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 comment during the approval process. This column also advises of ANSI approval of documents.

The following revised standards are submitted for public review. A copy may be obtained by sending the amount shown to AWS Technical Dept., 550 N.W. LeJeune Rd., Miami, FL 33126.

Deadline for Receipt of Comments: April 29, 1997

ANSI/AWS C7.2-9X, *Recommended Practices for Laser Beam Welding, Cutting, and Drilling*. Revised Standard $35.75

Revised AWS Standards Approved by ANSI

ANSI/AWS D14.4-97, *Specification for Welded Joints in Machinery and Equipment*. Approval Date: January 14, 1997.

Technical Committee Meetings

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, telephone (305) 443-9353.

March 2, A5X Executive Subcommittee. Lake Buena Vista, Fla. General meeting. Staff contact: H. M. Woodward

March 3-4, A5 Committee on Filler Metal. Lake Buena Vista, Fla. General meeting. Staff contact: H. M. Woodward

March 4-6, B2 Committee on Procedure and Performance Qualification. Lake Buena Vista, Fla. General meeting. Staff contact: H. M. Woodward

March 5, A5A Subcommittee on Carbon and Low Alloy Steel Electrodes and Rods for Shielded Metal Arc and Oxyfuel Gas Welding. Lake Buena Vista, Fla. Standard preparation meeting. Staff contact: H. M. Woodward

March 11-14, D1 Committee on Structural Welding. Phoenix, Ariz. General meeting. Staff contact: H. H. Campbell, III

March 20-21, D3D Subcommittee on Underwater Cutting. New Orleans, La. Standard preparation meeting. Staff contact: L. P. Connor.

Notes: A "standard 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.

Tech Topics

ASME Section IX, A96 — New Developments

The following is a summary of the changes that will appear in the 1996 addenda to ASME Section IX. These changes and related discussion are reported by Walter J. Sperko, P.E., vice-chairman of Subcommittee IX. Readers are advised that the opinions expressed in this article are those of Mr. Sperko and not the official opinion of Subcommittee IX.

Base Materials

Welding Procedure Qualification Changes

According to paragraph QW-203, when a PQR shows that a groove weld test coupon was welded in any position (1G, 3G, 5G, etc.), the Welding Engineer may write the WPS to permit welding in all positions. This is true except when impact testing is involved.

QW-203 does, however, impose some additional limitations on allowing the WPS to be written for any position. First is that the process must be compatible with the positions permitted in the WPS. This would mean that submerged arc welding in the overhead position would not be permitted unless the Welding Engineer specified anti-gravity flux.

Second is that QW-203 requires that the electrodes and filler metals, as defined in Section II, Part C, (*i.e.*, the SFA Specifications) must be suitable for use in the positions specified. For example, E7024 would be limited to groove welding in the flat position and fillet welding in the flat and horizontal positions.

The second part of these limitations has caused some Code users difficulty. In particular, some SFA specifications specify that SMAW electrodes larger than $\frac{5}{16}$ in. diameter are not designated for use in all positions, when, in fact, a fabricator of heavy plate may be perfectly capable of welding with $\frac{3}{32}$ or $\frac{1}{4}$ in. diameter electrodes vertically or horizontally. Accordingly, QW-203 has been revised to delete the reference to the SFA specifications, leaving it up to the Welding Engineer's good engineering judgment to specify the appropriate positions in the WPS.

Paragraph QW-211 has been editorially revised to make it clearer that Section IX does not specify the test coupon dimensions or groove design, except to say that the coupon needs to be big enough to remove the required specimens.

In a similar note, QW-212 has been revised to delete the requirement that the test coupon groove design be "one proposed for construction." Since procedure qualification is a demonstration of the properties of the weldment, not the skill of the welder, the groove design used on a test coupon may be significantly different from that used in construction for the common welding processes. Accordingly, the most efficient groove design to use for a test coupon is a double V-groove since it requires less weld metal, is easier to weld soundly and produces less distortion than a groove welded from one side.

In hardfacing using GTAW or PAW, QW-404.14 was added; this means that it is now required that a procedure be qualified separately if welding is done with filler metal added or without filler metal added.

The qualification requirements for WPSs that are used for welding impact tested materials have been clarified for situations where impact testing of the WPS is required, but impact testing of either the heat-affected zone (HAZ) or of the weld metal is exempted by the Code construction Section (*i.e.*, Section I, Section III, Section VIII, etc.). QW-403.5, which deals with Group Numbers, no longer has to be addressed when impact testing of the HAZ is exempted, and QW-404.12 and QW-404.35, which limits filler metal classifications to those which were used during qualification, no longer applies when impact testing of the weld metal is exempted.

QW-408.2 has been revised, but its technical content has not been changed. The new version says that a separate PQR is required for each of the following conditions:

(a) a change from a single shielding gas to any other single shielding gas;
(b) a change from a single shielding gas to a mixture of gasses, and vice-versa;
(c) a change in the specified percentage composition of a mixture of shielding gasses;
(d) the addition or omission of shielding gas.

The Subcommittee hopes that this is easier to understand than the previous version in which all the conditions ran together in continuous text.

A minor change has been made in QW-442, which is the A-number table. For A-1 steels, the maximum carbon content was raised from 0.15% to 0.20%. This change was made at the request of a major electrode supplier who advised that one of his most popular E6010 electrodes frequently exhibited carbon contents of 0.17/0.18%, and that reducing the carbon degraded the electrode's operating characteristics. After due consideration of the increased hardenability resulting from permitting a higher carbon content, this change was considered and accepted.

Another issue related to chemical analysis was clarified in QW-453, which covers test coupons, testing and ranges qualified for corrosion-resistant and hardfacing weld metal cladding. Previously, a chemical analysis of the weld deposit was always required by note (9) of QW-453 for both corrosion resistant and hardfacing cladding. This revision changed note (9) to require that chemical analysis be performed on the weld metal only when a chemical analysis is specified in the WPS.

The nonobvious difference is that chemical analysis of the weld deposit is no longer automatically required for corrosion-resistant and hardfacing weld metal cladding. The Welding Engineer may simply specify that the welding electrode be E310, ENiCrMo-3, Stellite 6 or some other electrode or filler metal which he knows will result in an adequately corrosion-resistant or hardened surface. Chemical analysis of the test coupon weld deposit is, however, required if the Welding Engineer specifies in the WPS that the resulting weld metal shall have some defined chemical analysis.

The Welding Engineer may specify chemical analysis of the weld metal for any element or group of elements that he chooses to specify, and he may also specify the ranges of analysis for those elements; these decisions are based on the application and the Welding Engineer's education, experience and engineering judgment. In addition, the required chemical analysis is frequently dictated by the end user. There is no requirement that the chemical analysis of the weld deposit conform to the requirements for the weld deposit as shown in any filler metal specification.

Some clarification has been made in QW-420 regarding S-numbers. S-numbers, as readers will recall from previous articles, are assigned to materials which are found in the ASME B31 *Code for Pressure Piping* and in ASME *Boiler Code* Cases, but are not fully recognized as ASME materials; ASME policy prohibits these materials from being assigned P-numbers. Many ASTM materials and API materials are assigned S-numbers.

The benefit to having materials assigned S-numbers is that they are almost the same as having the materials assigned P-numbers. In procedure qualification, if a P-number material is used for the test coupon, all metals with the same P-number and also with the same S-number may be welded. The previous words in Section IX said nothing about when S-number materials were used in test coupons. This addenda will allow procedure qualifications performed using S-number materials to support welding on materials assigned the same S-number, but not on materials assigned the same P-number. It is a far, far better thing to weld test coupons using materials assigned P-numbers than materials assigned S-numbers.

In contrast to the above, welders qualified using either P-number or S-number metals for their test coupons may weld both materials assigned to the same P-number and materials assigned to the same S-number. See QW-423 for even more allowances.

The 1996 addenda shows many changes in QW/QB-422 (P/S-number table), but the vast majority of those changes are editorial in nature, such as correction of chemical analysis, tensile strength and product form. Some new materials, however, have been added, most notably various grades of pipe fittings conforming to MSS SP-75 made from and matching various grades of high-strength API 5L pipe.

Welder Qualification Changes

In this Addenda, SFA 5.22 will add a new classification for stainless steel flux cored wire, EXXXT-5, which is suitable only for use with GTAW. The intended use is as a replacement of backing (purge) gas for open-root welding on piping.

Since GTA welding using a flux cored wire is significantly different from welding with solid wire, QW-404.23 has been added to the GTAW and PAW variables for welder qualification. As a result, welders who change from solid or metal-cored wire to flux cored wire will now require separate qualifications when using GTAW or PAW. This variable has been added to the recommended form QW-484.

Brazing

There have been one significant and several minor changes in the brazing rules. The minor changes are a clarification of QB-402.1 and QB-402.2. These variables now specify that a procedure or brazer must be requalified when a change is made from a base metal listed under one P-number listed in QW/QB-422 to any of the following:

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(a) an alloy listed under another P-number
(b) a base metal not listed in QW/QB-422;
(c) as permitted in QW-420.2 (for S-numbers).

The major change occurred with the addition of QB-408.4 to procedure qualification. This new variable specifies that, if the overlap length in a socket or lap joint is decreased to less than the overlap length that was used during qualification, the BPS needs to be requalified. This means that, if a BPS is qualified using an overlap of 1 in. during qualification, 1 in. is the minimum overlap permitted during production.

The rational for this change is that the only other variable that addressed overlap length, QB-408.1, allowed the overlap to be increased by up to 25% over that qualified, but it did not limit the minimum overlap. In brazing of lap and socket joints, the overlap length has a very significant effect on joint strength — too little overlap, and the joint will fail through the braze metal.

It should be noted that QB-408.1 still applies. This means that brazed joints are limited to overlap lengths not less than that qualified and not more than 25% greater than that qualified. The best approach to covering a wide range of overlaps would be to qualify the minimum overlap that is needed and the maximum overlap in separate coupons; all overlap lengths in between would, as a result, be qualified.

General Items

One of the provisions of Section IX that many Code users do not understand or find confusing is that the changes to Section IX only apply to new qualifications. According to QW-100.3, it is not a requirement that, when new variables are added to the Code, that all old qualifications related to the change be revised and updated. Qualifications that met the requirements of Section IX on the date that the qualification test coupon was welded, even as far back as 1962, may be used in construction to any later edition and addenda of the Code.

For example, updating of old PQRs was not required due to the division of P-5 into P-5A, P-5B and P-5C several years ago, and updating of existing welder qualifications is not required to the change discussed above in dealing with use of flux cored wire in GTAW and PAW.

One word of caution on this matter is that the construction Section rules supersede the rules of Section IX. This means that, when Section VIII revised its impact testing rules, and those changes affected how welding procedure qualification was done, the requirements of the edition and addenda of Section VIII relative to qualification of impact-tested welding procedures applicable to the specific contract have to be met.

Inquiries

There are a couple of inquiries of interest in this addenda. Both deal with one company purchasing another and using PQRs qualified by the other.

The first question asked if company A purchased Company B, could Company A write WPSs using Company B's PQRs. The reply was "yes."

The second question asked if Company A purchased Company B and changed its name to C. The new Company C continued to use the WPSs and PQRs previously qualified and new ones qualified by company C, but, after some time, Company C was split and presently operates as two companies, but both are owned by the original Company A. May both companies continue to use the WPSs and PQRs qualified by Company C. The reply was "yes."

There have been eight to ten inquiries of this nature that have been considered by the Subcommittee during the last two years. There are several schools of thought on the life and death of WPSs, PQRs and welder qualifications when companies are bought and sold; these ranged from 1) the position that nothing is valid any longer when a company is sold to 2) they survive and are valid no matter how many times a company is bought, sold, combined or divided. The sense of the Subcommittee is that the latter is closer to final position with some added provisions, but several more inquiries and some specific changes to Section IX are pending.

Until the final position of the Subcommittee is published, the smart thing to do with WPSs and PQRs of purchased companies or divested companies is to reformat the documents showing the name of the new company, sign and date the qualifications and keep a record of the source of the qualifications. This could be done on each qualification record or in a master historical document.

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Fast Track

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Some of our adult students supervised. Then students in other specialties contributed their skills. The kids in the math program calculated the gear ratios and tire diameters. Physics students computed the spring weights to determine the exact weights that the special spring-supported shock absorbers could take," the automotive instructor added.

"The kids built the entire car. This was a high-profile program that all kids wanted to work on. Becoming involved was highly motivational. Students had to test into the program just as if they were qualifying for employment. Also, students had to earn the right to be on the project. Some students who didn't take their participation seriously were even fired from the project.

"The work was split among five teams. Each team's leader reported on their progress each Friday, then gave an estimate of where the team would be by the following Friday," said Gavedon, the welding instructor.

"We used oxyfuel and plasma cutting to gut the insides from the car. We fabricated using GMAW and copper-free 0.35 wire. We did use some SMAW in making the front spindle assembly. We had to get spindles from four different 9 in. brake caliper assemblies. We had to heat, forge and form the parts to fit.

"We used wet sponges to cool the car as we were heating it with the torch to control distortion. We took on the challenge of not repainting even though we were cutting within 1/4 in. of the outer body.

"At one point, only the unibody was left hanging from the gantry. Sheet metal was the only thing holding everything together. The telling moment was after the car was reconstructed," said Gavedon. "The auto instructor and I each stood on either side of the car, dropped the hinge pins into the driver and passenger doors and slammed them shut. Both closed perfectly."

Hank Gavedon is an AWS Certified Welding Inspector and Certified Welding Educator. The entire Kentucky School System has accepted the QC10, AWS Entry Level Welder Program. Twelve of his students students are preparing to take the the QC10 test in spring.