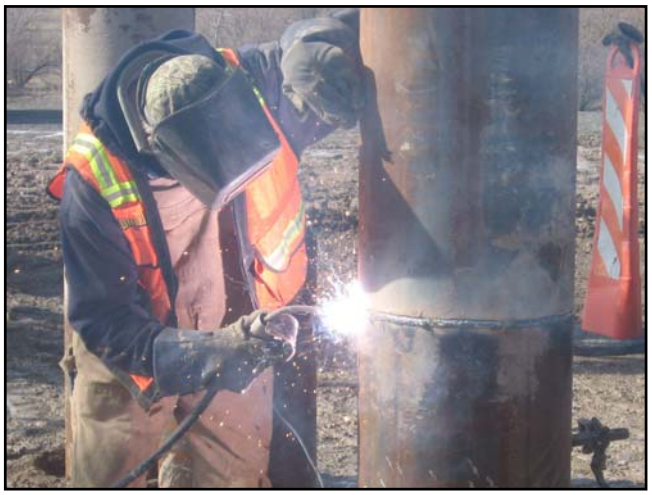
UTAH DEPARTMENT OF TRANSPORTATION

TECHNICAL BULLETIN MT-07.01
February 13, 2007



DRIVEN PILE WELDING

UDOT standard specification 02455 – Driven Piles requires that the contractor follow the D1.1 portion of the American Welding Society's (AWS) Welding Code. Few Department personnel outside of UDOT Central Materials understand all that is required by this reference. This bulletin briefly outlines submittals, certifications, and processes stipulated by AWS D1.1 that UDOT field crews should expect from the contractor. Driven piles are a structural element providing essential support to the foundation system of highway structures. The connection between sections of steel pile must be properly constructed or the pile may become separated. Following the welding code helps assure that the required performance is achieved.

WHAT DOES THE WELDING CODE REQUIRE?

The following are some of what the welding code outlines.

Welding Procedure Specification (WPS) – Prior to the beginning of any welding an approved Welding Procedure Specification must be in place. The WPS is prepared by the contractor and submitted to the Resident Engineer (RE). The RE may approve the WPS, but they are encouraged to send the WPS to Central Materials for review and comment. When included, Central Materials will verify the processes, joint details, and materials outlined in the WPS and indicate modifications as needed. The WPS for pile welding will likely only cover a few pages. The WPS provides a good reference for field inspectors as it describes steel properties, welding rod used, connection details and fit up, as well as pre-heat and interpass temperatures.

Electrodes (Welding Rod) – In the field, inspectors should verify that the electrodes used are the same as required in the WPS. Certifications for electrodes used on the project should be provided upon request. Electrode manufacturers do not typically send certifications with the rod. Verify lot numbers on the certifications with the welding rod being used. Some welding rod (low hydrogen) has limitations on how long it can be exposed to open air before being used in a weld. Inspectors should be aware that the time limits begin as soon as the airtight seal on the welding rod container is broken. Opened low-hydrogen rod may be stored and the time limits reset in an on-site rod oven (maintained at minimum 250 degrees F) provided that the time limits have not already been reached. Welding rod should always be protected from moisture. Wet or expired welding rod should be destroyed and disposed of.

Max air exposure time limits for low hydrogen electrodes	
Rod ID Code	**Time Limit**
E70XX-X	4 hours
E80XX-X	2 hours
E90XX-X	1 hour
E100XX-X	1/2 hour

Welder Certification – Pipe pile welding is done to the minimum standards (D1.1) established in the AWS welding code. A Certified Welding Inspector (CWI) is not required to be present as would be for more critical elements such as steel bridge girders. A welder doing work controlled by section D1.1 must have a

Welder Certification with them and it must be presented on request. The certification has the welder's name, lists the types of welding the welder may perform, and is signed and stamped by the CWI that certified them. A CWI's signature will typically be across the stamp issued by the American Welding Association and includes the CWI's identification number. This stamp and signature is similar to that of a Professional Engineer. Verify the welder's identity with a picture ID. A Welder's Certification will list the "Qualifications & Positions" for which they are certified to weld. You may see one or more of the following (G = groove weld, F = fillet weld):

Typical Plate Welding Positions and Welds				
1G	Flat		1F	Flat
2G	Flat & Horizontal		2F	Flat & Horizontal
3G	Vertical Up		3F	Vertical Up
4G	Overhead		4F	Overhead

Typical Tubular Welding Positions (No Fillet Welds)		
2G + 5G	All	Only valid certifications for welding on piles.
6G	All	
6GR	All	

Cold Weather Limitations – When the base metal is below 32 degrees F, it shall be preheated to 70 degrees F and the minimum interpass temperature (shown in WPS) be maintained during welding.

Quality of Work – Welding should have all slag removed and the weld and adjoining metal should be wire brushed for final inspection. When multiple passes of welding are required, the previous welds and adjoining surfaces should be wire brushed before starting additional welding. Arc strikes not located within the final weld must be removed by grinding to a smooth contour. An arc strike is defined as a discontinuity consisting of any localized remelted metal, heat-affected metal, or change in the surface profile of any part of a weld or base metal resulting from an arc. They look like globs of melted metal or pits in the steel surfaces.

Further Information

Other issues associated with pile driving are not addressed in this bulletin. The Central Materials office is always willing to provide more detailed field support and training as desired by Resident Engineers and their staff. Contact information is listed below.

Central Materials

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Degen Lewis, P.E., Materials Engineer for Concrete & Steel – 801-965-3814 – dlewis@utah.gov
Examples of a WPS, Welder Certification, or Electrode Certification are available on the Central Materials Website. http://www.udot.utah.gov/index.php/m=c/tid=196

Other Sources

American Welding Association - www.aws.org