

h Transcription: English subtitles

Here is the footage from "Site Safety Seminar for Capital Works New Works Contracts" organised by the Hong Kong Housing Authority on 30 April 2015.

The speaker is Mr. Ng Chun Wah Terence, Senior Project Manager of Vibro (HK) Ltd
His presentation topic is "Safe Construction of Bored Piling Work with Use of Casing Oscillator"

Mr. Ng Chun Wah Terence: Hello everyone, I'm Terence from Vibro (H.K.) Limited.

I'd like to share with you

the safe construction of bored piling work with the use of casing oscillator.

I'll first talk about the typical process

of bored pile construction. It's a brief introduction.

Then I'll introduce

a new "piling appliance", known as "Under-reamer". I'll talk about why it emerges, how to use it for piling works

and what influence it has on the safe construction later. It is common to use casing oscillator,

also called "Pile Grinding Machine". I'll briefly introduce it later.

When we conduct under-reaming, it plays a very important role.

For this purpose, Vibro has developed our operation manual as a reference for our operators of casing oscillator.

They also need to receive training before operating our casing oscillator.

Our company has made a series of improvement on the casing oscillator process, I'll talk about it later.

For the casing oscillator, I just mentioned about the under-reamer to be used. We use a RCD,

known as "Reverse Circulation Drill".

I'll also talk about the enhanced safety measures that we have taken later.

Finally, I'll talk about the safety training for our operators of casing oscillator and frontline supervisory staff.

Finally, there is a Q & A session, which will be at the last session after the presentation is completed.

Let me introduce the typical bored pile construction process. First, we conduct pre-drilling,

then use the casing oscillator to bring the temporary casing to the bedrock, while using the soil clamp to remove the soil in the middle. When we get to the bedrock,

we will put a Reverse Circulation Drill (i.e. RCD) over it, then start boring in the bedrock.

At the same time if bell-out is required, we will use an under-reamer to conduct reaming in the bedrock.

After that we will clean the pile with water.

Then we place the reinforcement cage and concrete.

Basically this is how

a typical bored pile was constructed.

But in the process of piling works, we may often encounter obstacles in the soil.

There might be existing concrete structure,

or there were existing scattered stones or large boulders to be dealt with.

And the casing has to pass through it too. How can we do it?

Previously

if you see a big piece of iron, we call it a rock chisel,

with the weight varied from ten tons to twenty tons.

What is it for?

It is used in piling.

Use a crane to lift it

like that in piling or final set and let it free fall,

so what is that for? To crash the boulders or obstruction.

Then we use the clamp to remove it. I think this was a common practice more than a decade ago.

What are the disadvantages? As we can imagine,

the sound of "Bang! Bang!" is similar to the H-piling works will cause large vibration.

In addition, many of our present construction sites are very close to the residential area,

or in the vicinity of slopes, or retaining walls

or even some sensitive public utilities, such as town gas, etc.

Large vibration nearby is not appropriate, so this method is rarely used now.

In recent years, what method did we adopt to solve the boulder problem or underground obstruction? I'll explain later.

Instead, we use machinery,

a bell-out drill called Under-reamer Later you will see in the picture,

there are a total of twenty-five "pineapple heads", namely, twenty-five cutters.

The position here can be widened to grind that stone layer,

so that there will be enough space for the outer liner to continue going down.

Why do we do this?

For the design in Hong Kong,
all the piles are required to be driven into the bedrock, for 500mm
for grade 3 stones.

So we need to use under-reamer to drill through the rock layer, then use the casing
oscillator

to take the temporary steel casing to the bedrock

Only then it would be considered firmly sitting on the bedrock. What are the
benefits?

Less vibration.

As it does not involve impact.

This is how an under-reamer looks like in a vertical position. As you can see,
originally, when we construct a three-meter diameter pile, the under-reaming
diameter is about 2.8 meter,

but when it is belled out, it will be 3.15 meter, wide enough for us, but not too wide
to put a three-meter diameter casing and down to the bedrock

or underground obstruction. To carry out this work,

we need different appliances. As I have mentioned before, it is simple to use chisel.

There is no picture for this here.

We just need a crane to lift the heavy chisel.

Then keep smashing within the pile-casing... to break the obstacles,
so that the casing can be brought down.

The casing oscillator can continue pushing the casing to go down.

When we use the under-reamer, the machinery involved is different. Firstly, we need
a casing oscillator. Clamp the casing first.

As we can imagine,

when we drill to the bottom, and make it belled-out

Which is greater than the diameter of the casing.

In fact, there is

an empty hole below the casing underground. So the casing oscillator plays a big
role,

to support the weight of the casing, RCD and the whole set of drill,

with the lightest ranging from seventy or eighty tons and the heaviest up to even two
or three hundred tons. All rely on this casing oscillator to clamp the casing and
stabilize it,

so that the entire group of materials will not move downward. As I just said,

For chisel, we will work like this. Clamped with the casing oscillator, hang the chisel
inside,

then chisel until it smashes the underground obstruction. It is different when using the casing oscillator.

When it passes through the obstruction, the casing oscillator will bring the casing to grind from left to right, until the casing reaches the designated position in the bedrock.

What shall we note when using the casing oscillator?

For the application of casing oscillator, as we know, there is no established requirement under laws and regulations in Hong Kong so far.

Then do we have any operating procedures?

or any checking system for our operators of casing oscillator? What is the qualification of operators of casing oscillator?

I'll talk about it later.

In addition, we can see that On the control panel, there are a lot of gauges and many different joysticks.

Then which gauge is for which joystick?

Vibro has made an improvement in this aspect.

It's also worth mentioning that the casing oscillator will rise from the ground to a certain height, varied from 1.5 m to 2 m.

Then how to provide a safe access to working platform so that workers can reach this position of the casing oscillator to measure the verticality of the pile-casing, or connect the casing,

which will be mentioned later. In view of this, our company has also developed an operation manual for operators of casing oscillator, or the so-called pile grinding machine operator or driver. You will see a lot of text. I will explain briefly page by page.

We have nine points in the operation procedures. Simply put, before starting the machine every day,

our operator of casing oscillator shall check whether the oil is enough.

In addition, before working every day, they shall add some oil to the whole machine to ensure each component can work properly.

Owing to time limit, I won't talk about the remaining three points. I'd like to talk about something else for your information.

As I have mentioned earlier in one of the operation manual, as the casing oscillator

has to bear heavy weight
up to 200-300 tons,
especially when we conduct under-reaming, we pay great attention to
the upper and lower pressure gauges.

As our entire casing oscillator relies on these upper clamp and lower clamp, also
known as the upper or lower clamp in the industry,
to clamp the casing.

These two pressures should be checked to ensure they were between operation,
so that the machine can provide adequate support for the weight of the entire group
of casing,
RCD and reamer.

In addition, in terms of operation, as we mentioned before,
we must ensure that the upper and lower clamp are locked firmly.

How can we do it?

In fact, we have a checking system to deal with this problem We can come to point
thirteen.

We have set a daily checklist for the casing oscillator for our operator of casing
oscillator.

He needs to check every item daily on the list of casing oscillator operation.

There are a total of eight points

to ensure the normal operation of the casing oscillator.

It may not be trustworthy if the system relies on the inspection by one person.

In Vibro, we rely on a system to ensure

what the operator of casing oscillator inspects, It is a counter-checking system, in
which,

beside the casing oscillator operation manual just mentioned, there are also some
operation notices

when lowering the casing.

200-230

bar

during

In fact, we include all these points in the operation manual for our operators of
casing oscillator,

and also explain to them point by point in the training.

We have specifically simplified them into two casing oscillator manuals,
with the main points summarised,

such as how to operate a casing oscillator, what special issues to notice,

all these are included.

There are also some graphics to illustrate each joystick and the corresponding gauges.

In the casing oscillator operation manual of Vibro, we put a copy of this page near the control panel.

If our operator of casing oscillator forgets at that moment what does this joystick control?

they will know clearly what to do when they take a look at the manual. In addition, when other personnel start working at their post, they will read the manuals.

In fact, all know what function each joystick of the casing oscillator control, and what the respective pressure gauge shows,

this can allow other people to see it clearly. We adopt this practice for each machine.

For some of the casing oscillator operations as I have mentioned Vibro has taken improvement measures.

This is Item 1.

Item 1 is access and egress arrangement to the loading position, which is ranging from one meter to two meters,

and we fabricated some special ladders,

so that workers can safely gain access from the ground to oscillator.

For the ladder, we also designed some openable gates,

so as to protect the workers from falling through the opening. Is there a risk of falling?

This can avoid the risk.

In addition, we tell the workers

what pressure each gauge represents, and which gauge is the joystick controlling, so that they do not have to distinguish them. Just like a roadmap,

for example, when they operate a red joystick, they can refer to the red gauge.

Color coding system.

We paint them with colors,

so that it is convenient for our operators of casing oscillator to know when they move a joystick,

which corresponding gauge to refer to, and no need to find it themselves.

the

working

platform

of

the

casing

They simply look at the text, and do not need to look for it on their own.

We also have an enhanced measure. You can see this enlarged figure.

There are six joysticks and five gauges

you can see whatever you want.

In addition, as I have mentioned before,

we require the operator of casing oscillator to check the casing oscillator every day, in which there are eight required items.

Beside the inspection by the operators of casing oscillator, we also require our site professionals to check.

We select T1 or T4.

As per the Code of Practice for Site Supervision issued by the Buildings Department, T1 or T4 will accompany with the operator of casing oscillator to inspect the eight items. For example,

firstly we will inspect whether the motor oil, water and diesel level is normal before starting-up, or whether the positions like pump and bull eye are normal.

This is what we do.

We will inspect all the eight items.

What system do we use in the inspection? I'll talk about it in the next slide.

We also apply the practice of pointing and calling. In the previous inspection, we do this too.

When the operator of casing oscillator inspects the motor oil, T4 will respond to it.

There are some pictures for your reference.

For example, when he checks whether the oil pressure on the upper or lower clamp is normal or not,

T1/T4 will say:

"Now we check the oil pressure on the upper clamp." And the operator of casing oscillator will answer:

(If under normal situation)

"The oil pressure on the upper clamp is normal." This will be carried out for each part.

For the position of the bull eye, the practice is the same.

T1/T4 will ask the operator of casing oscillator whether the lifting position of the bull eye is normal. And the operator needs to answer orally as well.

We point at the item to be inspected, and answer questions at the same time. If it is normal, the answer is "it's normal",

if it's abnormal, then answer is "it's abnormal".

We also need some power system to operate the casing oscillator. We call it power pack.

As I have mentioned before,

when our casing oscillator performs the under-reaming operation, it may have to bear the weight up to 300 tons or so.

Accordingly we set the rule for the application of the power system. For example, before we increase loading to the steel casing,

while we are reaming,

or when the casing is not sitting on firm soil, or on the bedrock,

we require the operator of casing oscillator to push the upper and lower clamp, namely, the upper and lower clamp joystick again,

so as to make sure that it works under a normal pressure. Secondly, when the casing is not located on solid bedrock, our power pack should be connected to the control panel. prior to addition of loading on the steel casing.

Because if there is no power pack, the casing oscillator cannot run. Oil pressure will be locked and cannot be operated.

So if we want to increase the oil pressure, we have to connect it with the power pack.

Thirdly, if we have to perform reaming for a long period of time, but it happens to be Easter and the Chinese New Year

What shall we do if the operation has not yet been finished?

Before we shut it down, we must re-pressurize the upper and lower clamps. And when we get back to work after holiday,

we also need to re-pressurize the upper and lower clamps again to ensure that the machine was sufficiently re-pressurized

and enough bearing capacity to support the weight of the whole steel casing, drill pipes, reamer and RCD.

As I have mentioned,

the responsibility of the casing oscillator is very significant. One machine can support up to 300 tons of weight alone.

Vibro have already

taken this situation into account,

and have taken some enhanced measures.

We will cast four "Triangular wedges" on the pile.

Four iron plates

are located on top of the casing oscillator, just in case,

for example, if there is a mechanical failure resulting in sudden loss of power to support the hundreds of tons of weight, We still have the four iron plates. Of course, we need to calculate the required capacity in advance to support the weight of the whole group, so that when workers are working on the RCD platform, they won't worry about their safety due to the risk of moving downward.

This can protect the safety of our workers on the platform. Though the RCD platform of Vibro has railing and toe board, which is a proper working platform, for the entire pile, during the under-reaming, there is a risk of the whole group moving downward. If that casing oscillator has a failure, and the triangular iron plates have a failure, there is a risk of moving downward.

Although this risk is very small, our management still takes it into consideration. On this commonly called "portal frame", we make some anchor points, along with some lifelines. During the under-reaming, if our workers or our operators need to work at height, they must use the independent lifelines before their operation. As I have just mentioned, in the industry or laws and regulations, there is no protocol so far to require what exactly the casing oscillator operator shall do.

But our company has arranged and set up the internal training for our operators of casing oscillator.

As I have introduced, also mentioned in the briefing, we tell each operator the requirements on them, their responsibility, and information about the machine.

In addition, how he cooperates with others, such as the crane operator, or other work crew.

All the information is included in the training course. We will also tell them about their responsibilities.

For example, conduct inspection with T1 or T4 every day, apply the pointing and calling system, we also do it in the training.

After completing the introductory training course, although it is brief, there are 16 items.

We give a three-hour class to the operators of casing oscillator .

After the class, we conduct an exam

for the budding operators of casing oscillator, who had not yet been employed. If they pass the exam,

the company will award a certificate of qualification,

and make an appointment as an operator of casing oscillator.

Our company sets the validity period of the appointment at five years.

After five years, they are required to receive refreshment course, or if necessary, take the exam again.

After that, they can renew their certification. That's how we do it.

This is the safe construction of bored piling work with use of casing oscillator. This is the end of my presentation. Thank you.