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ANSWERED BY
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Q: Can you give a quick explanation of what is meant by two-way traceability?

A: Let's define this using structural steel as an example. "Two-way traceability" basically means that when a project is completed you should be able to do the following:

1) Go to the structure, point to a piece of steel, and be able to trace it back to its Certified Material Test Report (CMTR) supplied by the steel manufacturer; and

2) Pull out a CMTR from the project documentation and identify all areas of the structure where that steel has been installed.

There are a number of ways to accomplish this, but in every case some degree of control and documentation is required during the various phases of construction. One of the simplest ways is by use of the fabrication drawings and the cutting or nesting plan that is used when the plate is first cut into pieces.

The fabrication drawings should, of course, indicate for each individual item the material's type, grade, thickness, dimensions, and some sort of piece mark designation. When the time comes to cut the items from raw plate, the cutting/nesting plan will show for each individual plate the same information (i.e., the material's type, grade, and thickness, and the piece mark designation and dimensions for each individual piece to be cut from that plate). Prior to cutting, each individual piece mark should be laid out on the plate and the appropriate traceability information (piece mark as a minimum) must be physically marked on the plate in the appropriate locations. Additionally, the plate's heat number or plate number must be recorded on the cutting/nesting plan.

The unique cutting/nesting plan number or the material's heat number can then be recorded on the as-built fabrication drawings, and/or the necessary information (CMTR number, heat number, cutting/nesting plan number, fabrication drawing number, and piece mark number) can be entered into a spreadsheet.

This is a simplified explanation of two-way traceability. Of course, during fabrication some degree of control is required to ensure that each piece mark is indeed installed in its designated location in accordance with the fabrication drawings. There may be other details that need to be worked out to design a fully functioning traceability system (for instance, what happens when additional cuts are made to the structure during erection). This should all be detailed in a material traceability procedure that is specific to your needs and requirements.

Q: We've just signed on to do field installation of a structural steel job that has bolted connections on galvanized girders using high-strength bolts. The spec says that before we put the joints together, we have to hand wire brush the faying surfaces. Power wire brushing is prohibited. It seems stupid to make us brush these surfaces but say we can't power brush them, and nobody here can figure out why this is required.

A: It took a while to find the answer to this, but it finally was discovered in a document published by the Research Council on Structural Connections titled *"Specification for Structural Joints Using ASTM A325 or A490 Bolts,"* June 23, 2000, edition. It seems to apply to your case. Based on what you say and what is in this document, the connections you are talking about are slip-critical joints. When these joints are hot-dip galvanized, if prior to assembly the faying surfaces are roughened by hand wire brushing, the mean slip coefficient and therefore the performance of the joint are improved. This document specifically states in the commentary to Section 3.2.2 that power wire brushing "may polish rather than roughen the surface, or remove the coating." It is likely this publication is somewhere referenced in the specification for your project.

It appears you may be unfamiliar with all of the requirements for this installation project you've signed on to do. It is recommended you familiarize yourself with all of the project documentation and requirements.

Q: We are doing a structural job to AWS D1.1 for an international client and the drawings use the metric system. To help avoid confusion, we have used the metric system for our procedures for this project. Recently this has become a bit of an issue, for instance with regard to weld reinforcement. The code allows ⅛-in. (3 mm). One eighth of an inch is actually 3.2 mm, so our welders are being penalized by using the metric system. What are your thoughts on this?

A: AWS D1.1:2002 in paragraph 1.8 states that "this standard makes use of both U.S. Customary Units and the International System of Units (SI). The measurements may not be exact equivalents; therefore, each system shall be used independently of the other without combining in any way." Basically, you need to decide which system of measurement you are going to use, and stick with it.

If your point of view is that you are calculating SI equivalents from the U.S. units, then theoretically you are penalized on weld reinforcement, as you note. However, you gain in other areas, such as depth of undercut (refer to Table 6.1). A better way to look at this is that you are not calculating equivalents, but simply using the values given in D1.1M (refer once again to paragraph 1.8).

If you are having "issues" over 0.2 mm of weld reinforcement, there are other problems that need to be addressed internally within your organization.

Q: Our customer received a tubular structure that had multiple fractures at the weld heat-affected zone region after getting it back from being galvanized. The customer now wants to

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ultrasonically test numerous remaining galvanized welds on the project. What type of calibration block is needed to perform UT over galvanized surfaces?

AWS D1.1 paragraph 6.26.3 indicates that surfaces need to be free from spatter, paint, loose scale, and such from which a search unit will be applied and used. Just as paint is, galvanization is a protective coating and thus can affect the UT results. The variation in test results will be directly attributable to the thickness, surface profile, and any potential disbonding of the coating applied. Should the surface from which UT shall be performed not be first cleaned to the base metal, another option (with prior engineering approval) that may be used would be the following:

1) Perform a standard AWS UT calibration for tubular structures per AWS D1.1.

2) Establish a minimum of a two-point pitch-catch distance amplitude correction (DAC) from a similar thickness tubular structure that has not been galvanized. If this is not available, obtain a similar material composition and thickness piece as that of the tubular structures to be tested. The DAC constructed should correlate to at least two material thicknesses for the item to be examined or the sound path required for examining the entire cross-section thickness of the welds in question.

3) Perform this same transfer technique on several different locations that have been galvanized and note the difference in gain (±) to adjust this signal to the previously constructed DAC. Since the thickness of the galvanized coating may vary from item to item and also vary upon the item itself, it is important that you check several locations to obtain a confident comfort level for the overall difference in gain to be adjusted to your primary reference level before any scanning takes place. If you find the difference varies significantly at each location, you may need to perform a transfer check at each weld to be examined and possibly at each potential flaw location within each weldment.

Note: Ultrasonic testing may reveal that the cracks are isolated to the surface only, in which case either magnetic particle (MT) and/or liquid penetrant (PT) testing can be utilized to locate the fractures after the galvanized coating has been removed from the weld area.

Q: Our company is attempting to qualify stainless steel welding procedures for which we cannot locate information on the material within AWS B2.1 or ASME Section IX. Our customer has indicated the material is a duplex stainless 2205.

A: The material is actually UNS S32205. UNS stands for unified numbering system, which is a method used for identifying and cross-referencing different metals, alloys, and filler metals. This material offers excellent pitting and crevice corrosion cracking and better stress corrosion cracking resistance than 300 series austenitic stainless steels. The yield strengths are also two to three times higher than those of 304, 316, or 317 stainless steels. This material is not listed under the list of prequalified base materials for AWS B2.1, D1.6, or D1.3, so each application for use will need to be qualified by testing to the applicable standard. When ordering this material, be sure to order by the UNS number and obtain a CMTR (certified material test report) from the material supplier. Due to the tensile strength of the material (90 ksi), you will need to utilize filler metal that complies with AWS A5.9.

Thanks to Damian Kotecki of The Lincoln Electric Company for providing information concerning duplex stainless steel. ❖