



TITLE: ISQ-O&G ULTRASONIC THICKNESS & CORROSION SCANNING PROTOCOL	Number: O&G-UTT-4
	Revision: 3
	Date: July 15, 2019

ISQ-O&G

Ultrasonic Thickness and Corrosion Scanning Protocol

ASNT Document O&G-UTT-4 Revision 3



The American Society for Nondestructive Testing, Inc.

The American Society for Nondestructive Testing,
 Inc. (ASNT)
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Revision	Date	Summary of Revisions
Original	March 5, 2019	Original Document Release
1	April 3, 2019	Modified definition in 4.6. In 7.3, changed .95 to .90
2	May 16, 2019	Modified wording in section 6.2.
3	July 15, 2019	Changed "No Flaw" to "No Damage", "inclusion" to "lamination" and modified the tolerance in section 9.3.1



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1.0 Scope

This protocol covers the requirements for the O&G ISQ for NDT Ultrasonic thickness and corrosion scanning. This ISQ examination is referred to as the O&G-UTT. The applicable product forms for the O&G-UTT include, but are not limited to; plate, piping, pressure vessels, storage tanks, structural components, valves, etc. The applicable operating environments for the O&G-UTT include, but are not limited to; refineries, chemical plants, pipelines, shipping terminals, marine transport, floating & fixed platforms, floating production & storage (FPSO) marine and hull facilities, liquefied natural gas (LNG) facilities, equipment fabrication facilities, plate & pipe mills, etc..

2.0 References

The following documents are referenced herein and are considered supporting documentation for this protocol. Unless otherwise specified below, refer to the latest edition of the referenced documents.

2.1 ASNT Documents

SNT-TC-1A	Recommend Practice for Personnel Qualification and Certification in Nondestructive Testing Personnel
ASNT CP-189	Standard for Qualification and Certification of Nondestructive Testing personnel
ASNT UT-PTP7	ASNT procedure for Ultrasonic Thickness Measurements on Carbon Steel components
AEC-1	AEC – Program Document Requirements
QP-ISQ-2	Industry Sector Qualification Oil & Gas Program
AEP-1	Authorized Examination Proctor (AEP)
AEP-2	AEP Examination Administration

2.2 Industry Codes and Standards

International Organization for Standardization (ISO)

ISO-9712	Nondestructive testing Qualification and Certification of NDT Personnel
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American Society of Mechanical Engineers (ASME)

BPV Section V Article 5	Boiler & Pressure Vessel Code Ultrasonic Methods for Materials
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American Society for Testing & Materials (ASTM)



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SE-797/SE-797M


Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method

3.0 Acronyms

AEC	Authorized Examination Center
AEP	Authorized Examination Proctor
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society of Non-destructive Testing
ASTM	American Society for Testing & Materials
BPV	Boiler & Pressure Vessel
CMC	Certification Management Council
ISC	International Service Center
ISQ	Industry Sector Qualification
NDT	Nondestructive Testing
O&G	Oil & Gas
UTT	Ultrasonic Thickness

4.0 Definitions

- 4.1 **Authorized examination center (AEC):** An organization with facilities and personnel, independent of the NDT technician’s employer that has been authorized and approved by the ASNT Certification Management Council (CMC) to administer NDT qualification examinations.
- 4.2 **Authorized Examination Proctor (AEP):** An individual that has been authorized and approved by the ASNT Certification Management Council (CMC), and the International Service Center (ISC) certification group, to administer NDT qualification examinations at an authorized examination center (AEC) or an approved remote examination location.
- 4.3 **Candidate:** An individual seeking qualification in accordance with this document.
- 4.4 **Certification Management Council (CMC):** The ASNT council that has the overall responsibility for developing and maintaining the technical content of all ASNT certification programs and shall have the sole

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responsibility for the determination of certification outcomes in those programs.

- 4.5 **Industrial Sector (IS):** A specific area in industry or technology where specialized NDT practices are utilized requiring specific skill, knowledge, equipment or training to achieve satisfactory performance.
- 4.6 **Industry Sector Qualification (ISQ):** A qualification program where performance demonstration examinations are given to an NDT technician, for a specific NDT technique applicable to a given industry sector, that assess competency in performing examinations. The ISQ shall be awarded to candidates upon successful passing of the performance examination.
- 4.7 **International Services Center (ISC) Certification Group:** The ASNT department responsible for the administration and facilitation of ASNT certification programs in accordance with procedures developed by the ASNT Certification Management Council (CMC).
- 4.8 **Qualification:** As it pertains to the ISQ program, within this document and elsewhere, qualification refers to the verification of competency in a given method and technique through hands on performance demonstration testing. It does not refer to the use of the word qualification as it pertains to NDT certification.
- 4.9 **Steering Committee:** The group of O&G owner / operator subject-matter experts responsible for the development and maintenance of the ISQ program that fairly and equitably represents the interests of all parties significantly concerned with the ISQ-O&G scheme without any particular interest predominating. The parent committee is the ASNT Certification Management Council (CMC) over the Oil & Gas owner/user steering committee for the ISQ-O&G program.
- 4.10 **Test specimen:** a sample of a product form containing known discontinuities used in practical examinations.

5.0 Responsibilities

- 5.1 The test specimens, procedures, grading criteria, test keys and other confidential information relating to this program shall be maintained confidentially with ASNT ISC certification group and approved by review from the CMC Oil & Gas industry sector steering committee.
- 5.2 All examination applications shall be processed through ASNT ISC certification group and shall meet the requirements established within this procedure.
- 5.3 All test specimens shall be fingerprinted to establish the truth data for exam grading keys by the CMC.
- 5.4 Examinations shall only be administered by ASNT AEC's utilizing AEP's, or at ASNT authorized remote sites utilizing AEP's, that meet the requirements for the AEC-1 document and ISQ-O&G program as established by the steering committee.



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5.5 Grading shall not be conducted at the AEC’s or remote examination sites by AEP’s. All exams shall be entered into an online computerized system by the candidate, who will receive immediate grading and results notification. In a situation where the online computerized data entry and grading is unavailable, exams will be sent back to ASNT by the AEC or AEP. This will be handled utilizing either email or facsimile, where they will be graded directly by the ASNT ISC certification group and email results notification will be sent out within 48 hours.

6.0 Examination Prerequisites

- 6.1 All O&G-UTT candidates shall apply to ASNT through the ASNT website.
- 6.2 The ISQ UTT candidates shall understand that the expected prerequisite level of competency to sit for this exam is at least equal to a Level II ultrasonics limited certification in A-scan thickness measurement per the guidelines in SNT-TC-1A.
- 6.3 Guidance on the method of Ultrasonic thickness & corrosion scanning techniques can be found in ASME BPV code Section V Article 5 and ASTM SE-797/SE-797M.
- 6.4 Candidates shall present a color digital photo along with a unique email address as part of their application. Photos must be a passport or government issued license style headshot. Photos may be taken on devices such as personal digital cameras, cell phones, or webcams. The image format shall be .jpg, .gif, or .png.
- 6.5 At the examination center or remote examination location, the AEP will match the name of the candidate’s ID to the name in their system (candidates name as it appears on their ASNT account). The name on the candidate’s ID must match exactly, **no exceptions**. If the candidate’s ASNT account name does not match the name on their ID, they need to contact ASNT as least 72 hours prior to the exam in order to get their record updated.
 - 6.5.1 Identification (ID) Requirements;
 - 6.5.1.1 The first and last name that the candidate uses to register must match exactly the first and last name on any ID’s that are presented on exam day.
 - 6.5.1.2 All ID’s required must be issued by the country in which the candidate is testing. If the candidate does not have a qualifying primary ID issued from the country they are testing in, an international travel passport from their country of citizenship is required, along with a secondary ID.
 - 6.5.1.3 Candidates are required to present *original* (no photo copies or digital IDs), *valid* (unexpired) IDs; one form as a primary ID (government issued with name, recent recognizable photo, and



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signature) and one form as a secondary ID (with at least a name and signature, or name and recent recognizable photo) if requirement in 6.5.1.2 is not met. See table below for reference;

PRIMARY ID		SECONDARY ID
International Travel Passport	Alien registration card (green card, permanent resident, visa)	Any ID containing at least name and signature, or name and recognizable photo that meets above ID requirements
Driver's License	Local Language ID (not in Roman characters) – accepted only if issued from the country the candidate is testing in	
Military ID (including spouse and dependents)		
Identification Card (national/state/province identity card)		

6.5.2 Additional Identification Allowances;

6.5.2.1 Expired forms of ID are not acceptable unless accompanied by valid renewal papers.

6.5.2.2 If a government issued ID is missing a visible signature, or has an embedded signature, the candidate is allowed to test as long as the other requirements for primary and secondary ID's are met.

7.0 Examination Test Specimens

- 7.1 Test Specimens – All O&G-UTT examination specimens shall be evaluated ultrasonically by at least three ASNT certified UT Level III technicians from the CMC and/or Steering Committee to establish the truth data for the examination keys. All O&G-UTT examination specimens shall also be measured physically with one of the following to ensure correlation to the Ultrasonic truth data; micrometers, digital pit gauges, laser profilometry, or structured light profilometry.
- 7.2 All equipment used for truth data collection and evaluations shall be calibrated with traceability to national standards.
- 7.3 All examination test specimens shall be assigned a difficulty rating value at time of truth data determination. This value shall be initially established by the CMC Level III's determining the specimen truth data. These values shall be in the range of 0.3 (30%) to 0.90 (90%) representing the percentage of Ultrasonic technicians who would be able to correctly evaluate the specific specimen in question.
- 7.4 ASNT may complete reviews of the pass / fail statistics for the UTT specimens to evaluate the current difficulty ratings of specimens in the database. If significant variations are observed during these reviews the steering committee will decide what action, if any, shall be taken.
- 7.5 Examination specimen sets shall be made up of a group of test specimens that the cumulative difficulty rating value is in the range of 0.5 to 0.8, 50% to 80% pass rates from statistics gathered. This process shall assist with ensuring



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comparable difficulty across all UTT exam specimen sets.

- 7.6 Material of test specimens shall be carbon steel.
- 7.7 Thickness range of test specimens shall be from 0.250" (6.35mm) to 2.5" (63.5mm).
- 7.8 Test specimens may be of either flat plate or curved section product form. Curved section specimens shall not have a radius smaller than that of a ANSI 4" outside diameter pipe.
- 7.9 The number of test specimens per ISQ O&G-UTT exam shall be ten (10) when the ISQ O&G-UTT is completed as a stand-alone exam.
- 7.10 Flaws on test specimens may be natural, artificial, or implanted.
- 7.11 Test sets shall consist of specimens with one of the following conditions; wall loss due to corrosion or erosion, mid-wall laminations, or no damage. NO test specimens shall have a flaw type from more than one of these three listed flaw type conditions.
 - 7.11.1 Wall Loss may take the form of one or more of the following modes;
 - 7.11.1.1 General or large area wall loss.
 - 7.11.1.2 General wall loss with pitting / deeper areas.
 - 7.11.1.3 Isolated pitting.
 - 7.11.1.4 Localized wall loss (small areas with significant depth).
 - 7.11.1.5 Smooth elongated round areas from erosion.
 - 7.11.1.6 Multiple areas of wall loss on a single specimen with one or more of the above wall loss modes.
 - 7.11.2 Mid-Wall laminations may take the form of one of the following modes;
 - 7.11.2.1 Single lamination
 - 7.11.2.2 Multiple laminations at various depths with various dimensions.
 - 7.11.3 No Damage is the flaw type when a test specimen contains a difference from the maximum thickness to the minimum thickness of $\leq 0.030"$ (0.75mm) for all test specimens $< 1"$ in maximum thickness and $\leq 0.050"$ (1.27mm) for all test specimens $\geq 1"$ in maximum thickness.
- 7.12 Test specimens may be coated with 10 to 50 mils of coating; fusion bonded epoxy, two-part polyurethane, or similar.



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- 7.13 All test specimens shall be uniquely identified by an appropriate permanent marking method to ensure traceability for each specimen. Such marking shall not interfere with the practical examinations of the test specimens and may, when needed, be concealed from candidates with alternative identification marking while the test specimens are being used for examinations.
- 7.14 There shall be a master test specimen examination key report maintained by the ASNT ISC staff.
- 7.15 All test specimens shall have a cover attached to the back-side surface (opposite scanning surface) to mask any flaw types present on the test specimens.
- 7.16 Test specimens shall have a maximum number of uses during examinations at any given AEC or region. When the maximum number of exposures is reached at any given location or region, the test specimens shall be either sent back to ASNT, or to another AEC or region, and replaced with other O&G-UTT specimens from the test specimen pool for that AEC or region. The test specimen shall then be utilized at other AEC or regional locations and not sent back to the AEC with the maximized number of exposures until the replacement issued specimen to the initial AEC has met its maximum number of exposures.

8.0 Examinations

- 8.1 Examination guidelines and O&G-UTT examination procedure, UT-PTP7, shall be made available to the technicians before the examination, and can be found at any time, through the ASNT ISQ website.
- 8.2 The examination guidelines and O&G-UTT examination procedure, UT-PTP7, should be read and understood before a candidate applies for an examination. The candidate shall be expected to follow the testing guidelines and the O&G-UTT examination procedure, UT-PTP7, during the examination. Failure to do so may cause a failure on the exam.
- 8.3 The candidate shall have a maximum of four (4) hours to complete the examination, including calibration time, examination of ten (10) test specimens, and filling out all paperwork. For computerized examinations additional time shall be allowed for electronic data entry and submission of the examination report however no access to the test specimens shall be allowed after the four (4) hour timeframe has passed.
- 8.4 Questions may be asked to the AEP only. Specific questions about the exam content shall not be answered.
- 8.5 Each test specimen shall be examined to determine the presence and type of any flaws in the specimen by scanning the entire specimen. Possible flaw types are detailed above in section 7.11. The flaw type determined shall be recorded in the 'flaw type' data entry location for the corresponding specimen by the candidate. The flaw type options for data entry for each specimen are as follows;



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N’ for a specimen with no damage observed, W’ for a specimen observed as containing any form of wall loss, or M’ for a specimen with one or multiple mid-wall laminations observed. No specimens shall include flaw types from more than one of the above three categories.

- 8.6 For test blocks identified as containing wall loss of any type detailed above in section 7.11, the minimum remaining thickness for the entire test specimen shall be determined and recorded in the ‘minimum thickness’ data entry location for the corresponding specimen by the candidate.
- 8.7 For test blocks identified as containing (a) mid-wall lamination(s), the minimum remaining thickness for the entire test specimen shall be determined and recorded in the ‘minimum thickness’ data entry location for the corresponding specimen by the candidate. The depths or horizontal dimensions of the mid-wall lamination(s) shall not be recorded.
- 8.8 The maximum thickness shall be determined for each test specimen and recorded in the ‘maximum thickness’ data entry location for the corresponding specimen by the candidate.

9.0 Examination Grading

- 9.1 A candidate shall correctly identify all the flaw types with no errors allowed in order to pass the exam. E.g., if a specimen containing wall loss is reported as having (a) mid-wall lamination(s) or no damage, the exam shall be an automatic failure. If a specimen containing (a) mid-wall lamination(s) is reported as containing wall loss or no damage, the exam shall be an automatic failure. If a specimen containing no damage is reported as having wall loss or (a) mid-wall lamination(s), the exam shall be an automatic failure.
 - 9.1.1 A test specimen shall be considered as having No Damage when the difference from the maximum thickness to the minimum thickness is ≤ 0.030 ” (0.75mm) for all test specimens < 1 ” in maximum thickness and ≤ 0.050 ” (1.27mm) for all test specimens ≥ 1 ” in maximum thickness.
- 9.2 A candidate must correctly report **80%**, eight (8) out of the ten (10) specimens for the minimum and maximum thicknesses data entries in order to pass the exam. If a candidate reports a value outside of the acceptable tolerance for either the minimum or the maximum thickness for a given specimen, then they will not receive credit for that specimen.
- 9.3 The acceptable answers for both minimum and maximum thickness values for each specimen shall be within the following tolerances to be given credit per each given flaw type;
 - 9.3.1 For specimens with no damage the acceptable tolerance range shall be ± 0.020 ” (0.5mm) for all test specimens < 1 ” (25.4mm) in maximum thickness and ± 0.040 ” (1mm) for all test specimens ≥ 1 ” (25.4mm) in maximum thickness.



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9.3.2 For specimens with (a) mid-wall lamination(s) the acceptable tolerance range shall be +/- 0.020" (0.5mm) for all test specimens < 1" (25.4mm) in maximum thickness and +/- 0.040" (1mm) for all test specimens \geq 1" (25.4mm) in maximum thickness.

9.3.3 For specimens with wall loss the acceptable tolerance range shall be +/- 0.030" (0.75mm) for all test specimens < 1" (25.4mm) in maximum thickness and +/- 0.050" (1.27mm) for all test specimens \geq 1" (25.4mm) in maximum thickness.

9.4 Candidates shall be allowed to retake the exam per the retake requirements detailed in the QP-ISQ-2 program document.

10.0 Qualification Validity

10.1 Candidates who successfully pass the O&G-UTT exam shall be qualified for a period of three years from the date they receive notification of qualification.

10.2 ASNT may withdraw or revoke ISQ credentials if the performance or ethics of the technician does not meet ASNT requirements anytime during the validity period.

11.0 Authorized Examination Centers

11.1 Only ASNT AEC's or ASNT approved locations shall be utilized for the administration of ISQ-O&G exams. Specific requirements for AEC's can be found in the ASNT AEC-1 document.

12.0 Authorized Examination Proctors

12.1 Only ASNT approved AEP's shall be utilized for the administration of ISQ-O&G exams. Specific requirements for AEP's can be found in the ASNT AEP-1 & 2 documents.

13.0 Conflict Resolution

13.1 Candidates shall submit any inquiries or conflicts, among the ISQ documents or program, in writing, to ASNT International Service Center (ISC) for resolution.