



Tech Topics

Summary of Changes to ASME Section IX

By Walter J. Sperko, P.E.

The following is a summary of the changes that will appear in the 1995 addenda to ASME Section IX. The changes will be issued this month and become mandatory in July 1996.

Base Materials

ASME Code Goes International

There is an effort by ASME to make its *Boiler and Pressure Vessel Code* and other engineering standards more international. Use of metric units is the most common change that will eventually occur, but another significant change will be the incorporation of non-ASTM standards into Section II. This process has already started with Canadian (CSA) materials specifications. This means that, eventually, many materials that are not currently assigned P-numbers will be assigned P-numbers by Section IX. Although the administrative details of this change in ASME philosophy are found in the Foreword to Section IX, no non-ASTM materials have been incorporated via these addenda.

Those who have worked with the new format tables of P- and S-numbers (QW/QB-422) may have noticed that the new table has a column for S-numbers, but no S-numbers are shown. This printing error will be corrected in the 1995 addenda. The S-numbers shown in the previous (1993) addenda are still valid and should be used by anyone who will be using S-number materials for construction.

The 1995 addenda show many changes in QW/QB-422, but the vast majority are editorial in nature, such as correction of chemical analysis, tensile strength and product form. Some new materials, however, have been added.

Welding Procedure Qualification Changes 'Brief of Variables'

Some Code users interpret the words and symbols in the "Brief of Variables" column in the tables in QW-250 as the essential, nonessential or supplementary essential variables for a particular weld-

ing process. The real variables, however, are the paragraphs shown in the column "Paragraph" in these tables. Because of inquiries, a clarification has been added to QW-251.1, advising Code users that the "Brief of Variables" is only for reference, and that the complete variable which must be followed is found in Article IV (*i.e.*, the QW-400 section).

Partial Penetration Repair and Buildup

Changes in QW-202.2(b) and QW-203(b), which deal with qualification of partial penetration groove welds, repair welds and weld buildup, make it clear that there is no upper limit on base metal thickness for partial penetration welds, repair welds and weld buildup when the qualification test was made using 1.5-in.-thick or thicker material.

Supplementary Essential Variables

Another change that was made in response to inquiries was the addition of a phrase in QW-251.2 regarding supplementary essential variables. This phrase clarifies the concept that supplementary essential variables are variables that have to be addressed after all relevant essential variables have been satisfied; that is, some supplemental essential variables, such as QW-403.5, have been interpreted as providing relaxation of the conditions imposed by essential variables. It has always been the intent of the Subcommittee that the essential variables have to be satisfied before the further limits of the supplementary essential variables are applied.

Laser Beam Welding

Rules for hardfacing and corrosion-resistant weld metal cladding using laser beam welding have been added. In addition, there has been clarification in what has to be controlled and measured relative to beam power when laser beam

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welding. The previous words required control of wattage without specifying where or how that wattage was to be measured. The revised QW 409.21 requires that power delivered to a calorimeter or similar device be measured and controlled rather than "wattage," and that the ratio of the beam diameter to focal length be controlled to $\pm 2\%$.

Base Metal Interchangeability

Table QW-424 has been tightened in the sixth line to specifically permit a procedure qualification using P-5A welded to any lower P-number metal to support a WPS for welding P-5A to all lower P-numbers, and it permits a procedure qualification using P-4 welded to any lower P-number metal to support a WPS for welding P-4 to all lower P-numbers. The previous paragraph could readily be interpreted to permit combinations of higher and lower P-number qualifications to support WPSs for many combinations of P-numbers beyond those which the paragraph was intended to support.

Welder Qualification Changes Visual Examination of Welds

There is an editorial change in QW-190 that deals with visual examination of welder test coupons that may cause some confusion. In the last several addenda, QW-190 has covered the acceptance criteria for visual examination of welder test coupons. In this addenda, the acceptance criteria have been removed from paragraph QW-190 and relocated to QW-194. Appropriate changes in the references to this new paragraph have been made in QW-302.4. We mention this change so that Code users do not think that the requirement to perform visual examination of welder test coupons has been dropped from the Code.

Copper-Nickel (Cu-Ni) Alloys

As a result of changes to Tables QW-423, the use of carbon steel test coupons will be permitted for qualification of welders who will be welding Cu-Ni alloys. In permitting this, the Code recognizes that much Cu-Ni welding will be done using Monel ENiCu-7 filler metal or electrode, which is nickel based. When this is done, the worker may weld the test coupon using carbon steel rather than Cu-Ni for the test coupon. In addition, a welder qualified using any nickel-alloy filler metal, F-41-F-45, may also weld using an F-34 (Cu-Ni type) filler metal. These practices are permitted because the Subcommittee believed that the skill required when welding using any nickel-alloy electrode or filler metal is not significantly different from that

required to weld using Cu-Ni-type electrodes.

Qualification Using F-5 Electrodes

A change was made to QW-433 which allows welders who have qualified using F-5 stainless steel SMAW electrodes to also weld using F-1 electrodes which are both carbon steel and stainless steel. This change is the result of the addition of the EXXX-26 and EXXX-27 electrodes to SFA 5.4, and their classification as F-1 due to their "drag" (similar to E7024) operating characteristics. The old rule of thumb that welders who were going to weld using SMAW stainless steel electrodes had to qualify using stainless steel electrodes is no longer accurate.

Inquiries

1) Inquiry IX 95-12 deals with the purity level of shielding gas. It points out that it is not necessary to indicate a percentage composition of shielding gas or a purity level when the gas used is a single gas rather than mixed gases. For example, WPSs for GTAW frequently specify "100% argon," which is prohibitively expensive. Alternatively, one could specify: 1) 99.995% minimum argon; 2) welding grade argon; 3) argon. The last choice, argon, is acceptable since the code does not require a percentage or purity when using a single shielding gas.

2) Inquiry IX-95-14 deals with QW-300.3, which provides rules for qualification of many welders simultaneously by many contractors at one time, also known as mass qualification. This inquiry was an attempt by a third party to have all contractors who would be involved in mass qualification hire that third party to conduct welder tests in their name. The inquiry asks if there is any circumstance under which a non-employee person or organization can represent one or more contractors during testing of welders when a "mass" qualification is being conducted; the answer was "No."

This response is consistent with the philosophy of Section IX that each manufacturer or contractor is required to provide supervision and control during testing of welders not only to demonstrate the ability of the welder to deposit sound weld metal (QW-301.1), but also to demonstrate that the manufacturer or contractor has the technical and administrative ability to follow his own welding procedures, and that they "are capable of developing the minimum requirements specified for an acceptable weldment" (QW-300.2). If this activity is delegated to another party or organization,

the manufacturer or contractor does not demonstrate his ability to control the manufacturing process of welding; QW-300.2 also specifically prohibits such delegation.

In the writer's opinion, the test supervisor who will provide "supervision and control" as required by Section IX should be capable of identifying and verifying the following during testing of welders and welding operators:

- The identity of the person welding the test coupon.

- Welding or brazing process to be used (SMAW, GMAW, TB, etc.) and whether it is manual, semiautomatic, machine, or automatic.

- The identification number, revision and date of the WPS to be followed.

- Pipe size and the schedule or thickness of material making up the test coupon, (e.g., NPS 2, Schedule 80, NPS 6, 0.432 wall, 1/4-in.-thick plate, etc.)

- Test coupon specification, type and grade (SA-106 Gr. B, SA-53, Gr. B, A-36, etc.).

- Position of test coupon (6G, 2G, 5G, 1G, etc.) and marking of where the top-center is if mechanical testing will be done.

- Whether the joint is welded from one or both sides. If welded from one side (normal for pipe welds), whether a backing ring or no backing is used.

- Whether or not gas backing is used (only applicable for GTAW and GMAW when welding is done from one side of the groove without a backing ring, as in a typical pipe weld).

- The electrode(s) or filler metal that will be used. For GTA and PA, whether welding of the root pass is done adding filler metal, using a consumable insert, or welding autogenously (*i.e.*, tight butt).

- For GTAW, the current type and polarity (based on machine connections).

- For GMAW, the transfer mode (based on welding parameters used).

- The direction of progression (uphill or downhill) that the welder will use. This may be different for the root pass and for the fill passes.

During welding, the supervisor should observe that processes and electrode types are used in the correct sequence; record the approximate thickness of the weld metal deposited with each process or electrode type on the test coupon; observe that the test coupon is not moved from its preset position; observe that the amps and volts are within the range specified on the WPS.

The supervisor should visually examine the completed coupons' weld surfaces for cracks, incomplete fusion and,

when the weld has been made from one side without backing, incomplete penetration in the root or evidence of grinding of the root side weld metal. Test coupons exhibiting these conditions should be rejected. The supervisor should also examine for porosity, undercut, reinforcement and slag; coupons exhibiting these conditions may be rejected if the supervisor determines that these conditions are excessive. After completion of physical or radiographic testing, the supervisor should complete the qualification record, such as QW-484.

An organization whose test supervisor does the above when testing a welder is providing supervision and control and also demonstrating that that organization has some technical competence in welding technology and also the ability to administratively control welding as a manufacturing process.

Comments on Letters to the Editor

In my previous update (April, 1995), I provided some insight into the reasons that Subcommittee IX requires that each manufacturer or contractor is required to qualify his own welders and procedures. That discussion prompted at least two letters to the *Welding Journal's* Editor questioning the validity of continuing this requirement and exhorting ASME to consider adoption of "Standard WPSs" in lieu of the current requirements. To those who participate in ASME activities, consideration of adopting "Standard WPSs" is nothing new; in fact, ASME assigned a task group in 1990 to examine the possibility of adoption of AWS's Standard Welding Procedure Specifications (AWS B2.1-X-X series) by the ASME *Boiler and Pressure Vessel Code*. The conclusion of that task group was that adoption was feasible, but that several administrative matters had to be addressed.

One of those administrative matters was that there were not a sufficient number of WPSs to justify the effort; that has been resolved during the last year.

Another administrative matter is establishing the in-house procedures and/or quality system aspects that the manufacturer or contractor should possess to properly use standard WPSs — something that would demonstrate that the manufacturer or contractor had some reasonable level of technical competence in controlling welding as a manufacturing process since that would not be done through qualification anymore. There is a task group presently assigned to work on this. In establishing a replacement for qualification by each

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manufacturer or contractor, the Committee must recognize that simply demonstrating competence and control to the satisfaction of an ASME survey team will not be adequate since the majority of use of Section IX is outside the formal quality system and audit required for ASME Boiler and Pressure Vessel Code construction. Since ASME Section IX is recognized as the premiere welding code not only in the U.S.A. but

worldwide, adoption of standard WPS without some provisions to ensure that those who use them know enough about welding to implement them properly would damage the reputation not only of Section IX, but also of the Boiler and Pressure Vessel Code.

Another unresolved administrative matter is that WPSs are documents that are used directly for construction, and that, if adopted, ASME would be providing much more detailed manu-

facturing instruction and direction than it ever has in the past. Providing such detailed instructions will, doubtless, leave ASME open to broader liability in the event of a weld failure, and ASME needs to determine whether or not such risks are acceptable. Such liability exposure adds more motivation to being sure that those who use Standard WPSs know something about welding and have the wherewithal to control it properly as a manufacturing operation. ♦



Standards Notices

AWS was approved as an accredited standards-preparing organization by the American National Standards Institute (ANSI) in 1979. AWS rules, as approved by ANSI, require that all standards be open to public review for comments during the approval process. This column also advises of ANSI approval of documents.

The following document is submitted for public review. Review copies may be obtained by sending remittance for the amount shown to AWS Technical Dept., 550 N.W. LeJeune Rd., Miami, FL 33126.

Deadline for Receipt of Comments: February 29, 1996

ANSI/AWS A5.28-96, *Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Metal Arc Welding*. Revised Standard — \$7.75.

Standard Approved by ANSI
ANSI/AWS D10.13-95, *Recommended Practices for the Brazing of Copper Pipe and Tubing for Medical Gas Systems*. Approval date: October 16, 1995.

Technical Committee Calendar

All AWS technical committee meetings are open to the public. Persons wishing to attend a meeting should contact the staff secretary of the committee as listed below at: AWS, 550 N.W. LeJeune Rd., Miami, FL 33126; (305) 443-9353, ext. 340; FAX (305) 443-7559.

Jan. 8-10, D14H Subcommittee on Surfacing, Cleveland, Ohio. Standards preparation. Staff contact: C. B. Pollock.

Jan. 10-14, D15A Subcommittee on Cars and Their materials, Pittsburgh, Pa. Standards preparation. Staff contact: C. B. Pollock.

Feb. 8-10, D15D Subcommittee on Qualification — Inspection and Testing, Houston, Tex. Standards preparation. Staff contact: C. B. Pollock.

Feb. 13-15, B2 Committee on Procedure and Performance Qualification, Pittsburgh, Pa. General meeting. Staff contact: L. P. Connor.

Feb. 19-22, G1 Committee on Joining of Plastics and Composites, Orlando, Fla. General meeting. Staff contact: D. B. Rohm.

Feb. 21-25, C3 Committee on Brazing and Soldering, Albuquerque, N.Mex. General meeting. Staff contact: C. B. Pollock. ♦

Notes: A "standards preparation" meeting's primary purpose is to work on a specific document. A "general meeting" means no work is contemplated on a specific standard. The committee's standards may be reviewed or discussed, but no formal action is expected.

The AWS Foundation 'On the Campaign Trail'

Fund-raising, just like any other activity, is most successful when it's planned and organized. The most common way that direct fund-raising attempts are structured, are through campaigns.

Webster's Dictionary defines a campaign as "a connected series of operations designed to bring about a particular result."

Models for campaigns can be used for small efforts, as well as large endeavors. It doesn't matter if it's an annual program, an intensive capital campaign or an endowment program, the same basic organizational principles apply.

The AWS Foundation currently promotes two fund-raising programs: 1) an annual support campaign; and 2) Campaign: 1000. Both activities are designated for different reasons to accomplish different goals.

The purpose of the Annual Support Campaign is to establish an effort on a yearly basis to maintain educational programs. Since the needs of the educational programs are ongoing, the funding needs are ongoing. Our goal is more short term in nature.

The purpose for Campaign: 1000 is to build the endowment of the District Scholarship Program. The goal is to raise \$1 million by obtaining 1000 gifts

of \$1000 each; hence, the name Campaign: 1000. The campaign addresses long-term needs, and usually will have a longer duration. To date, nearly \$30,000 of unrestricted funding has been received toward this goal.

Three AWS Sections are currently working in partnership with the AWS Foundation in conducting their own fund-raising campaigns in order to establish their own local scholarship programs. The activity will be evaluated in the spring and, hopefully, made available for other interested Sections by the fall of 1996.

For more information about becoming involved in a partnership campaign for your Section, contact Kathy Schunk, Director of Development, AWS Foundation, Inc., 550 N.W. LeJeune Rd., Miami, FL 33126; (305) 445-6628; FAX (305) 443-7559. ♦