A Review of the Changes to the ASME Section IX A93 Addenda

By Walter J. Sperko

The following is a summary of the changes that appear in the 1993 addenda to ASME Section IX that were issued in January and will become mandatory in June 1994.

Procedure Qualifications Using Fillet Weld Assemblies

A new paragraph was added to QW-181 to allow use of production weld mock-ups using any product form for procedure qualification for fillet welds. The previous rules provided only for qualification using plate.

Users of Section IX should keep in mind that procedure (and welder) qualification may be done using fillet welds. Fillet weld procedure qualification can be done simply by making a mock-up, cross-sectioning and etching the weld, visually examining the cross-sections and measuring and recording the weld leg and throat sizes. Keep in mind that procedure qualification made using fillet weld test coupons are permitted for use on nonpressure-retaining fillet welds only.

Welding Procedures and Procedure Qualification

The latest editions of SFA 5.1, SFA 5.5, SFA 5.17 and SFA 5.23, which cover SMAW and SAW electrodes, wires and fluxes, add "supplemental designators" covering diffusible hydrogen levels and moisture resistance. For example, E7018 is now available with E7018R (moisture-resistant coating), E7018-H4, E7018-H8 and E7018-H16 (diffusible hydrogen) supplemental designators, in addition to the old designators of E7018M and E7018-1 (improved impact properties). QW-404.33, a nonessential variable for SMAW and SAW, which requires that the welding engineer specify the AWS classification of the welding electrode or filler metal in the WPS, was revised to discuss these supplemental designators. It states that the supplemental designators do not have to be addressed in the WPS unless the welding engineer chooses to specify them; however, if these supplemental designators are specified in the WPS, electrodes and wire-flux combinations that meet the supplemental designator requirements must be used.

A related variable, QW-404.12, which is only of concern when the WPS will be used for welding impact-tested metals, has also been revised to address these supplemental designators. This variable permits the use of only the specific AWS classification of filler metal or electrode that was used during procedure qualification. As revised, the variable recognizes that the diffusible hydrogen and moisture-resistant coating indicators are not part of the AWS classification, and therefore, these supplemental designators may be added, changed or deleted in the WPS by a simple revision of the WPS without requalification. The indicators for improved impact properties (–1 and M), however, are considered part of the AWS classification, and only the AWS classification that was qualified, including the indicator for improved impact properties that was used during qualification, may be specified in the WPS. The revision does, however, allow electrode classifications with improved properties over that qualified to be used without requalification. In addition, changes in coating types among the various low-hydrogen types, and also changes in the position usability designation for flux cored electrodes, do not require requalification.

The essential variable QW-408.9, which concerns backing gas for nickel, titanium, zirconium and several low-interstitial high-chromium steels, previously required that purge gas flow rates be qualified within ±15% of what was to be used in production. This was determined to be unreasonably restrictive, since changes in pipe size required changes in backing gas flow rates of more than ±15%, to work properly. The new variable requires requalification only when the backing gas is changed from inert to noninert or if the backing gas is deleted.

Several supplemental variables, *i.e.*, those that are uniquely invoked for procedure qualifications for welding impact-tested materials, have been changed to address changes in impact properties when welds are subjected to normalizing or austenizing heat treatment. When weldments are heat treated above the upper transformation temperature (about 1600°F) and when stainless steel and nickel-alloy welds are solution heat treated (above 1900°F), the strength and toughness of the welds become fully dependent on the chemical analysis of the weld metals rather than on the cast substructure of the welds. This means that the heat input, interpass temperature, postweld heat treatment time, progression, and thickness of the base metal do not influence the impact properties of the weld metal. Recognizing this, variables QW-403.6, QW-404.7, QW-405.2 and QW-409.1 were modified so that they do not have to be considered when the weld will be heat treated above the upper transformation temperature or when stainless steels or nickel alloys will be solution heat treated.

Welder and Welding Operator Qualification

A subtle editorial revision was made to the welder qualification groove weld diameter limits in Table QW-452.3. This table was revised in the 1992 addenda to clarify that welders who demonstrated the ability to weld small-

Walter J. Sperko is a welding engineering consultant at Sperko Engineering Services, Inc., Greensboro, N.C.; and a member of the ASME Subcommittee IX. This summary represents the author's interpretations and may not be those of ASME. The author can be reached for comment at (910) 674-0600; FAX (910) 674-0202.

diameter pipe could weld larger diameters of pipe and also plate without requalification. In the first column of the table (size of the test coupon pipe), the words "and over" were added to the 2⅞-in. outside-diameter line, making it clear that the line applies to all pipe of 2⅞-in. outside diameter and greater, not just to test coupons that have a 2⅞-in. outside diameter. This revision is considered editorial, which means that it was always intended that any pipe size 2⅞-in. and over could be used. Since the change is editorial, readers do not have to be concerned about welders who qualified on larger pipe sizes under the 1992 addenda rules, since editorial changes to Code rules are retroactive.

An extension of the "Special Position" qualification limits for welders was made in Table QW-461.9 to allow welders who qualified in any "special position" (*i.e.*, a position other than 1G, 3G, 4G, 6G, etc.) to be qualified in that special position and, as the result of the change, also in the flat position.

QW-322, which specifies how to renew a welder's qualification after it has expired, was expanded to make it clear that renewal of qualification may be done on production work as well as on test coupons. This was always intended, and the change simply confirms it.

Brazing Section

In the Brazing Section, QB-406.1 was changed to require requalification of the brazing procedure if flux was deleted or added to the process. The previous version only specified that the requalification was required if the chemical composition of the flux changed.

Inquiries of Interest

In the 1990 addenda to Section IX, footnotes were added to Table QW-452.1 that required that welder qualification test coupons be visually examined for penetration and fusion before mechanical testing. These requirements were moved from that table to the body of Section IX in the 1992 addenda, and a line was added to the Welder Qualification Form, QW-484, to encourage documentation of this examination. A Code user asked if it was necessary to document the required visual examination of welder test coupons for penetration and fusion prior to the 1992 changes. The reply was that the visual examination did not have to be documented on the Welder Qualification Record for tests made during the interim from July 1991 to July 1993, even though the visual examination was a code requirement during that time. The rationale for this reply was that this new and significant requirement was not obvious to the user as a footnote to a table. Now, since there is a space on the form and it is addressed in other Code paragraphs, it is expected that the visual examination will be performed and documented.

A number of requests were received to retract the major change in the 1991 addenda where P-5 metals were subdivided into P-5A, P-5B and P-5C, each requiring a separate qualification. This change was made because a wide variety of new materials were added to P-5 over the course of the last 25 years. The new P-5 assignments make 2¼ and 3% chromium-type steels: P-5A; 5, 7 and 9% chromium steels: P-5B; and metals of either composition, but having properties enhanced by heat treatment (normalizing, quenching and tempering, or similar processing): P-5C. Subcommittee IX decided to retain these requirements, while stating that it is not necessary to revise or requalify WPSs that were qualified before the introduction of the P-5A, P-5B and P-5C designations.

Although Code users may revise WPSs and PQRs to reflect the revisions, the only time the new rules must be followed is when a new qualification test is made. This is addressed in QW-100.3, paragraphs 5 and 6.

Future Improvements to Section IX

Section IX presently has three tables that assign P numbers to metals: QW-422, Welding P Numbers; QB-422, Brazing P Numbers; and Appendix C, Welding and Brazing P Numbers for Non-Boiler Code Metals. A revision is in process that will consolidate these three tables into one. The table will be organized in numerical sequence by ASTM or ASME material specification number, type and grade, or UNS number. This should make the determination of a P number much easier. A nonmandatory appendix will be added listing materials by P number so that it will be easier to determine alternate materials that may be used for qualification purposes.

Tables QW-415, QB-415, QW-416 and QB-416 will be dropped from Section IX. These tables summarize the variables for each welding or brazing process for both procedures and performance in a single table. These tables were originally developed as a quick cross-reference for the convenience of the Subcommittee. As published tables, they were regularly found to be out of date and at variance with the official variables published in QW-250, QB-250, QW-350 and QB-350. Code users should be aware that the real variables that must be followed are presented in the QW-400 paragraph referred to in the tables in QW-250, QB-250, QW-350 and QB-350. The "Brief of Variables" column should be used only as a shorthand reference for those who are intimate with the actual variables that are found in QW-400 or QB-400. ♦

AWS Brazing and Soldering Committee Names Officers

Charles M. Norlin, sales manager for Cybertech International, was elected chairman of the AWS Brazing and Soldering Committee. Elected vice chairman was Roger Cooke, industrial sales manager for Wilkinson Co. Dr. Yehuda Baskin, president and technical director of Superior Flux and Manufacturing Co., was appointed second vice chairman.

For more information on the AWS Brazing and Soldering Committee, contact the AWS Technical Department, 550 N.W. LeJeune Rd., Miami, FL 33126; (800) 443-9353; FAX (305) 443-7559. ♦