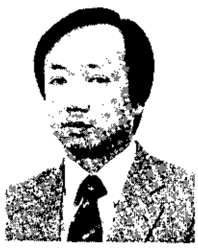
Development of Controlled-Rolled 70 kgf/mm² and 80 kgf/mm² Class High Tensile Strength Steel Plates for Welded Structures*

Keniti Amano
Dr. Engi., Senior Researcher, Plates, Shapes & Castings Lab., Heavy Steel Products Research Dept., I & S Research Labs.



Osamu Tanigawa
Staff Deputy Manager, Plate, Casting & Forging Control Sec., Technical Control Dept., Mizushima Works

Synopsis:

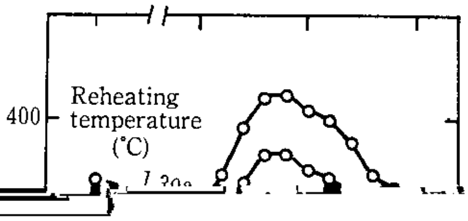
To meet demands for higher strength steel plates for construction machines with excellent cold formability and weldability, as-rolld HT70 steel plates (TS: 686 MPa) having a maximum thickness of 25.4 mm and as-rolled HT80 (TS: 784 MPa) steel plates of 12.7-mm thickness have successfully been developed by using a plate mill. Both precipitation hardening and inhibition of recovery of deformed ferrite are maximized by optimizing ferrite and austenite dual-phase region rolling. Consequently, strength of the plate has been much increased without deteriorating toughness for lower C_{eq}. The cold formability of the developed steels is superior to that of conventional as-hot-rolled HT80. Weldability tests have shown that the steels developed have good impact properties at welded HAZ and do

of the steels with mill scale is slightly higher than 50% of its TS, indicating the same behavior as that of the conven-

Table 1 Chemical compositions of steels

(wt. %)

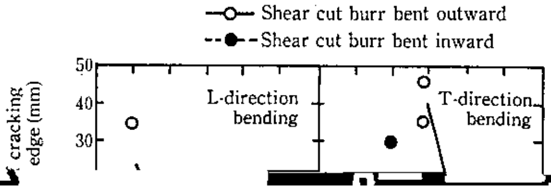
Slab reheating [illegible] 1,050°C



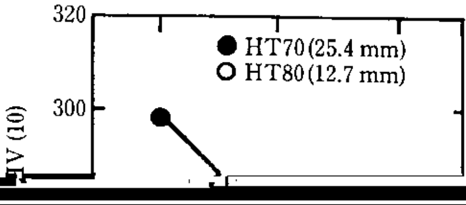
($\alpha + \gamma$) dual-phase region rolling.

Results of electron microscope observation using the two-stage replica method are shown in **Photo 2**. In the Ti-bearing steel finished at 710°C, α grains formed sub-grains, while a cell structure of dislocation which did

Table 4 Tensile and bend test results of steel plates



Shear cut burr bent outward
Shear cut burr bent inward
cracking edge (mm)
50
40
30
L-direction bending
T-direction bending



320
300
HT70 (25.4 mm)
HT80 (12.7 mm)

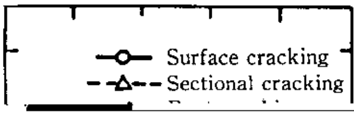


Table 8 Welding conditions for HT70

	SMAW	GMAW
Welding wire	KSA106 4 mmϕ	KM60 1.6 mmϕ

of the joints was equivalent to that of the base metals.

Results of the Charpy impact test are shown in **Fig. 9** for each notch position. Even at the fusion line (FL), which showed the greatest deterioration, the absorbed