the answer is...

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ANSWERED BY
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Q: What is the proper way to calculate a welder's travel speed?

A: Travel speed is a function of time and distance traveled. Distance traveled represents the actual length for which weld metal is deposited from the initiation of the arc to the termination of the arc. This is quite simple to calculate for a given welding process. Determine the actual location on the workpiece at which the welder begins depositing filler metal along with a starting time. You can use a timepiece with a second hand or a stopwatch for this. Begin timing the welding process when the welder initiates the arc and stop when the weld pass is terminated. Then determine how much time elapsed along with the total length of filler metal deposited. For example, let's say the welder traveled 4.5 inches in 50 seconds. Divide 4.5 by 50 and you get 0.09 inches per second. Multiply 0.09 by 60 (seconds per minute) and the resultant answer is 5.4 inches per minute (in./min). This particular welder's travel speed is 5.4 in./min at his/her current welding parameters. Travel speed is generally expressed in inches per minute. Note that the welder's travel speed will generally change with welding variables such as position, filler metal diameter, joint accessibility, etc.

Q: I have taken a contract as a CWI that involves several new buildings being constructed to AWS D1.1. The engineer has asked for all welders to be certified in the past 24 months including welding of rebar. I cannot locate a specification or standard for rebar. Can you help?

A: Refer to AWS D1.4, *Structural Welding Code — Reinforcing Steel*, which covers the qualification and certification of welding procedures and welders for reinforcing steel applications. You will need to research the project specifications to verify all the different types and sizes of reinforcing steel and weld joints to be utilized. In addition, attempt to obtain the certified material test report (CMTR) for each type of reinforcing steel from the contractor responsible for this activity. The CMTR should designate each carbon equivalent factor, which will be helpful in qualifying welding procedures for your application.

Q: A welder is qualifying on plate using the SMAW process in the 4G (overhead) position, complete penetration, open butt joint detail with backgouge in accordance with AWS D1.1. In which position should the welder perform the backgouge and finish the weld joint once the backgouge has been completed?

A: Good question. The premise of the welder qualification test is to determine if the welder has the ability to perform, complete, and successfully pass a test with given parameters that include a selected position. This test configuration in the 4G position requires that a portion of the existing weld metal be removed by backgouging and completed from the opposite side. In general, it is recommended that the test booth area duplicate as close as possible the actual field conditions for which the welder will be employed. In this case, the welder who would perform this type of joint in the field would be welding the removed backgouged area in the 1G (flat) position and not the 4G. As you may well know, a welder qualified in the 4G position also qualifies in the 1G but not vice versa. For welder qualification purposes, the complete weld joint needs to be completed by the welder being tested in the same position from start to finish. For this testing application, I would instruct the welder to deviate from the general rules in the test booth and turn the plate over to complete the backgouge process and remaining weld in the 4G position.

Q: We have been looking into the use of ceramic backing for structural steel fabrication in order to save time and money. A lot of the sales literature we have seen seems to claim that the quality obtained will be such that backgouging and back welding will not be necessary. Do you agree with this?

A: I agree up to a point. In many cases you can achieve these kinds of results, but not always. There are many factors of which you should be aware.

Paragraph 2.17.1 of AWS D1.1-2004 (you said structural steel so I presume you work to D1.1) requires qualification of the WPS for one-sided welds backed with anything other than steel. As you state that you are interested in these products for the purpose of avoiding both-side welding, make sure to consider this extra cost in your evaluations.

You need to use the proper shape and size of ceramic backing in order to obtain the type of results you want, and it must be properly placed on the joint. Fitup conditions are critical for the use of ceramic backing. You will find in many cases that even with the ceramic backing, variations in such fitup characteristics as root opening, root face, misalignment, etc., result in an unacceptable weld condition that will require backgouging and back welding, at least locally. Ceramic backing may also be difficult to use for some configurations, such as at the ends of a girder web splice, and backgouging and back welding will likely be necessary in areas such as these.

Another consideration is that ceramic backing is porous, and is therefore subject to picking up moisture. If your application is sensitive to hydrogen, you will want to treat the ceramic backing much like the other weld consumables with regard to atmospheric exposure limits. Though not as sensitive as SMAW electrodes, for instance, you don't want to

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leave them lying around and exposed to rain, dirt, etc. They should be placed on the joint immediately prior to welding.

Q: In the Winter 2004 issue of *Inspection Trends*, Steven Snyder wrote an interesting article comparing various codes in regard to welder qualification. Could you give some advice on what to look out for during the actual welder qualification test itself?

A: As Snyder stated in his article, when "administering welder performance qualification tests, the CWI or other test supervisor should extensively review the code that is being used." This will allow you to be aware of the specific requirements for welder/welding operator qualification for the particular code to which the welders are being tested.

During the actual qualification testing, you will find that in some respects it is very much like the sort of monitoring/inspection that needs to be done during production welding. Things that need to be checked include WPS, position, base and filler materials, welding process variables, etc.

As when verifying if a welder is qualified for a particular production weld, during welder testing you need to verify the identity of the welder. In this case, a photo identification card, passport, etc., should be checked to verify the welder's identity. If there are many welders to be tested, some sort of system needs to be in place to ensure that each welder works on only his/her own test coupon. Tags, pieces of paper with the welder's name or number pinned to his/her back, etc., may be used for this purpose. Make sure the contractor or testing facility is well organized so that control of the situation is not lost.

Verify that the WPS to be used for welder testing is appropriate. Some codes require that an approved WPS be used during welder/welding operator testing.

Fitup and positioning of test coupons should be checked to ensure that they meet the code or WPS requirements. Each coupon should be hard stamped or otherwise marked with the welder's unique identifying information. Check to see if the base materials are of the type, size, and thickness required. Once in the proper test position, the welder must not move or change the position of the coupon (except for those tubular coupons that are rotated during welding).

You need to monitor what happens once the welder or welders have been given the okay to start welding in order to make sure that all requirements are met. Is the required filler material being used? Is the welding progression as required (uphill or downhill)? Does the welder indeed make a stop and start in the middle of an AWS D1.1 fillet weld qualification test? The list goes on and on. Keep on your toes. You need to monitor what is happening to make sure that a welder only works on his/her own coupon, does not change the position or welding progression, does not grind excessively (if grinding is allowed at all), etc.

Once welding is completed, visual testing will need to be performed in accordance with the requirements of the applicable code. Also at this stage, you should verify that hard stamping or other marking is performed as necessary so that traceability will not be lost during further testing. For instance, each macroetch or bend test location will need to be marked with the welder's number, position, etc., as required to ensure that whoever eventually inspects these knows that they come from a valid welder qualification coupon. Good practice would be for the inspector present during the qualification test to apply his/her own unique hard stamp to each sample location.

In addition, don't forget the proper documentation. Review the welder performance qualification record to ensure that all of the variables are correctly recorded.❖