



Diagonal & Circular Cutting Type Cutting Machine

Diagonal-cutting SS Construction Method

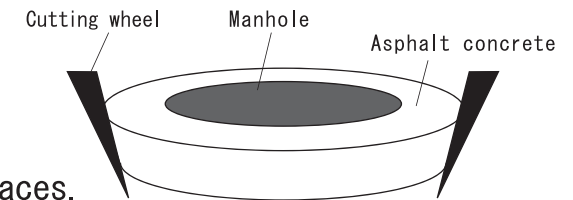
(Patent Number 3115131)



SANKO Corporation

What is the Diagonal & Circular Cutting Type Cutting Machine?

- A cutting machine, which is designed to cut around a manhole in a circle, for example, in order to increase the height of the manhole.
- A two-blade cutting wheel rotates like an electric fan to cut road pavement.
- The cutting wheel can be inclined to increase the degree of bonding of joint surfaces.



A shutter provided to enclose the machine during cutting work for preventing concrete pieces from flying and reducing noise level.



Rotating two-blade cutting wheel



Lifting the machine with a crane after the completion of cutting work

What is the Diagonal-cutting SS Construction Method?

- A construction method, which combines cutting work using the Diagonal & Circular Cutting Type Cutting Machine and restoration work using the SANKO's unique materials.
- The diagonal SS construction method uses the SANKO's unique no-shrink type SS concrete as well as asphalt composite for surface finish. Inclining the cutting wheel provides a high degree of strength for joints. This method requires no epoxy materials that use for other construction methods, providing clean pavement surface without leaving any joint lines on it even in case of construction after completion of road paving work.
- The diagonal-cutting SS construction method is an officially certified construction method in Japan.

Advantages of Diagonal-cutting SS Construction Method

Advantages for Owner

- Achieving construction cost cutting.
- Energy and resource saving achieved by reduction of cutting wastes and materials used for restoration to approximately 1/8* compared to the conventional open-cut (square-cut) construction method.
- Seamless (no joint) finish by the diagonal cutting feature.(at an angle of 0 to 20 degrees)
- Exceedingly low cutting noise level.(Silent type)
- Available not only for asphalt, but also for concrete.
- Available for cutting diameters ranging from 80 cm up to 160 cm.
- Adjustable arm length enabling free adjustment of cutting diameter.
- Possible to use asphalt for surface finish, thus enabling cut work without leaving noticeable cut marks even if it is conducted after the completion of road paving work.



Advantages for purchaser of the cutting machine

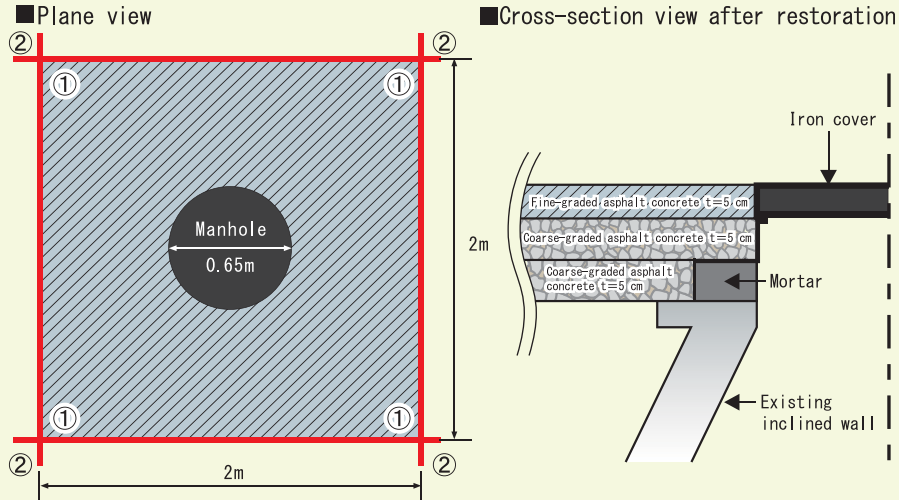
- Achieving reduction of running cost.
- A single machine available for free cutting in the range of diameter of 80 cm up to 160 cm by arm length adjustment.
- The same cutting wheel available for cutting to different diameters, eliminating unnecessary stock and facilitating control of cutting wheels.
- Saving of warehouse space achieved by standardizing one type of cutting machine and cutting wheel.



Comparison with Conventional Open-cut (Square-cut) Construction Method

Conventional open-cut construction method

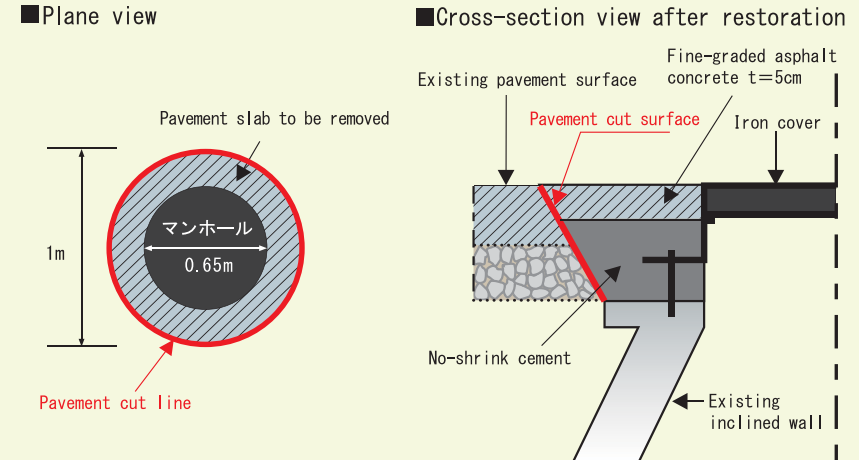
This method cuts a pavement slab in a rectangular using a concrete cutter, and then removes the pavement slab and a manhole cover using a compressor.



- Concrete in the corner ① cannot be evenly compacted. Consequently, settlement is caused due to consolidation in the corner ① after the completion of restoration.
- The pavement slab is overcut in the corner ② and rainwater enters from the overcut part to accelerate damage to the pavement.
- Joints come apart several months after the completion of construction.

Diagonal-cutting SS construction method

1. This method diagonally cuts a pavement slab using the Diagonal & Circular Cutting Machine, and then removes the pavement slab and a manhole cover using a hydraulic jack.
2. This machine has the function of making quick change of cutting diameter to any diameter in increments of 10 cm as well as easy change of cutting angle in the range of 0 to 20 degrees in increments of 5 degrees.



- The cut surface is inclined, and thereby settlement due to the consolidation of tires after restoration is prevented.
- Concrete can be evenly compacted to seamless surface finish, thus preventing entry of rainwater and increasing the degree of bonding.

Advantages of Diagonal-cutting SS Construction Method

Advantages for Owner

Is it possible to shorten construction time?

● It is expected to shorten construction time by 70 to 100 minutes per place.

■ Construction procedure and time



What a fast job!!

Conventional open-cut (square-cut) construction method	Diagonal-cutting SS construction method
Approximately 190 minutes	Approximately 90 to 120 minutes
<ul style="list-style-type: none"> ○ Preparation and cutting of pavement slab (20 minutes) ○ Demolition and loading of pavement slab, removal of manhole cover, and removal of adjustment concrete (90 minutes) ○ Installation of manhole cover (including height adjustment) (30 minutes) ○ Concrete pavement restoration (30 minutes) ○ Curing (20 minutes) ○ Traffic opening 	<ul style="list-style-type: none"> ○ Preparation and cutting of pavement slab (20 minutes) ○ Removal of manhole support frame, pavement slab, and adjustment concrete (15 minutes) ○ Installation of borehole, anchor bolts, manhole cover, and inner and outer concrete formworks (15 minutes) ○ Kneading, casting, and curing noshrink concrete (20 minutes)

* Source : Experimental comparison by SANKO Corporation based on existing pavement slab thickness of 15 cm and adjustment height of 4 cm

Advantages of Diagonal-cutting SS Construction Method

What about noises?

- Since the Diagonal & Circular Cutting Type Cutting Machine is of the electric motor-driven type and also enclosed with a shutter while in cutting operation it is definitely quiet compared to conventional engine-driven cutters. In addition, this machine requires no compressor and thereby achieves substantial reduction of vibration and noise levels.

It's so quiet!!



What about energy saving performance?

- Wastes are reduced to approximately 1/8 compared to those from the open-cut (square-cut) construction method thus making a significant contribution to reduction of CO2 emissions.
- Reduction of wastes leads to reduction of materials used for restoration. This is the reason why the Diagonal-cutting SS Construction Method is environmentally friendly and economical.

We've got energy saved a lot!!



■ Area to be restored (including the area of a manhole)

Conventional open-cut (square-cut) construction method	Diagonal-cutting SS construction method
Area of pavement slab removed : 2.0 m × 2.0 m = 4.0m ² (standard)	Area of pavement slab removed : 1.0 m in diameter = 0.785 m ² (standard)

4.0m² = 0.33m² (Area of manhole) = 3.67m² → 0.785m² = 0.33m² (Area of manhole) = 0.455m²

Reduced to approx.1/8

Strong and clean, indeed!!


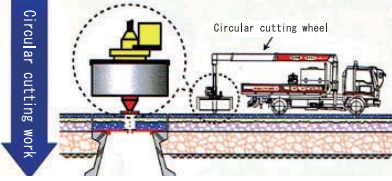
What are the merits of diagonal cutting?



- Facilitating removal of a manhole and providing seamless (no joint) finish.
- Increasing the degree of bonding of joint surfaces after restoration and reducing settlement due to traffic.
- Making the same asphalt composite as that for road pavement restoration available to provide clean surface even by construction after the completion of road paving work.



Comparison with Similar Construction Methods

- Major circular cutting construction methods
(construction methods certified by the Tokyo Metropolitan Government Bureau of Sewage)

EPO Construction Method
Cutting type (disc cutter)
A large-size core boring machine is used.

<ul style="list-style-type: none"> High equipment cost High running cost High construction cost Fixed cutting blade diameter (Cutting blades of each diameter need to be stocked)


Diagonal-cutting SS construction method
Cutting type (two-blade cutting wheel)
A two-blade cutting wheel rotates like an electric fan to diagonally cut pavement surface.

<ul style="list-style-type: none"> Diagonal cutting to provide seamless finish Slide arm adaptable to different cutting diameters Driven by an electric motor achieving quiet cutting work Available for concrete Reducing machine inventories


Advantages of Diagonal-cutting SS Construction Method

Advantages for Owner

Wow, what a low cost!!



What about unit-cost of construction per place?

● It can expect to complete construction at lower cost compared to other construction methods.

■ Construction cost per place based on cutting diameter of 95 cm to 100 cm and excavation depth of 15 cm (Standard type)

EPO Construction Method	Diagonal-cutting SS construction method
136,000yen (φ100)	90,000yen (φ100)

■ Construction cost per place based on cutting diameter of 115 cm and excavation depth of 15 cm (Standard type)

EPO Construction Method	Diagonal-cutting SS construction method
178,000yen	100,000yen

* Source : Survey by SANKO Corporation based on the Kensetsu-Bukka 2007

What about construction time and volume?

● All construction methods are at a roughly equal level.

■ Construction time (until traffic opening) per place

EPO Construction Method	Diagonal-cutting SS construction method
about 150 minutes	about 120 minutes

■ Construction volume per day

EPO Construction Method	Diagonal-cutting SS construction method
3 places	3 places

* Source : Experimental comparison by SANKO Corporation based on existing

Advantages of Diagonal-cutting SS Construction Method

Advantages for Owner

What are the merits of diagonal cutting?

- Facilitating removal of a manhole and providing seamless (no joint) finish.

■ Diagonal cutting

EPO Construction Method	Diagonal-cutting SS construction method
×	○

We've got clean finish!!

SANKO's the only one supplier for diagonal cutting!!



- Increasing the degree of bonding of joint surfaces after restoration and reducing settlement due to traffic.
- Making the same asphalt composite as that for road pavement restoration available to provide clean surface even by construction after the completion of road paving work.

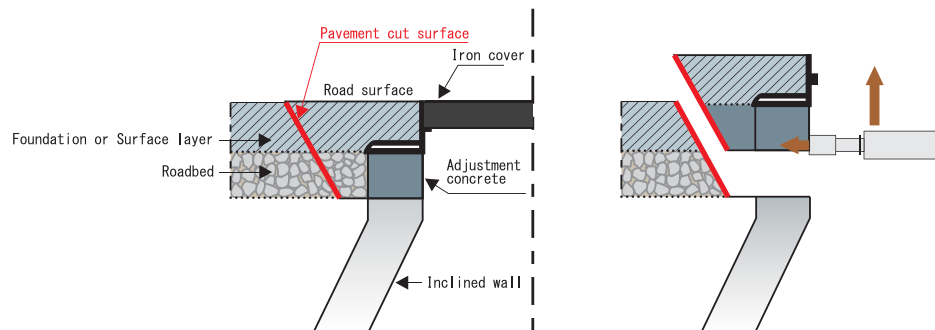
Materials used for restoration

EPO Construction Method	Diagonal-cutting SS construction method
Epoxy-based ES concrete	Noshrink type SS concrete

■ Standard materials used for surface finish

EPO Construction Method	Diagonal-cutting SS construction method
Epoxy-based ES concrete	Asphalt composite (5cm thick)
Cut marks are left after the completion of pavement slab restoration.	Cut marks are practically unnoticeable.

* Materials meeting individual requirements are available.



Facilitating removal



Practically unnoticeable joints

Advantages of Diagonal-cutting SS Construction Method

Advantages for Owner

What about noise level?

- Since the cutting machine is of the electric motor-driven type, it is quiet while in cutting operation, it runs quietly compared to engine-driven cutters. In addition, the machine is enclosed with a shutter while in cutting operation, thus significantly reducing the noise level.

It's so quiet!!



Shutter



■ Operation types and noise levels

EPO Construction Method	Diagonal-cutting SS construction method
Hydromotor-driven	Electric motor-driven
Low noise level	Low noise level (71 to 82dB)

* Source : SANKO Corporation

noise test



Available for concrete?

- Available for concrete due to the application of cutting type.

Concrete's OK too!!



■ Construction of concrete pavement slab

EPO Construction Method	Diagonal-cutting SS construction method
○	○

Advantages of Diagonal-cutting SS Construction Method

Advantages for Owner

What is the maximum cutting depth?

So deep!!



● This method is available for cutting to the depth of 30 cm at maximum.

■ Cutting (Shearing) depth

EPO Construction Method	Diagonal-cutting SS construction method
5~30cm	5~30cm

What is the maximum cutting diameter?

Freely adjustable!!



● This method is available for cutting to the diameter of 160 cm at maximum.
Since the arm length is adjustable, cutting diameter is freely adjustable too.

■ Cutting (Shearing) diameter

EPO Construction Method (fixed)	Diagonal-cutting SS construction method (freely)
80・100・115・130・140cm	80~160cm

Advantages of Diagonal-cutting SS Construction Method

Advantages for purchaser of the cutting machine



Great!! Less inventories.

How much money can be saved?

- Low in running cost
Only one type of machine and cutting wheel are required to eliminate useless inventories.

■ Cutting machine (Shearing machine) - Initial cost

EPO Construction Method	Diagonal-cutting SS construction method
80・100・115・130・140cm	80~160cm
Shared use with 1 unit	Coordination with 1 unit
40,000,000yen (Hydraulic unit included)	6,000,000yen (Suggested retail price:8,000,000yen)

* Source : SANKO Corporation

■ Cutting blades - Running cost

Blades : Five types	1 unit
1,500,000yen (300,000yen per blade on average)	80,000yen (1 set of cutting wheel) (Price notified to the authorities : 80,000 yen)

* Source : SANKO Corporation

■ Construction volume per cutting blade (cutting wheel)

60 places	10 places
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* Source : SANKO Corporation

■ Unit price per place

5,000yen	3,800yen
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* Source : SANKO Corporation

Advantages of Diagonal-cutting SS Construction Method

Advantages for purchaser of the cutting machine

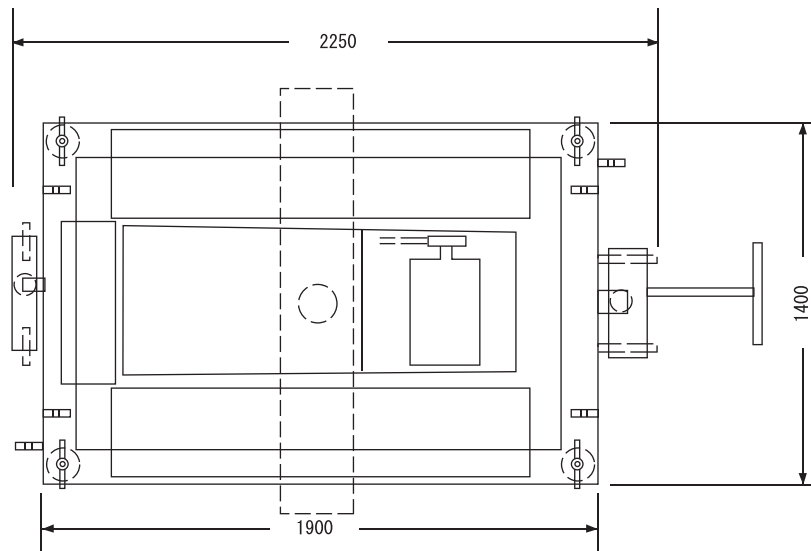
What about other equipment required?

■ Equipment required for construction

EPO Construction Method	Diagonal-cutting SS construction method
One truck with crane (4-ton truck, 2.9-ton crane) Hydraulic jack 2-ton truck	One truck with crane (4-ton truck, 2.9-ton crane) Hydraulic jack 2-ton truck 25K generator (200V)
Available for rental	Available for rental

* Source : SANKO Corporation

Diagonal & Circular Cutting Machine – Specification



(Unit : mm)

