



ASME B31.3 PROCESS PIPING CODE: NEW CHAPTER X TO ALLOW COUPON EXAMINATION FOR ORBITAL WELDS

The 2010 edition of the Code, published in March, 2011, includes a new chapter, Chapter X, High Purity Piping. A new B31.3 High Purity Fluid Service was introduced in Chapter X that permits the use of weld coupon examination in lieu of 5% radiography when orbital (fusion) welding is used in fabrication. Gas tungsten arc welding (GTAW) has been listed as the only acceptable welding process for High Purity and a definition of the term orbital welding has been added to the B31.3 list of definitions since this is the first mention of orbital welding in the Code.



Weld coupon

During the ASME B31.3 Process Piping Code meeting held in Reno last April, there have been several modifications for the 2012 Edition of B31.3 which will be published later this year. The allowance of coupon examination will be limited to autogenous orbital welding and autogenous orbital welds done with consumable inserts as are used for welding 6-moly superaustenitic and duplex stainless steels. The committee may also extend the use of coupon examination to autogenous lathe welds, but this needs further discussion by the High Purity subgroup, Subgroup H.

While the ASME Bioprocessing Equipment (BPE) Standard has never required radiographic examination, general industrial type piping in Normal Fluid Service or Category D Fluid Service requires either 5% radiography, or ultrasonic or in-process examination as part of the requirement for Code compliance. B31.3 makes the distinction between examination and inspection where examination is performed by the installing contractor or his representative (not the welder) and inspection is performed by the owner's representative. Detailed requirements for examiners and inspectors are listed in B31.3 and full documentation of the results of examination and inspection is required.

The B31.3 Section Committee has asked Subgroup H to provide more detailed background on weld coupon examination. An appendix has been proposed and is in the process of discussion for inclusion in the 2014 Edition of the Code. The appendix will include the following information: coupon examination was used as a method of quality assurance for orbital welds in the semiconductor industry. Prior to production welding, a sample weld (or coupon) is made and examined visually on the OD and ID surfaces. The examination is visual, either by sectioning (cutting open) the coupon or by viewing the weld ID with a mirror or borescope. If the weld meets the specified acceptance criteria, then production welding is begun. It has been shown that if the coupon weld is



acceptable there is a high probability that subsequent production welds will also be good due to the repeatability of orbital welds; thus the coupon serves as QA for the production welds.

Coupons are made at specified intervals such as: a change in power supply, weld head, gas source, etc. as well as at the end of the shift. It is similar to in-process examination except that the coupon is not generally a production weld. Installers using the BPE Standard also do weld coupons prior to and during production welding and the results of the examination are recorded on a coupon log.

A draft of an Appendix (U) on Coupon Examination for B31.3 was developed by Barbara Henon, Ph.D., AMI's long term technical writer who is also a member of the ASME B31.3 Committee, in collaboration in collaboration with William Huitt who is a member of ASME BPE and B31.3 Subgroup H. Appendix U will contain information on how coupons are made, how they are examined, applicable weld criteria, frequency of couponing and documenting of coupon examination. The draft of Appendix U was discussed at length at the meeting in Reno and hopefully it will be balloted at the Subcommittee level before the next B31.3 meeting which will be in September in Virginia. After that it must be balloted to the B31.3 Section Committee.

Since the introduction of Chapter X, if an owner who would normally have to do the 5% radiographic examination declares his piping system to be "High Purity" and does the installation with autogenous orbital welding, he can perform coupon examination and avoid the requirement for radiography, Since radiography is expensive and involves shutting down production, this could save significant amounts of money for the owner.

There was an action item at the Reno meeting to revise the requirements for welding operator performance qualification to allow coupon examination of sample welds in lieu of radiography to qualify welding operators to Section IX of the ASME BPVC. Contractors are presently obliged to pay for radiography of weld samples in order to qualify their welders. As we know, radiography of thin wall tubing is of limited value, especially when radiography of qualification welds for the Weld Procedure Specification have already been done and welding operators are using the same weld schedule. This item is complex and involves Sect. IX as well as B31.3, so it may probably take several years to gain approval. It would represent significant savings for contractors using orbital welding.

Since Barbara Henon, Ph.D., I joined the ASME B31.3 Committee in 2007 there has been considerable interaction between the BPE and B31.3 Committees. She has the official liaison between the two committees and with William Huitt and Dr. Richard



Campbell, Chair of the BPE Materials Joining Subcommittee has worked to bring the two ASME documents into closer agreement. At each meeting she reports on the activities of the other committee. The 2012 Edition of the BPE Standard, due for publication later this year, now directs owners to the use of B31.3 Chapter X and the Materials Joining Part of BPE has been totally revised and renumbered with references to the appropriate Fluid Service of B31.3.

There are still areas of differences between the two ASME documents that need to be resolved. Most notably, BPE makes an allowance for OD concavity on fusion welds of tubing while B31.3, whose weld criteria are based on multipass welds on pipe, does not mention OD concavity. This has resulted in some welds that would be acceptable to BPE being rejected by inspectors familiar with B31.3 but not BPE. An item to allow some amount of OD concavity on welds without filler wire is now under consideration by the B31.3 Section Committee.

Subgroup H is hoping that the use of Chapter X will extend beyond the present High Purity industries covered by the SEMI Standards and BPE. William Huitt has written a couple of articles on crossover applications including an article on a producer of biodiesel fuels that uses some CIP (clean-in-place) piping systems and may need to specify some of the high purity requirements of BPE and/or B31.3 Chapter X, but not all of those requirements. If he does orbital fusion welding and coupon examination he can still meet the safety requirements of B31.3 and avoid the requirement for radiography.

However, in order to get users in other industries to specify Chapter X, and thus autogenous orbital welding in their engineering designs, we must be able to reach the architect engineers that write the specifications. Contractors will not do this on their own.

Dennis Cobb, Director of Engineering at Arc Machines, Inc. and Barbara Henon, Ph.D., will be presenting a paper on the addition of Chapter X High Purity Piping to the ASME B31.3 Code at the ASME Pressure Vessel and Piping Conference, PVP-2012, to be held in Toronto, Canada, July 16-17, 2012. They will be presenting to owners and highly placed people in refineries, nuclear and other industries that could benefit from the use of Chapter X and orbital welding technology. ♦