

Ultra-Supercritical Steam Boiler Steel Weld Repair: Consumable, Procedure, and Practice Selection

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Steels for ultra-supercritical steam boiler applications require increased strength, corrosion resistance, and creep resistance to meet higher operational efficiency goals. Proper welding consumable and welding procedure and practices need to be carefully selected, characterized, and certified for the ability to achieve the necessary properties. The selected welding consumables, procedures, and practices need to be very robust.

Most of the focus to date has been on the development of shop or site fabrication, which allows for much better controls than field repair welding. Power-plant weld repair will likely require different welding processes than would be developed for fabrication. This paper will describe the criteria that need to be met for acceptable robust power-plant field repair welding of ultra-supercritical steels, particularly Grade 91 steels. The research and development necessary to achieve an acceptable level of repair welding will be described. With weld microstructure correlating to properties, it is necessary to understand the proper weld repair by full characterization of microstructure evolution of the weld metal and heat affected zone. Advanced non-destructive evaluation practices need to be developed to achieve confidence in the reliability of the repair welds.

