Review of Changes in ASME Section V (NDE) Edition 2017

Diwakar D. JOSHI and Pradeep KUMAR
Insight Quality Services,
507/508, Siddharth Towers, S. No. 12/3 B,
Kothrud, Pune – 411029, India
Email: diwakarj@gmail.com

Abstract:
As you are aware, ASME Boiler and Pressure Vessel (BPV) Code Edition 2017 is released! And it will be applicable from 1st January 2018. In globalization, International certifications are playing a very important role in developing confidence at customer’s end. For example, ASME certification (U, U2, R, S, N Stamps etc.) is considered a hallmark in quality of fabricated equipments.

Many of us use ASME Codes extensively. We design, manufacture, inspect, test, and evaluate as per the Code. We interpret the Code or get it interpreted so as to be totally compliant to the code and our customer requirements. Interpreting the code or getting to know the changes in the code requires a lot of effort. This could be a specialized job and may require a long time. But we definitely do not have that time with us! We are supposed to get to know the changes, understand the implications and do our best in implementing the changes, all in a short while. After all, the job, and in turn the customer is at stake!

The first ASME code was released in 1914 and subsequently it is continuously getting revised (editions, addenda, interpretations, code cases and so on). Code changes are the result of new knowledge, new developments in manufacturing and inspection area, new experience in the field, failures observed, computerization and so on.

The code changes are major changes (where one has to change the system to meet the requirements by changing the design and procedures, changing the methodology of manufacturing, adding the facilities, training the manpower and so on) or minor changes (like typographical errors, errata, etc.). If one understands the code philosophy behind the change, the implementation becomes more effective.

This paper is taking a stock of the major changes in ASME Section V for major techniques like Radiographic Testing, Ultrasonic Testing, Liquid Penetrant Testing, Magnetic Particle Testing, Visual Testing, Leak Testing and Eddy Current Testing. It will give the reader an overall idea about the change. However, going through the code is always essential before implementation the change.

Key words: ASME BPV Code, Interpretation, 2017 Changes, Philosophy of change, major changes and minor changes
The ASME BPV Code has 12 sections. Some are referencing code and some are referenced code. Examples of referencing codes are Section VIII Div.1,2,3, Section III, Section IV, Section XII, which describe the method of constructions of different types of equipments like Pressure vessels, Power boilers, Nuclear components, Heating boilers, transport tanks. There are referenced codes which help these referencing codes, for example section II, Section V, Section IX etc. Referencing codes will refer to the referenced codes like ASME Section II for materials or ASME Section IX for welding. Whenever referencing code sections refer to referenced code the requirements of referenced code are to be fulfilled. There might be some exemptions or additions given by referencing code which need to be followed.

All ASME codes are subjected to revisions. ASME Codes are revised every 2 years are issued in July and become mandatory in next January. All certificate holders of ASME are given a time of 6 months for them to review these changes and implement these in their Quality control system and applicable procedures.

ASME Section V has some of major changes in the year 2017. The main methods like RT, PT, UT, MT, VT, ET and LT are covered here.

**Article 1 - General Requirements**

1) T 120 (e) refers to SNT TC 1A /CP 189 Edition 2006. In previous edition reference to this edition was referred by referencing code sections. In 2017 only, section V states the edition requirements. All referencing codes refer to this clause for NDE certifications. For example, ASME Section VIII Division 1 UW 54 refer to these paragraphs for qualification and certification of NDE personnel.

2) T 120 (h) ASME has introduced a new certification system for NDE personnel named ASME NDE and QC Inspection Personnel Certification (ANDE). Examiners under these certifications can be used for ASME jobs provided these provisions are clearly stated in Quality control system of manufacturer.

**Article 2 - Radiographic Examination**

1) T 223 - BACKSCATTER RADIATION - The lead symbol “B” shall be placed in a location so that it would appear within an area on the radiograph that meets the requirements of T-282 which is newly added in Edition 2017. This change needs the procedural change.

2) Location markers (see Figure T-275), which shall appear as radiographic images on the radiograph, shall be placed on the part, not on the exposure holder/cassette. In 2015 the wording was-the Location Markers “are to” appear, which has been changed to “shall be”. The intent of this para was same previously too, that location markers shall appear as radiographic images. In 2017 it is revised for clarification.

3) T-276.2 – “(a) Welds with Reinforcements. The thickness on which the IQI is based is the nominal single-wall material thickness plus the actual weld reinforcement thickness estimated to be present on both sides of the weld (I.D. and O.D.). The values used for the estimated weld reinforcement thicknesses shall not exceed the maximums permitted by
the referencing Code Section. Physical measurement of the actual weld reinforcements is not required”.

The 2015 edition of ASME Section V was only stating to consider the estimated reinforcement which shall not to exceed that stated in referencing code. A clarification is given in 2017 edition that physical measurement of actual weld reinforcement is not required. However, para T276.2 (c) states that if the reinforcement can be measured then actual values shall be taken for selection of IQI.

4) T-277.1 Placement of IQIs: (d) IQI Placement for Welds — Wire IQIs. “The IQI (s) shall be placed on the weld so that the length of the wires is across the length of the weld”. Upto 2015 edition it was the requirement that the wire type IQI shall be placed perpendicular to the length of weld. According to edition 2017 IQI shall be across the length of weld which means a tilt of IQI due to some reason is allowed provided the length of the wire is across the length of the weld.

Article 4- Ultrasonic Examination Methods for Welds

1) T-432.2 Contact Wedges – Newly added - “Examinations performed on a curved component having a diameter less than 14 in. (350 mm) (at the examination surface) shall be performed using a contoured wedge, to ensure sufficient ultrasonic coupling is achieved and to limit any potential rocking of the search unit as it is moved along the circumference of the component” and shall fulfill the requirements of T-432.2 (a) and (b).

This implies that the proper contoured wedges shall be made and used.

2) T-434.1.2 (c) newly added – “Transfer Correction. When the block material is not of the same product form or has not received the same heat treatment, it may be used provided it meets all other block requirements and a transfer correction for acoustical property differences is used. Transfer correction shall be determined by noting the difference between the signal response, using the same transducers and wedges to be used in the examination, received from either

(i) the corresponding reference reflector (same type and dimensions) in the basic calibration block and in the component to be examined, or
(ii) two search units positioned in the same orientation on the basic calibration block and component to be examined. The examination sensitivity shall be adjusted for the difference”.

This is giving option for calibrating with calibration blocks of different product form and Heat Treatment.
3) **T-453 Newly Added SCANNING TECHNIQUES**

“Examination may be performed by one of the following techniques:
(a) manual scanning using no scanner equipment
(b) nonautomated scanning using nonautomated scanner(s)
(c) semiautomated scanning using semiautomated scanner(s)
(d) automated scanning using automated scanner(s)”.

This is clarifying the scanning techniques.

4) **T-492 – Revised** - Reference to T 190 (a) has been made to add date of examination, name or identity and level of certification, identification of weld or part, or component examined including weld number, serial number, or other identifier, examination method, technique, procedure identification and revision, results of the examination to be documented on the report.

### Article 5- Ultrasonic Examination Methods for Materials

1) **T-534 CALIBRATION BLOCK REQUIREMENTS**

The material from which the block is fabricated shall be

(a) the same product form,
(b) the same material specification or equivalent P-Number grouping, and
(c) of the same heat treatment as the material being examined.

For the purposes of this paragraph, **product form is defined as wrought or cast**, and P-Nos. 1, 3, 4, 5A through 5C, and 15 A through 15 F materials are considered equivalent.

Revised T-534 to provide clarification of “product form” and to consider product form as “either wrought or cast.”

2) **T-592 – Revised** - Reference to T 190 (a) has been made to add date of examination, name or identity and level of certification, identification of weld or part, or component examined including weld number, serial number, or other identifier, examination method, technique, procedure identification and revision, results of the examination to be documented on the report.

### Article 6- Liquid Penetrant Examination

1) **T-673.1 newly added** - “water-washable penetrants may be removed by wiping with a clean, dry, lint-free cloth or absorbent paper, repeating the operation until most traces of penetrant have been removed. The remaining traces shall be removed by wiping the surface with a cloth or absorbent paper, lightly moistened with water. To minimize removal of penetrant from discontinuities, care shall be taken to avoid the use of excess water”.
For water washable Penetrant as alternative to water spray excess removal may be done by wiping with a clean, dry, lint-free cloth or absorbent paper, repeating until most traces of penetrant have been removed. The remaining traces shall be removed by wiping the surface with a cloth or absorbent paper, lightly moistened with water. To minimize removal of penetrant from discontinuities, care shall be taken to avoid the use of excess water.

2) T-673.3 Revised – “Excess solvent removable penetrants shall be removed by wiping with a clean, **dry, lint-free cloth** or absorbent paper, repeating the operation until most traces of penetrant have been removed”.

   Code has now clarified the requirement of clean, dry, lint-free cloth during excess removal.

3) **MANDATORY APPENDIX II- II-641 - NICKEL BASE ALLOYS:** “When examining nickel base alloys, all penetrant materials shall be analyzed individually for sulfur content in accordance with SE-165, Annex 4. Alternatively, the material may be decomposed in accordance with SD-129 and analyzed in accordance with SD-516. The sulfur content shall not exceed **0.1%** by weight”.

   Edition 2015 stated the requirement of Sulfur content to be 1% by weight which is changed to 0.1 % by weight in edition 2017.

4) **MANDATORY APPENDIX II - II-642 AUSTENITIC OR DUPLEX STAINLESS STEEL AND TITANIUM-** “When examining austenitic or duplex stainless steel and titanium, all penetrant materials shall be analyzed individually for **chlorine and fluorine** content in accordance with SE-165, Annex 4”.

   “The total chlorine and fluorine content shall not exceed **0.1%** by weight”.

   Edition 2015 stated the requirement of halogen contents to be within 1% by weight for austenitic or duplex stainless steel and titanium. In Edition 2017 the total chlorine and fluorine content shall be analyzed and total content shall be within 0.1 % by weight.

5) **MANDATORY APPENDIX II- II-643 –** If water is used as the cleaning agent during liquid penetrant examination following requirement is newly added and shall be mandatory from edition 2017

   “(a) For water used in precleaning or as part of processes that involve water, if potable water (e.g., drinking, bottled, distilled, or deionized water) is used, it is not required to be analyzed for chlorine and sulfur.

   (b) Any other type of water used that does not meet the requirements of (a) above shall be analyzed for chlorine in accordance with ASTM D1253 and for sulfur in accordance with SD-516. The chlorine content shall not exceed 0.1% by weight and the sulfur content shall not exceed 0.1% by weight”.

**Article 7- Magnetic Particle Examination**
1) T-773 (b) – “Wet Particles. The magnetizing current shall be turned on after the particles have been applied. Flow of particles shall stop with the application of current. Wet particles applied from aerosol spray cans or pump sprayers may be applied before and/or during magnetizing current application. Wet particles may be applied during the application of magnetizing current if they are not applied directly to the examination area and are allowed to flow over the examination area or are applied directly to the examination area with low velocities insufficient to remove accumulated particles”.

When using wet magnetic particle examination pumps sprayers can be used and wet particles can be applied during magnetizing current application which is newly added in Edition 2017

**Article 8 - Eddy Current Examination**

1) T-810- Subparagraphs (a), (e), (g), (h), Mandatory Appendix III, III-810, III-850, Mandatory Appendix V, V-810, V-820, Table V-821, V-850, Mandatory Appendix VI, VI-810, VI – 820, Table VI-821, Mandatory Appendix VII, VII-810, VII-821, VII-862 Revised to change “magnetic” and “ferritic” to “ferromagnetic” and change “nonmagnetic” to “nonferromagnetic”.

**Article 9 - Visual Examination– No Changes in Edition 2017**

**Article 10 – Leak Testing**

**T-1063 Calibration Leak Standards (Revised entirely)**

T-1063.1 Reservoir Leak Standard. This standard leak shall have a reservoir of the tracer gas connected to the leak. The leak standard shall

(a) have a leakage rate in the range and tracer gas species specified by the referencing Code Section or, if not specified, per the Mandatory Appendix.

(b) be calibrated with discharge either to vacuum or to an air environment of 1 atm (101 kPa absolute) to match the test application or instrument type.

T-1063.2 No reservoir Leak Standard. This standard leak does not have an inherent supply of tracer gas. The leak shall
have a leakage rate in the range and tracer gas species specified by the referencing Code Section or, if not specified, per the Mandatory Appendix.

(b) be calibrated with discharge either to vacuum or to an air environment of 1 atm (101 kPa absolute) to match the test application.

(c) be calibrated at a pressure differential across the leak of 1 atm (14.7 psi, 101 kPa) or at a differential that represents the differential to be used in the specific test procedure.

Revised T-1063.1 and T-1063.2 to accommodate changes that have occurred in the technology for the design and manufacture of calibrated standard leaks. In this regard, discussion of the technology of the leak element (permeation vs. capillary) has been deleted from the text. Revised T-1063.1 and T-1063.2 to distinguish between two basic types of calibrated standard leaks, reservoir standard leaks that include an integral reservoir of tracer gas, and non-reservoir standard leaks that do not have an integral reservoir of tracer gas. Revised Article 10, Mandatory Appendices III, IV, V, VIII, IX, and X, paras. xxx-1033 to maintain alignment with the revised T-1063.1 and T-1063.2. Revised Article 10, Mandatory Appendices V and IX, V-1061.2 to maintain alignment with the revised T-1063.1 and T-1063.2.

The above is a brief summary of section V Edition 2017 changes in major NDE methods, which need attention. However, one has to go through the actual code clauses to implement the change in the respective area of working.

Reference: