

# NRC INSPECTION MANUAL

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## INSPECTION PROCEDURE 57080

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### ULTRASONIC TESTING EXAMINATION

PROGRAM APPLICABILITY: 2515, 2700

#### 57080-01 INSPECTION OBJECTIVES

01.01 To determine whether the ultrasonic testing (UT) examination procedures used by the licensee or contractor meet applicable American Welding Society (AWS)/American Society of Mechanical Engineers (ASME) Code, regulatory, specification, and contract requirements.

01.02 To determine through direct observation whether the UT examination is being conducted by properly qualified personnel, in accordance with qualified procedures and the licensee's or contractor's approved Quality Assurance (QA) program.

01.03 To review a sample of records and images to determine whether they are prepared, evaluated, and maintained in accordance with applicable commitments and/or requirements.

#### 57080-02 INSPECTION REQUIREMENTS

##### 02.01 Procedure Review

- a. Review the active UT examination procedure(s) and ascertain whether it has (they have) been issued and qualified in accordance with the licensee's or contractor's QA program.
- b. Review each special test procedure that deviates from the technique prescribed in the ASME Code or exceeds the range of examination parameters specified in the ASME Code to determine that they have been qualified in accordance with the Code requirements and have been approved by the licensee's authorized inspection agency or that NRC has granted relief in accordance with 10 CFR 50.55a.
- c. Determine whether the UT examination procedure contains information or references a general inspection procedure or supplementary instructions sufficient to assure that all parameters are specified and controlled within the limits

permitted by the applicable Code and other additional specification requirements. For each UT examination procedure, ascertain whether essential examination variables are defined and whether these variables are controlled within the limits specified by the applicable Code, other specification, and contract requirements. Perform the following evaluations:

1. Verify that the type of apparatus is specified, including ultrasonic frequency range, linearity, and signal attenuation accuracy requirements.
2. Verify that the extent of coverage (beam angles, scanning surface, scanning rate, and directions) and scanning technique are specified and are consistent with the applicable ASME Code and contract requirements.
3. Verify that calibration requirements, methods, and frequency including calibration block type, size, geometry, and material, as well as the location and size of calibration reflectors' within the block are clearly specified and consistent with the applicable ASME Code and contract requirements.
4. Verify that the sizes and frequencies of search units are specified and are consistent with the applicable ASME Code and contract requirements.
5. Verify that the beam angle or angles is (are) specified and is (are) consistent with the applicable ASME Code and contract requirements.
6. Verify that methods of compensation for the distance traversed by the ultrasonic beam as it passes through the material including distance (amplitude correction curves) and electronic distance (amplitude correction and transfer mechanisms), if used, are specified and are consistent with the applicable ASME Code and contract requirements.
7. Verify that reference reflectors for accomplishing transfer and the frequency of use of transfer mechanisms, if applicable, are in accordance with applicable ASME Code and contract requirements.
8. Verify that the reference level for monitoring discontinuities is defined and the scanning gain setting is specified, and that these values are in accordance with the applicable ASME Code and contract requirements.
9. Verify that methods of demonstrating penetration and coverage are established.
10. Verify that levels or limits for evaluation and recording of indications are specified and are in accordance with the applicable ASME Code and contract requirements.

11. Verify that the method of recording significant indications is established and that the reporting requirements are in accordance with the applicable ASME Code and contract provisions.
12. Verify that acceptance limits are specified or referenced and are in accordance with the applicable ASME Code and specific contract requirements.

02.02 Work Observation. Observe the performance of a UT examination for a randomly selected weld sample and conduct the following reviews:

- a. Determine whether the applicable drawing, instructions, or travelers clearly specify the test procedure to be used and that a copy of the procedure is available in the area in which the work is being performed.
- b. Identify for subsequent record review, the personnel performing the examination and ascertain whether they are qualified to perform the assigned task.
- c. Determine whether the required equipment and materials (as specified in the examination procedures) are available at the work station. Identify materials/equipment serial number(s) for subsequent review of calibration records and certifications as required.
- d. Determine whether the specific areas, locations, and extent of examination are clearly defined.
- e. Determine whether the test attributes are as specified in the applicable test procedure and are consistent with the limits or ranges given in paragraph 02.01c above.
- f. Ascertain whether the indications are evaluated in accordance with the procedure requirements, correct acceptance criteria are used, and the inspection results are reported in a prescribed manner.
- g. Verify that the licensee has nondestructive examination (NDE) indication evaluation process that contains a provision for adequate corrective action or analysis of the indication before plant system startup.
- h. Verify that sequencing or timing of the examination relative to other operations, such as machining, heat treating, or painting, is clearly specified and is in accordance with the applicable ASME Code and contract requirements.

02.03 Record Review

- a. Review a random sample of qualification records for UT inspection personnel and ascertain whether the qualification records properly reflect the following:

1. Employer's name.
  2. Person certified.
  3. Activity qualified to perform.
  4. Level of qualification.
  5. Effective period of certification.
  6. Signature of employer's designated representative.
  7. Basis used for certification.
- | 8. Annual examination of visual acuity and color vision examination and periodic recertification.
- | b. Review the calibration records and material certification records for the equipment and materials recorded during the work observation inspection of paragraph 02.02c. Review a random sample of calibration and certification records for equipment and materials listed in the records reviewed in paragraph 02.03c below.
- | c. Review a random sampling of UT inspections records for compliance with procedures requirements, for recording of examination, for evaluation of data, and for results.

## 57080-03 INSPECTION GUIDANCE

### General Guidance

- a. Applicable portions of the Safety Analysis Report (SAR) should be reviewed to determine licensee commitments relative to NDE of components and equipment. The applicable Code editions and special requirements will generally be indicated in specifications, drawings, and/or QA manuals. The inspector is responsible for determining the acceptance criteria for each individual application.
- b. Inspection of UT examination as outlined in this procedure can be described as a three-phase, progressive review: First, a general audit is made of the applicable UT procedure to verify that it is properly prepared, approved, and qualified in accordance with the applicable Code and contract requirements. Secondly, the use of the procedure is observed to verify that the work is planned, scheduled, and accomplished in accordance with the licensee's and/or contractor's QA program, and that personnel performing the examination are properly qualified. Finally, records are reviewed to verify that they are complete, accurate, and retrievable. It is preferable to complete all phases of the inspection during a single inspection. However, this may not always be possible since there may be no UT examination in progress during a particular inspection. Under such circumstances, completion of a specified phase of the

procedure may be deferred and resumed during a subsequent inspection.

- c. Findings from this inspection activity should address each element as being satisfactory, being unresolved and requiring resolution, or being in violation and requiring correction. When significant inadequacies are identified indicating possible generic deficiencies, the issue should be addressed at the appropriate level of licensee management.

#### Specific Guidance

03.01 Procedure Review. The UT examination method described in Sections V, III, and XI of the ASME Code is applicable to most conditions encountered during fabrication and inservice inspection. However, the Code recognizes that special conditions may be encountered that require modification of these techniques. If modified procedures are used, they must be equivalent or superior to the Code techniques. Such special procedures must also be proven by demonstration to be capable of detecting discontinuities to at least the same extent as the applicable Code technique under normal conditions. This applies to all NDE procedures used to meet Code acceptance criteria.

03.02 Work Observation. The number and location of welds to be inspected should be selected by the inspector. The selected number of welds scheduled for observation should be adequate to permit an effective evaluation of the inspected UT examination activities.

In addition the sample selection should include such considerations as contractors performing the work at the manufacturing facility or plant site (construction or modification), combination of systems, weld configurations, and difficulties of performing the required NDE.

03.03 Record Review. Qualification of NDE personnel involved in the performance, evaluation, or supervision of NDE should meet the qualification requirements stated in the applicable codes and standards referenced in the licensee's SAR. Qualification certificates, visual acuity examination, color vision examination, and periodic recertification should be included in the licensee's and/or contractor's procedures.

(Specific guidance for procedures and personnel qualifications according to ASME, Section XI, Appendix VIII is being developed.)

#### 57080-04 REFERENCES

10 CFR Part 50, Appendix B, Criterion IX.

ASME Boiler and Pressure Vessel Code Sections III, V, and XI

Society for Nondestructive Testing - Recommended Practice No. SNT-TC-1A and supplements

- | ANSI/ASNT CP-89 - Standard for Qualification and Certification of Nondestructive Testing Personnel
- | Regulatory Guide 1.88, Collection, Storage and Maintenance of Nuclear Power Plant QA Records
- | Regulatory Guide 1.19, Nondestructive Examination of Primary Containment Liner Welds
- | Regulatory Guide 1.58, Qualification of Nuclear Power Plant Inspection, Examination and Testing Personnel
- | ANSI N45.2.9, Requirements for Collection, Storage and Maintenance of QA Records for Nuclear Power Plants
- | ANSI N45.2.6, Qualification of Inspection, Examination and Testing Personnel

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