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Recommended Practices for Root Pass Welding of Pipe Without Backing



American Welding Society

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Recommended Practices for Root Pass Welding of Pipe Without Backing

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Abstract

This standard presents recommended practices for welding the root pass of metal pipe butt joints with an open root or a consumable insert. Joint designs, assembly, consumable insert configurations, base metals, filler metals, and purging are discussed. Applicable arc welding processes and techniques are described.

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Recommended Practices for Root Pass Welding Of Pipe Without Backing

Introduction

When the pipe system designer has determined that the use of backing rings is unacceptable and that complete joint penetration, and a continuous root surface is needed, butt joints may be made from one side without backing using special groove designs and techniques described in this document. Although gas tungsten arc welding (GTAW) is commonly used for precise control in root pass welding, shielded metal arc welding (SMAW) and gas metal arc welding (GMAW) are also widely used to achieve complete joint penetration and an acceptable root surface.

1. Cleanliness

Cleanliness is important in all welding, and it is especially so in root pass welding. This includes groove faces and a minimum of 1 in. (25mm) from the groove on both inside and outside surfaces of the pipe. Grinding or other mechanical means should be used to remove all paint, scale, rust, and dirt. In addition, all parts of the joint should be free of grease and oil; these may be removed by use of a suitable solvent. A suitable solvent is one that does not leave a residue and is not harmful to the welder or the weldment. Most solvents require good ventilation, and many are flammable; therefore, proper precautions should be taken.

Grinding and cleaning operations should be done just prior to welding. After cleaning, the pipe should be handled with clean gloves to preserve cleanliness.

2. Preparations for Purging

The highest quality root welds are obtained by using GTAW either with or without consumable inserts. A purge (displacement of air at the inside surface of the weldment with a suitable gas) is required for stainless and nonferrous piping systems, except aluminum, if a smooth root surface is to be obtained. Carbon steels and most low alloy steels

can be welded, using an open root groove, without the use of an internal gas purge. Purging of joints with consumable inserts reduces the occurrence of defects resulting from oxidation of the insert. Purging will also increase welding speed.

2.1 Purging Gases. Welding grade argon is the gas most often used for internal purging. For some applications, nitrogen, carbon dioxide, helium, and mixtures of these gases are suitable purge gases. These gases can be used at lower cost than argon for specific applications, but they should be demonstrated as suitable by testing prior to use in production.

The purity of purging gases is important and should be included in the welding procedure specification. Argon, helium, and nitrogen of better than 99 percent purity are available commercially and should be used. The moisture content should be controlled by specifying a dew point of -40°F (-40°C) maximum.

The purging procedures described in this document are based on the use of argon as the purging gas. If nitrogen or helium is used, modifications to the purging procedure may be necessary because both gases are less dense than air and argon.

2.2 Purge Gas Containment. Purging requires entrance and exit openings through which the purge gas can enter and leave the weld joint area at controlled rates. For piping where both ends can be capped, properly-sized wood or plastic disks can be taped to the pipe ends. Plastic caps that are used to prevent damage to pipe ends during shipment are commonly used as purge caps.

The cap on the entrance side requires a hole to receive the purge gas. The other cap requires a hole large enough to prevent build-up of gas pressure. Since air is lighter than argon, the exit hole should be at a higher elevation to minimize the entrapment of air. Precautions should be taken to ensure that all leak paths are blocked and that branch