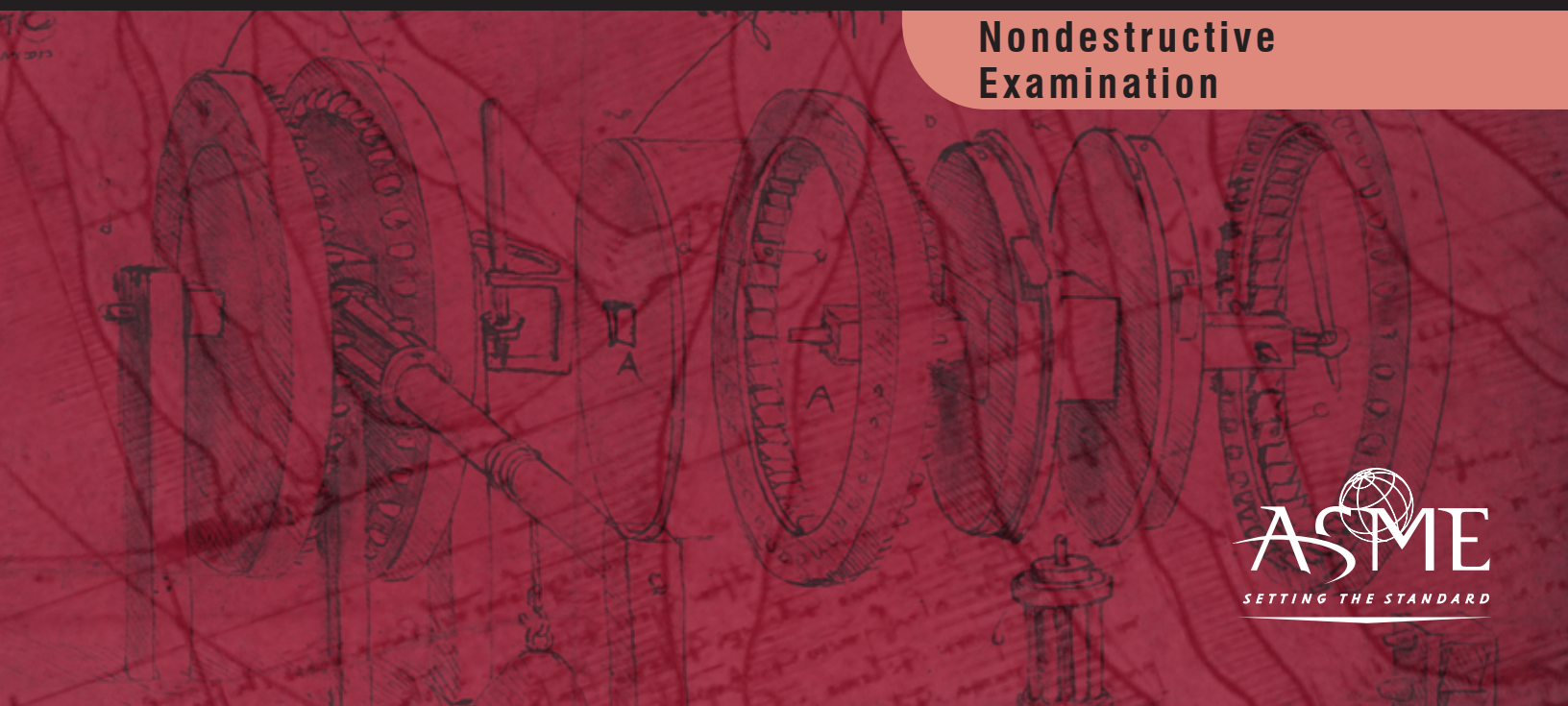
ASME BPVC.V-2023

# SECTION V

# 2023 ASME Boiler and Pressure Vessel Code

An International Code

## Nondestructive Examination



ASME
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# 2023 ASME Boiler & Pressure Vessel Code

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# V
# NONDESTRUCTIVE EXAMINATION

ASME Boiler and Pressure Vessel Committee
on Nondestructive Examination

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# ARTICLE 9
# VISUAL EXAMINATION

## T-910 SCOPE

*(a)* This Article contains methods and requirements for visual examination applicable when specified by a referencing Code Section. Specific visual examination procedures required for every type of examination are not included in this Article, because there are many applications where visual examinations are required. Some examples of these applications include nondestructive examinations, leak testing, in-service examinations and fabrication procedures.

*(b)* The requirements of Article 1, General Requirements, apply when visual examination, in accordance with Article 9, is required by a referencing Code Section.

*(c)* Definitions of terms for visual examination appear in Article 1, Mandatory Appendix I, I-121.6, VT — Visual Examination.

## T-920 GENERAL

### T-921 WRITTEN PROCEDURE REQUIREMENTS

**T-921.1 Requirements.** Visual examinations shall be performed in accordance with a written procedure, which shall, as a minimum, contain the requirements listed in Table T-921. The written procedure shall establish a single value, or range of values, for each requirement.

**T-921.2 Procedure Qualification.** When procedure qualification is specified by the referencing Code Section, a change of a requirement in Table T-921 identified as an essential variable shall require requalification of the written procedure by demonstration. A change of a requirement identified as a nonessential variable does not require requalification of the written procedure. All changes of essential or nonessential variables from those specified within the written procedure shall require revision of, or an addendum to, the written procedure.

**T-921.3 Demonstration.** The procedure shall contain or reference a report of what was used to demonstrate that the examination procedure was adequate. In general, a fine line $^{1}/_{32}$ in. (0.8 mm) or less in width, an artificial imperfection or a simulated condition, located on the surface or a similar surface to that to be examined, may be considered as a method for procedure demonstration. The condition or artificial imperfection should be in the least discernable location on the area surface to be examined to validate the procedure.

### T-922 PERSONNEL REQUIREMENTS

The user of this Article shall be responsible for assigning qualified personnel to perform visual examinations to the requirements of this Article. At the option of the organization, he may maintain one certification for each product, or several separate signed records based on the area or type of work, or both combined. Where impractical to use specialized visual examination personnel, knowledgeable and trained personnel, having limited qualifications, may be used to perform specific examinations, and to sign the report forms. Personnel performing examinations shall be qualified in accordance with requirements of the referencing Code Section.

### T-923 PHYSICAL REQUIREMENTS

Personnel shall have an annual vision test to assure natural or corrected near distance acuity such that they are capable of reading standard J-1 letters on standard Jaeger test type charts for near vision. Equivalent near vision tests are acceptable.

**Table T-921**
**Requirements of a Visual Examination Procedure**

| Requirement (as Applicable) | Essential Variable | Nonessential Variable |
|---|---|---|
| Change in technique used | ... | ... |
| Direct to or from translucent | X | ... |
| Direct to remote | X | ... |
| Remote visual aids | X | ... |
| Personnel performance requirements, when required | ... | X |
| Lighting intensity (decrease only) | X | ... |
| Configurations to be examined and base material product forms (pipe, plate, forgings, etc.) | ... | X |
| Lighting equipment | ... | X |
| Methods or tools used for surface preparation | ... | X |
| Equipment or devices used for a direct technique | ... | X |
| Sequence of examination | ... | X |
| Personnel qualifications | ... | X |

## T-930 EQUIPMENT

Equipment used for visual examination techniques, for example, direct, remote, or translucent, shall have the capabilities as specified in the procedure. Capabilities include, but are not limited to viewing, magnifying, identifying, measuring, and/or recording observations in accordance with requirements of the referencing Code Section.

## T-950 TECHNIQUE

### T-951 APPLICATIONS

Visual examination is generally used to determine such things as the surface condition of the part, alignment of mating surfaces, shape, or evidence of leaking. In addition, visual examination is used to determine a composite material's (translucent laminate) subsurface conditions.

### T-952 DIRECT VISUAL EXAMINATION

Direct visual examination may usually be made when access is sufficient to place the eye within 24 in. (600 mm) of the surface to be examined and at an angle not less than 30 deg to the surface to be examined. Mirrors may be used to improve the angle of vision, and aids such as a magnifying lens may be used to assist examinations. Illumination (natural or supplemental white light) of the examination surface is required for the specific part, component, vessel, or section thereof being examined. The minimum light intensity shall be 100 fc (1 076 lx). The light intensity, natural or supplemental white light source, shall be measured with a white light meter prior to the examination or a verified light source shall be used. Verification of light sources is required to be demonstrated only one time, documented, and maintained on file.

### (23) T-953 REMOTE VISUAL EXAMINATION

In some cases, remote visual examination may have to be substituted for direct examination. Remote visual examination may use visual aids such as mirrors, telescopes, borescopes, fiber optics, cameras, or other suitable instruments. Such systems shall be demonstrated to have a resolution capability and lighting intensity at least equivalent to that obtainable by direct visual observation (e.g., T-921.3; Section XI, Division 1, Table IWA-2211-1; ISO 12233; USAF 1951 Resolution Target).

### T-954 TRANSLUCENT VISUAL EXAMINATION

Translucent visual examination is a supplement of direct visual examination. The method of translucent visual examination uses the aid of artificial lighting, which can be contained in an illuminator that produces directional lighting. The illuminator shall provide light of an intensity that will illuminate and diffuse the light evenly through the area or region under examination. The ambient lighting must be so arranged that there are no surface glares or reflections from the surface under examination and shall be less than the light applied through the area or region under examination. The artificial light source shall have sufficient intensity to permit "candling" any translucent laminate thickness variations.

### T-955 LIGHT METER CALIBRATION

Light meters shall be calibrated at least once a year or whenever they have been repaired. If meters have not been in use for 1 yr or more, they shall be calibrated before they are used.

## T-980 EVALUATION

*(a)* All examinations shall be evaluated in terms of the acceptance standards of the referencing Code Section.

*(b)* An examination checklist shall be used to plan visual examination and to verify that the required visual observations were performed. This checklist establishes minimum examination requirements and does not indicate the maximum examination which the Manufacturer may perform in process.

## T-990 DOCUMENTATION

### T-991 REPORT OF EXAMINATION

*(a)* A written report of the examination shall contain the following information:

*(1)* the date of the examination

*(2)* procedure identification and revision used

*(3)* technique used

*(4)* results of the examination

*(5)* examination personnel identity, and, when required by the referencing Code Section, qualification level

*(6)* identification of the part or component examined

*(b)* Even though dimensions, etc., were recorded in the process of visual examination to aid in the evaluation, there need not be documentation of each viewing or each dimensional check. Documentation shall include all observation and dimensional checks specified by the referencing Code Section.

### T-993 RECORD MAINTENANCE

Records shall be maintained as required by the referencing Code Section.

# 2023 ASME Boiler and Pressure Vessel Code

AN INTERNATIONAL CODE

The ASME Boiler and Pressure Vessel Code (BPVC) is a globally recognized and trusted source of technical requirements and guidance for the design, construction, and certification of boilers, pressure vessels, and nuclear components. With each new edition, the Code continues to evolve, introducing new technologies and processes to promote safety across pressure equipment applications and disciplines. Developed through a rigorous consensus process and fueled by the foresight of leading industry experts from around the world, the ASME BPVC is an ever-evolving set of standards that meets the needs of a changing world.

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