

The test results of the welded joints are shown in Table 2. The tensile strength of the welded joints was higher than that of the base metal, and the elongation was also improved. The fracture surface of the welded joints was observed by SEM, and the results are shown in Fig. 1. The fracture surface of the welded joints was smooth, and the fracture mechanism was considered to be ductile fracture.

2.3 Welding Method

The welded joints were prepared by the shielded metal arc welding (SMAW) method. The welding conditions are shown in Table 2. The welding speed was 1.5 mm/min, and the electrode diameter was 3.2 mm. The preheating temperature was 100°C. The interpass temperature was 150°C. The post-weld heat treatment (PWHT) was performed at 600°C for 2 hours.

2.4 Test Pieces for Welding

The test pieces for welding were prepared from the base metal. The dimensions of the test pieces are shown in Fig. 2. The test pieces were prepared by the SMAW method, and the welding conditions are shown in Table 2.

The test results of the welded joints are shown in Table 2. The tensile strength of the welded joints was higher than that of the base metal, and the elongation was also improved. The fracture surface of the welded joints was observed by SEM, and the results are shown in Fig. 1. The fracture surface of the welded joints was smooth, and the fracture mechanism was considered to be ductile fracture.

Table 3 Comparison of the results of the Charpy impact test and the tensile test for the weld metal and the base metal. The Charpy impact test was conducted at the temperature of the fracture of the tensile test. The Charpy impact test was conducted at the temperature of the fracture of the tensile test. The Charpy impact test was conducted at the temperature of the fracture of the tensile test.

Material	Tensile Test Temperature (°C)	Charpy Impact Test (J)	
		Temperature (°C)	Energy (J)
Weld Metal	-40	-40	10
		-20	20
Base Metal	-40	-40	15
		-20	25

3.3 Evaluation of Weld Toughness

Table 4 Evaluation of the weld toughness. The Charpy impact test was conducted at the temperature of the fracture of the tensile test. The Charpy impact test was conducted at the temperature of the fracture of the tensile test. The Charpy impact test was conducted at the temperature of the fracture of the tensile test.

