

SPECIFICATION

“NISSHA”

BK series

BELL-PILE BUCKET

**for NISSHA “EARTH BOY” series
Earth Drilling Rigs**

Quantity: _____ unit

January, 2000

NIPPON SHARYO, LTD.

Nagoya, Japan

Tel: 81 - (52) -623-3329

Fax: 81 - (52) -623-4349

E-mail: KIDEN-KAIGAI@cm.n-sharyo.co.jp

Home page: <http://n-sharyo.co.jp>

CONTENTS

	Page
1. Foreword	3
2. Features.....	3
3. Structure and functions of BK series bell-pile and monitor/recorder...4	
3.1 Structure and functions of BK series bell-pile bucket.....	4
3.2 Outline of monitor/recorder.....	5
3.3 Monitor (Starting display)	6
3.4 Monitor (Bell-pile process).....	7
4. Specifications of NISSHA BK series bell-pile bucket.....	9
4.1 BK10 ~ BK15	9
4.2 BK17 ~ BK23	10
4.3 BELL-PILE ratio	11
4.4 Applicable earth drilling rig	12

1. Foreword

This specifications shall cover the standard specification of NISSHA BK series Hydraulic bell-pile buckets manufactured by NIPPON SHARYO, LTD.

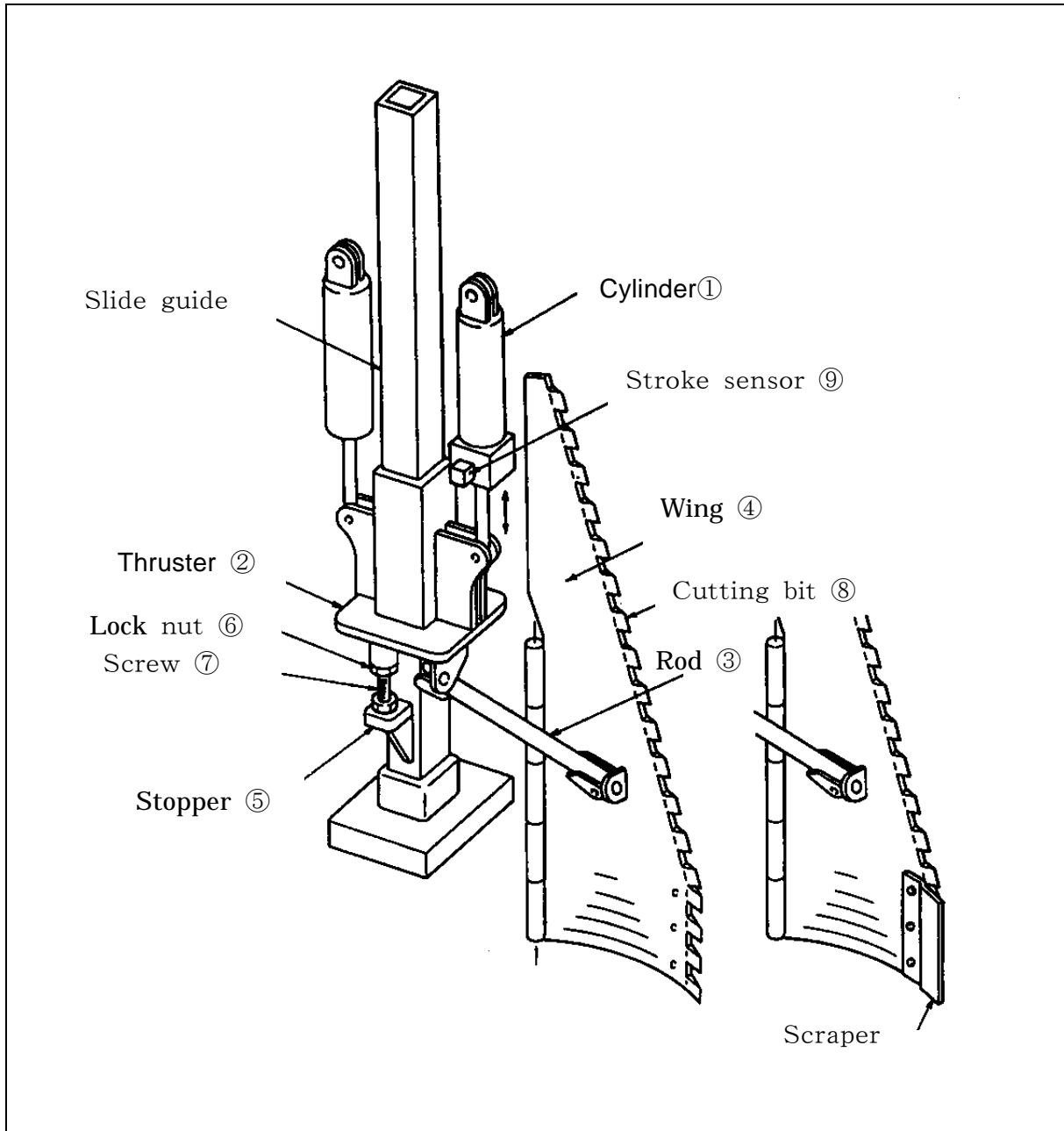
The general arrangements and principal dimensions of the equipment are shown in the drawing attached.

2. Features

- 1) Adoption of a full size wing for forming total cross sections of various sized bell-shaped piles assures smooth and stable bell-pile construction.**
- 2) All of functions as [Bucket opening/closing of NISSHA BK series bell-pile buckets can be timely monitored through a monitor/recorder installed in the operator's cab for avoiding any mal-operation of the bell-pile bucket in the bore hole.**
- 3) A wide monitor display and a voice message/chime give necessary information to the operator for controlling the bell-pile bucket in the bore-hole perfectly.**
- 4) Graphic features of [Bell-shape] and [Drilling depth] showing timely in the monitor display give the operator an actual shaping process of the bell-pile.**
- 5) Every data such as [Bell-pile shape / drilling depth - graphic] and shaft diameter, target bell-pile diameter/actual bell-pile diameter, target depth/actual depth, height of bottom shoulder and angle of slope are monitored and recorded, and are printed out through a recorder in the operator's cab.**

3. Structure and functions of BK series bell-pile and monitor/recorder

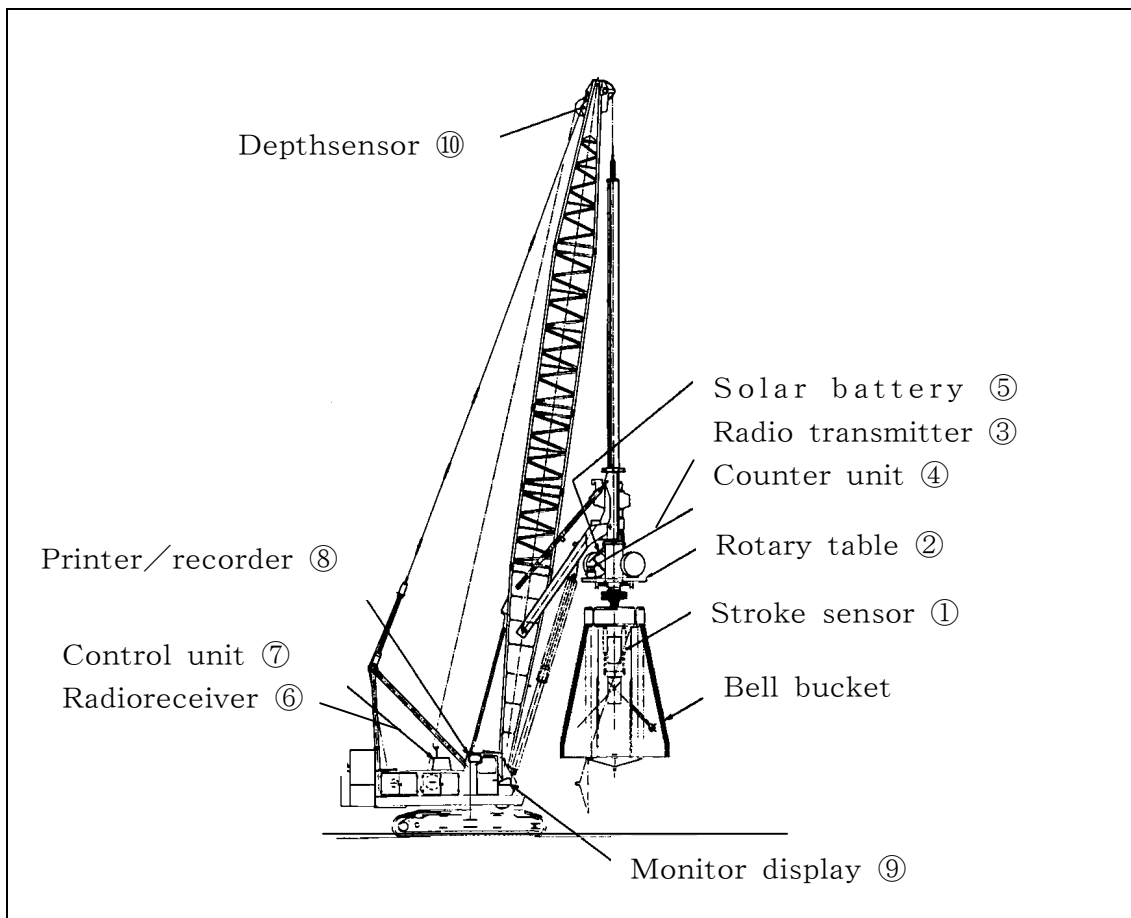
3.1 Structure and functions of BK series bell-pile bucket



When pressing [Bucket open switch] in the operator's cab, a pressurized oil is delivered via rotary table through hydraulic hoses into the cylinder ①. When a cylinder rod of cylinder ① is extended, thruster ② is pushed down, resulting wing ④ to be opened through rod ③.

The required bell-pile diameter can be set up by stopper ⑤, stopper screw ⑥ and lock nut ⑦. Cutting bits ⑧ are provided along the edge of wing ④. Stroke sensors ⑨ provided on the cylinder ① detects the length of the rod stroke and sends its signal to the counter unit. The wing ④ can be closed by retracting the cylinder rod.

3.2 Outline of *monitor/recorder*

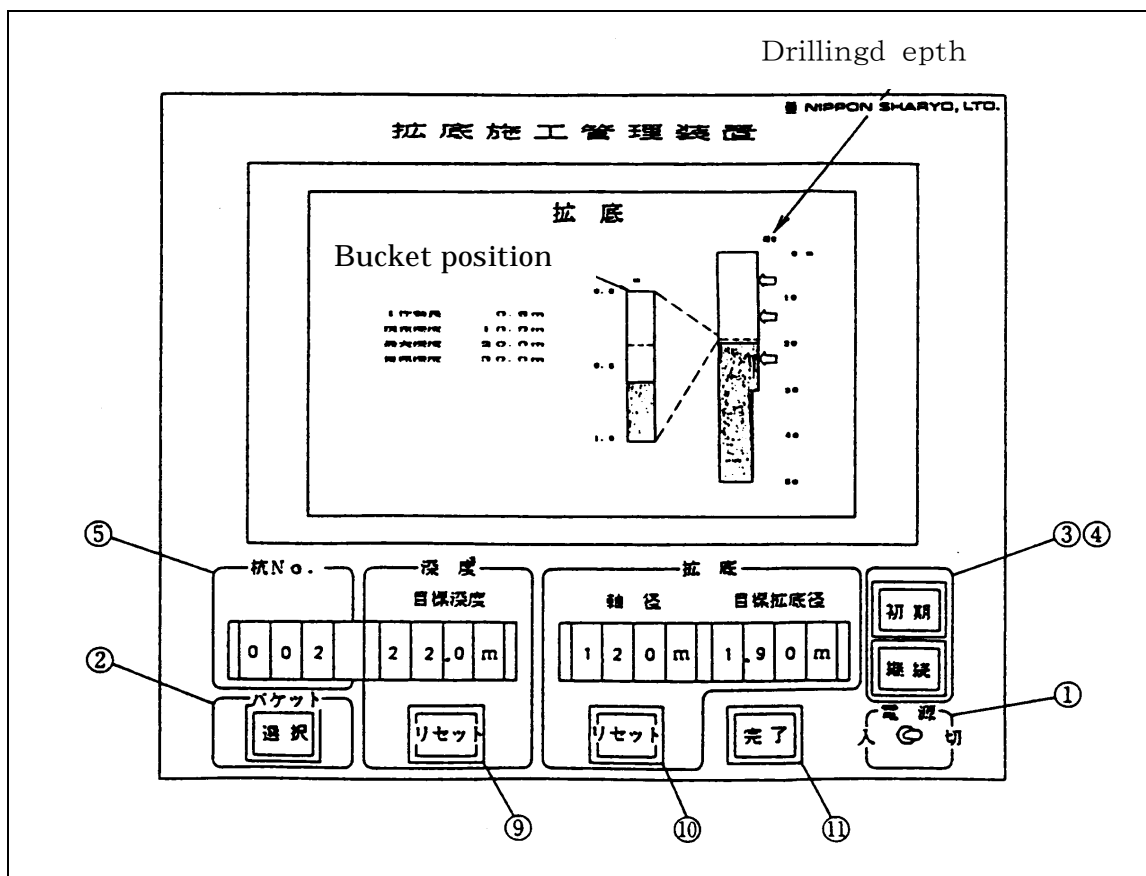


1) The NISSHA BK series bell-pile bucket and monitor/recorder system consists of a bell-pile bucket with a stroke sensor ①, a rotary table ② (Radio transmitter ③, counter unit ④ and solar battery ⑤), radio receiver ⑥ and control unit ⑦, printer/recorder ⑧, monitor display ⑨ and depth sensor ⑩.

2) Stroke sensor ① sends an electrical signal of [Bucket opening degree] through a cable to radio transmitter ③ and counter unit ④ which are energized through solar battery ⑤. These data are radio-transmitted to receiver ⑥ on the earth drilling rig.

3) Depth sensor ⑩ gives a signal of the drilling depth to the control unit ⑦. They are graphically or digitally figured on the monitor display ⑨. These data are also recorded in the printer/recorder ⑧ and printed out through it.

3.3 Monitor (Starting display)



(Outline)

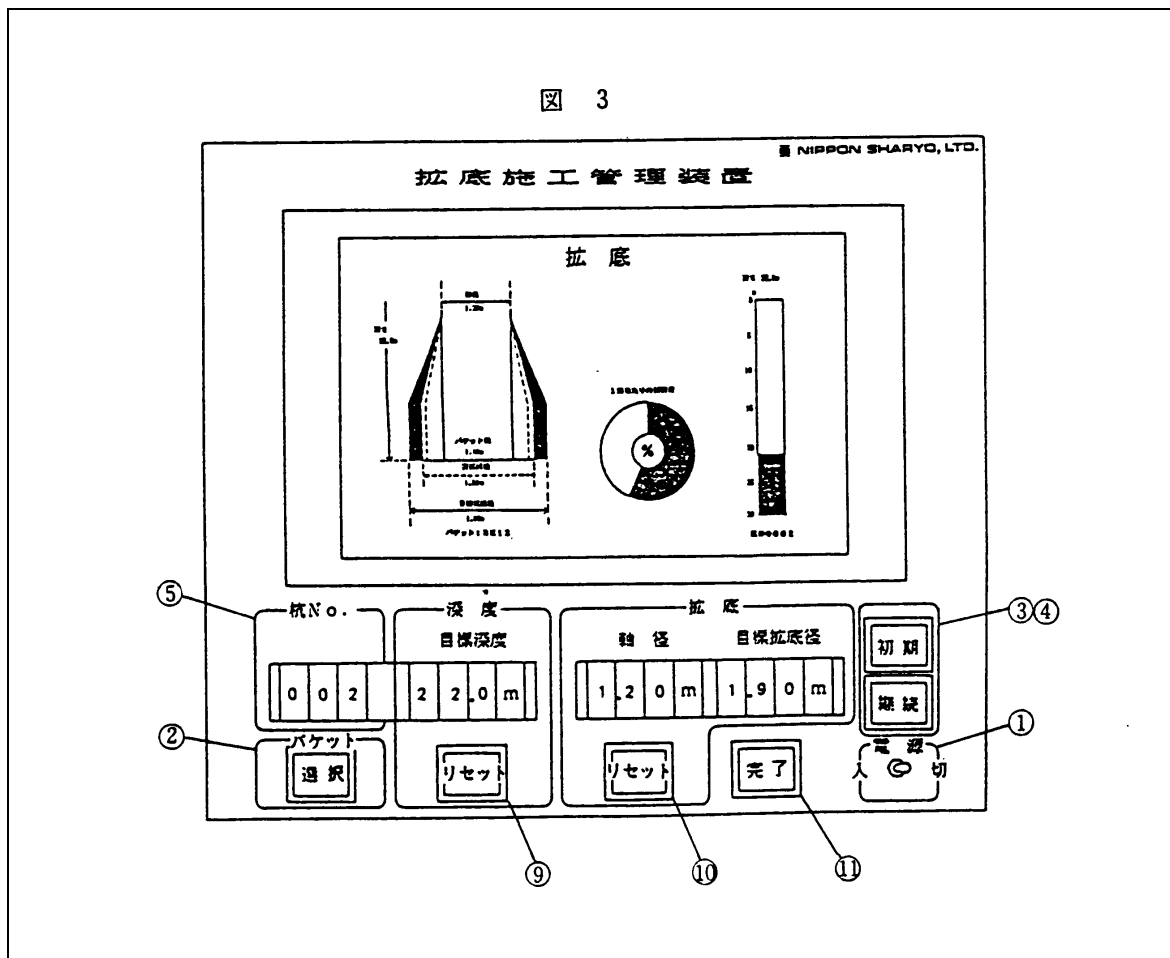
A wide monitor display with graphic features of [Bell-shape] and [Drilling depth] and voice message/chime gives necessary information to the operator for controlling the bell-pile bucket in the bore-hole properly.

- ① Power switchWhen the switch ① is turned on, the display shows a feature shown above.
- ② Bucket selection switch.... To determine the model of BK series bell-pile buckets, press the switch ② and respective indicators are lights one by one.
(基本: Shaft drilling)
- ③ Reset button Press the switch ③ at the start of working.
- ④ Continue button...Press this switch ④ when stopping operation once and at lunch time and restart it. (Once turning power switch ① off and restart the operation)
- ⑤ Pile No. indicator.....Input serial number of pile to be constructed.
- ⑥ Target depth indicator.....Input the required (Target) pile depth.
- ⑦ Shaft diameter indicator...Input the diameter of the shaft drilling.

- ⑧ Target bell-pile diameter indicator...Input the diameter of the belling pile to be constructed.
- ⑨ Depth reset button.....Once suspend the bucket with its bottom plate to be located just over the ground level and press it to reset the depth meter of 00m.
- ⑩ Bell-pile diameter reset button....Suspend the bell-pile bucket and open its wings until the target belling diameter (The required diameter) and press the button to reset the [Target bell-pile diameter ⑧]
- ⑪ Conclusion button When the bell-pile bucket reaches to the target bell-pile diameter, a chime sounds. Press the button to send every job execution data to the recorder for printing out the data and also memorizes the data in to the recorder.

3.4 Monitor (Bell-pile process)

After shaft-boring is completed, replace a shaft-boring bucket with a bell-pile bucket and input all necessary data for the target bell-pile construction into the monitor.....See clause 3.2 Monitor (Starting display). Then, lower the bucket gradually into the bore hole.

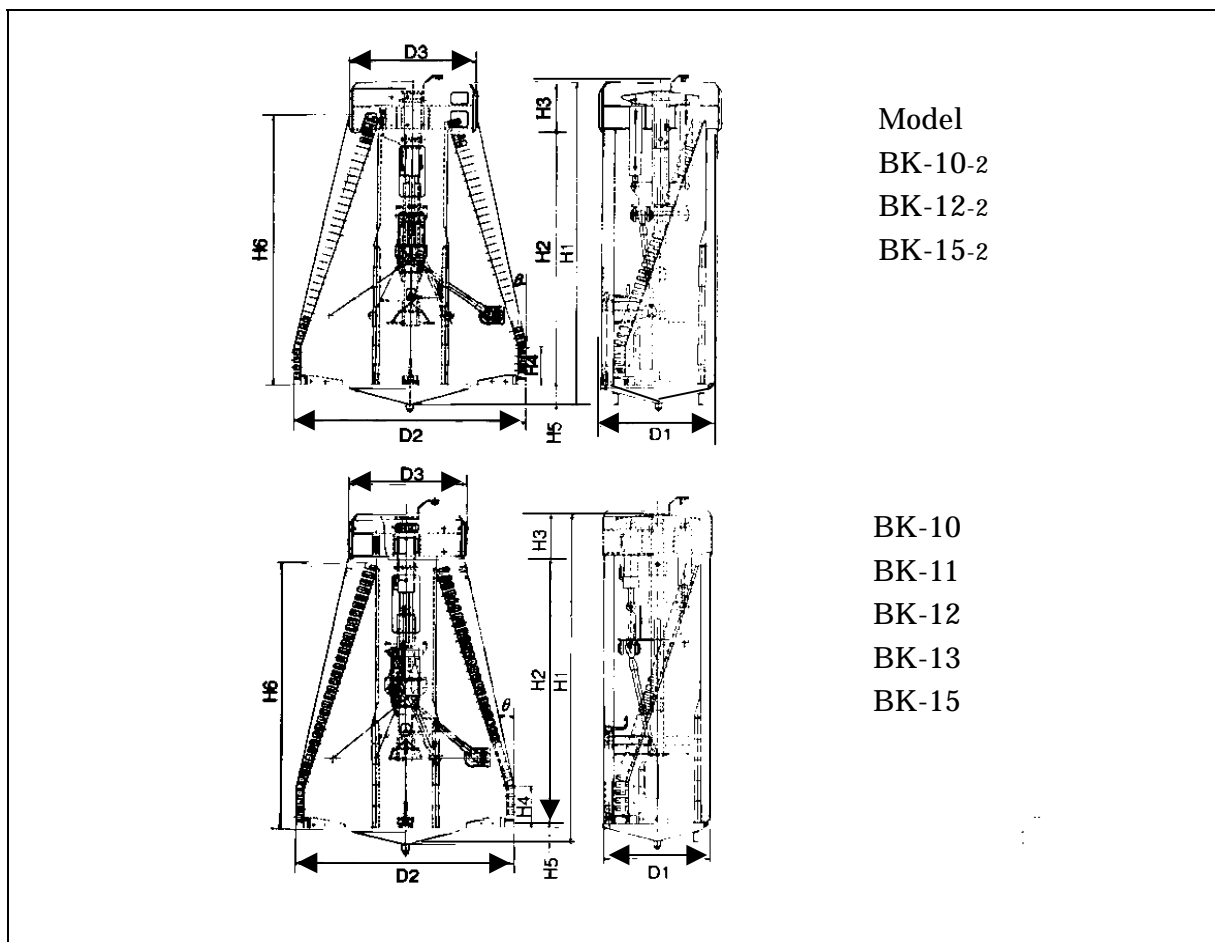


- 1) A chime sounds twice when the bottom plate of the bell-pile bucket reaches within 30cm over the bore hole bottom. Carefully lower the bucket furthermore to ground it.
A bar graph in the display indicates the depth of the bucket.
- 2) After the bucket is grounded, open the wing of the bucket gradually while the bucket is turning.
A circular graph shows a volume of the excavated soil in the bucket. When the circular graph turns to fully (360 degrees) red color that means the bucket is filled up with soil. Then, an alarm sounds and a voice message and an indication of [Close bucket] are performed at the same time.
- 3) Stop to rotate the bucket and close the wings. A chime sounds when the wing are completely closed. Then, lift the bucket for discharging soil in it.
- 4) The L.H. feature [Bell-pile] shows the proceeding of the bell-pile shape.
While there is a red color space, the shape of bell-pile is not completed yet.
When there is no red color but all white in the bell-pile feature, then a music starts to notice [Bell-pile shape is completed].
- 5) After the bell-pile shape is completed, clean up slime on the bottom of the bore hole.
- 6) When the bell-pile construction is completed, press conclusion button⑪ and the data are delivered to the recorder for printing out.

4. Specifications of NISSHA BK series bell-pile bucket

4.1 BK10 ~ BK15

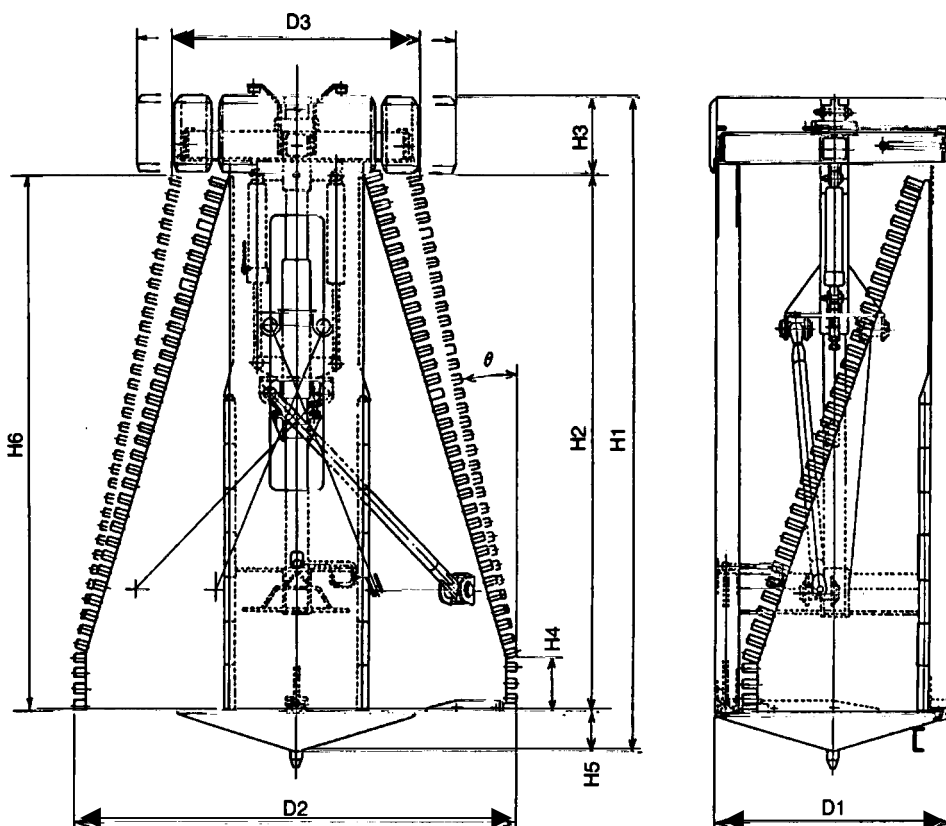
Model of BK bucket Descriptions	BK10	BK10 -2	BK11	BK12	BK12 -2	BK13	BK15	BK15 -2
Bucket diameter D1 (mm)	900	900	980	1080	1080	1180	1380	1380
Maximum Bell diameter D2 (mm)	1600	1700	1900	1950	2100	2400	2600	2700
Stabilizer D3 (mm)	970 1070 1170 1270	1070 1170 1270 1370	1070 1170 1270 1370	1170 1270 1370 1470	1270 1370 1470 1570 1670	1270 1370 1470 1570 1670	1470 1570 1670 1770 1870 1970	1470 1570 1670 1770 1870 1970
Height of bucket H1 (mm)	2770	3040	3260	3180	3500	4020	3880	3880
Height of wing H2 (mm)	2950	2320	2450	2380	2750	3180	3180	3180
Height of stabilizer H3 (mm)	620	620	620	620	620	620	700	700
Height of bottom shoulder H4 (mm)	520	520	520	520	520	520	520	520
Maximum slope angle θ (°)	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Bottom height H5 (mm)	150	170	190	180	200	220	220	220
Wing height H6 (mm)	2050	2190	2430	2380	2680	3160	3180	3400
Weight of bucket (kg)	2600	2500	2980	3400	3400	3940	4870	5080



4.2 BK17 ~ BK23

Model of BK bucket		BK17	BK20	BK23
Descriptions				
Bucket diameter	D1 (mm)	1570	1870	2170
Maximum bell diameter	D2 (mm)	3100	3600	4100
Stabilizer	D3 (mm)	1660 ~ 2260	1960 ~ 2560	2260 ~ 2960
Height of bucket	H1 (mm)	4860	5400	5940
Height of wing	H2 (mm)	3900	4400	4900
Height of stabilizer	H3 (mm)	700	700	700
Height of bottom shoulder	H4 (mm)	500	500	500
Maximum slope angle	θ ($^{\circ}$)	11.7	11.7	11.7
Bottom height	H5 (mm)	260	300	350
Wing height	H6 (mm)	3880	4370	4850
Weight of bucket	(kg)	8400	10300	12700

Model; BK-17, BK-20, BK-23



4.3 Bell-pile ratio

Model of bell bucket	Shaft range	Bell-pile range
BK10, 10 -2	φ 1000	φ 1100~1700
BK11	φ 1100~1300	φ 1200~1900
BK12, 12-2	φ 1200~1500	φ 1300~2100
BK13	φ 1300~2400	φ 1400~2400
BK15-2	φ 1500~2000	φ 1600~2700
BK17	φ 1700~2300	φ 1800~3100
BK20	φ 2000~2600	φ 2100~3600
BK23	φ 2300~3000	φ 2400~4100

Bell-pile ratio = Effective belling pile sectional area / shaft sectional area

$$= \frac{(D - 0.1)^2}{d^2} \quad (\text{m}) \quad \text{here} \quad \begin{array}{l} D : \text{Bell-pile bottom diameter} \\ d : \text{Shaft diameter} \end{array}$$

4.4 Applicable earth drilling rig

Rig	BK10 BK10-2	BK12 BK12-2	BK13	BK15 BK15-2	BK17	BK20	BK23
ED5500	○	○	○	○	○		
ED6500				○	○	○	○
PDH-90			○	○	○	○	

