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SANDIA NATIONAL LABORATORIES
WASTE ISOLATION PILOT PLANT
QUALITY ASSURANCE PROCEDURE (QAP)
QAP 2-3

QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES

Revision A

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NDE Level III

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**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

CONTENTS

1.0 Scope	3
2.0 Applicability	3
3.0 References	3
4.0 Implementation	3
5.0 Level of Qualification	3
6.0 Certification Considerations	4
7.0 Process	5
8.0 Training Requirements	9
9.0 Examination Requirements	9
10.0 Visual Acuity Examination	10
11.0 Certification Requirements	11
12.0 Recertification Procedure	11
13.0 Records	12
14.0 Termination	13
15.0 Outside Agency Use	13
16.0 Forms	13

Tables

A. Minimum Training Level I	6
B. Minimum Training Level II	7
C. Minimum Training Level III	8

Appendix I

Leak Testing	14
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Example Forms

SNL WIPP Form 261	17
SNL WIPP Form 262	18

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

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

SNT-TC-1A - Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing (1984).

4.0 IMPLEMENTATION

This procedure will be applied using a phased approach. The SNL WIPP Project Manger 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 or conducting those training programs necessary for certification.

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

- 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.

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

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.

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

Table A

**MINIMUM TRAINING AND EXPERIENCE REQUIREMENTS FOR NDE
LEVEL I CERTIFICATION**

METHODS	TRAINING REQUIREMENT	EXPERIENCE REQUIREMENT
(LT) LEAK TESTING (L)*	20 HOURS	175 HOURS
(LT) LEAK TESTING	20 HOURS	640 HOURS

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.
3. *Limited to SNL Procedures and Test Equipment.

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

Table B

**MINIMUM TRAINING AND EXPERIENCE REQUIREMENTS FOR NDE
LEVEL II CERTIFICATION**

METHODS	TRAINING REQUIREMENT	EXPERIENCE REQUIREMENT
(L T) LEAK TESTING (L)*	40 HOURS	400 HOURS
(L T) LEAK TESTING	40 HOURS	1600 HOURS

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.
4. *Limited to SNL Procedures and Test Equipment.

**SANDIA NATIONAL LABORATORIES
 QUALIFICATION OF SNL PERSONNEL PERFORMING
 LEAK TESTING ACTIVITIES
 QAP 2-3
 REVISION A**

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

METHODS	NO COLLEGE DEGREE	ASSOCIATE DEGREE*	BACHELORS DEGREE*
(LT) LEAK TESTING	4 YEARS	2 YEARS	1 YEAR

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.

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

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.

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

- 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

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION 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

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

certification. The Level III shall determine the scope of the re-examination and document such in the individuals 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.

**SANDIA NATIONAL LABORATORIES
QUALIFICATION OF SNL PERSONNEL PERFORMING
LEAK TESTING ACTIVITIES
QAP 2-3
REVISION A**

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).

**SANDIA NATIONAL LABORATORIES
 QUALIFICATION OF SNL PERSONNEL PERFORMING
 LEAK TESTING ACTIVITIES**

**QAP 2-3
 REVISION A**

APPENDIX I

LEAK TESTING

SUBJECT	RECOMMENDED INSTRUCTION PERIOD -- HOURS	
	<u>LEVEL I</u>	<u>LEVEL II</u>
1.0 Introduction		
1.1 Brief history of leak testing	.5	
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	.5	.3
2.1 Leak testing units		
2.2 Leak conductance		
2.3 Detector sensitivity		
2.4 Leakage measurement		
3.0 Testing Standards	.5	.4
3.1 Calibration versus qualification		
3.2 Common types of calibrated leaks		
3.3 Calibration techniques		
4.0 Choice of Procedure for Leak Testing	.5	.3
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	<u>2.0</u>	<u>1.0</u>

**SANDIA NATIONAL LABORATORIES
 QUALIFICATION OF SNL PERSONNEL PERFORMING
 LEAK TESTING ACTIVITIES
 QAP 2-3
 REVISION A**

LEAK TESTING		RECOMMENDED INSTRUCTION PERIOD -- HOURS	
SUBJECT		<u>LEVEL I</u>	<u>LEVEL II</u>
5.0	Leak Testing Method		
5.1	Mass Spectrometer Leak Testing		
	1. Principles of mass spectrometer testing	8.0	
	a. Vacuum and pressure technology		
	b. Outgassing of materials vs. pressure		
	c. Vacuum pumping technology		
	2. Terminology related to mass	2.0	1.0
	3. Helium mass spectrometer	2.0	4.0
	a. Operation		
	b. Calibration		
	4. Helium mass spectrometer by detector probe technique	1.0	3.0
	a. "Sniffer" speed		
	b. "Sniffer" hose diameter and length		
	c. Mixture percentage		
	d. Pressure differential		
	e. Bagging-accumulation technique		
	f. Calibration of helium mass spectrometer for "sniffer" testing		
	5. Helium mass spectrometer vacuum testing by hood and tracer probe	1.0	4.0
	a. Probe		
	b. Bagging		
	c. System calibration		
	d. Helium mixture		
	e. Calculation of leakage rate		
	f. Calculation of response time		
	6. Helium mass spectrometer vacuum testing by accumulation method		1.0

**SANDIA NATIONAL LABORATORIES
 QUALIFICATION OF SNL PERSONNEL PERFORMING
 LEAK TESTING ACTIVITIES
 QAP 2-3
 REVISION A**

SUBJECT	LEAK TESTING	RECOMMENDED INSTRUCTION PERIOD -- HOURS	
		<u>LEVEL I</u>	<u>LEVEL II</u>
7.	Helium mass spectrometer testing equipment	4.0	6.0
	a. Mechanical vacuum pump systems		
	b. Cryogenic pumps		
	c. Diffusion pumps		
	d. Vacuum gauges		
	e. Vacuum hose		
	f. Vacuum valves		
	g. Standard leaks		
	h. Vacuum sealing materials		
	i. "Sniffer" probes		
	j. Helium probes		
	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.

**SANDIA NATIONAL LABORATORIES
 QUALIFICATION OF SNL PERSONNEL PERFORMING
 LEAK TESTING ACTIVITIES
 QAP 2-3
 REVISION A**

EXAMPLE FORM 261

WIPP Waste Isolation Pilot Plant	Title: Visual Acuity Certification Record Effective <u>12-16-97</u>	Sandia National Laboratories Procedure _____ Revision _____ Form No. 261
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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: _____
5. Color Blindness - Ishihara's Test - 1978 Edition.
 Passed Failed Acceptable Deficiency

 Initial Examination: Satisfactory. Date: _____
6. a. Annual Re-examination: Satisfactory.

_____ Date: _____
 (Examiner)

7. Comments:

_____ Date

**SANDIA NATIONAL LABORATORIES
 QUALIFICATION OF SNL PERSONNEL PERFORMING
 LEAK TESTING ACTIVITIES
 QAP 2-3
 REVISION A**

EXAMPLE FORM 262

WIPP Waste Isolation Pilot Plant	Title: Nondestructive Examination Certification Record Effective <u>12-18-92</u>	Sandia National Laboratories Procedure _____ Revision _____ Form No. 262-A
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Name: _____
 Method: _____ Level: _____

Training

Classroom
 Hours: _____ Instructor: _____
 Dates: _____

On-the-Job
 Hours: _____ Supervisor: _____
 Dates: _____

Comments:

Restrictions:

Examination Results

Gc = (Gg x Wg) + (Gs x Ws) + (Gp x Wp) where Gc = Composite Grade in % (must be 80 or above)
 Gg = Actual Grade from General Exam in % (must be 70 or above)
 Wg = Weighting Factor for General Exam
 Gs = Actual Grade from Specific Exam in % (must be 70 or above)
 Ws = Weighting Factor for Specific Exam
 Gp = Actual Grade from Practical Exam in % (must be 70 or above)
 Wp = Weighting Factor for Practical Exam

	SCORE	WEIGHTING FACTOR	DATE OF EXAM
General Exam (Gg) =	_____	Wg = _____	_____
Specific Exam (Gs) =	_____	Ws = _____	_____
Practical Exam (Gp) =	_____	Wp = _____	_____
Composite Grade (Gc) =	_____		

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

Certification Date _____
 Recertification Date _____

Certification

I hereby certify that _____ meets all requirements for qualification as and NDE inspector in the above method (with noted restrictions) and to the indicated level based on the criteria established in SNL QAP 2-3 and as documented in this record.

NDE Level III Examiner _____ Date: _____
 SNL QA Chief _____ Date: _____