

## KAWASAKI STEEL TECHNICAL REPORT

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*Steel Pipe*

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### Development of Long Span Pipe Jacking Method for Laying Underground Pipe

Kohzo Akahide, Tomoya Fujimoto, Eiji Nagano, Hiroshi Sasaki, Takashi Takeuchi, Hatsuji Doi

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#### Synopsis :

When it is difficult to use the conventional open-cut method for laying pipe underground, a pipe jacking method is often utilized. In such a case, a longer span is more desirable for actual construction because of the potential cost saving, construction efficiency, minimization of traffic interruption, an

# Development of Long Span Pipe Jacking Method for Laying Underground Pipe\*



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*When it is difficult to use the conventional open-cut method for laying pipe underground, a pipe jacking method is often utilized. In such a case, a longer span is more desirable for actual construction because of it*

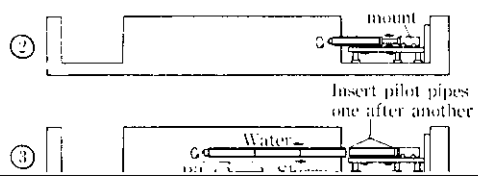
## 2.1 Komatsu Iron Mole

### 2.1.1 Basic units

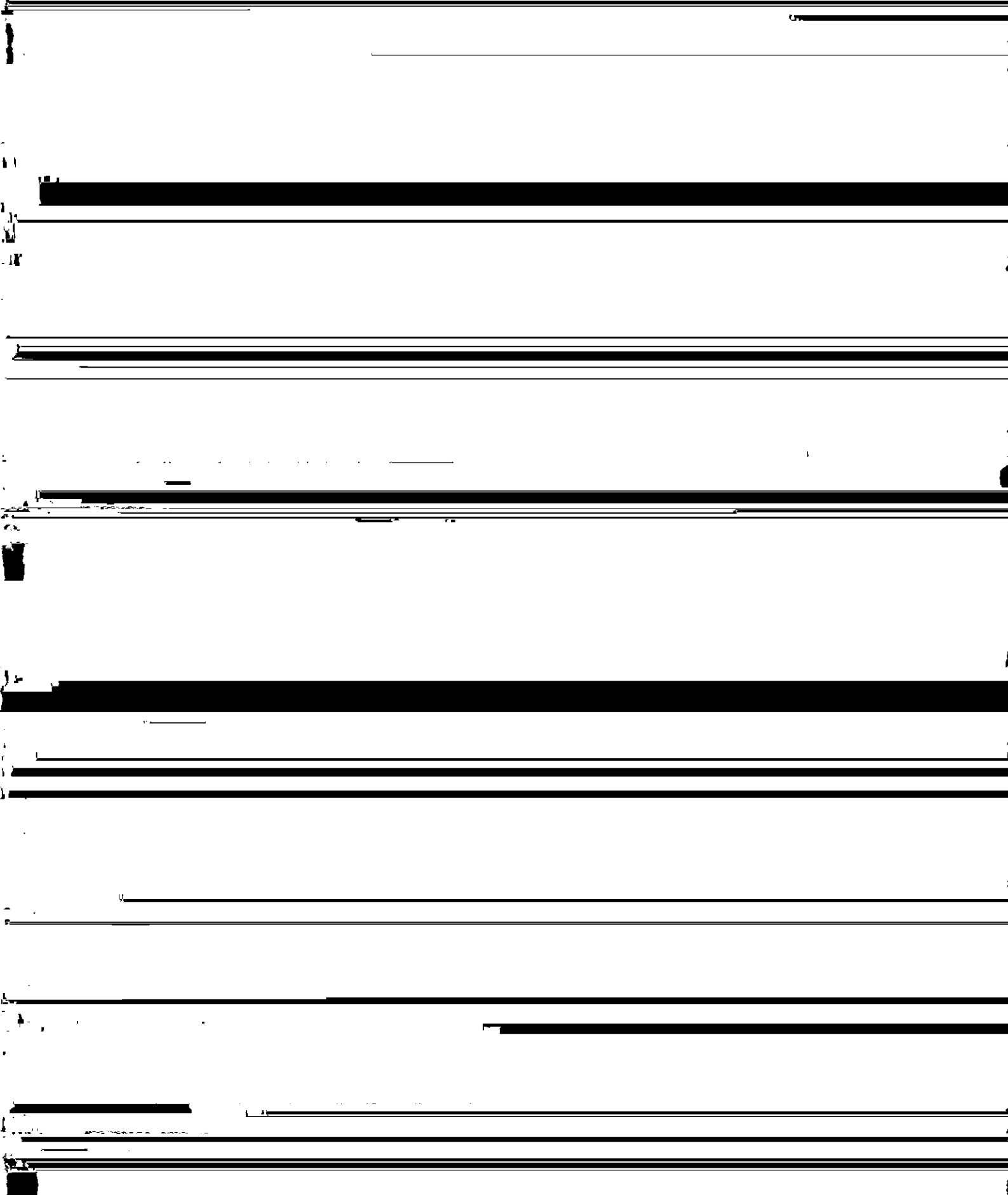
As shown **Photo 1**, it consists of a hydraulic unit,

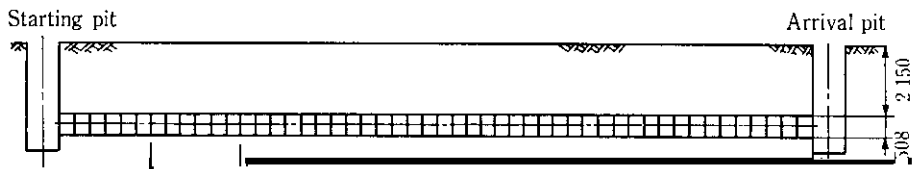


pipe diameters are 250 to 900 mm.



trouble occur, it can be judged at the jacking point





(6p × @ 4 000) (6p × @ 4 000) (38p × @ 4 000)  
 Bare pipe Expanded pipe Double walled pipe

Fig. 4. Arrangement of specimens

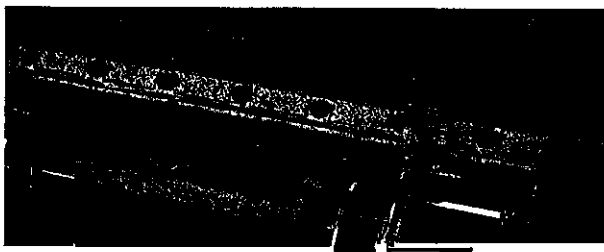
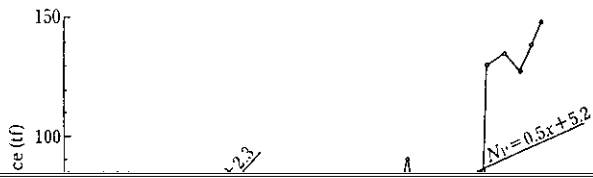


Table 2 List of buckling test specimens

Type of pipe	Geometry (mm)	Number
Double walled		2



other hand, the fluctuations have completely changed compared with the pilot pipe jacking in Fig. 5. Namely, the jacking force realizes a peak value at around 60 to 70 m, and there-after does not increase, even if the jacking distance becomes longer, and remains constant.

in which

$$s\pi D = K_1 \dots\dots\dots(6)$$

Integrating Eq. (5) over  $x$  we have

This is an area where the jacking distance exceeds 60 or 70 m. It is considered that in this case the main pipe and pilot pipe move simultaneously. Thus, the following assumption in Eq. (1)

$$N_H = e^{K_1x+a_1} = C_1 e^{K_1x},$$

provided that  $C_1 = e^{a_1}$ .

From the measured values, we obtain

$$\left. \begin{array}{l} x = 0 : N_H = 105 \\ x = 6000 : N_H = 180 \end{array} \right\} \dots\dots\dots(7)$$

Substitution of the above gives

$$C_1 = 105, K_1 = 0.9 \times 10^{-4}.$$

Thus  $N_H$  is given as

$$N_H = 105 \exp(0.9 \times 10^{-4}x) \dots\dots\dots(8)$$

$$\pi(f_H D - f_P d) = K_2 \dots\dots\dots(12)$$

will give

$$dN_H = K_2 dx \dots\dots\dots(13)$$

$$\therefore N_H = K_2 x + \alpha_2 \dots\dots\dots(14)$$

where if we apply the measured data,

$$K_2 = 0, \alpha_2 = 175$$

are obtained. Then, we obtain Eq. (15) from Eqs. (12) and (14).

$$\therefore \frac{f_H}{f} = \frac{d}{D} \doteq \frac{1}{1} \dots\dots\dots(15)$$

0.5



in  
direc-

Right

40

150



Table 4. Cycle time for pipe connection operation

Type of pipe	Procedure	Cycle time (min)
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during main pipe jacking, the jacking force must be analyzed in two separate zones. In the independent sliding zone where the main pipe is not in contact