KAWASAKI STEEL TECHNICAL REPORT

No.40 (May 1999)

Steinless Steel and Steel Platel

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)	$310 \times 2\,240 \times 3\,000$
Heating temperature (°C)	1 250
Surface temperature at the start of forging (°C)	1 000

Density: 7 700 kg/m³
Heat conductivity: 23.2 W/mK (at 1 100°C)
Yield point: 0.9 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)
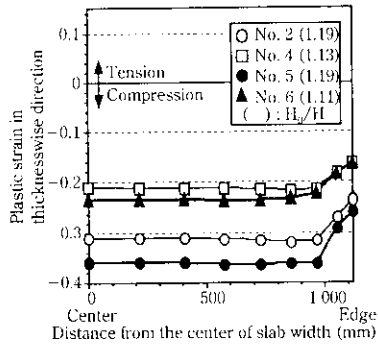Work hardening coefficient: 25.2MPa (at 1 100°C)
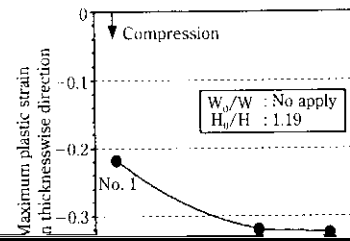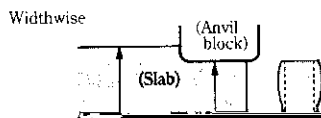
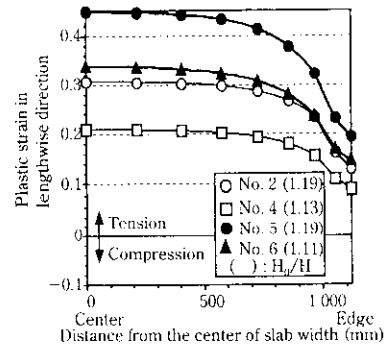Fig. 3 Plastic strains by simulation in thicknesswise direction at the center of thickness ($B/H_0 = 0.74$)

Fig. 5 Plastic strains by simulation in lengthwise direction at the center of thickness ($B/H_0 = 0.74$)
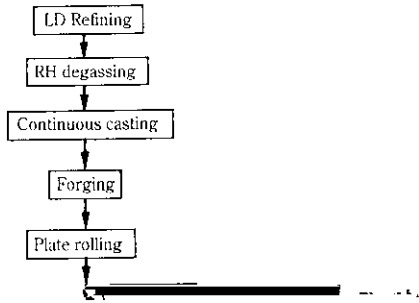
immediate vicinity of the widthwise edge. The compres-

LD Refining
↓
RH degassing
↓
Continuous casting
↓
Forging
↓
Plate rolling

Table 6　Condition of UST

Probe	2Z30I
Sensitivity	V15-2.8: 50%
Frequency	2 MHz
Medium	Water
Surface condition	As roll

After plate rolling

200 μm

| | A ($H_0/H = 1.07$) | B ($H_0/H = 1.13$) | C ($H_0/H = 1.19$) |

Table 7 Results of tensile test

No.	Location	Direction	YP (MPa)	TS (MPa)	El (%)	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

Width of plate (mm)

Ingot casting

Continuous casting slab

● Forging and plate rolling
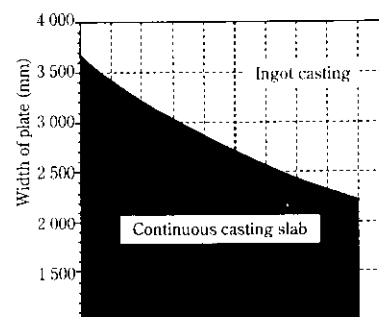
the following conclusions were obtained.

(1) Reduction of slabs in the thicknesswise direction