Welder Qualification Standards – Philosophy and Feedback

One would think that the experts involved in writing welding standards could agree on what a welder should be permitted to do in production if that welder takes a test using a particular welding process, filler metal, size coupon, material, position, progression, etc. Granted, one might have some variations depending on the type of product being welded; for example, welders making welds on pipelines do not usually normally make butt welds between pipes that are positioned vertically (i.e., "2G" in the US or "PC" in Europe) so a standard for testing of pipeline welders might not have a test for that position. On the other hand, a standard for testing welders who will install process piping in a refinery would have such a test because that position will frequently be encountered in production welding.

The basic philosophy, however, would be the same in both standards: the welder has to take a test that demonstrates that they can deposit sound weld metal utilizing the welding process used in production, under conditions that are at least as challenging as the conditions encountered in production welding. Once that philosophy is established, then it is "simply" a matter of the standards developers finding the transition points when a change in welding conditions are sufficient to require the welder to take a test under the more challenging conditions. Obviously, the experience of the standards developers themselves will dictate when such a change should occur, but ultimately, the industry that the standard serves will provide feedback to the standards developers on the adequacy and accuracy of those transition points. This works particularly well when some of the standards developers use the standard on a daily basis.

ISO Standards Development

The writer has been involved in welding standards development for the last 20 years as a member of ASME Subcommittee IX. During the last 8 years, he has also been involved in development and revision of various International Organization for Standardization (ISO) welding standards, including a series of ISO standards on welder qualification, ISO 9606. This standard is being revised under an agreement between ISO and CEN, the European standards development organization. Under this agreement, CEN committees draft ISO standards, and, when the documents are almost completed, they are balloted simultaneously in both CEN and ISO. To ensure representation outside CEN, ISO is allowed to send up to 4 observers such as the writer to the CEN meetings.

The differences between the CEN/ISO standards development process and the ASME process are stark. ASME and AWS meetings, are open to the public: CEN meetings are officially by invitation only. ASME and AWS meetings are required to have balanced representation from all interest groups including manufacturers, owners, engineers, regulatory agencies, insurance and inspection agencies and general interest. On the other hand, CEN/ISO meetings have no requirement for interest balance. As a result, ISO 9606, meetings were dominated by standards devel-

opment staff and training and testing agencies from the various European countries; rarely did a person who actually used the standard attend the meeting. This is not to say that those present were out of touch with their industries; in fact, much of the work was held up so those present could consult with their experts.

The ISO voting system is also different: it is "one country, one vote." As a result, ISO adoption of whatever the CEN committee agreed on was largely assured since Europeans have enough votes for any CEN-agreed proposals to pass the vote at ISO.

The current European welder qualification standard, ISO 9606 was originally published as a derivative of EN 287, and it contains several parts. The first part, ISO 9606-1, covers only the equivalent of P/S/M-1 through 11 metals; Part 2, ISO 9606-2 covers aluminum, etc. Drafts of ISO 9606-1were prepared by CEN/TC 121/SC 2 and sent out for review by both ISO and CEN member countries. Over 280 comments were received, and 5 meetings were held in Europe to resolve those comments. Consequently, the current draft revision of ISO 9606-1 is significantly improved over previous versions in technical content, readability and clarity. Nevertheless, it does not reflect several critical practices recognized as necessary outside Europe. It also imposes requirements that have been recognized outside Europe as not cost-effective. The following are some examples::

- **Welding Process**

  The proposed ISO 9606-1 recognizes the same basic welding processes that are recognized in the US and Canada except that they are identified by numbers (e.g. SMAW is process 111, GTAW is process 141, etc.) when addressed in the standard.

  Although the numbering system for GMAW distinguishes between many variations of GMAW such as welding with inert versus welding with active gas, it does not distinguish between transfer modes. Consequently, the current draft ISO 9606-1 does not require any special treatment for GMAW-S [short-circuiting (or dip) transfer]. Feedback from industry to US standards developers is that special training and qualifications are necessary for GMAW-S due to the tendency of the process to cause lack-of-fusion defects.

- **Base metals**

  The base metal grouping system that was established by CEN and ISO for welding standards is very similar to the ASME/AWS system for assigning P, S and M-numbers. The base metals used for welder test coupons are restricted as follows:

- To weld on Group 4 or 5 (Cr-Mo steels), the welder has to test on Group 4 or 5 test coupons. Such a test also qualify Groups 1 through 3
- To weld on Group 8 or 10 (stainless steel) the welder has to test on Group 8 test coupons. No other metals are qualified except if used in a dissimilar metal joint.

US industry feedback indicated more than 40 years ago that the filler metal has a lot more to do with welder skill than the base metal; accordingly, US standards allow the use of carbon steel test coupons for all materials from Groups 1 through 11.

Under the proposed ISO 9606-1 rules, the thickness that a welder is qualified to weld is based on the thickness of the test coupon base metal. Early US welding standards also used base metal thickness as the basis for qualification, but with industry feedback, those standards switched largely to using weld deposit thickness as the basis for qualification. This has proven to be quite effective and practical, particularly for multi-process qualifications.

Under ISO 9606-1, a welder who demonstrates his skill to weld on pipe smaller than 25 mm is only qualified to weld on pipe up to twice the diameter of the test coupon. US feedback is that a welder who can handle small-diameter pipe can weld all larger diameters of pipe and also plate without difficulty.

- **Filler metals**

Consumable inserts are not recognized in ISO 9606-1. Feedback in the US is that welders using consumable inserts require special training and qualification. It should be noted that consumable inserts are widely used in the United Kingdom but not much throughout the rest of Europe.

The proposed ISO 9606-1 requires separate qualification with cellulosic electrodes (EXX10). Industry feedback in the US is that welders who can handle cellulosic electrodes can use other types except basic flux (i.e., low hydrogen) types.

- **Duration of Qualification**

The proposed ISO 9606 (all parts) requires that a welder use a process at least once every six months in order to continue to be qualified with that process. In addition, a weld made with that process must be volumetrically examined every 2 years in order for the welder to continue to be qualified for that process.

Since it was published in 1941, ASME Section IX required that a welder use a process at least once every six months in order to continue to be qualified with that process. Industry's feedback is that this approach is successful and adequate.

- **Backing Gas**

  The use of inert backing gas (purge) has long been recognized in US standards as a condition that makes it easier to make the root pass of a single-welded groove weld, yet ISO 9606-1 does not mention use of gas backing.

Global Relevance

All of the US comments on the draft ISO 9606-1 were fairly considered, discussed and voted on by CEN/TC 121/SC 2, but the US and Canada voted against the draft since it deviated from US and Canadian practices so much that it could not be adopted in either country. Further, it was recognized that US practices are recognized and used internationally, particularly via the ASME Boiler and Pressure Vessel Code and B31.3 Process Piping Code. The US and Canada appealed to ISO's Technical Management Board (TMB) that the standard was not globally relevant and should not be published in its current form as an ISO standard. ISO/TMB agreed, and TMB has directed ISO/TC 44/SC 11 to develop a plan for making ISO 9606-1 globally relevant.

The situation on ISO 9606-1 is precedent-establishing since there are other parts of ISO 9606 waiting to be published. In addition, there is a collection of other ISO standards (ISO 15607 through 15614) related to welding procedure qualification that TMB may not consider globally relevant.

What's the Rush?

ISO standards are either adopted by individual countries as their official standards or they are not; normally there is little pressure on countries to adopt ISO standards.

Members of the European Union, however, have agreed to have common standards in order to have a single market. Accordingly, all national standards (DIN, BS, AF etc.) in any technical area will be abolished on publication of replacement European (EN) standards.. There is pressure on welding standards developers in Europe to have one set of standards to complement the European boiler and pressure vessel code that was recently developed to satisfy the European Pressure Equipment Directive.

What's the Solution?

Currently, the disposition of ISO 9606-1 is in the hands of the ISO/TMB; ISO TC44 SC11 ignored ISO/TMB direction to prepare a plan to make ISO 9606 globally relevant, and voted to proceed to the vote on the final standard as it is written. ISO/TMB's response will only be known later this year.

There is hope, however, that ISO standards will be adopted by the US as well as the rest of the world; after some 23 years of meetings, discussions and innovation, select welding filler metal and mechanical testing standards that meet US needs and practices have been published by ISO and are in the process of being adopted as US standards, The hope for ISO15607/15614 and ISO9606 is to find the common elements in the CEN/ISO and ASME/AWS systems and publish standards that can be used by everyone with little requalification. As countries adopt such ISO standards, local concerns, such as GMAW-S, consumable inserts, etc. can be added to the ISO standard a using locally-mandatory appendix.

If the US Adopts ISO Welding Standards

If the US is coerced into adopting ISO welding procedure and performance qualification standards in their current form, US industry would have to requalify all WPSs and all welders at great cost with no plausible benefit. The US Technical Advisory Groups that represent the US positions on ISO TC 44 and its subcommittees must continue to work to make ISO welding standards globally relevant, competent and cost-effective. It has recently become easier to attend ISO Committee and working group meetings since travel funds are available to volunteers through AWS. Contributions to this fund from businesses are also needed to ensure that lack of financial support does not keep them from promoting US practices and experience in the global standards market.

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