

# 2.25%Cr-1.6%W Ferritic Steel for Boiler Piping and Tubing Applications<sup>†</sup>

## 1. Introduction

In thermal power plants, relatively high temperature and/or pressure steam conditions are essential from the viewpoint of improving thermal efficiency. To meet this need, further improvement in the performance of boiler piping and tubing is also required. From an early date, JFE Steel focused its attention on the tensile properties at elevated temperature, steam o level equivalent to those of 9%Cr-1%Mo-Nb-V steel,

while maintaining excellent weldability equal to that of 2.25%Cr-1%Mo steel.

## 2. Features of W-Added 2.25%Cr Steel Pipe

JFE Steel obtained the chemical composition patent<sup>1)</sup> for this steel in the 1980s and has realized the following advantages, which are unique to JFE Steel, with the composition design (Table 1) of this steel pipe.

- (1) Low C and N contents result in good weldability (Fig. 1). Preheating and post weld heat treatment are unnecessary, and the crack resistance of the heat affected zone (HAZ) was improved.
- (2) The low Al content, which was reduced to the minimum possible limit, results in good creep properties (Fig. 2).

× 8.0 mm, Non preheating)

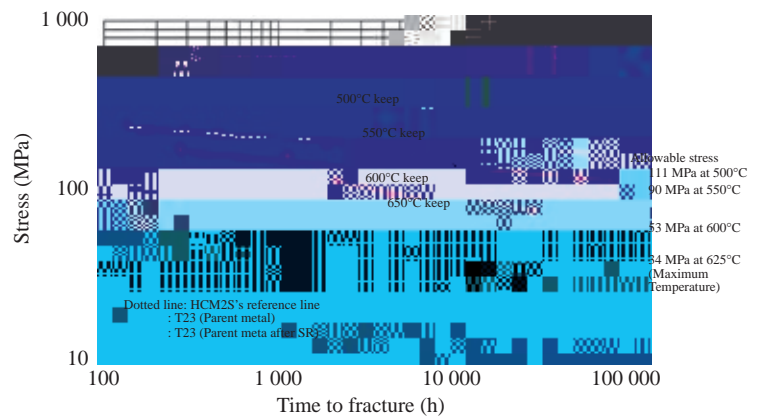


Fig.2 Creep rupture strength of T23 compared the thermal and nuclear power (HCM2S)<sup>2)</sup>

	C	Si	Mn	P	S	Cr	Mo	V	Nb	W	B	N	Al
ASME Specification	0.04–0.10	Max.: 0.50	0.10–0.60	Max.: 0.030	Max.: 0.010	1.90–2.60	0.05–0.30	0.20–0.30	0.02–0.08	1.45–1.74	5–60 ppm	Max.: 0.030	Max.: 0.030
JFE Steel Aim	0.055	0.20	0.43	Max.: 0.024	Max.: 0.010	2.25	0.10	0.25	0.06	1.65	30 ppm	Max.: 0.005	0.002

<sup>†</sup> Originally published in *JFE GIHO* No. 9 (Aug 2005), p. 51–52

- (3) The high W, high Nb and high V composition design results in tensile properties at elevated temperature approximately 1.8 times higher than those of the conventional 2.25%Cr-1%Mo steel (**Fig. 3**).