AP1000DCDFileNPEm Resource

From: DeBlasio, John J. [deblasjj@westinghouse.com]
Sent: Wednesday, June 09, 2010 2:27 PM
To: Buckberg, Perry
Cc: Melton, Michael A
Subject: Additional information relative to RAI SRP5.2.3-CIB1-01 Rev 2

The additional discussion that Westinghouse had with the NRC in a phone call about EC filler metals resulted in additional information being requested to augment the RAI response by articulating what was discussed in that telecom. This additional information provided below is to augment the Rev 2 response by incorporating the information below:

Regarding note 6 of the table which permits the use of EC type filler metals: The DCD Rev 17 table 5.2-1 was not intended to limit the filler metal forms permitted in SFA-5.9, because the design has always allowed other forms. However, since only the most common form is listed (such as ER308L), it could be construed that it was limiting the allowable forms. So other equally valid forms such as EQ and EC were added to the table to clarify this position. First of all, the note is not designated as applicable to Ni-Cr-Fe filler metals in SFA-5.14 because that specification does not have an EC type classification for wire/rod as of this point, so since EC wires are not separate from ER wires in this specification, are already allowed by default. So the EC type classification only needs to be applied to SFA-5.9 as listed in the table. Also note that the low-alloy steel and carbon steel filler metal specifications listed in this table, paragraph 6.1.1.2, and 5.2.3.1 already permit composite wires as well. The reason it is desirable to clarify that EC filler metals may be used is that there are several advantages to using EC type filler metals, and some WEC vendors either are, or have proposed using them in production. One advantage for using stranded wire for EC for automatic GTAW is that the stranded wire is more flexible, which aids in wire feeding. When feeding the wire into tight quarters, the more flexible wire can feed more smoothly when the wire conduit makes sharp turns. The lack of cast to the stranded wire after coming off of the spool also keeps the wire more stable at the point of wire feed. Another advantage that is available for EC type filler metals is metal cored wire used for GMAW. The arc characteristics can have more welder appeal than solid wire, which can lead to more repeatably sound welds. Due to higher current density of the metal-cored wires, they can also be more productive than solid wires due to a higher deposition rate. Specifically listing composite filler metals in the DCD does not decrease standardization because the weld deposit composition of either stranded or metal cored wires must meet the exact same composition requirements as the solid wire in SFA-5.9. The mechanical properties must also meet identical standards. Therefore, there would not be any degradation in corrosion resistance or mechanical performance due to the use of composite wires. The identical composition that cored wires have to the sold wires may be accomplished in cored wires with the same principle used for SMAW welding, where the sheath (or core wire for SMAW) may be made from a similar composition material, but the weld deposit ends up with the correct composition. An example would be when the sheath or core wire could be made from 308L, but metal powder additions to the core (or flux for SMAW) add additional Molybdenum, so that the final composition ends up as 316L. Note that similar to solid wires, composite wires including metal cored wires, do not use a flux such as would be found with SMAW, SAW, or FCAW welding, and can be used in the same locations that GMAW or GTAW with solid wires would be used.

This bullet addresses the use of consumable inserts. The original NRC comment was:
Explain why AP1000 will not use Inconel (Alloy 690) consumable inserts (SFA 5.30) since Inconel (Alloy 690) safe ends will be used for some components (i.e., pressurizer and steam generator).

There were several go-rounds on this question, but the WEC response including the requested information could be summarized as below:

The code year of construction for the AP1000 is 1999 with 2000 addenda. This year of the code does not have a consumable insert classification for alloy 690 (IN-52). Since Westinghouse sub-contracts the construction of most of the equipment containing reactor coolant, it is the vendor's choice to use consumable inserts or not.

Most of the vendors do not choose to use consumable inserts since they primarily use automatic GTAW, and addition of filler metal using automatic GTAW is just as easy or easier to control using the automatic wire feeding equipment already in place rather than use consumable inserts. In addition to consumable inserts, there are several methods that can be used to achieve full penetration welds on Inconel or stainless steel material. One is open root welding with the back-side of the weld purged with shielding gas, eliminating the oxygen. The other is to back-gouge and re-weld the back side. An example of this approach is the current design for the RCP to SG weld, which is designed as a double sided weld since there is access to the 2nd side for back-gouging and re-welding.

Please review and provide any comments. If you have any questions, please send me an email and I will get back to you. I'm currently in an NRC meeting on the Shield Building.

Hearing Identifier: AP1000_DCD_Review
Email Number: 411

Mail Envelope Properties (61EA882EF664FC40AEFFD704C920596705FBB4D7AC)

Subject: Additional information relative to RAI SRP5.2.3-CIB1-01 Rev 2
Sent Date: 6/9/2010 2:27:08 PM
Received Date: 6/9/2010 2:27:20 PM
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Recipients:
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Tracking Status: None

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Files	**Size**	**Date & Time**
MESSAGE	5295	6/9/2010 2:27:20 PM

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