

If I Do Not See a Problem, There Must Not Be One

We have always stressed the importance of not cutting corners when hardbanding. In some cases you may see some problems, but in other cases, it might be what you don't see that may come back to haunt you. Though welding parameters may vary from machine to machine, pre-heating and post cooling requirements remain unchanged and are extremely important.

PREHEATING

Pre-heating helps prevent cracks from occurring in the heat affected zone (HAZ) which is the zone directly below and adjacent to the weld bead (Fig 1). The HAZ is a direct result of the arc welding process and consists of the base metal, not the hardband alloy itself. This area cools most rapidly, and in many cases, undergoes important changes in the structure and properties that may lead to cracking. The depth of the HAZ directly beneath the hardband is typically 3/32" and decreases as it wraps it's way up to the tool joint OD surface.

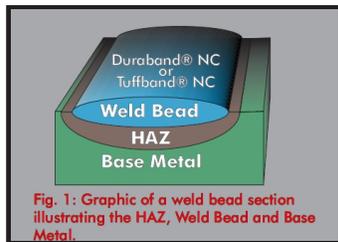


Fig. 1: Graphic of a weld bead section illustrating the HAZ, Weld Bead and Base Metal.

The hardness of the HAZ is of particular importance because if it's too hard (generally over 50Rc), a crack in the hardbanding could potentially penetrate into the base metal and perhaps lead to catastrophic failure Fig. 2. Typically 40Rc is the recommended maximum HAZ hardness. This is achieved by adjusting pre-heat temperatures and ensuring



Fig. 2: Catastrophic failure of a drill pipe due to excessive hardness in the HAZ.

that the tool joint is slowly cooled. In addition to lessening the dangers of cracking and minimizing HAZ hardnesses, pre-heating minimizes shrinking stresses and enhances diffusion of hydrogen from the steel allowing hydrogen to diffuse out

before it can cause any damage (hydrogen embrittlement).

ALWAYS PRE-HEAT! A length of pipe sitting in the sun on a 100°F day does not count as a pre-heat. You need to properly bring up the pre-heat to the recommended temperatures.

In colder temperatures, a good rule to follow is to "preheat for interpass temperature). Cold steel will suck the heat out of the tool joint and greatly reduce the pre-heat temperature prior to hardbanding. It is extremely important to remember to maintain your preheat while loading it into your hardbanding unit. In cold weather, increase you pre-heats to assure that you are welding on properly heated material and in addition, we recommend that you pre-heat to finish with an interpass temperature of 800°F (427°C). Pipe will cool down much quicker in cold temperatures and a higher pre-heat and interpass will help to keep the hardbanded connection from cooling too rapidly.

Induction heating is the best way to get a good soak heat, but not that practical in the field. Use a propane heater and rotate the connection often to get an even pre-heat.

SLOW COOLING

It is imperative that you immediately cover a completed hardbanded tool joint or other hardbanded connection no matter what the temperature or conditions. Wind, rain and snow have an immediate adverse affect on the hardbands. Cover the hardband area with a Postle HB Insulator (see below), cooling can or wrap connection in a cooling blanket. We recommend keeping the hardbands covered to slow cool at an average rate of 50°/hour. This is not normally done due to time constraints. We suggest keeping a minimum of 12 HB Insulators or cans on hand. Hardband and cover 12 tool joints and then start rotating. In inclement weather, we still highly recommend covering with some sort of blanket once the insulator or can is removed. If necessary, grinding should be done once parts have cooled down.

Our **Postalloy® HB Insulators** are the perfect solution for slowing down the cooling process on hardbanded tool joints, HWDP and drill collars.

- Size: 8" ID X 30" Long
- Fold Flat for Easy Storage
- Available in Closed End or Open Style for CWP
- Can Accommodate Up to 8" OD Tool Joints, as well as, Multiple Work String Upset Connections using Velcro® Straps
- Weather and Heat Resistant Cover



HB Insulator Wrap (Open Ends)



HB Insulator Bag (Closed End)

- Hi-Temp Liner:

Good to 1800°F (980°C) Constant

2500°F (1370°C) Intermittent

- Protective Lining: Stainless Steel Mesh to Help Prevent Liner Wear
- Light Weight: Only 8 1/2 lbs (4 kg)