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MARIWEL - Seawater Corrosion Resistant Steel for Welded Structures

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Synopsis :
Three types of weldable seawater corrosion resistant steels, "MARIWEL", have been developed: MARIWEL H50 is a 50kgf/mm2 cla ss low alloy steel containing Cu, Ni and Mo, and has a good corrosion resistance in splash zone; MARIWEL K is a 41 or 50kgf/mm2 class low alloy steel containing Cr and Mo, and has a good corrosion resistance in submerged zone; and MARIWE L R is a 41 or 50kgf/mm2 class low alloy steel containing Cr, Cu and Ni, which shows good corrosion resistance in both splash and submerged zone. The test results for the commercially produced steel plates indicate that these steels have good mechanic al properties and weldabilities and well as excellent seawater-corrosion resistance. These steels show about twice corrosion resistance compared with that of ordinary steels such as SM50B.

The body can be viewed from the next page.

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MARIWEL—Seawater Corrosion Resistant Steel for Welded Structures*

Three types of weldable seawater corrosion resistant steels "MARIWEL" have

[redacted]

ile properties (JIS No.1A)			Charpy impact value, min. $_VE_0$(kgf·m)
oint n. m²)	Tensile strength (kgf/mm²)	Elongation min. (%)	
	50-62	18	—
			2.8
		21	4.8
	41-52	19	—
			2.8
		22	4.8
	50-62	18	—
			2.8
		21	4.8
	41-52	19	—
			2.8
		22	4.8
	50-62	18	—
			2.8
		21	4.8

Table 2 Grade and characteristics of MARIWEL

Table 5 Chemical composition of weld metals(%)

Designation	Electrode	C	Si	Mn	P	S	Cu	Ni	Cr	Mo
MARIWEL H50C	KSM-50H	0.038	0.61	0.98	0.014	0.004	0.36	0.27	—	0.17
MARIWEL K50C	KSM-50K	0.040	0.58	0.88	0.014	0.005	—	—	1.00	0.19
MARIWEL R50C	KSM-50R	0.041	0.55	0.87	0.015	0.004	0.31	0.22	1.08	—

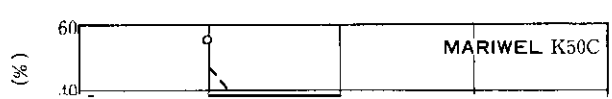
3.1 Characteristics of Base Metal

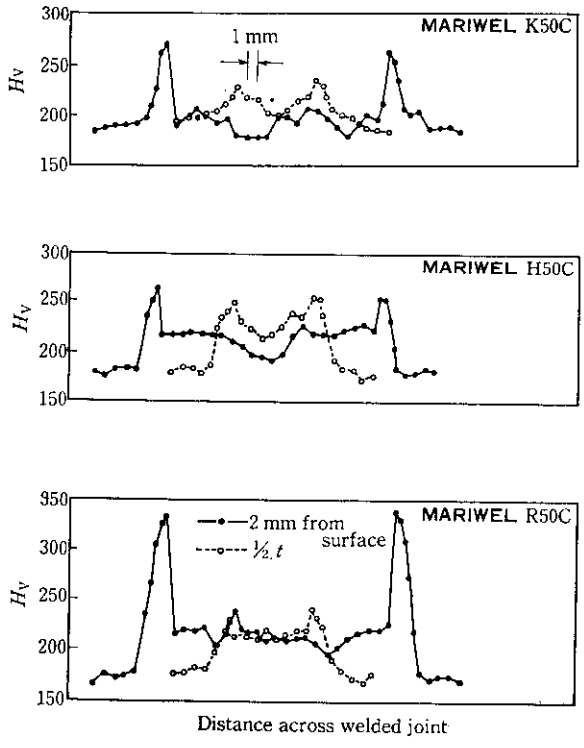
The mechanical properties of the base metal are shown in Table 4. Both strength and toughness satisfy

characteristics.

3.2 Weldability and Properties of Welded Joint

The coated electrodes shown in **Table 5** have the same chemical composition as that of the base metal so as to bring the seawater corrosion resistance to



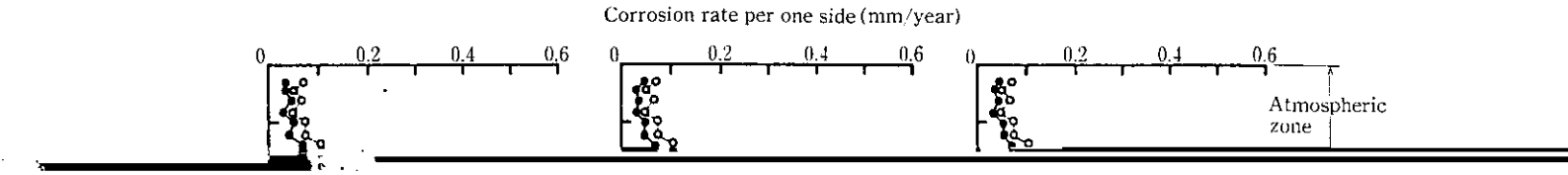


4 Seawater Corrosion Resistance

From the commercial steels of MARIWEL H50C and R50C, long ($8t \times 50 \times 5\,500$ mm) and short ($8t \times 200 \times 300$ mm) test-pieces were made and subjected to a seawater corrosion test for 3–4 years at Chiba, with SM50B and MARINER steel used as the reference material. The surface of the test-piece was finished by machine grinding.

The corrosion rate determined from the mean decrease of thickness in the long test-pieces is shown in **Fig. 4**. Evidently, the long test-piece extending from the atmospheric zone to the underground zone indicated a general tendency for the splash and submerged zones to show greater corrosion rate and for the atmospheric, tidal and underground zones to give relatively smaller corrosion rates. MARIWEL H50C, K50C and R50C gave corrosion rates about a half of that of ordinary steel at the splash zone, the submerged zone and both splash and submerged zones, respectively, proving their excellent corrosion resistance.

As shown in **Photo 1**, the corroded surface of MARIWEL R50C was fine-pitted in the splash zone, while pitting became increasingly irregular in the tidal


Corrosion rate per one side (mm/year)
0
0.2
0.4
0.6
0
0.2
0.4
0.6
0
0.2
0.4
0.6
Atmospheric zone

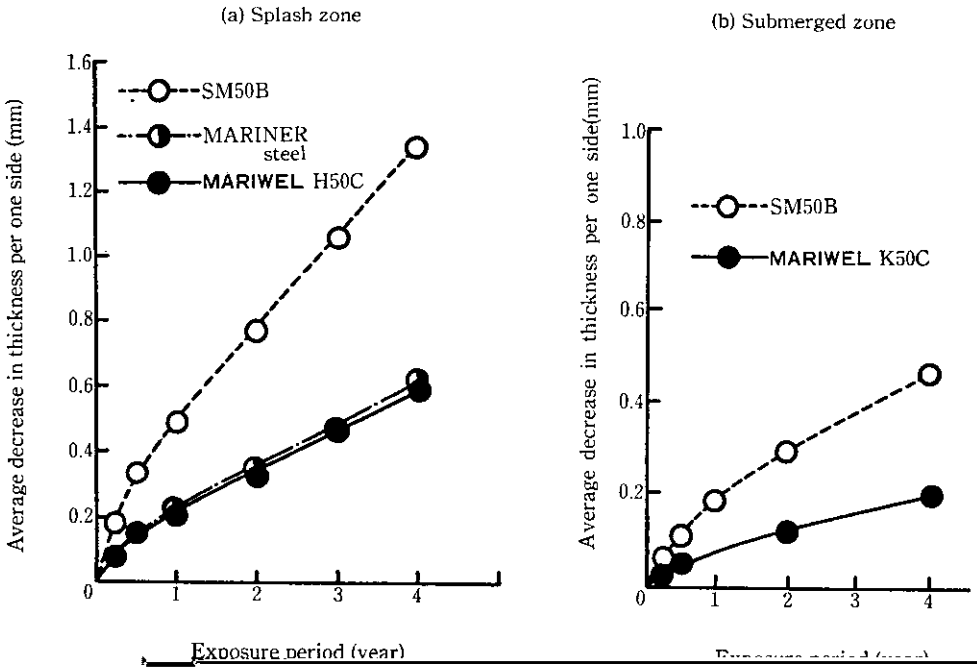


Fig. 5 Results of seawater exposure tests at Chiba (Specimen: $8t \times 200 \times 300$ mm)