福建省工程建设地方标准 **DB**

工程建设地方标准编号： **DBJ/T13–183–2014**
住房城乡建设部备案号： **J12566–2014**

基桩竖向承载力自平衡法静载试验技术规程

Technical specification for static loading test of self-balanced method of vertical bearing capacity of foundation pile

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Technical specification for static loading test of self-balanced method of vertical bearing capacity of foundation pile

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住房和城乡建设部标准定额司

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2013

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3 4 5

242 350001

162 350025 059183799249

E-mail Lxi@fjjky.com

Contents

1

1.0.1

1.0.2

1.0.3

1.0.4

2

2.1

2.1.1 foundation pile

2.1.2 static loading test of self-balanced method

–

2.1.3 ultimate vertical bearing capacity of a single pile

2.1.4 load cell

2.1.5 balanced point position

2.2

Q——

Q_{u}——

Q_{uk}——

R_{a}——

Q_{su}——

Q_{xu}——

W_{p}——

W_{l}——

γ——

s_{d}——

s_{s}——

s_{x}——

Q_{d}——

L——

E_{P}——

A_{P}——

u ——

U_{u}——

U_{su}——

3

3.1

3.1.1

3.1.2

3.2

3.2.1

1

3 1% 50

2

2

1% 3

50 2

3.2.2

3.2.3

5

3.2.4

1

2

3

3.2.5

1

4

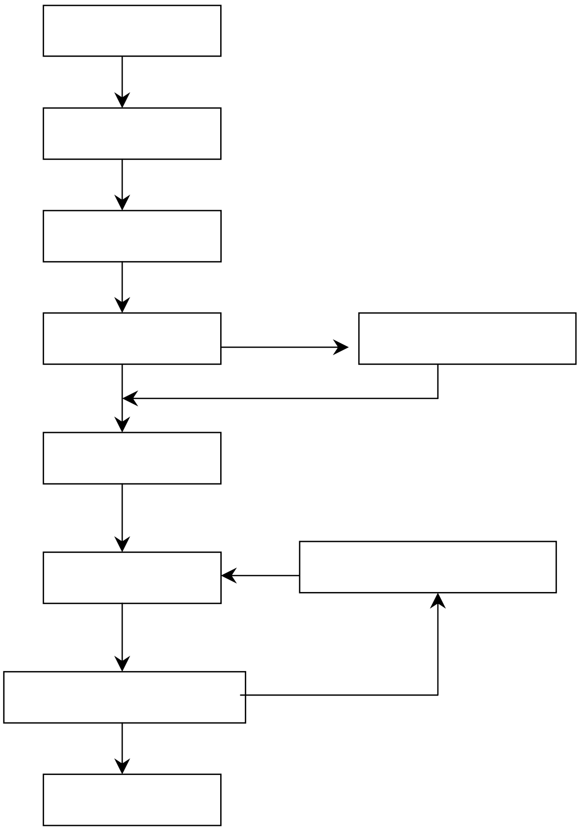
(1.25 1.5)

2

2

3.3

3.3.1 3.3.1



3.3.1

3.3.2

1

2

3

3.3.3

1

2

3

4

5

3.3.4

1

2

3.3.5

1 75%

1.5

2 1

3.3.5

3.3.5

		d
		7
		10
		15
		25

3 1 2

20d 15d

3.3.6

3.3.7

3.3.8

3.4

3.4.1

JGJ 106

3.4.2

3.4.3

3.4.4

3.5

3.5.1

3.5.2

1

2

3

4

5

6

4

4.1

4.1.1

1.2

4.1.2

1%

0.4

80%

4.1.3

0.1%FS / 0.01mm

2 2

2

4.1.4

A

4.2

4.2.1

4.2.2

5°

1

2

3 0.3m 0.5m

4

4.2.3

1 ( )

20cm ( ) 20cm

B B.1

2

3 ( )

4

B B.2

4.2.4

1 3D(D)

2.0m

2

3

4.3

4.3.1

JGJ 106 B

4.3.2

1 1/10

2

2 2

3

10%

4.3.3

1 5min 15min 30min 45min 60min

30min

2

0.1mm 30min 1.5h

30min

3

4 1h 5min 15min 30min 60min

3h

5min 15min 30min 30min

4.3.4 :

1

1 5

40mm

2 2

24h

3

4 – 80mm

100mm 100mm

2

4.3.2 4.3.3

1

5

2 100mm

3

4.3.5 D D

4.3.6

4.3.3

5

5.1

5.1.1

- Q-s - s-lg$t$

5.1.2

A

5.1.3 Q_{su} Q_{xu}

1 Q-s

2 s-lg$t$

3 4.3.4.1 2

4 Q-s

Q_{xu} s_x =40mm 800mm

s=0.05D D

Q_{su} s_s =30mm 40mm (

) 40m

5

Q_{su} Q_{xu}

5.1.4

Q_{su} Q_{xu}

$$Q_u = \frac{Q_{su} - W_p - W_l}{\gamma} + Q_{xu} \qquad (5.1.4$$

Q_u— kN

Q_{su}— kN

Q_{xu}— kN

W_p— kN

W_l— kN

γ—

$\gamma=0.8$ $\gamma=0.7$

$\gamma=1$ γ

γ

5.2

5.2.1 U δ U-δ δ

t δ-lg$t$

5.2.2

A

5.2.3

1 U-δ

2 δ-lg$t$

3

5.2.4 Q_{su}

$$U_u = U_{su} \qquad 5.2.4$$

U_u— (kN)

U_{su}— (kN)

5.3

5.3.1

1 5.1 5.2 n

Q_{ui} i Q_{ui}

2

$$Q_{um} = \frac{1}{n}\sum_{i=1}^{n} Q_{ui} \qquad (5.3.1\text{-}1)$$

3

$$\alpha_i = Q_{ui} / Q_{um} \qquad (5.3.1\text{-}2)$$

4 α_i S_n

$$S_n = \sqrt{\sum_{i=1}^{n} (\alpha_i - 1)^2 / (n-1)} \qquad (5.3.1\text{-}3)$$

5 Q_{uk}

$$S_n \leq 0.15 \quad Q_{uk} = Q_{um} \qquad (5.3.1\text{-}4)$$

$$S_n \quad 0.15 \quad Q_{uk} = \lambda\, Q_{um} \qquad (5.3.1\text{-}5)$$

5.3.2 λ

1 n=2 5.3.2-1

5.3.2-1 $\boldsymbol{\lambda}$ **n=2**

$\alpha_2-\alpha_1$	0.21	0.24	0.27	0.3	0.33	0.36	0.39	0.42	0.45	0.48	0.51
λ	1	0.99	0.97	0.96	0.94	0.93	0.91	0.9	0.88	0.87	0.85

2 n=3 5.3.2-2

5.3.2-2 λ n=3

$\alpha_3-\alpha_1$ α_2	0.30	0.33	0.36	0.39	0.42	0.45	0.48	0.51
0.84	—	—	—	—	—	—	0.93	0.92
0.92	0.99	0.98	0.98	0.97	0.96	0.95	0.94	0.93
1.00	1.00	0.99	0.98	0.97	0.96	0.95	0.93	0.92
1.08	0.98	0.97	0.95	0.94	0.93	0.91	0.90	0.88
1.16	—	—	—	—	—	—	0.86	0.84

3 $n \geq 4$

$$A_0+A_1\lambda+A_2\lambda^2+A_3\lambda^3+A_4\lambda^4=0 \qquad (5.3.2\text{-}1)$$

$$A_0=\sum_{i=1}^{n-m}\alpha_i^2+\frac{1}{m}\left(\sum_{i=1}^{n-m}\alpha_i\right)^2 \qquad (5.3.2\text{-}2)$$

$$A_1=-\frac{2n}{m}\sum_{i=1}^{n-m}\alpha_i \qquad (5.3.2\text{-}3)$$

$$A_2=0.127-1.127n+\frac{n^2}{m} \qquad (5.3.2\text{-}4)$$

$$A_3=0.147\times(n-1) \qquad (5.3.2\text{-}5)$$

$$A_4=-0.042\times(n-1) \qquad (5.3.2\text{-}6)$$

m=1 2…… 5.3.2-1 λ

5.3.3

1 30%

2 3 3

3

3 30%

5.3.4 R_a

5.3.5 3.5.2

1

2

3

4

5 5.1 5.2

Q-s Q-s

C

6

A

A.0.1

A.0.2

A.0.2

( )

A.0.2

A.0.3

1

1

18

;

2 2~4

A.0.4

1

1 600~1000mm

-

60% -

2

3~6mm 350Ω

3

2 1

A.0.5

500MΩ

1h

A.0.6

200MΩ

A.0.7

A.0.8

1με

A.0.9

1.2

1Hz

A.0.10

A.0.11

1

$$\varepsilon = \varepsilon'(1+\frac{r}{R}) \qquad (A.0.11\text{-}1)$$

$$\varepsilon = \varepsilon'(1+\frac{2r}{R}) \qquad (A.0.11\text{-}2)$$

ε——

ε'——

r—— Ω

R—— Ω

2

3

$$Q_i = \bar{\varepsilon}_i \cdot E_i \cdot A_i \qquad \text{A.0.11-3}$$

Q_i—— i kN

$\bar{\varepsilon}_i$—— i

E_i—— i kPa

A_i—— i m^2

4

$$q_{si} = \frac{\left|Q_i - Q_{i+1}\right|}{u \cdot l_i} \qquad \text{(A.0.11-4)}$$

$$q_p = \frac{Q_n}{A_0} \qquad \text{(A.0.11-5)}$$

q_{si}—— i $i+1$ kPa

q_{p}—— kPa

i—— $i=1$ 2 …… n

u—— m

l_i—— i $i+1$ m

Q_n—— kN

A_0—— m^2

5 i

$$\sigma_{si} \quad E_s \cdot \varepsilon_{si} \qquad \text{A.0.11-6}$$

σ_{si}—— i kPa

E_s—— kPa

ε_{si}—— i

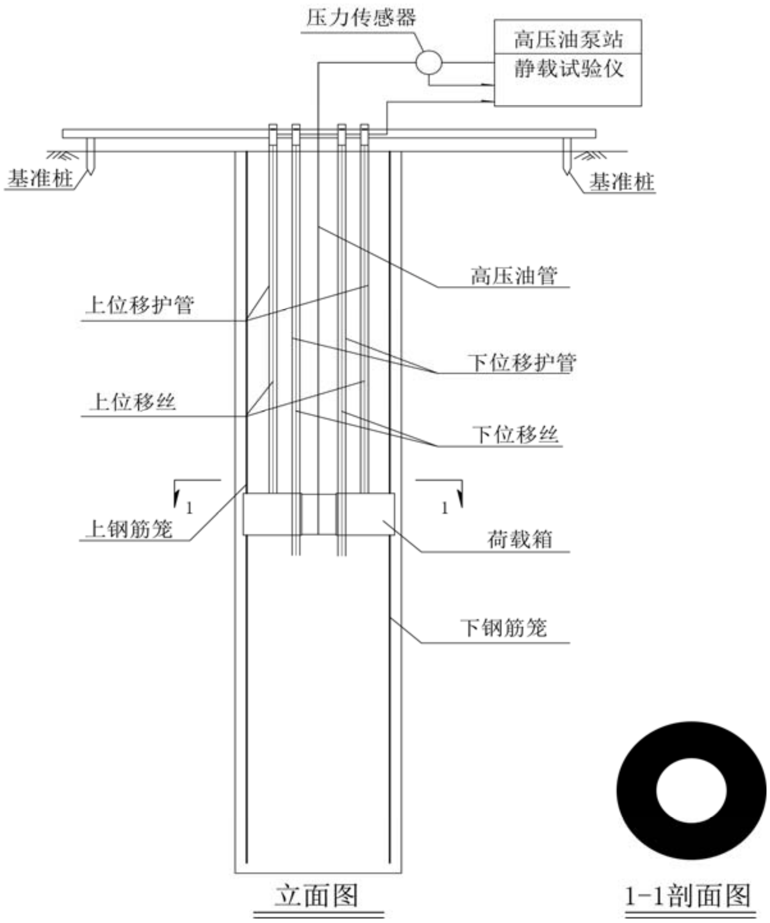
A.0.12 ( )

4.1.3

B

B.1

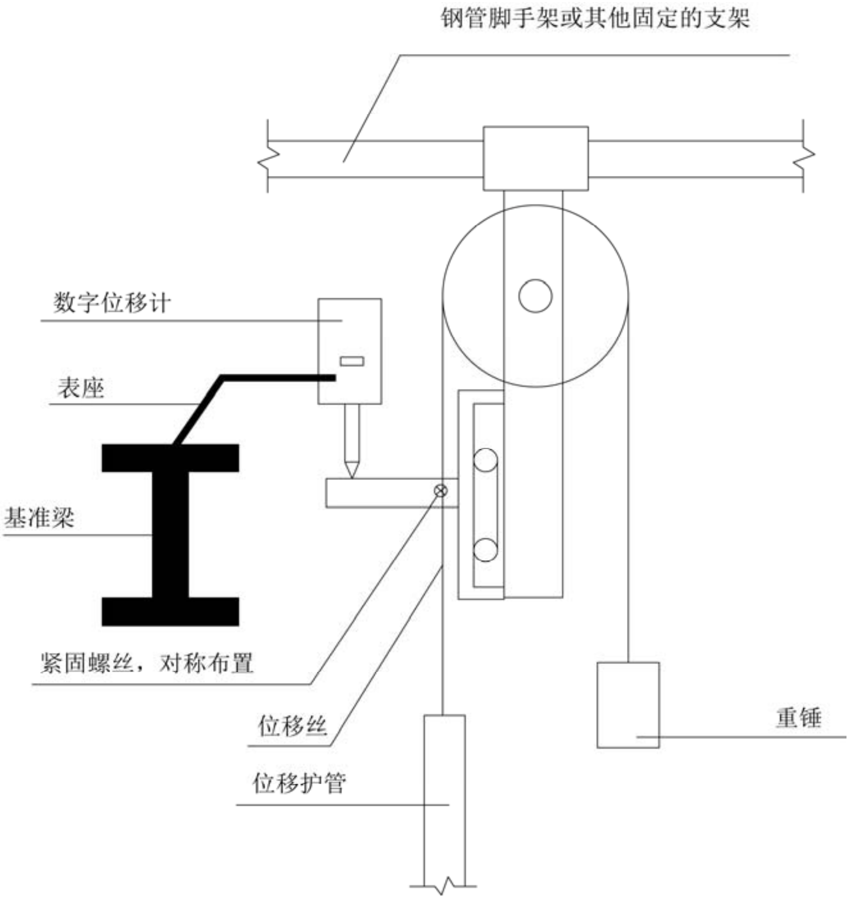
B.1


压力传感器
高压油泵站
静载试验仪
基准桩
基准桩
高压油管
上位移护管
下位移护管
上位移丝
下位移丝
1
1
上钢筋笼
荷载箱
下钢筋笼
立面图
1-1剖面图

B.1

B.2

B.2



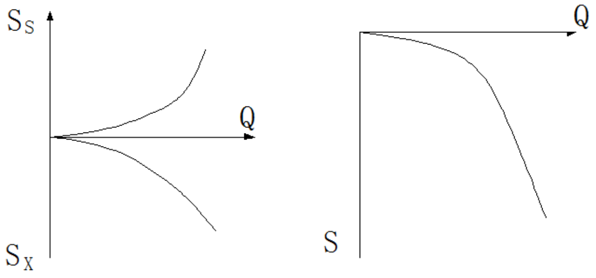
B.2

C

C.0.1

Q s

Q-s



a b

C.1

C.0.2

1

2

a

3

$s_a=s_x$

4 —

—

5 s

$$s= s_1+ s_2 \tag{C.0.2}$$

s_1 ——

(mm)

s_2 ——

(mm)

6 s_2 q_{sm}

7

C.0.3

1 C.0.2.5 C.0.2.6

$$\Delta s_1 = \frac{Q_x L}{E_p A_P} \quad \text{(C.0.3-1)}$$

$$\Delta s_2 = \frac{(Q_s \quad W_p - W_l)L}{2E_p A_p \gamma} \quad \text{(C.0.3-2)}$$

Q_x—— kN

Q_s—— kN

L—— m

γ——

E_P—— kPa

A_P—— m^2

W_p—— kN

W_l—— kN

C.0.3-1 (C.0.3-2) (C.0.2-1)

$$\Delta s = \Delta s_1 + \Delta s_2 = \frac{[(Q_s \quad W_p - W_l)/\gamma + 2Q_x]L}{2E_p A_P} \quad \text{(C.0.3-3)}$$

$$Q = (Q_s - W_p - W_l)/\gamma + Q_x \quad \text{(C.0.3-4)}$$

2 C.0.2.3 Q s

$$s = s_x \quad \Delta s \tag{C.0.3-5}$$

s_x s γ

D

D

D

	(MPa)	(kN)		(mm)				(mm)				
				表1	表2	本次	累计	表1	表2	本次	累计	

1

1

“ ”

“ ”

2

“ ”

“ ” “ ”

3

“ ”

“ ”

2 “
…… ” “ …… ”

1 GB 50007

2 GB 50202

3 JGJ 94

4 JGJ 106

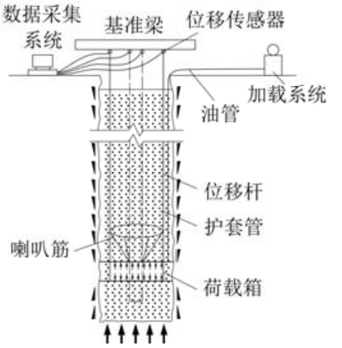
DBJ
/T13-183-2014 2014 1 22
[2014] 2
2014 2 12 [2014] 25

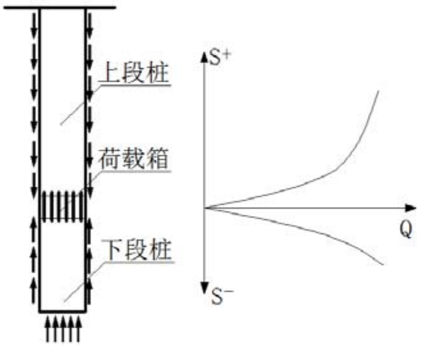
1

1.0.1

( )

1





1

(1)

(2)

(3)

30% 50%

(4) “ ”

“ ”

(5)

( )

(6)

(7)

1.0.2

800mm

( )

1.0.3

1.0.4

2.1

2.1.5

3

3.1

3.1.1

3.1.2

3.2

3.2.1

1

2

3

38

“ ”

GB 50202

3.2.2

1

2

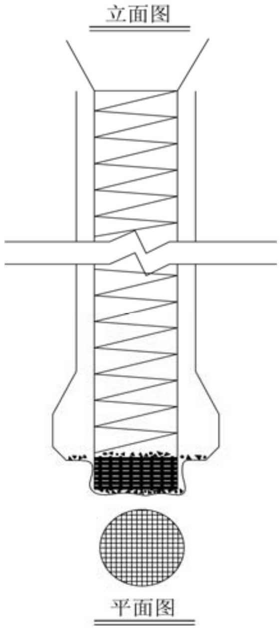
图 2 荷载箱处压浆示意图

2

3

40

3.2.3



3

3.2.4

1.25 1.5

2

3.3

3.3.1

3.3.2

3.3.3

3.3.4

3.3.5

75%

40%　400%

3.3.6

3.3.7

3.3.8

2MPa 30s

3.4

3.4.1

3.4.2

3.4.3

3.4.4

3.4.1

GB/T 50784

3.5

3.5.2

3.5.3 ,

1

20m

40~80%

2

3

4

4.1

4.1.1

1.5

5°

4.1.2

0.4

0.5

3/4

(JT/T875-2013)

4.1.3 50mm JJG379

1 40μm 8

μm 0.1%

1m

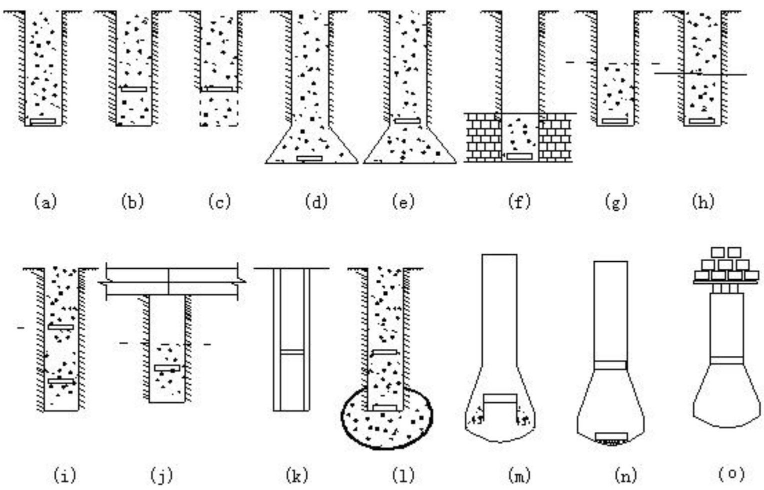
4.2.4

2

4.2

4.2.1

4


(a) (b) (c) (d) (e) (f) (g) (h)

(i) (j) (k) (l) (m) (n) (o)

4

4 a

4 b

4 c

4 d

4 e

4　f

4　g

4　h

4　i

4　j

4　k

4　l

4　m

45°

4　n

4 o

4.2.2

(a)

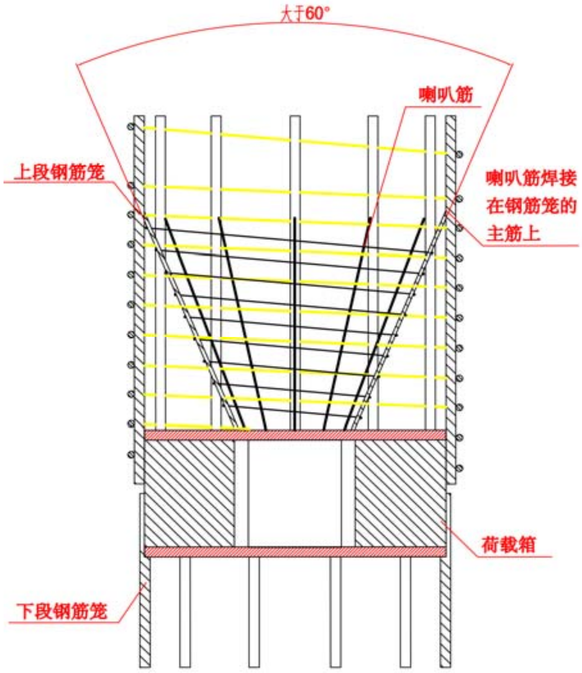
(b)

(c)

(d)

(e)

(f)



5

16mm 60˚

5

3 4

4.2.3

20cm

4.2.4

1985 ISSMFE

“ 2.5m 3D”

“ 4D 2.0m”

3D 2.5m

“

3D”

4.3

4.3.1

4.3.2

2h

4.3.3 4.3.3 2

2h

“ ”

“ ”

4.3.4

5

40mm

Q-s

40mm

1 40mm 5mm

2 40mm 10mm

(1) 40mm 5mm

(2) 40mm 10mm

4.3.6

4.3.3 30min

1

5

5.1

5.1.3 10%

ISSMFE

4%~5% 15% Q-s

s= 0.05D 800mm

Q_{su} s_s =30~40mm

Q_{su} s_s =30mm

5.1.4

1.5

/(0.6~0.8)

/(0.5~0.7)

0.5

Q-s

5.2

5.2.1

U-δ δ-lg$t$

δ-lgU lgU-lgδ

5.2.3

5.3

5.3.1 5.3.2

4

5.3.3

(GB50007)

30%

5 800 950 1000 1100 1150kN

1000kN 350kN

30% 800kN 4

3

1 n Q_{um}=1000kN;

$$Q_{um} = \frac{1}{n}\sum_{i=1}^{n} Q_{ui}$$

2 σ_f=137kN

$$\sigma_f = \sqrt{\sum_{i=1}^{n}(Q_{ui} - Q_{um})^2 / \left(n-1\right)}$$

3 δ=0.137

$$\delta = \sigma_f / Q_{um}$$

4 γ_s=0.87

$$\gamma_s = 1 - (1.704/\sqrt{n} + 4.678/n^2)\delta$$

5 Q_{uk}=870kN

$$Q_{uk} = \gamma_s \cdot Q_{um}$$

3 2

5.3.4

2