

Nondestructive Testing (NDT) users Bill of Right

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Abstract: During the last two years, a number of Nondestructive Testing (NDT) providers and users have been visited in Iran. In many cases it has been realized that the NDT providers do not fully meet the requirements of the codes and standards they suppose to follow and the NDT users do not fully know their rights as outlined in the codes and standards they utilize. The purpose of this paper is to educate the NDT users in their rights when they utilize a NDT provider to perform their NDT work. The focus especially is on the requirements of a quality operated company and in the area of NDT personnel qualification and certification.

Key words: Qualification, Certification, Written practice, Training, Examination, NDT related experience, Quality operated company.

Introduction: Dr. Philip B. Crosby, the author of "Quality is Free" [1], states that; "doing things right the first time adds nothing to the cost of your product or service. Doing things wrong is what costs money. The typical American Corporation spends 15 to 20 percent of its sales dollar on reworking, scrapping, repeated service, inspection, tests, warranties, and other quality related costs. Lapses in quality also damage corporate reputations and provoke government regulation. Most, or all, of these headaches could be prevented by a properly managed Quality Operation."

The codes and standards such as; American Society for Mechanical Engineers (ASME); American Welding Society (AWS); American Petroleum Institute (API); European Standards; Japan Standard Institute (JSI); etc. employed by different industries for NDT work. Almost all of these codes and standards reference three documents for training, qualification, and certification of NDT personnel. These three documents are American Society for Nondestructive Testing (ASNT), SNT-TC-1A; ANSI/ASNT CP-189; and EN 473/ISO 9712. The employer based certifications are considered for this paper.

Discussion: When reviewing the 2004 edition of ASME Section V, Article 1, "General Requirements", [2] the following sections addresses the requirements and methods for performance of NDT; T-110 Scope (a); T-120 General (e), (f), (h), and (j); T-130 Equipment (b); T-150 Procedure (b) and (c); T-160 Calibration (a); T-170 Examinations and Inspections (a); T-180 Evaluation; T-190 Records/Documentation. Where T-120 General (e) clearly states that "for those documents that directly reference this Article for the qualification of NDE

personnel, the qualification shall be in accordance with their employer's written practice which must be in accordance with one of the following documents:

1. SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing"; or
2. ANSI/ASNT CP-189, "ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel"

In the American Welding Society's "Structural Welding Code", AWS D1.1,[3] the requirements for inspection and NDT is outlined in section 6 scope; and 6.7; 6.7.1 through 6.7.7.2. Furthermore AWS D1.1 section 6.7.7 reads as follows: "Personnel performing nondestructive testing other than visual shall be qualified in accordance with the current edition of the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A. Only individuals qualified for NDT LEVEL I and working under the NDT LEVEL II or individuals qualified for NDT LEVEL II may perform nondestructive testing."

The last code to consider is API 1104 [4]. The following sections of the API 1104 code describes the requirements for inspection and NDT; 8.1 Rights of Inspection; 8.2 Methods of Inspection; 8.4 Certification of Nondestructive Testing Personnel; 8.4.2 Records; 11. Procedures for Nondestructive Testing; 11.1.1 General; 11.2 Magnetic Particle Test Method; and 11.3 Liquid Penetrant Test Method. Again 8.4 evidently states; "Nondestructive testing personnel shall be certified to Level II or III in accordance with the recommendations of American Society for Nondestructive Testing, Recommended Practice No. SNT-TC-1A, ACCP or any other recognized national certification program that shall be acceptable to the company for the test method used. Only Level II or III personnel shall interpret test results".

After careful review of all of the above requirements, it will become obvious that these requirements outlines what a quality operated NDT firm has to have in order to be in compliance with these codes. However, a quality operated NDT provider shall first have a quality system program and the program should address at least the following items;

- Quality System Description
- Annual Management Reviews
- Internal Audit Program
- **NDT Personnel Training, Qualification, and Certification Procedures**
- NDT Application Procedures
- Control of Suppliers Procedure
- Receiving Inspection Procedures
- Control of Items Tested Status Procedure
- Calibration of Measuring and Test Equipment Procedure
- Nonconformance Control Procedure
- Records Maintenance Procedure

The focus of this paper is on NDT personnel qualification and certification requirements and especially in employer based certification which was a part of the requirements of the above mentioned codes. ASNT, SNT-TC-1A is the backbone of all the employer based certifications today. This Recommended Practice is the most used personnel qualification and certification scheme all over the world and the 2006 edition of it is the most current available. The writer was a member of a team consisted of an oil company, an equipment manufacturer and other independent firms where 10 NDT providers were audited in 2004 in the USA [5]. The results of these audits and my experience in Iran have indicated that every NDT user and provider should be familiar with the requirements of this recommended practice (see Table 1 and 2).

Quality System Items	Company 1	Company 2	Company 3	Company 4	Company 5
Internal Audit Program	None	None	Done	None	Done
External Audit Program	None	None	Done	None	Done
Shop/Field Audit Program	None	None	None	Partial	None
Qualification/Certification Program	Partial	Partial	Partial	Partial	Yes
Training on Procedures	Done	Done	Done	None	Done
Equipment Calibration Program	Yes	Yes	Yes	Yes	Yes
Codes Availability	Yes	Yes	Yes	Partial	Yes
NCR Program	None	None	Done	None	Done
Preventive/Corrective Action Program	None	None	Done	None	Done
Client Feedback Program	None	None	Done	None	Done
ASNT Level III	No	No	Yes	No	Yes
ISO Accredited	No	No	Yes	No	Yes

Table 1

Quality System Items	Company 6	Company 7	Company 8	Company 9	Company 10
Internal Audit Program	None	None	Done	None	Done
External Audit Program	None	None	Done	None	Done
Shop/Field Audit Program	None	None	None	None	Done
Qualification/Certification Program	Yes	Yes	Yes	Partial	Yes
Training on Procedures	Done	Done	Done	None	Done
Equipment Calibration Program	Yes	Partial	Yes	Partial	Yes
Codes Availability	Yes	Yes	Yes	Partial	Yes
NCR Program	Done	Done	Done	None	Done
Preventive/Corrective Action Program	Done	Done	Done	None	Done
Client Feedback Program	Done	Done	Done	None	Done
ASNT Level III	Yes	No	Yes	No	Yes
ISO Accredited	Yes	Yes	Yes	No	Yes

Table 2

The first step in this process is to write a written practice in which the NDT provider should state steps every new or experienced employee has to take in order to become qualified and eligible for certification. Obviously, this written practice should follow the requirements set by SNT-TC-1A and can be modified to fulfill the NDT provider's specific need. However, it should be noted that these requirements are considered to be the minimum requirements by the users and the modifications can not be changed drastically. The following is how the 2006 edition of ASNT SNT-TC-1A states it [6];

The employer shall establish a written practice for the control and administration of NDT personnel training, examination, and certification. The employer's written practice should describe the responsibility of each level of certification for determining the acceptability of materials or components in accordance with the applicable codes, standards, specifications, and procedures. The employer's written practice shall describe the training, experience, and examination requirements for each level of certification. The employer's written practice shall be reviewed and approved by the employer's NDT Level III.

Obviously, the NDT provider should have a NDT Level III on staff or use the services of an outside NDT Level III provider on contact basis.

The other areas where many NDT providers needing help is in the examination requirement portion of the written practice. A few providers alter the exams they either do not use enough questions or use questions that are readily available to the technician. Furthermore, questions may be too easy or without much substance. SNT-TC-1A [6] sets the practical examinations as following;

8.5.1 The candidate should demonstrate familiarity with and ability to operate the necessary NDT equipment, record, and analyze resultant information to the degree required.

8.5.2 ***At least one flawed specimen or component should be tested and the results of the NDT analyzed by the candidate***

8.5.3 The description of the specimen, the NDT procedure, including check points, and the results of the examination should be documented.

8.5.4 NDT ***Level I Practical*** Examination – Proficiency should be demonstrated in performing the applicable NDT on one or more specimens or machined problems approved by the NDT Level III and in evaluating the results to the degree of responsibility as described in the employer's written practice. At least ten (10) different checkpoints requiring an understanding of test variables and the employer's procedural requirements should be included in this practical examination.

8.5.5 NDT ***Level II Practical*** Examination – Proficiency should be demonstrated in selecting and performing the applicable NDT technique within the method and interpreting and evaluating the results on one or more specimens or machined problems approved by the NDT Level III. At least ten (10) different checkpoints requiring an understanding of NDT variables and the employer's procedural requirements should be included in this practical examination.

Many NDT providers do not meet the above requirements and may utilize test samples with no flaws or just use what they are testing the day of examination as sample for examination which do not fully meet the intent of the recommended practice SNT-TC-1A. In other instances the experience requirement for each level of certification is not adhered to. NDT providers may certify technicians without enough or proper hands on experience which can be very dangerous indeed.

Conclusion: based on the above discussion it becomes apparent that the following statement can be made;

It is the NDT users right to receive quality NDT work from Quality Operated Companies with qualified personnel, who will use the right calibrated equipment, and will perform the work based on an approved written NDT procedure, and will document the results on a repeatable report form.

Finally, I would like to see one day where all of the NDT users and providers are fully aware and in compliance with these requirements.

References:

- [1] Philip B. Crosby, "Quality is Free" Mac Graw Hill, 2000
- [2] American Society for Mechanical Engineers, ASME Section V "Nondestructive Examination", Article 1, General Requirements, 2004.
- [3] American Welding Society, AWS D1.1, "Structural Welding Code - Steel", Section 6, Inspection, 2004
- [4] American Petroleum Institute, API 1104, "Welding of Pipelines and Related Facilities", 2005.
- [5] Morteza K. Jafari, "NDT Supplier Quality Awareness", ASNT International Chemical & Petroleum Industry Inspection Technology (ICPIIT) IX Conference Proceeding, 2004
- [6] American Society for Nondestructive Testing, ASNT "Recommended Practice No. SNT-TC-1A", 2006.