Summary of Latest Addenda to ASME Section IX

By Walter J. Sperko, P.E.

This article describes the major changes that have been adopted by ASME Section IX, *Welding and Brazing Qualifications*, in the 1994 addenda. The requirements of these addenda may be used immediately, and they become mandatory for all new qualifications performed after July 1, 1995.

New Format for P-number Tables

The most obvious change to Section IX in the 1994 addenda is the reformatting of the P-number and S-number tables previously found in QW-422, QB-422 and Appendix C. All assignments of P and S numbers are now found in one place, Table QW-422. There are no technical changes in the way that P and S numbers are assigned — only the format has been changed. In the old tables, it was common for users to spend hours searching through the tables to determine whether or not the materials they were using were assigned P- or S-numbers since materials were sorted by P- or S-numbers. With the new format, it will be simpler to find a material's welding or brazing P-number or S-number since the tables are sorted by specification number. For those who prefer the former sorting by P-number, a new appendix has been added in which the old sort (by P-number) is still available.

In addition, there is a significant technical change in the introductions to QW-420 and QB-420. This change permits metals of specific UNS numbers that are assigned P- or S-numbers under any product specification to be considered assigned to that P- or S-number regardless of the product form. This means that, since SB-163, UNS N08800 is assigned P-45, all ASME materials specifications that list UNS N08800 are considered as P-45, whether or not the specification is listed in QW-422. This is a tentative step by ASME in the direction of assigning most P-numbers by UNS numbers rather than by specification number.

Since the basis for assignment of P-numbers is not widely known, Table A provides a generic approximation of how P-numbers are assigned.

Welder Qualification

A clarifying change has been made in QW-100.3, which discusses the longevity of Welding Procedure Specifications (WPSs), Procedure Qualification Records (PQRs) and Welder Performance Qualifications (WPQs). This paragraph has always been clear that WPSs did not have to be requalified due to changes found in later editions of Section IX, but it was never clear that old welder qualifications were still valid when Code revisions changed what a welder was qualified to do. These addenda make it clear that once a welder is qualified and his range of qualification has been established on his WPQ form, his record and range qualified do not have to be revised due to later changes to Section IX.

What does one do if a welder's test coupon fails to pass visual inspection prior to mechanical testing? Obviously, the test coupon fails, and the welder has to weld another test coupon. But does the welder have to weld two coupons when he chooses to take an immediate retest, as has always been required if he fails mechanical or radiographic examination? These addenda require that the welder weld two coupons if the original coupon fails visual inspection and the welder is given an immediate retest; both of the coupons must pass visual inspection. The test supervisor may choose either coupon for mechanical testing. Readers should keep in mind that doubling of test coupons is only required for immediate retest, and that if the welder practices or is given further training, only one coupon needs to be welded. Section IX does not address how much training or practice is required — that is up to the manufacturer or contractor.

Another simplifying format change has been made in the way that F-numbers are listed for welder qualification. Where previously there were multiple variables that one had to look up to determine the interchangeability of various electrode types, all groupings of F-numbers have been consolidated into a new Table QW-433. This table brings all electrode and filler metal interchangeability rules into one place. In addition, the somewhat confusing conditions under which welds made with F-1 through F-4 electrodes when backing is used or not used during qualification has been clarified through the use of a new table. To implement this change, QW-404.15 has been revised to reference the new QW-433, and QW-404.11, QW-404.16 and QW-404.28 have been dropped from the lists of essential variables in QW-350 and QW-400.

It has been common knowledge that in order for a welder to use SMAW and F-5 electrodes (*i.e.*, austenitic stainless steel such as E308-16, E316L-15, etc.), he had to qualify using F-5 electrodes. These addenda make an exception for austenitic electrodes that are designed for use in the flat position only (EXXX-25 and EXXX-26) by assigning them to F-number 1. This means that welders who are qualified to use F-number 1 electrodes (E7024, E7028, etc.), which are also flat-position-only electrodes, may also weld with comparable stainless steel electrodes which are designed for welding in the flat position only. This revision does not permit welders who have qualified using F-5 stainless electrodes to use any F-1 electrodes — but that change should occur in the next addenda.

Welding Procedure Qualification

QW-200.4(b) provides some alternative conditions for qualifying the welding of root passes on thick materials when the process to be used for the

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The opinions expressed in this article are those of the author, and may not represent the official interpretations of the American Society of Manufacturing Engineers (ASME).

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root pass has not been qualified using an appropriately thick material as required by QW-451. These provisions allow use of thin (1/2-in.) test coupons to qualify the process to be used for the root pass when the process that will be used to complete the weld has been properly qualified for the thickness of base metal to be welded. There was some confusion about the proper interpretation of this paragraph, so it was changed in these addenda to make it clear that the provisions of QW-200.4(b) were not in addition to the rules of QW-451, but an alternative to those rules. Readers should keep this paragraph in mind since it can be used to reduce the cost of qualification when welding on thick materials.

EB, LB and Friction Welding

Electron and laser beam welding procedure qualification rules are found in QW-215. Revisions to this paragraph have added specific instructions which were missing in previous editions regarding the required testing and the variables that apply to these processes.

Operator qualification for electron and laser beam welding formerly required that the operator weld a test coupon that was the same as each procedure test coupon in order to be qualified to use that WPS. This revision significantly reduces the testing required by allowing the operator to qualify by making a test on any permitted weld joint design using bend test, or, where the joint design is not suitable for bend testing, to prepare, etch and examine a cross-section. To complete this revision, new variables were added to QW-361.1 to allow operators of electron, laser beam and friction welding equipment much broader latitude in what they may do without requalification.

Weld Metal Cladding

For those who deposit corrosion-resistant cladding on boiler tubes or pipe, there is significant relief in the amount of testing required for welders. QW-403.16, which deals with diameter, no longer requires that welders who will apply cladding to tubes be qualified for the diameter of the tube on which they will weld when the cladding will be applied to the tube parallel to the axis of the tube. Under the old rules, as many as four separate test coupons had to be welded in order to qualify the welder for all positions and diameters.

New figures have been added as QW-462.5(d) and (e) to clarify the bend test coupons needed for qualifying corrosion-resistant and hardfacing weld-metal claddings. In addition to clarifying bend specimen removal, the methods for performing chemical analysis were expanded to permit spectrographic analysis of the surface or removal of chips for wet chemistry. The minimum thickness of weld metal that has to be deposited in production is established based on the location of the chemical analysis relative to the approximate fusion line. Code users should be aware that the chemical analysis of the weld deposit has to conform to the chemical analysis defined in the WPS by the welding engineer, not the chemical analysis of the filler metal used. The smart welding engineer establishes the required chemical analysis range together with the design engineer who understands the service requirements.

Bend Testing

The figures for bend test specimens in QW-462.2 and QW-462.3 have been made more flexible by allowing the user to make bend specimens of whatever length is needed to make the bend, rather than six inches long. This can reduce testing costs by allowing use of shorter specimens for thin-walled test coupons, and it allows use of longer ones when longer ones are needed for larger test jigs, such as for welding some aluminum, titanium and zirconium alloys, and for some high-strength steel alloys.

The figures that show the fixtures for making guided bend tests in QW-466 have been simplified by the elimination of tables under each fixture figure, and by having all fixtures, regardless of type, refer to a single table for the radius around which test specimens have to be bent. This eliminates concern that the dimensions might be different for each figure, and it eliminates the possibility that the tables might inadvertently be different due to editorial error.

Brazing

There are many changes indicated in the brazing section, but most of them are editorial changes that will make the brazing section consistent with the welding section. The only significant technical change in brazing is the expansion of base metals that are assigned UNS numbers to include all base metals that are assigned that UNS number regardless of product form, as discussed previously.

Forms

Section IX has always had two appendixes containing, among other things, suggested forms for WPS, BPS, PQR, WPQ, etc. One appendix followed the welding (QW) section and the other followed the brazing (QB) section. In these addenda, the appendixes have been consolidated to a single appendix containing all forms in one place. The appendix is now located at the end of the body of the Code, immediately preceding the inquiries.

Inquiries

The ASME Boiler and Pressure Vessel Code Committee has a formal system for dealing with questions about the Code that are posed to the Committee by users of the Code. These formal questions and replies, known as Inquiries, are issued every six months. A perennial question asked of the Subcommittee IX concerns the need for each manufacturer or contractor (or any other form of organization that will make production welds under the Code) to qualify its own WPSs and its own welders. This requirement is clearly onerous to some users of Section IX, especially to those who have been caught having test coupons welded by another organization or a similar scenario when the Code states clearly in QW-201: "It is not permissible for the manufacturer or contractor to have the welding of the test weldments performed by another organization." There are comparable words for welder qualification in QW-300.2. Section IX clearly requires welding of both procedure and welder test coupons to be done under the supervision and control of the manufacturer who will do production welding.

One might ask what is so important about having the manufacturer or contractor qualify his procedures and his welders. The answer goes to the basic philosophy of the Boiler Code — the organization designing and building to the Code is responsible for all the work that it does, including material selection, design, assembly, fabrication, welding, heat treating, nondestructive examination and testing. The welding of a test coupon forces the fabricator or contrac-

tor to demonstrate that his organization can follow the requirements in Section IX, that his organization has obtained sufficient knowledge or technical guidance regarding welding to do so, and that his organization has sufficient administrative skill to prepare a WPS and weld the test coupon or to give a welder a test and to prepare the required records.

Welding of the test coupon is the essential demonstration by each manufacturer or contractor that his organization can responsibly supervise and control welding. When a procedure or performance qualification test has to be done in accordance with ASME Section IX, the test coupons have to welded under the supervision and control of the manufacturer or contractor who will be responsible for the production welding. They may not be welded by any other organization.

Missing Page

There is a printing error in these adenda that Section IX users can easily correct when they update their code books. In the previous version, Page 3.1 was printed on the back of Page 3. In these addenda, Page 4 is printed on the back of Page 3, losing paragraphs QW-150 and part of QW-151. ASME will issue new pages to correct this error. Users are advised to keep the old Page 3.1. ♦

P- or S-No.	Description of Material
	WELDING
1	Carbon Steel
2	Wrought Iron (No longer used)
3	Up to 1/2% Mo and/or Cr alloy steel
4	1 to 2% Cr and up to 1/2% Mo alloy steel
5A	2 to 3% Cr, 1% Mo alloy steel
5B	5 to 10% Cr, 1% Mo alloy steel
5C	All 5A and 5B metals heat treated to over 85 ksi
6	Martensitic stainless steel
7	Ferritic stainless steel
8	Austenitic stainless steel
9	2 to 5% nickel alloy steel
10	Mn-V, Cr-V, 9% Ni, high-Cr alloy steels
11	Low-alloy steel, quenched and tempered to 95 ksi min
21	1.2% Mg or Mn alloy aluminum
22	1.2% Mn 2.5% Mg 25% Cu aluminum
23	1.3 Mg 7% Si 25 Cr aluminum
25	1.5% Mg 8% Mn 15 Cr aluminum
31	Copper
32	Admiralty, Naval, aluminum brass, Muntz metal
33	Cu-Si alloys
34	Cu-Ni alloys
35	Aluminum bronze alloys
41	Nickel
42	Ni-Cu alloys
43	NiCrFe (77 Ni)
44	NiMo, NiMoCr
45	NiCrFe (33Ni), NiFeCrMoCu
46	NiCrSi (35 Ni)
51	Titanium
52	Titanium, 0.3% Mo, 0.8%Ni
61	Zirconium
62	Zirconium 2.5% Nb
	BRAZING
101	Carbon steels
102	Low-alloy and stainless steels
103	Cast irons
104	Unalloyed aluminum alloys
105	Alloyed aluminum alloys
107	Copper, brass and bronze
108	Aluminum bronze
110	Nickel and nickel-copper
111	Various nickel alloys
112	High molybdenum alloys
115	Titanium and its alloys
117	Zirconium and its alloys

On Her Retirement, Natalie Gars Reflects on Her Career at AWS

Natalie Gars, Executive Secretary for the Administration Dept., will retire this month. A well-known staff member, friend and associate of hundreds of AWS members and associates, Natalie wrote the following account of her memories of AWS, and the people she has worked with over the years.

Sometimes I reflect on the photos of the AWS Past Presidents displayed in the fourth-floor lobby of AWS Headquarters, and find it hard to fathom that I have met most of them, and worked with a good number of them since I first joined AWS in 1977. Time certainly does fly.

I remember when I first came to the American Welding Society for a job interview. I truly did not know what to expect. I wondered whether it would be a "dirty welding shop." But when I arrived, there was Ed Dato, with his wonderful smile and reassuring words, and I was hooked on AWS.

The Society's headquarters had moved from New York to Miami in 1971, but for some reason the office was not yet organized. I recall sitting on the floor in jeans and wading through mountains of papers. Together, Ed and I whipped the office into shipshape order. Bob Foxall was President at the time. He and I worked diligently updating the Bylaws — a monumental job.

In 1979, after Butch Sosnin's term as President, and encountering some personal problems I had to work out, I moved to Scottsdale, Ariz., for almost five years. I worked as a Division Secretary for Anheuser Busch, quite a different type of office. While there, I kept up on AWS news through correspondence with Joan Paisley, my replacement. I learned that Ed Dato had retired as Executive Director and the Society