KAWASAKI STEEL TECHNICAL REPORT

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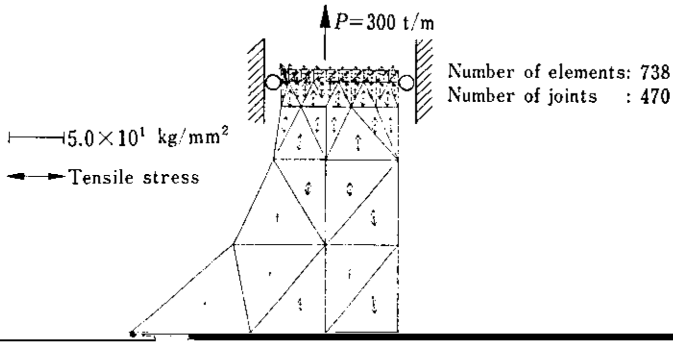
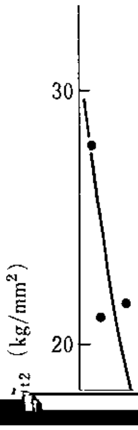
Interlock Strength of Flat-type Steel Sheet Piling*

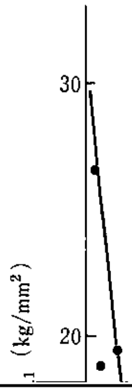
3.1.2 Stress distribution

(1) Main stress for interlock elements

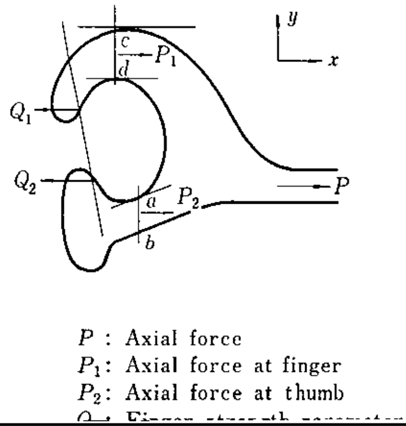

P=300 t/m
Number of elements: 738
Number of joints : 470
5.0×10[1] kg/mm[2]
Tensile stress



30
20
(kg/mm^2)



30
20
(kg/mm^2)



y
x
c
d
P_1
Q_1
Q_2
P
a
P_2
b
P : Axial force
P_1: Axial force at finger
P_2: Axial force at thumb

lock tensile test were compared with the

(1) At the thumb (measuring points A and D), elongation in the web direction was dominant, while that in the normal direction to web due to bending may be attributed to a slip generated at each contact point in the direction of stabilizing interlocking, immediately after the start of loading.

bending deformation to open finger was dominant

ed only to that of elastic deformation of material. In between the elasticity calculation using F.E.M. and the actual ones. On the other hand, in the

$$\beta = \tan^{-1}\frac{h}{g} \cdots\cdots\cdots\cdots\cdots\cdots(10)$$

$$\alpha = \alpha_p \pm \beta \cdots\cdots\cdots\cdots\cdots\cdots(11)$$

Putting **(18)**, **(19)** and **(21)** into **(22)**, web axial force Q_1 acting upon finger is solved.

[redacted]

mal to the web axial direction and moments around point F in Fig. 7

$$P = Q_1 + Q_2 \cdots\cdots\cdots\cdots\cdots\cdots(12)$$

$$V_1 = V_2 \cdots\cdots\cdots\cdots\cdots\cdots(13)$$

$$V_1 \cdot d - Q_1 \cdot a + V_2 \cdot \delta + Q_2 \cdot b = 0 \cdots(14)$$

From the equilibrium relations at thumb-finger contact R

$$\times t \cdot Y \cdots\cdots\cdots\cdots\cdots\cdots(26)$$

Eliminating Q_1 for **(19)** and **(26)**, the interlock separation strength P_0 is given by **(27)**.

$$P_0 = \frac{P}{t} = \left[\frac{(2a-c)-\epsilon(d+\delta)}{(a-c)} \times \frac{-2(y+\epsilon \cdot d)+\sqrt{4(y+\epsilon \cdot d)^2+(1+3\epsilon^2)\cdot f^2}}{(1+3\epsilon^2)}\right]$$

[redacted]

$$Q_1 = N \cdot \sin\alpha + R \cdot \cos\alpha \cdots\cdots\cdots(15)$$

$$R = \mu \cdot N \cdots\cdots\cdots\cdots\cdots\cdots(16)$$

$$V_1 = N \cdot \cos\alpha - R \cdot \sin\alpha \cdots\cdots\cdots(17)$$

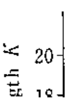
Rearranging (17) with (15) and (16), we obtain (18)

Equation **(27)** means that P_0 is determined by the yield stress of material and geometrical parameters of linked interlocks. The terms other than yield stress are defined collectively as interlock strength coefficient

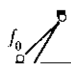
[redacted]

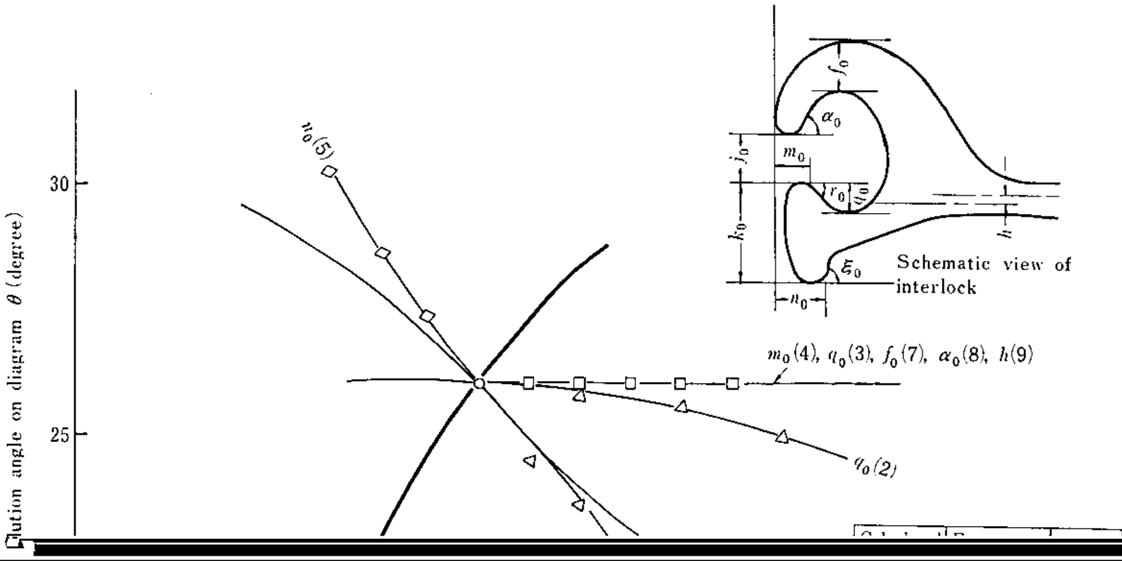
where K values calculated with equations of Bowen et

al. are also plotted. There was a high positive correlation between K and P_{0m}, allowing to evaluate the interlock strength P_0 from K which can be calculated on the basis of interlock geometry and dimensions.



a_0	25.15	f_0	12.68
c_0	15.55	h	2.0
y_0	12.49	α_0	6.3
d_0	7.27	μ_0	0.4
δ_0	7.72		





lution angle on diagram θ (degree)
30
25
n0(5)
m0(4), q0(3), f0(7), α0(8), h(9)
q0(2)
Schematic view of interlock

	Chemical composition								Mechanical properties		
SY 30	0.31	0.07	0.81	0.024	0.021	0.29			39.4	56.7	24
A	0.15	0.22	1.00	0.025	0.018	0.31	0.52	0.032	48.6	61.2	20

Y.P.: Yield stress (kg/mm^2)
T.S.: Tensile strength (kg/mm^2)

[illegible] FEM [illegible]