering personnel certification examinations and also be capable of conducting those training programs necessary for certification.
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5.2 NDE Level II shall be qualified to set up and calibrate equipment, perform inspections, and to interpret and evaluate results with respect to the applicable codes, standards and specifications. He shall be thoroughly familiar with the scope and limitations of the applicable equipment and test methods, and shall exercise assigned responsibility for on-the-job training and guidance of trainees and NDE Level I personnel. He shall be able to prepare written instructions, and to organize and report NDE investigations.

5.3 A NDE Level I shall be qualified to properly perform specific calibrations and tests according to written procedures.

5.4 A NDE trainee is an individual in the process of being qualified and certified to at least NDE Level I. He shall assist certified Levels I and II NDE technicians in performing test functions. A NDE trainee shall not independently conduct any code related test, and interpret or evaluate those test results. He shall receive the necessary guidance or supervision from NDE Level II or III individuals.

5.5 A Nondestructive Test (NDT) instructor who shall have the skills and knowledge to plan, organize and present classroom or on-the-job training programs of instruction, in accordance with approved course outlines, in the method for which appointed. The instructor shall be a certified Level III in the test method.

5.6 In any NDT method, a person may hold a partial (limited) certification level, (i.e. a Radiographer or Leak Tester). The limited certification level will be designated on the certification record by using a (L) after the certification level, (i.e. LT-II(L)) with the limitation noted in the comments section of the Certification Record.

6.0 CERTIFICATION CONSIDERATIONS

Personnel considered for certification as NDE technicians shall have sufficient previous training and experience to insure understanding of the principles and procedures for those areas in which they are being considered for certification. Previous training and experience shall be documented.
7.0 PROCESS

7.1 PERSONNEL QUALIFICATION REQUIREMENTS

7.1.1 The Level III may designate other individuals to assist in the administration of Level I and Level II examinations and tests and will document this.

7.1.2 To be qualified for NDE Level I, II or III, a candidate shall:

- Have completed the required training specified in Table A or B. Training shall be conducted in accordance with Appendix I unless prior training was received. All previous training shall be documented and objective evidence of training should be obtained if possible. For personnel credited with training from a prior employer or those not certified within 6 months of their training, refresher training must be provided. The subjects of the refresher training shall be determined by the responsible Level III.

- Have completed the required work experience specified in Table A, B, or C. Work experience should be documented. Previous certification to SNT-TC-1A in a method shall satisfy the work experience requirements providing objective evidence of previous certification is documented and verified by the former employer. For personnel certified under previous revisions of this Written Practice or other qualification/certification programs, the equivalency of their previous experience to the requirements of this procedure will be determined and documented by the Level III.

- Satisfactorily complete the required examinations in the methods for which he is being certified.
Table A

MINIMUM TRAINING AND EXPERIENCE REQUIREMENTS FOR NDE LEVEL I CERTIFICATION

<table>
<thead>
<tr>
<th>METHODS</th>
<th>TRAINING REQUIREMENT</th>
<th>EXPERIENCE REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(L T) LEAK TESTING</td>
<td>20 HOURS</td>
<td>175 HOURS</td>
</tr>
<tr>
<td>(L T) LEAK TESTING</td>
<td>20 HOURS</td>
<td>640 HOURS</td>
</tr>
</tbody>
</table>

NOTES:

1. Training shall be as outlined in this Written Practice.

2. The experience and training requirements in Table A may be reduced by the NDE Level III for limited certifications in a NDT method.

Table B

MINIMUM TRAINING AND EXPERIENCE REQUIREMENTS FOR NDE LEVEL II CERTIFICATION

<table>
<thead>
<tr>
<th>METHODS</th>
<th>TRAINING REQUIREMENT</th>
<th>EXPERIENCE REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(L T) LEAK TESTING (L)*</td>
<td>40 HOURS</td>
<td>400 HOURS</td>
</tr>
<tr>
<td>(L T) LEAK TESTING</td>
<td>40 HOURS</td>
<td>1600 HOURS</td>
</tr>
</tbody>
</table>

NOTES:

1. Training and experience requirements include Level I requirements. An individual may be certified directly to Level II by satisfying requirements of Table B.

2. Training shall be as outlined in this Written Practice.

3. The experience and training requirements in Table B may be reduced by the NDT Level III for limited certifications in a NDT method.

Table C

MINIMUM TRAINING AND EXPERIENCE REQUIREMENTS FOR NDE LEVEL III CERTIFICATION

EXPERIENCE AS A CERTIFIED LEVEL II IN THE APPLICABLE TEST METHOD AS FOLLOWS

<table>
<thead>
<tr>
<th>METHODS</th>
<th>NO COLLEGE DEGREE</th>
<th>ASSOCIATE DEGREE*</th>
<th>BACHELORS DEGREE*</th>
</tr>
</thead>
<tbody>
<tr>
<td>(LT) LEAK TESTING</td>
<td>4 YEARS</td>
<td>2 YEARS</td>
<td>1 YEAR</td>
</tr>
</tbody>
</table>

NOTES:

1. The above requirements may be partially reduced by experience as a certified NDE Level II or in assignments at least comparable to NDE Level II in other methods.

*Completion with a passing grade in Engineering or Science Study at a University, College, or Technical School.
8.0 TRAINING REQUIREMENTS

Personnel considered for certification shall receive, as a minimum, the training outlined in Appendix I as applicable for the Level(s) and method(s) of certification sought. The presentation does not need to be in the order defined in Appendix I.

9.0 EXAMINATION REQUIREMENTS

9.1 Each Level I, II and III examination shall consist of a general and specific written examination and a practical test, all approved by an NDE Level III in the applicable NDE method.

9.2 The general test shall be a closed book examination. It shall consist of, at least, 40 questions on the theory and principles of the method. The exam shall be completed within a period of two (2) hours. For Level III, the general examination questions shall include general knowledge questions from other NDT methods. Possession of a current ASNT NDT Level III certificate shall be satisfactory evidence that this general exam requirement is satisfied.

9.3 The specific test shall be a closed book examination, except that necessary data such as graphs, tables, specifications, procedures may be provided. It shall consist of, at least, 30 questions on the operating procedures, examination techniques, specifications and acceptance criteria that may be encountered in a specific assignment. This section shall consist of a review of the applicable procedures, codes and/or specifications. The exam shall be completed within a period of one (1) hour.

9.4 The practical test shall consist of a practical examination by the individual to show familiarity with and operation of the appropriate test equipment and related components and an understanding of test variables and procedural requirements. A checklist shall be used to document this evaluation by the Level III. Test specimens with known defects shall be used in the practical examination and all of the known indications shall be found to satisfactorily pass this exam. This section shall be completed in a reasonable period of time for the NDE method. The description of the specimen, the test procedure and the results of the examination shall be documented on a Test Report.
For a Level I, the candidate shall demonstrate proficiency by using the appropriate method to examine at least one test sample for each technique to be used. If the Level I is to accept products, then the practical exam shall also include proficiency in the interpretation and evaluation of indications.

For a Level II, the candidate shall demonstrate proficiency by using the appropriate method to examine at least one test sample for each technique to be used and at least two test samples in each method. The proficiency evaluation shall include the accuracy and completeness of interpretations and evaluation of indications.

For a Level III, the candidate shall demonstrate proficiency by preparing an NDT procedure appropriate to company’s requirements. When the candidate’s duties will include inspection or evaluation of products, then proficiency shall be demonstrated with a practical exam equivalent to that administered to the Level II. In the event that the candidate has already developed satisfactory procedures, then it is not necessary to develop another procedure for the practical exam.

9.5 The weighing factors for the respective examinations are equal and the composite score shall be the average of the individual exams.

9.6 When Level III examinations are administered and graded by an outside agency and the agency issues grades of Pass or Fail only on certified report, (i.e., ASNT) a Pass grade will be assigned a score of 80%.

10.0 VISUAL ACUITY EXAMINATION

A Visual Acuity examination shall be administered to the candidate prior to the initial certification and thereafter on an annual basis or at more frequent intervals, if required. This examination shall be administered by a professional optometrist, medical doctor, nurse or any other qualified/certified designee. The candidate shall have natural or corrected near distance acuity in at least one (1) eye, capable of reading a minimum of J-1 letters on a standard Jaeger test chart at a distance of not less than 30.5 cm (12”). The ability to perceive an Ortho-Rater minimum of 10, or similar test pattern, shall be acceptable. The individual shall receive a
color vision examination to verify the capability of distinguishing color and differentiating contrast between the colors normally used in the applicable NDE method. The results of the visual acuity examination shall be recorded on the Visual Acuity Certification Record, SNL Form 261.

11.0 CERTIFICATION REQUIREMENTS

11.1 After the candidate has satisfactorily completed the qualification examination and test in the allotted time, the Level III or designee shall grade and sign the examination and/or checklist in the appropriate place. A Level III shall then review and sign the Nondestructive Examination Certification Record, SNL Form 262.

11.2 For certification, a composite grade of 80% or greater is required. In addition, each individual grade for the general, specific and practical examinations or basic, method and specific exams shall be 70% or greater.

11.3 Individuals failing an examination or test for any level must wait at least thirty (30) days for re-examination and testing. In the event the candidate can show evidence of completing additional training or study, then re-examination or testing may be administered before the end of the thirty (30) day waiting period.

11.4 If the certification is disapproved, the Level III shall promptly notify the cognizant individual.

11.5 Certifications may be questioned or revoked at any time by a Level III.

11.6 Certification is the responsibility of the SNL NDE Level III.

12.0 RECERTIFICATION PROCEDURE

12.1 NDE Levels I and II personnel shall be recertified by re-examination at intervals not to exceed three (3) years. Re-examination and recertification may be required at any time the Level III deems necessary. Recertification shall require, as a minimum, that a physical and practical examination equivalent to those required for initial
certification. The Level III shall determine the scope of the re-examination and document such in the individual's certification records.

12.2 NDE Level III personnel shall be recertified at intervals not to exceed five (5) years based on evidence of continued satisfactory performance. The physical examination and practical proficiency test (for those performing product testing and evaluations only) shall only be required.

12.3 Personnel with an suspended certification, may be reinstated when the cause for the suspension has been corrected to the satisfaction of the Level III.

12.4 Personnel with an expired or revoked certification shall be recertified.

13.0 RECORDS

13.1 The certification records shall be maintained by the SNL NDE Level III and shall include as a minimum the following:

13.1.1 The personnel records of the certified individuals should include as a minimum the following:
   a. Name of certified individual.
   b. Level, method, and techniques for which individual is certified.
   c. Results of all qualification examinations, including the separate test scores, that the individual has taken.
   d. Date of current certification(s) and recertification date.
   e. History of all previous NDT certifications with the current employer.
   f. Training history which identifies source and dates of training course hours and grades (if given after training), and instructor's name.
   g. Experience history, both with current and previous employers, sufficient to justify satisfaction of experience requirements for certification.
   h. Results of the physical examination.
   i. Extent and documentation of formal education.
14.0 **TERMINATION**

14.1 All certifications shall be automatically terminated when the individual permanently leaves the employment of the company.

14.2 A certification shall be terminated when the individual does not perform in the method certified for at least 24 consecutive months.

14.3 A certification shall be terminated when the individuals' conduct is found to be unethical or incompetent by the Level III.

15.0 **OUTSIDE AGENCY USE**

15.1 Should an outside agency or consultant be utilized for the training, testing, physical examination and/or qualification of NDE personnel, they shall first be approved by the SNL WIPP Project Manager for compliance with the requirements of this procedure. Documentation of this review and acceptance is required.

15.2 Personnel trained, tested, examined or qualified by the outside agency or consultant will still be required to be certified to this procedure by the SNL QA Chief.

15.3 SNL shall be responsible to maintain all personnel certification records.

16.0 **FORMS**

Documentation to satisfy the requirements of this procedure should be by the use of the following forms. Examples are attached to this procedure.

1. Visual Acuity Certification Record, SNL WIPP Form 261 (most recent revision).
2. Nondestructive Examination Certification Record, SNL WIPP Form 262 (most recent revision).
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APPENDIX I

LEAK TESTING

SUBJECT

1.0 Introduction
   1.1 Brief history of leak testing
   1.2 Reasons for leak testing
       1. To prevent loss of contents
       2. To prevent contamination
       3. To detect unreliable components
       4. To assure maintenance of a pressure differential

2.0 Fundamentals of Testing
   2.1 Leak testing units
   2.2 Leak conductance
   2.3 Detector sensitivity
   2.4 Leakage measurement

3.0 Testing Standards
   3.1 Calibration versus qualification
   3.2 Common types of calibrated leaks
   3.3 Calibration techniques

4.0 Choice of Procedure for Leak Testing
   4.1 Discussion
   4.2 Type of leak testing
   4.3 Leakage measurement
   4.4 Units accessible on both sides--single sealed units
   4.5 Units which may be evacuated
   4.6 Systems leaking at atmospheric pressure
   4.7 Evacuated unit testing
   4.8 Units sealed with ambient gas
   4.9 Units sealed with tracer gas
   4.10 Leak location

Subtotal Minimum Hours

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
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<tbody>
<tr>
<td>Introduction</td>
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<td>Fundamentals of Testing</td>
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<td>.5</td>
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<tr>
<td>Testing Standards</td>
<td>3.0</td>
<td>.5</td>
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<tr>
<td>Choice of Procedure for Leak Testing</td>
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Recommended Instruction Period -- Hours

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LEAK TESTING

<table>
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<th>SUBJECT</th>
<th>RECOMMENDED INSTRUCTION PERIOD -- HOURS</th>
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<tbody>
<tr>
<td>5.0</td>
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</tr>
<tr>
<td>5.1</td>
<td>Leak Testing Method</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Mass Spectrometer Leak Testing</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Principles of mass spectrometer testing</td>
</tr>
<tr>
<td>5.1.2.a</td>
<td>Vacuum and pressure technology</td>
</tr>
<tr>
<td>5.1.2.b</td>
<td>Outgassing of materials vs. pressure</td>
</tr>
<tr>
<td>5.1.2.c</td>
<td>Vacuum pumping technology</td>
</tr>
<tr>
<td>5.1.3</td>
<td>Terminology related to mass</td>
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<td>Helium mass spectrometer</td>
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<td>5.1.4.a</td>
<td>Operation</td>
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<td>5.1.4.b</td>
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<td>Helium mass spectrometer by detector</td>
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<td>5.1.5.a</td>
<td>“Sniffer” speed</td>
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<td>5.1.5.b</td>
<td>“Sniffer” hose diameter and length</td>
</tr>
<tr>
<td>5.1.5.c</td>
<td>Mixture percentage</td>
</tr>
<tr>
<td>5.1.5.d</td>
<td>Pressure differential</td>
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<tr>
<td>5.1.5.e</td>
<td>Bagging-accumulation technique</td>
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<tr>
<td>5.1.5.f</td>
<td>Calibration of helium mass spectrometer</td>
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<tr>
<td>5.1.6</td>
<td>Helium mass spectrometer vacuum testing</td>
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<td>5.1.6.a</td>
<td>Probe</td>
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<td>5.1.6.b</td>
<td>Bagging</td>
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<tr>
<td>5.1.6.c</td>
<td>System calibration</td>
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<td>5.1.6.d</td>
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<td>5.1.6.e</td>
<td>Calculation of leakage rate</td>
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<tr>
<td>5.1.6.f</td>
<td>Calculation of response time</td>
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<tr>
<td>5.1.7</td>
<td>Helium mass spectrometer vacuum testing</td>
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<tr>
<td>5.1.7.a</td>
<td>by accumulation method</td>
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LEAK TESTING

RECOMMENDED INSTRUCTION
PERIOD -- HOURS

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
</tr>
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<tbody>
<tr>
<td>7. Helium mass spectrometer testing equipment</td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>a. Mechanical vacuum pump systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Cryogenic pumps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Diffusion pumps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Vacuum gauges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Vacuum hose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Vacuum valves</td>
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</tr>
<tr>
<td>g. Standard leaks</td>
<td></td>
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</tr>
<tr>
<td>h. Vacuum sealing materials</td>
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</tr>
<tr>
<td>i. &quot;Sniffer&quot; probes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Helium probes</td>
<td></td>
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</tr>
</tbody>
</table>

Subtotal Minimum Hours 18.0 19.0

6.0 Safety

Note: Safety training is provided by the Safety Department and covers all leak testing hazards. This training satisfies the required 4 hours of safety training.
The below named individual has been evaluated and it has been determined that he/she has successfully completed the examinations listed below on the dates indicated. Satisfactory annual re-examination denotes successful completion of all examinations initially administered.

1. Employer: 

2. Certified Individual: 
   Date of Birth: 

3. Natural or corrected near distance acuity such as the individual is capable of reading the standard Jaeger J-1 Test Chart. 
   - Passed
   - Failed
   - Corrective Lenses
   Initial Examination: □ Satisfactory. Date: 

4. Natural or corrected far distance acuity such as the individual is capable of reading the standard Snellen Test Chart. 
   - Passed
   - Failed
   - Corrective Lenses
   Initial Examination: □ Satisfactory. Date: 

   - Passed
   - Failed
   - Acceptable Deficiency
   Initial Examination: □ Satisfactory. Date: 


   (Examiner) __________________________ Date: ________

7. Comments: 
   _______________________________________
   _______________________________________
   _______________________________________
   _______________________________________ 

Initial Examination - Examiners Signature __________________________ Date: ______
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### EXAMPLE FORM 262

<table>
<thead>
<tr>
<th>WIPP</th>
<th>Title: Nondestructive Examination Certification Record</th>
<th>Sandia National Laboratories Procedure</th>
<th>Revision</th>
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<tbody>
<tr>
<td>Waste Isolation Pilot Plant</td>
<td>Effective 12-18-92</td>
<td>Form No. 262-A</td>
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</tbody>
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### Training

#### Classroom
- **Hours:**
- **Instructor:**
- **Dates:**

#### On-the-Job
- **Hours:**
- **Supervisor:**
- **Dates:**

### Examination Results

\[ Ge = (Gg \times Wg) + (Gs \times Ws) + (Gp \times Wp) \]

- **Score**
- **Weighting Factor**
- **Date of Exam**

<table>
<thead>
<tr>
<th>General Exam (Gg)</th>
<th>Wg</th>
<th>Date of Exam</th>
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</thead>
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<tr>
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</table>

<table>
<thead>
<tr>
<th>Specific Exam (Gs)</th>
<th>Ws</th>
<th>Date of Exam</th>
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<thead>
<tr>
<th>Practical Exam (Gp)</th>
<th>Wp</th>
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<table>
<thead>
<tr>
<th>Composite Grade (Ge)</th>
<th>Certification Date</th>
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<tbody>
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<td></td>
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</tbody>
</table>

- Passed
- Failed - Additional training and re-examination required
- Failed - Not eligible for re-examination

### Certification

I hereby certify that

<table>
<thead>
<tr>
<th>NDE Level III Examiner</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

SNL QA Chief

<table>
<thead>
<tr>
<th>Date:</th>
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