

employer of the personnel being certified, which shall be based on the following minimum requirements:

(A) instruction in the fundamentals of the nondestructive examination method.

(B) on-the-job training to familiarize the NDE personnel with the appearance and interpretation of indications of weld defects. The length of time for such training shall be sufficient to assure adequate assimilation of the knowledge required.

(C) an eye examination performed at least once each year to determine optical capability of NDE personnel to perform the required examinations.

(D) upon completion of (A) and (B) above, the NDE personnel shall be given an oral or written examination and performance examination by the employer to determine if the NDE personnel are qualified to perform the required examinations and interpretation of results.

(E) certified NDE personnel whose work has not included performance of a specific examination method for a period of 1 year or more shall be recertified by successfully completing the examination of (D) above and also passing the visual examination of (C) above. Substantial changes in procedures or equipment shall require recertification of the NDE personnel.

As an alternative to the preceding program, the requirements of ASME Section V, Article 1 may be used for the qualification of NDE personnel. Personnel qualified to AWS QC1 may be used for the visual examination of welds.

136.4 Examination Methods of Welds

- (07) **136.4.1 Nondestructive Examination.** Nondestructive examinations shall be performed in accordance with the requirements of this Chapter. The types and extent of mandatory examinations for pressure welds and welds to pressure retaining components are specified in Table 136.4. For welds other than those covered by Table 136.4, only visual examination is required. Welds requiring nondestructive examination shall comply with the applicable acceptance standards for indications as specified in paras. 136.4.2 through 136.4.6. As a guide, the detection capabilities for the examination method are shown in Table 136.4.1. Welds not requiring examination (i.e., RT, UT, MT, or PT) by this Code or the engineering design shall be judged acceptable if they meet the examination requirements of para. 136.4.2 and the pressure test requirements specified in para. 137. NDE for P-Nos. 3, 4, 5A, and 5B material welds shall be performed after postweld heat treatment unless directed otherwise by engineering design. Required NDE for welds in all other materials may be performed before or after postweld heat treatment.

136.4.2 Visual Examination. Visual examination as defined in para. 100.2 shall be performed in accordance with the methods described in Section V, Article 9, of

the ASME Boiler and Pressure Vessel Code. Visual examinations may be conducted, as necessary, during the fabrication and erection of piping components to provide verification that the design and WPS requirements are being met. In addition, visual examination shall be performed to verify that all completed welds in pipe and piping components comply with the acceptance standards specified in (A) below or with the limitations on imperfections specified in the material specification under which the pipe or component was furnished.

(A) *Acceptance Standards.* The following indications are unacceptable:

(A.1) cracks — external surface.

(A.2) undercut on surface which is greater than $\frac{1}{32}$ in. (1.0 mm) deep.

(A.3) weld reinforcement greater than specified in Table 127.4.2.

(A.4) lack of fusion on surface.

(A.5) incomplete penetration (applies only when inside surface is readily accessible).

(A.6) any other linear indications greater than $\frac{3}{16}$ in. (5.0 mm) long.

(A.7) surface porosity with rounded indications having dimensions greater than $\frac{3}{16}$ in. (5.0 mm) or four or more rounded indications separated by $\frac{1}{16}$ in. (2.0 mm) or less edge to edge in any direction. Rounded indications are indications which are circular or elliptical with their length less than three times their width.

136.4.3 Magnetic Particle Examination. Whenever required by this Chapter (see Table 136.4), magnetic particle examination shall be performed in accordance with the methods of Article 7, Section V, of the ASME Boiler and Pressure Vessel Code.

(A) *Evaluation of Indications*

(A.1) Mechanical discontinuities at the surface will be indicated by the retention of the examination medium. All indications are not necessarily defects; however, certain metallurgical discontinuities and magnetic permeability variations may produce similar indications which are not relevant to the detection of unacceptable discontinuities.

(A.2) Any indication which is believed to be nonrelevant shall be reexamined to verify whether or not actual defects are present. Surface conditioning may precede the reexamination. Nonrelevant indications which would mask indications of defects are unacceptable.

(A.3) Relevant indications are those which result from unacceptable mechanical discontinuities. Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications which are circular or elliptical with the length less than three times the width.

(A.4) An indication of a discontinuity may be larger than the discontinuity that causes it; however, the size of the indication and not the size of the discontinuity is the basis of acceptance or rejection.