

## **Welding Stainless Steel Piping With No Backing Gas Updated**

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### **Abstract**

Fluor successfully implemented welding of austenitic stainless steel with no backing gas (NBG). Metallurgical characteristics and corrosion resistance in austenitic stainless steel welds without the presence of backing gas for ASTM A 312 Types 304/304L and 316/316L materials have been evaluated and compared to matched control welds performed with the presence of backing gas. All welds were performed in shop and field environments utilizing GMAW-S—*No Backing Gas (NBG)*. Extensive research and development demonstrated that the desirable visual root bead appearance was achieved using rich silicon content (0.8%) filler metals in combination with a shielding gas mixture of 90% helium, 7.5% argon, 2.5% carbon dioxide. Testing focused on the evaluation of potential contamination and oxidation of the root bead, sugaring, which typically occurs in welds that are not protected from the environment with use of backing gas. In addition to mechanical tests, the welded samples were also subjected to ASTM A 262 – Practice E (Strauss Corrosion Test), ASTM G 48 Pitting/Crevice Test, and in-house electrolytic pitting tests. Chemical analysis of the root weld metal and scale layer were examined at incremental depths with a scanning electron microscopy with energy dispersive spectroscopy (SEM/EDS), per ASTM E 1508. Results of all tests validated that NBG welds successfully met ASME B31.3 and Section IX Codes and produced quality welds for both shop and field without compromising corrosion resistance or root weld metal chemistry. In addition to the aforementioned, currently new data is expected to support further applications of the NBG technique, which will be presented at this Convention.