D Box®

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Metry Technical Institute

What is D・BOX?

D・Box is a product which brings ground reinforcement and vibration reduction as well, availing a principle of sectional binding system of soil particles*.

(* The principle of sectional binding system of soil particles: This principle was elucidated by Emeritus Professor Matsuoka of Nagoya Institute of Technology. The principle indicates that perfect confinement particles of various sizes and shapes causes large frictional resistance among particles, resulting in strength within that sectional unit.)

Main effects of D・Box

1) Ground reinforcement
   (Applicable even at very soft ground like marshes)
2) Vibration reduction against machineries and traffic
3) Vibration reduction against seismic impacts (earthquakes)
4) Countermeasure against liquefaction
5) Prevention of frost heaving

Main Characteristics of D・Box Method

1) Environmentally friendly as cement-based solidification is not used.
2) Permeability similar to coarse sand will not bring negative effect to the original ground.
3) D・Box can alleviate CO_2 emission as its filling material is only soil particles (our company's comparison).
4) Cost effective as ground reinforcement and vibration reduction can be attained at the same time.
5) D・Box-SS types are easy to handle with guide gauges inside. Firstly, place those boxes close to each other, and pour the fillings later. Productive works can be expected with minimum damage to outer coverings.
6) D・Box-LS types can be easily and accurately installed, as each box can be lifted by one sling retaining its cuboid shape.
7) Ground reinforcement can be efficiently conducted, as D・Box is only installed on the ground surface.
8) Compaction work after installation of D・Box will further strengthen ground solidity.

Basic Theory of D・Box Strength

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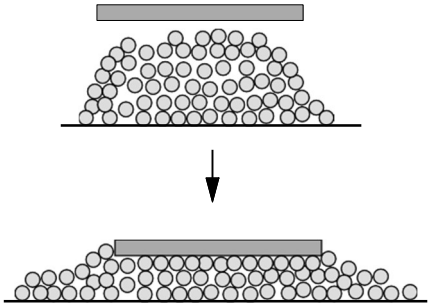
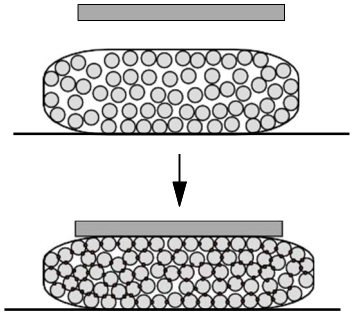
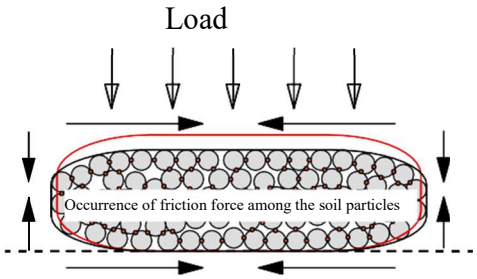


Piled up soil particles



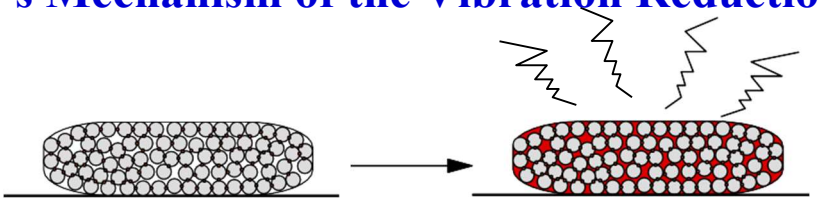
Soil particles in the bag



The elastic action of the bag leads the friction force

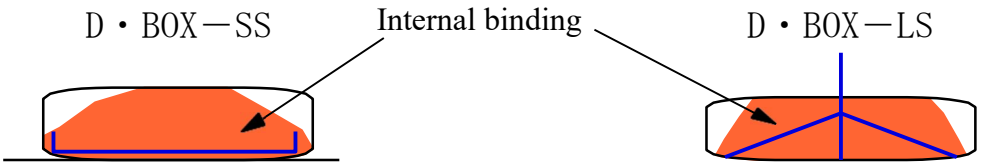
When external load is added on the bag, D・Box, it will be flatly deformed. This elastic action of the bag leads to the tension force. The tension force presses the soil particles inward, leading to the friction force among the soil particles. The friction force among the soil particles, generated by the tension force as additional stress, works as a glue. This is the source of the fundamental strength of D・Box.

D・Box's Mechanism of the Vibration Reduction



When external vibration energy reaches D・Box, the bag will be infinitesimally deformed. Then, solid particles inside the bag start to move, however, that behavior invites more frictions. D・Box alleviates vibration by exchanging vibration energy for friction energy.

Self-binding force effect of D・Box

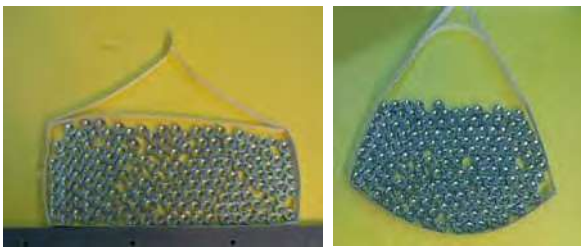


Internal self-binding effect with the guide gauge

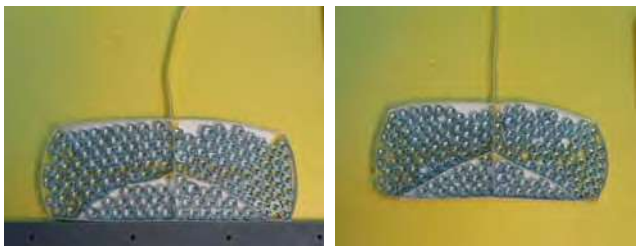
Internal self-binding effect with truss bands

Each D・Box has binding devices to strengthen the binding effect, enhance the vibration reduction effect and point load endurance.

D・BOX-LS: Structural difference between with and without the internal truss bands



Without self-binding devices



With self-binding devices

D・Box-SS45/SS90

D・Box-SS series are products to cope with rather small works such as housing works, small size structures or works where heavy machineries cannot be used. This series can attain ground reinforcement and vibration reduction at once.

SS45: (upper left) SS90: (upper right)

Guide gauges are utilized as per the photo.

Attachments: (from the left) Guide gauge, pin lock, lock joint

Main Characteristics of D・Box-SS Series

1) D・Box can be a rather accurate module by using the guide gauges at the bottom.
2) Installation process is simple. Firstly, place D・Box close to each other, and pour the fillings later. Productive works can be expected with minimum damage to outer coverings.
3) The internal binding effect by the guide gauge gives vibration reduction effects as well as increased strength.
4) Lock joint attachments enable rather perfect sequenced connection of bags horizontally in two directions. Eventually, load distribution effect is remarkably improved, avoiding point load disadvantages.

D・Box-SS series has two types by size as per the table below.
(Recommendable filling materials are C40-0 and RC40-0.)

Type	Size(mm)			Remarks
	Width	Depth	Height	
D・Box-SS45	450	450	100	Filling Material: 0.0203 m^3
D・Box-SS90	900	900	100	Filling Material: 0.081 m^3

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Work Process of D・Box - SS Series

1) Place D・Boxes neatly connecting them with each other using special lock joints

2) Set the formwork.-Open the top surface for filling works. Fill fillings up to the specific volume, then level its surface.

3) Fill fillings, then level its surface.

4) Close the bag tightly and fasten with Velcro tapes

5) Compact with plate compactors until they get tight enough

6) Completion example (the picture shows the ground reinforcement for housing constructions)

D Box-LS100/LS150

D・Box-LS series are products that effectively bring soil reinforcement and vibration reduction. They are suitable for a large scale of construction works such as road constructions, land development work, warehouse building and temporary works.

Shape of D・Box-LS

Closed (Unfilled bag)

Opened the top surface (LS100)

Main Characteristics of D・Box-LS Series

1) When the bag is lifted up, the truss bands connected with the lifting band at the center will give strong compression stress to the filling material, in addition to the tension force of the bag. This mechanism leads to solidification of the filling material and enables lifting without deformation.
2) Working productivity is remarkably improved as one sling operation work can be done in a tidy shape.
3) As the upper side opens thoroughly, filling works can be done effectively. Opening and closing works of the bag are also easy to handle with Velcro tapes.
4) The fillings can be effectively bound and solidified by the internal binding effect of the truss bands. Therefore, more effective vibration reduction effects and strength can be achieved.

* In the small workspace, hand works can be done without heavy lifting machineries or devices, however productivity will be decreased.

D・BOX-LS Series

(LS series can be lifted by only one truss band. Recommendable filling materials are C40-0 and RC40-0.)

Type	Size(mm)			Remarks
	Width	Depth	Height	
D・BOX−LS100	1,000	1,000	250	Filling materials: 0.25 m^3
D・BOX−LS150	1,500	1,500	450	Filling materials: 1.0 m^3

Working Process of D・Box-LS Series

1) Set the D・Box bag in the dedicated frame. Open the bag and pour the filling material.

2) Close the bag with Velcro tapes.

3)Lift the bag with heavy equipment and place neatly

4)Compact D・Box with rammers

5)An example of works for the ground reinforcement and vibration reduction.

6)An example of a ground reinforcement work of the retaining wall behind the river where the ground has been boiling.

- Listed in the Saitama New Technologies and New Manufactures Program
- Sainokuni Industrial Technology Special Award 2010
- Listed in NETIS (New Technology Information System) with Ministry of Land, Infrastructure, Transport and Tourism (Japan) ‘in the field of vibration reduction construction method’
- Certified by the Coastal Development Institute of Technology (Japan)
- Certified by The Building Center of Japan

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