

Tips for Welding P-91 Heavy Wall Pipe

- ☑ Preheat and Inter-pass control is absolutely critical. (400°F to 600°F Range)
- ☑ All contaminants (esp. grease & oil) must be removed from the weld zone.
- ☑ P-91 acts a lot like stainless steel in that it concentrates and holds heat.
- ☑ It's easier to burn-thru the root pass in P-91 than in P-22.
- ☑ Stringers with a slight weave should be used.
- ☑ Bead shape is very important. A little convexity (crown) can prevent hot cracking.
- ☑ P-91 has about 110,000 psi tensile strength (P-22 has about 70,000), so P-91 is brittle.
- ☑ High tensile steels are very sensitive to under bead cracking due to moisture pickup.
- ☑ Post heating can help prevent cracking due to moisture (hydrogen) pickup.
- ☑ Post heat welds to about 700°F for about 15 minutes & wrap for a slow cool down.
- ☑ The most critical places for preheat are at the tack welds and root passes.
- ☑ Spools that have not been stress relieved should be handled with care.
- ☑ Always slow cool by wrapping, even when welding is interrupted.
- ☑ Do not move spools with weld joints less than 1/3 full.
- ☑ Root passes must be purged for at least 1/4" of weld thickness.
- ☑ After purge dams are installed, the purge supply can be placed either in the root opening or in gamma plugs opening when they are installed.

Because P-91 acts a lot like stainless steel, it is very easy to suck back the root pass. A good prac-

tice is to put in a heavier root pass to avoid cracking and suck back. When welding with the SMAW process, rod angle and amps are very critical. The rod must be at the proper angle to assure complete fusion to the beveled angles (side walls). Because of heat transfer from the bottom to the top of the weld joint, amps may need to be adjusted starting from the bottom position.

Due to the thermal expansion of heavy wall pipe, it is important to use a 5/32" gap for the root opening and 5/32" filler wire for the root pass and the hot pass. Using 5/32" filler wire will increase productivity as well as protect the root pass. Using the 5/32" root opening should help prevent the opening from closing all the way and allow for the use of the proper size filler wire which will result in a consistent penetrated weld. Because these welds are very costly, it is recommended to have a competent person looking the welder in while the root pass is in progress.

It is also very critical to use the proper size gas lens and lava cone for the root and hot pass. The proper size will depend on the wall thickness and joint design. For example, 37/10 or 37/20 degree bevel and a wall thickness of 1" to 3", a medium 1/8" gas lens with a 3" long #6 lava cone is recommended for the root pass. For the hot pass, a large 1/8" (Jumbo) Gas lens with a #8-10 lava cone is recommended. For larger and longer lava cones, consult your nearest welding supply store. When using the SMAW process the stringer bead placement should not be oscillated more than 2 to 3 rod diameters in width. Amps will be determined by the procedure specifications.

These are only recommendations, always read and understand the procedure specifications that are unique to each job site. ■