



# Development of Heavy Section Steel Plates with Improved Internal Properties through Forging and Plate Rolling Process Using Continuous Casting Slabs\*



*Synopsis:*

*Heavy steel plates with thickness of over 150 mm have usually been manufactured by using materials obtained through ingot casting process in consideration of the*

Table 1 Condition of elastic-plastic stress calculation

Dimension of slab (mm)	310 × 2 240 × 3 000
Heating temperature (°C)	1 250
Surface temperature at the start of forging (°C)	1 000

Density: 7 700 kg/m<sup>3</sup>

Heat conductivity: 23.2 W/mK (at 1 100°C)

Yield point: 0.9 MPa (at 1 100°C)

U<sub>0.2</sub>: 21.5 MPa (at 1 100°C)

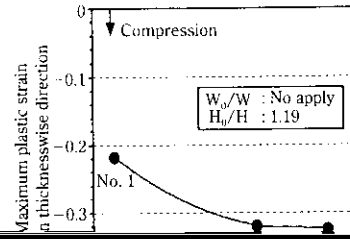
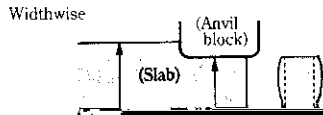
Table 2 Calculation of forging condition

No.	$B/H_0$	$W_0/W$	$H_0/H$
1	0.10	No apply	1.19
2	0.74	No apply	1.19
3	1.06	No apply	1.19
4	0.74	No apply	1.13
5	0.74	1.10	1.19
6	0.74	1.19	1.11

Poisson's ratio: 0.3

Thermal expansion factor: 0.000 018/°C (at 1 100°C)

Work hardening coefficient: 25.2MPa (at 1 100°C)



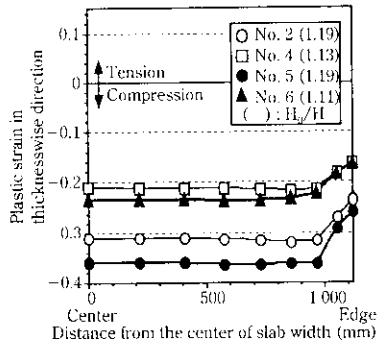


Fig. 3 Plastic strains by simulation in thicknesswise direction at the center of thickness ( $B/H_0 = 0.74$ )

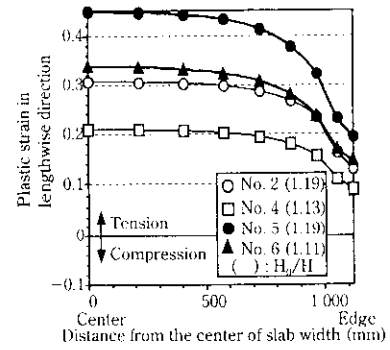


Fig. 5 Plastic strains by simulation in lengthwise direction at the center of thickness ( $B/H_0 = 0.74$ )

0.1

immediate vicinity of the widthwise edge. The compres-

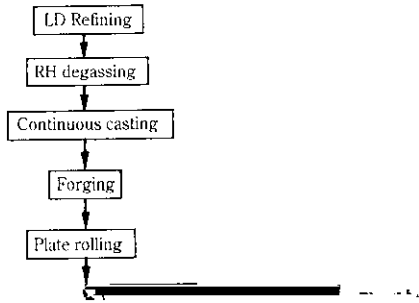


Table 6 Condition of UST

Probe	2Z301
Sensitivity	V15-2.8: 50%
Frequency	2 MHz
Medium	Water
Surface condition	As roll

After plate rolling

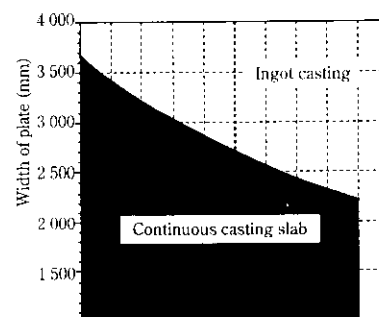
region

200  $\mu\text{m}$

A ( $H_0/H = 1.07$ )	B ( $H_0/H = 1.13$ )	C ( $H_0/H = 1.19$ )
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Table 7 Results of tensile test

No.	Location	Direction	YP (MPa)	TS (MPa)	EI (%)	RA (%)
A			219	432	20	28
			217	426	19	27
			217	425	19	22
B			218	432	25	36
			216	430	20	29
			217	428	24	35
			218	435	25	37



the following conclusions were obtained.

(1) Reduction of slabs in the thicknesswise direction