The mechanical properties of multi-pass Pulsed Gas Metal Arc Welding (GMAW-P) welds were compared using two shielding gases, 95% Argon – 5% Oxygen and 90% Argon – 10% Carbon Dioxide along with two welding electrodes ER70S-3 and ER70S-6. The American Welding Society (AWS) 5.18 Specification for Carbon Steel Electrodes for Gas Shielding Arc Welding was used as an experimental outline. The joint configuration was a 0.5-inch plate butt joint with a 45° included angle along with a 0.25-inch backing strip; both pieces were ASTM A656 Grade 50.

John Deere Des Moines Works (JDDMW) is developing a business case for changing weld shielding gas mixtures from the current mix of 90 percent Argon – 5 percent Oxygen to a mix of 90 percent Argon – 10 percent Carbon Dioxide. There is a need to evaluate the robustness of manual arc welding using these different shielding gas mixtures to validate the business decision. The American Welding Society (AWS) 5.18 Specification for Carbon Steel Electrodes for Gas Shielded Arc Welding, was used as a platform to compare these two shielding gases have on the mechanical properties and joint performance of welds.