



SEI

Mushi High Ranger : ムシハイレンジャー

For Prevention of Termite Damage

ムシハイレンジャー

S シリーズ

Mushi High Ranger S Series



未来工業株式会社

Mirai Industry Co., Ltd.

Termite damage

As termites build nests and live in the ground and gnaw underground power cables and communication cables, power failure and malfunctions are caused by the termite damage in coastal regions with a mild climate.


Termites can enter a 0.6-mm gap. Even if you try to prevent intrusion into the building from the inside of the ground, termites may invade from cracks or gaps formed on the outer circumference of conduit penetrating the foundation, or may penetrate into the building by making holes in underground conduit.

Termite damage can be prevented using Mushi High Ranger S Series with termite-prevention effect.


Distribution map of termite damage

Typical termites that live in Japan

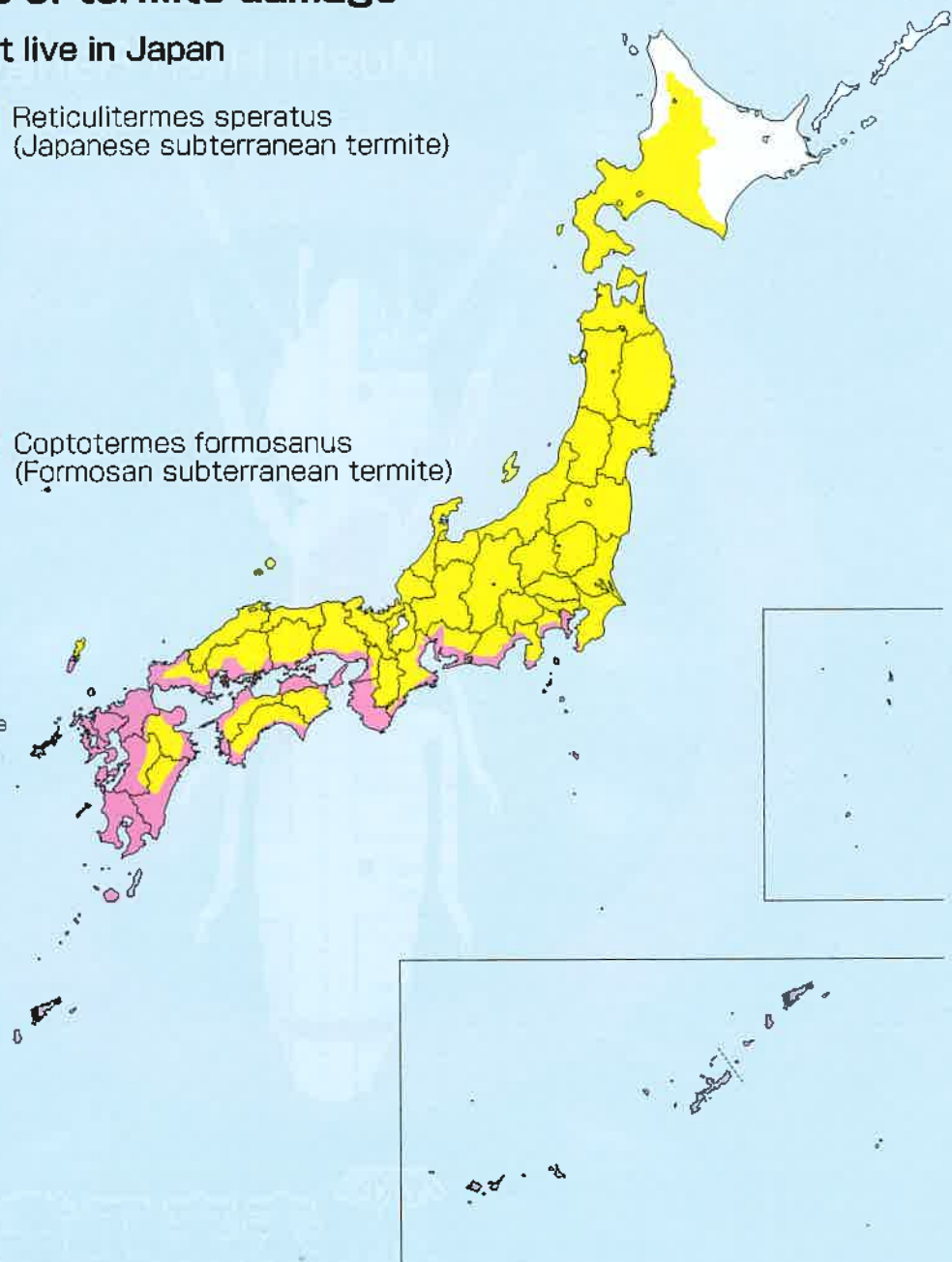


 *Reticulitermes speratus*
(Japanese subterranean termite)



 *Coptotermes formosanus*
(Formosan subterranean termite)

* *Reticulitermes speratus* also live in the habitat of *Coptotermes formosanus*



Photos of termite damage



● Damaged electric cables (inside manhole)



Trace of termite damage.



Burn marks of electric leakage caused by termites.



Cable inhabited by termites within.



Trace of termite damage.

● Damaged junction boxes (above residential ceiling)



Termite mud found inside junction boxes (for lighting fixtures) concealed in concrete slab.

* It is believed that the termites entered through underground conduits for exterior lights, etc.

● Damaged panelboard



TV system panelboard.



TV system panelboard filled with termite mud.



TV system panelboard after termite mud has been removed.



A termite mud tube (or mud tunnel) inside panelboard.

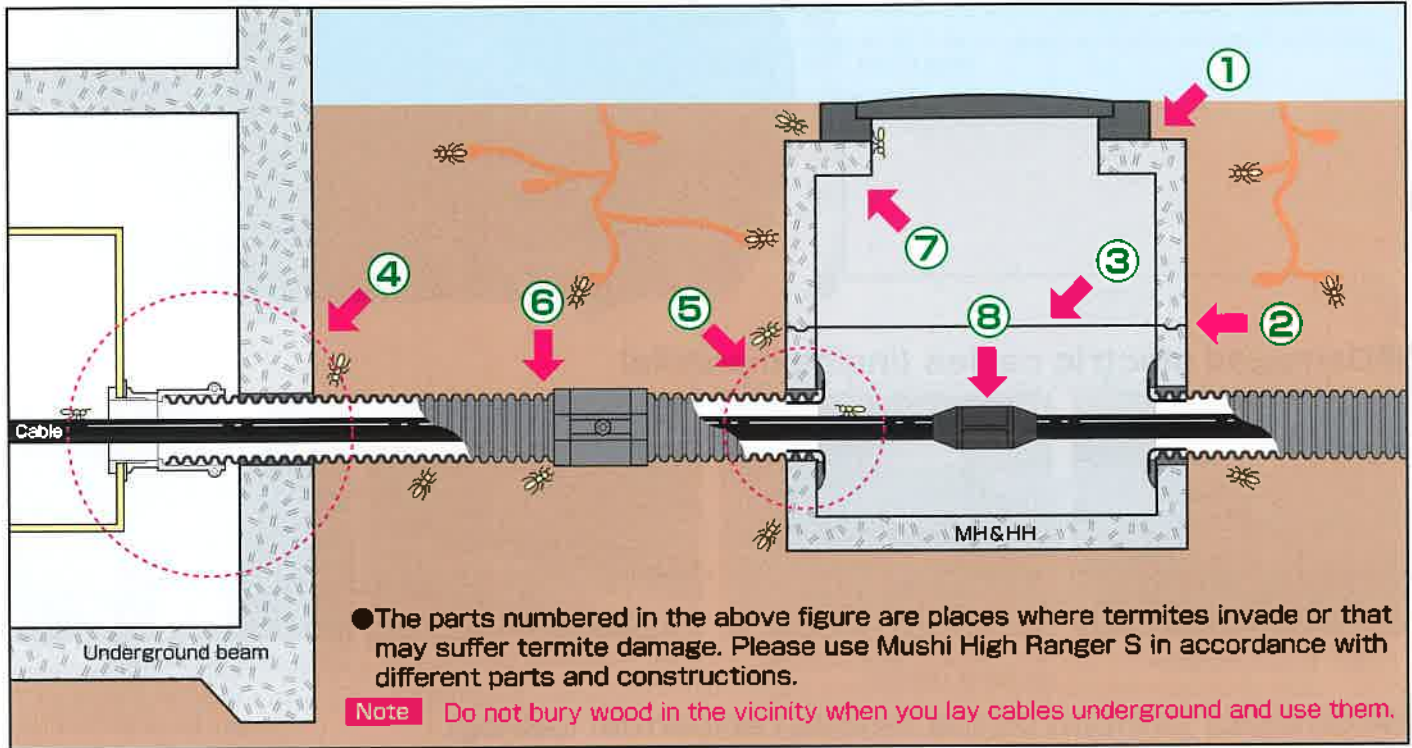
● Damaged electric cable (inside riser room)



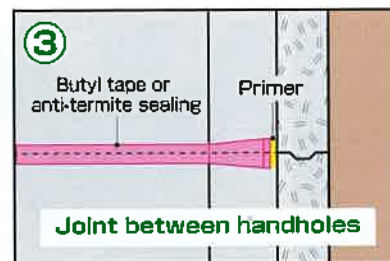
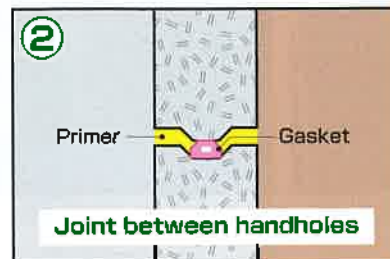
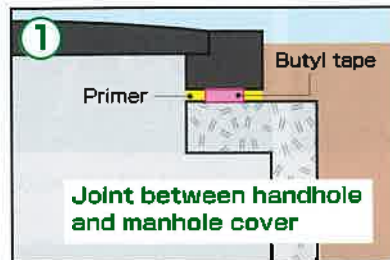
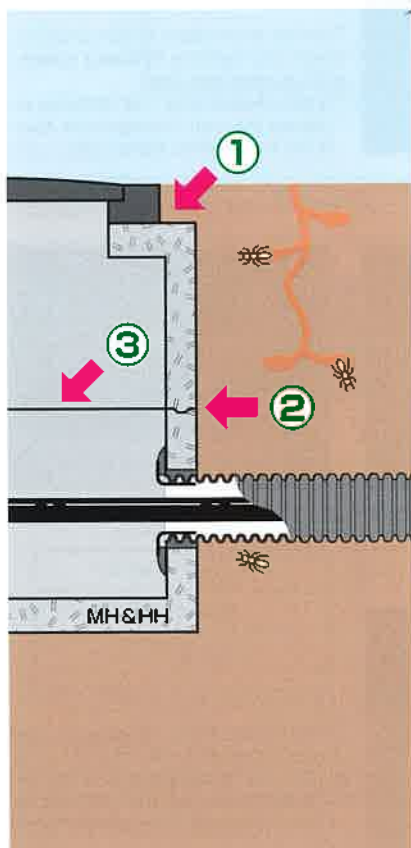
Termite mud found inside electrical conduit (power) in the electrical riser room (of an apartment building).

* It is believed that the termites entered through underground portion.

Examples of Termite Prevention Treatments for Underground conduit and Handhole



①②③ Termite Prevention Treatment for Joint between Handhole and Manhole Cover



Products to Be Used

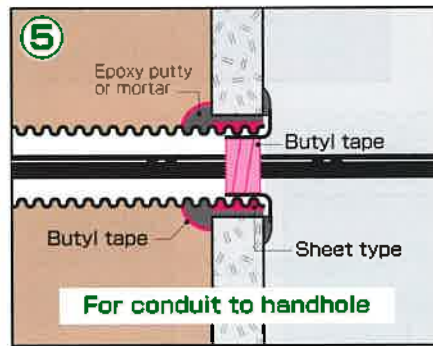
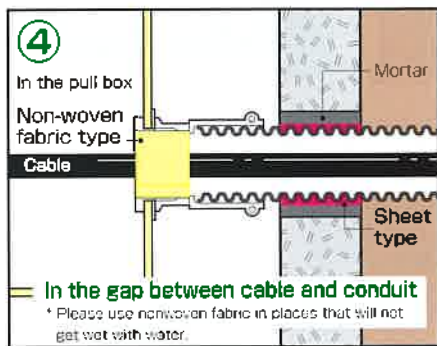
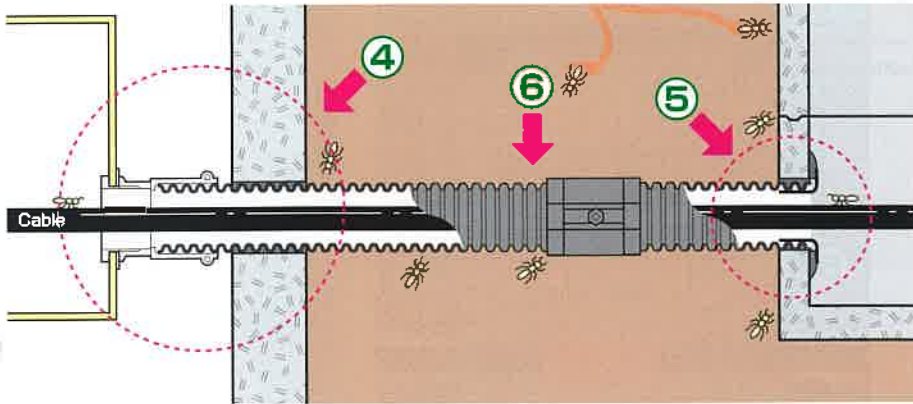
Butyl tape
Primer
anti-termite sealing
Gasket

Refer to pages 7-10



④⑤ Termite Prevention Treatment for Through Holes to Draw Cable into Handhole and Gaps between Cable and Through Hole

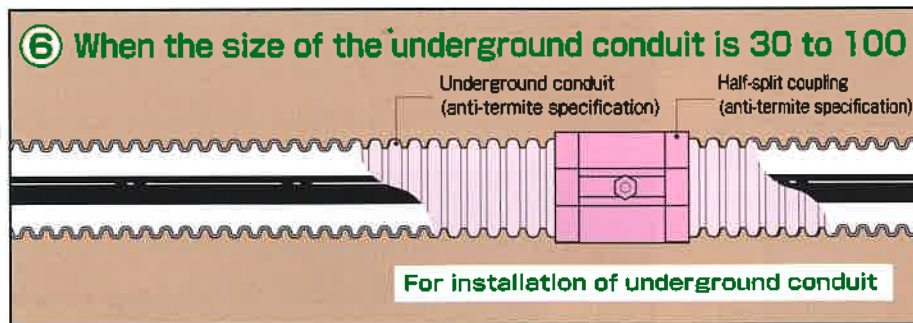
⑥ Termite Prevention Treatment for Anti-termite Underground conduits and conduit Connection



Products to Be Used



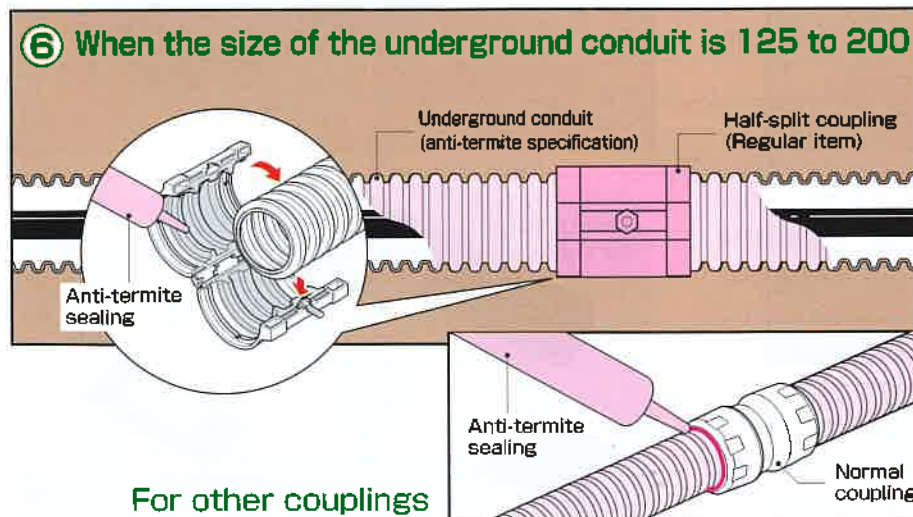
Refer to pages 8 and 9



Products to Be Used



Refer to pages 6-10



● Apply the anti-termite sealing to the gasket of the half-split coupling.

⑦ Termite Prevention Treatment for Inside of Handhole

⑧ Termite Prevention Treatment for Connections of Cables

The diagrams show two methods for termite prevention in handholes and cable connections:

- Method ⑦:** Shows a cross-section of a handhole with a non-woven fabric type barrier installed at the base.
- Method ⑧:** Shows a cross-section of a handhole with a butyl tape barrier installed around the cable connections. The label 'MH&HH' is present at the bottom of the handhole.

Products to Be Used

- Non-woven fabric type
- Butyl tape

Refer to pages 8 and 9

Termite Prevention Treatment for Through Holes in Foundation

The diagrams illustrate three methods for termite prevention in through holes in a foundation:

- Installation of Underground conduit ①:** Shows an underground conduit (anti-termite specification) installed through a hole. The hole is sealed with epoxy putty or mortar and a sheet-type barrier.
- Installation of Thin-wall PVC Pipe or Steel conduit ①:** Shows a thin-wall PVC pipe or steel conduit installed through a hole. The hole is sealed with epoxy putty or mortar and a sheet-type barrier.
- Installation of Underground conduit ②:** Shows an underground conduit (anti-termite specification) installed through a hole. The hole is sealed with anti-termite putty and anti-termite sealing. A note states: "Apply the sealing to the circumference of the hole."
- Installation of Thin-wall PVC Pipe or Steel conduit ②:** Shows a thin-wall PVC pipe or steel conduit installed through a hole. The hole is sealed with water sealing mortar and anti-termite sealing or anti-termite putty.
- Installation of Flanged Sleeve:** Shows a flanged sleeve installed through a hole. The hole is sealed with epoxy putty or mortar and a sheet-type barrier.

Products to Be Used

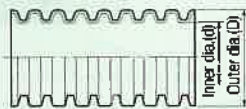
- Underground conduit (anti-termite specification)
- Anti-termite sealing
- Anti-termite putty
- Sheet-type

Refer to pages 6, 9 and 10

Underground conduit (FEP)



Fire-retardant Type



Installation Example



(Production by Order)

Mirarex F (Anti-termite Specification)

- Both the inside and outside of these FEP conduits have termite prevention effects so as to kill termites when they walk on either side.
- You can use the rich accessories of conventional FEP conduits as it is.

Note Do not bury wood in the vicinity when you bury underground and use.

Forced Contact Test

Coptotermes (worker termites) on the inside of the buried conduit. After putting in 50 termites, we measured the mortality rate of termites over time.



Test results

Specimen	Contact Time (Hours)				
	1.5	3	8	24	48
FEP (φ 100) with Termiticide	50	100	100	100	100 (annihilated)
FEP (φ 100) without Termiticide	0	0	0	0	10

Application	Product No.	Nominal Outer Dia (φ Dmm)	Nominal Inner Dia (φ dmm)	Regular Size(m)	Weight (kg)	Qty.	Standard Price
Termite prevention	FEP-30L-MHS	41	30	50	Approx. 10	50m	960
	FEP-40L-MHS	55	41	50	15	50m	1,320
	FEP-50L-MHS	66	50	50	20	50m	1,720
	FEP-65L-MHS	86	66	50	30	50m	2,160
	FEP-80L-MHS	103	81	50	40	50m	2,780
	FEP-100L-MHS	131	102	50	55	50m	3,660
	FEP-125L-MHS	163	125	50	80	50m	5,300
	FEP-150L-MHS	194	147	50	100	50m	6,100
	FEP-200S-MHS	257	200	30	120	30m	10,400

* The price of this item is the unit meter price.

Fire-retardant Type

Application	Product No.	Nominal Outer Dia (φ Dmm)	Nominal Inner Dia (φ dmm)	Regular Size(m)	Weight (kg)	Qty.	Standard Price
Termite prevention	N-FEP-30L-MHS	41	30	50	Approx. 10	50m	1,080
	N-FEP-40L-MHS	55	41	50	15	50m	1,520
	N-FEP-50L-MHS	66	50	50	20	50m	1,980
	N-FEP-65L-MHS	86	66	50	30	50m	2,500
	N-FEP-80L-MHS	103	81	50	40	50m	3,220
	N-FEP-100L-MHS	131	102	50	55	50m	4,240
	N-FEP-125L-MHS	163	125	50	80	50m	6,140
	N-FEP-150L-MHS	194	147	50	100	50m	6,980
	N-FEP-200S-MHS	257	200	30	120	30m	13,000

* The price of this item is the unit meter price.

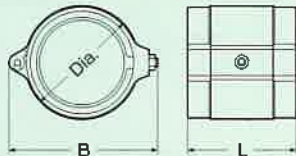
For connection between conduits



Size: 30-50

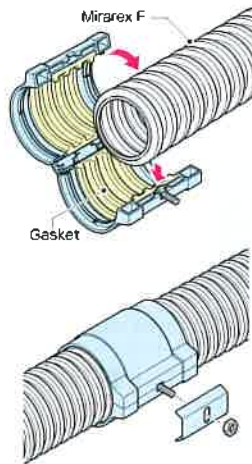


Size: 65-100



Mushi High Ranger S (Half-split Coupling)

- It is used when connecting conduits to each other, and prevents termites from entering from the joint.
- Sizes 30 to 50 are wing nuts, so tools are unnecessary.



Installation Example



Note : When connecting Mirarex F (anti-termite specification) sizes 125 to 200, use the usual half-split coupling and coupling. Please connect the connecting part so that there is no gap by using the anti-termite sealing or anti-termite putty.

Application	品番	Conforming conduit	Dia.	B	L	Qty.	Standard Price
Termite prevention	MMH-SC30F	Mirarex F 30	49.5	75	69	1	Open price
	MMH-SC40F	Mirarex F 40	66	97	80	1	
	MMH-SC50F	Mirarex F 50	78	112	90	1	
	MMH-SC65F	Mirarex F 65	99	132.5	110	1	
	MMH-SC80F	Mirarex F 80	116.5	163	132	1	
	MMH-SC100F	Mirarex F 100	144	193	140	1	

Mushi High Ranger S (Primer for Gasket)

- It is a primer for attaching Mushi High Ranger S (gasket) (butyl tape) sold separately to the concrete surface.

How to Use

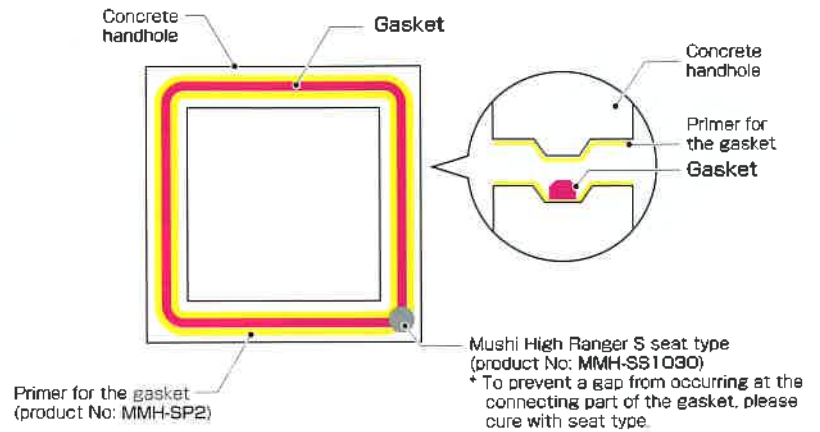
- ① Put a primer in a roller dish for paint, etc., spread it evenly on the adhesion surface with a wool roller etc. until the surface becomes white.
- ② Please paste when the applied part becomes transparent from white.
- ③ After pasting, please strongly press it.



Product No.	Application	Capacity	Qty.	Standard Price
MMH-SP2	MMH-SP1 MMH-ST2020	1,000mℓ	1	Open price

Mushi High Ranger S (Gasket)

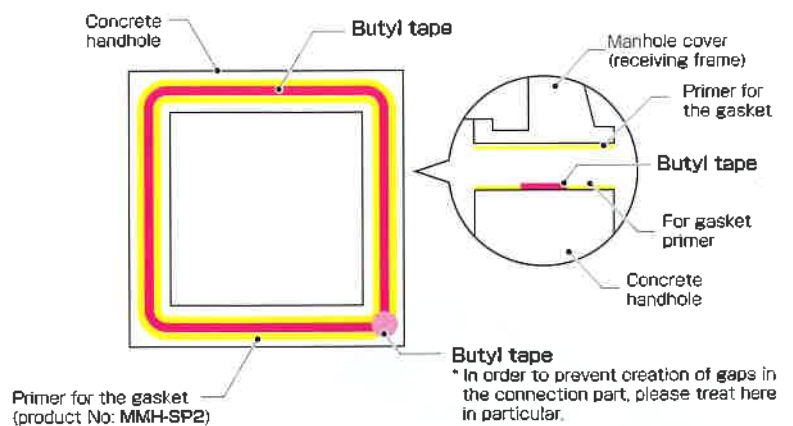
- It is a waterproof anti-termite gasket used to prevent termites from entering from the joint part of the assembled concrete handhole.
- * When installing the gasket on the concrete surface, please use primer for the gasket.



Application	Product No.	Length	Qty.	Standard Price
Termite prevention	MMH-SP1	6m	6	Open price

Mushi High Ranger S (Butyl Tape)

- It is an anti-termite butyl tape used to prevent termites from entering from the joint part of the assembled type concrete handhole and manhole cover frame.
- * When attaching the butyl tape to the concrete surface, please use primer for the gasket.

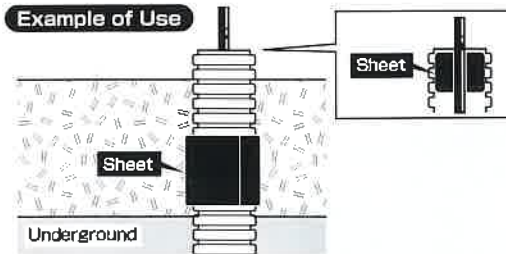


Application	Product No.	Size	Qty.	Standard Price
Termite prevention	MMH-ST2020	20mm×3mm×10m	6	Open price

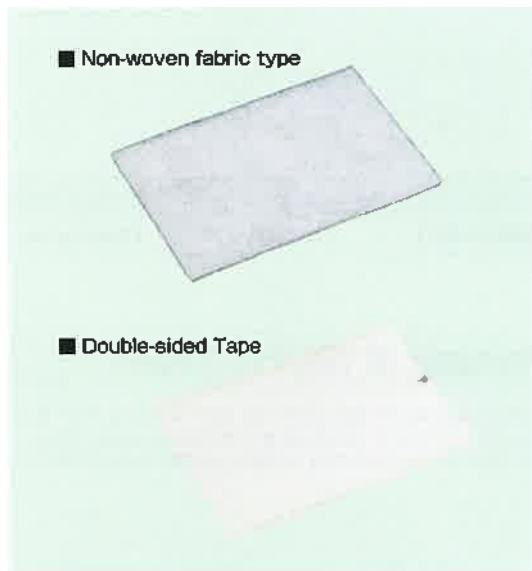


Mushi High Ranger S (Sheet Type)

- It wraps around the conduit material for electrical wiring that penetrates the foundation and prevents intrusion of termites from the gap between conduit material and concrete and from inside the conduit.



Application	Product No.	Size	Qty.	Minimum Qty.	Standard Price
Termite prevention	MMH-SS1030	30×10cm	10 bags/box	5 sheets/bag	Open price



Mushi High Ranger S (Non-woven fabric type)

- Stuffing between the cable and the conduit can prevent intrusion from inside the conduit.

■ Non-woven fabric type

Application	Type	Product No.	Size	Qty.	Minimum Qty.	Standard Price
Termite prevention	—	MMH-SF	30×19cm	20 boxes/case	5 sheets/box	Open price
	Flame retardant	MMH-SFN	30×19cm	20 boxes/case	5 sheets/box	Open price

■ Double-sided Tape

Product No.	Application	Size	Qty.	Standard Price
MMH-SFT	Nonwoven- fabric type	30×19cm	5 sheets/bag	Open price



Mushi High Ranger S (Anti-termite Putty)

- It is a non-drying putty containing a termiticide.
- It is water resistant and is ideal for preventing entry of termites into underground conduits.
- It is also ideal for curing of the base clearance, the clearance of the handhole frame, and the opening hole for conduit installation.

Application	Product No.	Capacity	Qty.	Standard Price
Termite prevention	MMH-SPT200	200	1	Open price

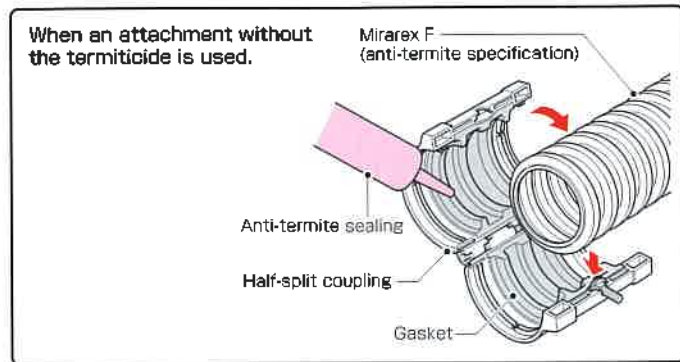
ムシハイランジャー Sシリーズ

Mushi High Ranger S Series



Mushi High Ranger S (Anti-termite Sealing)

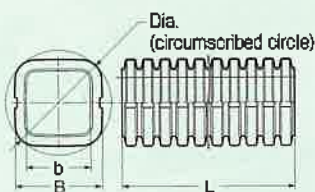
- It is silicone caulking with a termiticide.
- It is used for curing of gaps during conduit connection work for the hand hole.
- It can also be used for treating from inside the existing handhole.
- It is also ideal for filling gaps between connecting parts, such as conduit and coupling.



Application	Product No.	Capacity	Qty.	Standard Price
Termite prevention	MMH-SSC320	320m l	1	Open price

Square Underground conduit

Soon to Be Released



* For size 30, the shape is slightly different from others.

(Production by Order)

Kakufureki (Anti-termite Specification)

Application	Product No.	Nominal Weight(kg)	B	b	Dia.	Maximum Length(m)	Qty.	Standard Price
Termite prevention	KFEP-30S-MHS	9	45	30	55	200	30m	Soon to be released
	KFEP-30L-MHS	15					50m	
	KFEP-50S-MHS	18.5	70	50	86	200	30m	
	KFEP-50L-MHS	27.5					50m	
	KFEP-80S-MHS	36	110	81	133	100	30m	
	KFEP-80L-MHS	60					50m	
	KFEP-100S-MHS	51	138	103	165	100	30m	
	KFEP-100L-MHS	85					50m	
	KFEP-130S-MHS	75	178	130	207	30	30m	

■ Flame-retardant Type

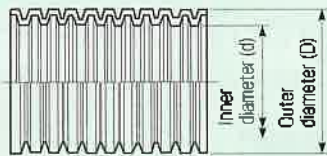
Application	Product No.	Nominal Weight(kg)	B	b	Dia.	Maximum Length(m)	Qty.	Standard Price
Termite prevention	N-KFEP-30S-MHS	9	45	30	55	200	30m	Soon to be released
	N-KFEP-30L-MHS	15					50m	
	N-KFEP-50S-MHS	18.5	70	50	86	200	30m	
	N-KFEP-50L-MHS	27.5					50m	
	N-KFEP-80S-MHS	36	110	81	133	100	30m	
	N-KFEP-80L-MHS	60					50m	
	N-KFEP-100S-MHS	51	138	103	165	100	30m	
	N-KFEP-100L-MHS	85					50m	
	N-KFEP-130S-MHS	75	178	130	207	30	30m	

* Please note that the weight of a long item with a size of 80 or more may exceed 100 kg.

JIS C8411 For concrete burial only



(CD Single layer wave conduit)

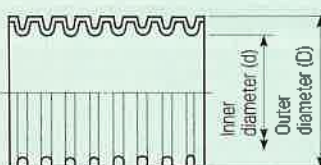


Orange

JIS C8411



(PF Single layer wave conduit)



Beige

Mirafureki CD (Anti-termite Specification) Type -25

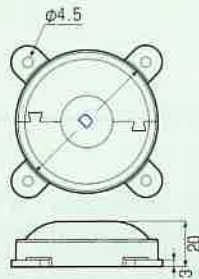
Application	Product No.	Nominal Outer Dia (D:mm)	Nominal Inner Dia (d:mm)	Regular Size (m)	Weight (kg)	Qty.	Standard Price
Termite prevention	MFCD-16-MHS	21	16	50	Approx 3.9	1	7,400
	MFCD-22-MHS	27.5	22	50	6.1	1	11,400
	MFCD-28-MHS	34	28	30	4.7	1	9,200

Mirafureki SS (Anti-termite Specification) Type -25

Application	Product No.	Nominal Outer Dia (D:mm)	Nominal Inner Dia (d:mm)	Regular Size (m)	Weight (kg)	Qty.	Standard Price
Termite prevention	MFS-16-MHS	23	16	50	Approx 4.7	1	13,600
	MFS-22-MHS	30.5	22	50	7	1	18,800
	MFS-28-MHS	36.5	28	30	5.3	1	14,400



- Screws for concrete (4 pieces) are attached.



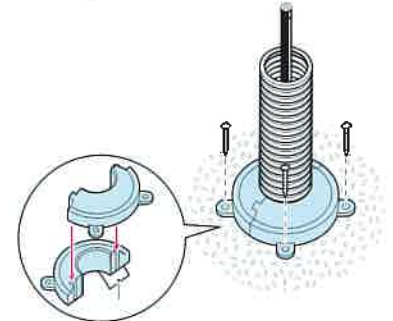
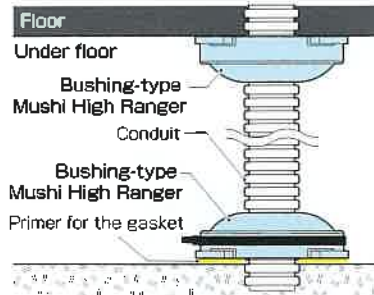
FEP conduit accessories



- Space filling putty (10 pieces/sheet)

Mushi High Ranger S (Bushing Type)

- It is attached to the foundation penetrating part of the conduit material for electrical wiring and prevents the entry of termites through the gap between conduit material and concrete.



■ For PF conduits

* Please use primer for the gasket on the reverse side.

Application	Product No.	Applicable conduit	Diameter	Quantity	Standard Price
Termite prevention	MMH-SV16P	PFconduit(16)	63	1	Open price
	MMH-SV22P	PFconduit(22)	70.5	1	Open price

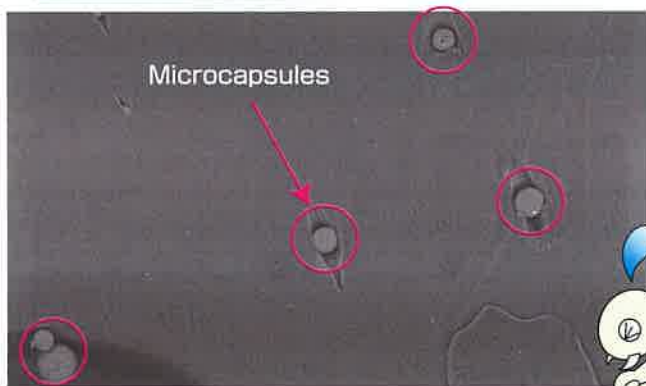
■ For CD conduits

Application	Product No.	Applicable conduit	Diameter	Quantity	Standard Price
Termite prevention	MMH-SV16C	CDconduit(16)	61	1	Open price
	MMH-SV22C	CDconduit(22)	67.5	1	Open price

■ For FEP conduits

Application	Product No.	Applicable conduit	Diameter	Quantity	Standard Price
Termite prevention	MMH-SV30F	FEPconduit(30)	81	10 pieces/bag	Open price

Inside of Anti-termite conduit



The termiticide microcapsules dispersed in the resin of anti-termite conduit.

Amount of Termiticide Contained in Surface Layer of Anti-termite conduit

- When the anti-termite conduit (FEP-100-MHS) in length of 1 km is installed.

Surface area : Approx. 513 m²
 Amount of termiticide : 0.018-0.035 g/m²

The amount of the termiticide that contacts the soil when laid for 1 km is 9.3 to 18 g. Also, the termiticide is covered with microcapsules and is not exposed.



Test materials①

- It is a test on ingredients used for Anti-termite conduit and nonwoven fabric type.

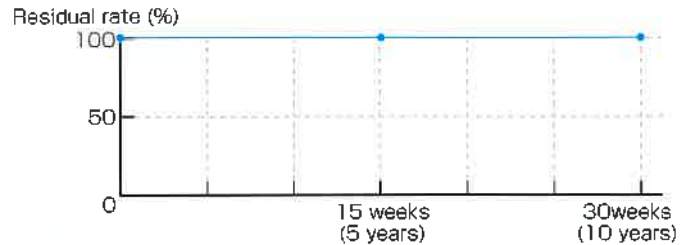


- How long does the effect of the termiticide last?

Accelerating Test

The termiticide exhibits a long-lasting effect.

- The termiticide was stored at 60°C for 30 weeks and the residual ratio of the active component was measured.
* Storage at 60°C for 30 weeks is roughly equivalent to storage at 20°C for 10 years.



<Results>

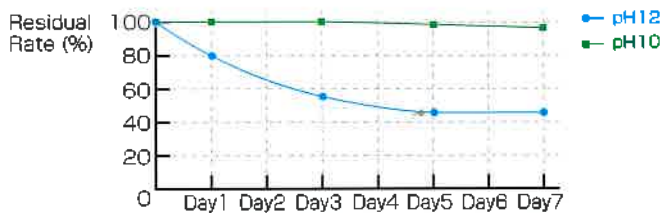
No clear decrease in active ingredients was observed.

- Does the termiticide have resistance to alkalinity of a concrete foundation?

Alkali Resistance Test

- The termiticide was added to an alkaline aqueous solution (pH 12 and pH 10) and stored at 40°C for 1 week and the residual ratio of the termiticide was measured.

* Storage at 40°C for 1 week is roughly equivalent to storage at 20°C for about 1 month.



<Results>

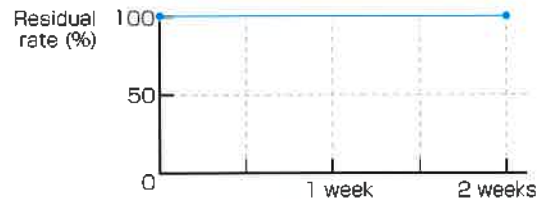
Even with the residual ratio mentioned above, it also has excellent preventive performance.

- Do the products have resistance to ultraviolet rays?

Ultraviolet Ray Resistance Test

Deterioration caused by ultraviolet rays

- The termiticide was irradiated with an UV lamp (30 $\mu\text{w}/\text{cm}^2$) for 2 weeks and the residual ratio of the active ingredient of the termiticide was measured.
* Natural exposure is supposed to be about 4 days. (Converted by the amount of ultraviolet rays. There will be a difference among different places and regions.)



<Results>

No decrease in active ingredients was observed.

- Does the termiticide eluviate to the soil?

Water Solubility Test

Solubility in water

- The anti-termite conduits (CD conduit and FEP conduit) were immersed in water and stored at room temperature and a concentration of the termiticide dissolved in water was measured with a HPLC at regular intervals.

Type of conduit	5th day Dissolution analysis results
CD conduit	0.1 ppm or less
FEP conduit	#
Fire-retardant Type FEP conduit	#

<Conclusion>

We conclude that the influence of the termiticide flowing out of the completed product on the external environment is extremely small.

- Are the products affected by ultraviolet rays?

Storage Test

Decrease in performance during storage

- Packed and rolled anti-termite conduits (CD conduit and FEP conduit) (roll shape) were stored outdoors for 1 month and a decrease in the termite prevention performance of the conduits owing to ultraviolet rays was verified.

Test method : Place a the anti-termite conduits containing wood piece on the soil. Release the worker termites and confirm their state at regular intervals.

Type of conduit	Unexposed	Osaka Region	Okinawa Region
CD conduit	○	○	—
FEP conduit	○	○	○
Fire-retardant Type FEP conduit	○	○	○

< Results >

The termites fell and died before reaching a piece of wood put in the anti-termite conduits.

Test Materials ②

- It is a test concerning the components used for bushing type, half-split coupling, sheet type.



- Does the termiticide have resistance to the alkalinity of a concrete foundation?

Alkali Resistance Test

- The termiticide was soaked in water (20° C) for 45 days and deterioration and the residual ratio of the effective components of the termiticide were measured.

Appearance	Before soaking	Black (uniformly tinted)
	After soaking	No blisters or cracks were observed.
Mass Change Rate (%)	Before soaking	—
	After soaking	3%
Hardness	Before soaking	72
	After soaking	70

<Conclusion>

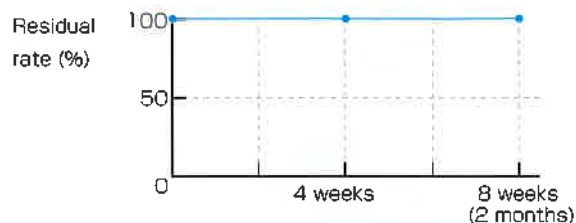
From the above results, it is considered that there is no deterioration of the rubber after soaking, and there is no outflow of the termiticide from inside the rubber.

- How long does the effect of the termiticide last?

Accelerating Test

The termiticide exhibits a long-lasting effect.

- The termiticide was exposed in a thermostat at 80° C and the residual ratio of the active ingredient was measured.
* Storage at 80° C for 8 weeks is roughly equivalent to storage at 20° C for 10 years.



< Results >

No clear decrease in active ingredients was observed.

- Does the termiticide eluviate to the soil?

Water Resistance Test

- The termiticide was soaked in water (20° C) for 45 days and deterioration and the residual ratio of the effective components of the termiticide were measured.

Appearance	Before soaking	Black (uniformly tinted)
	After soaking	No blisters or cracks were observed.
Mass Change Rate (%)	Before soaking	—
	After soaking	2%
Hardness	Before soaking	72
	After soaking	71

<Conclusion>

Based on the above results, it is considered that there is no deterioration of the rubber after soaking, and there is no outflow of the termiticide from inside the rubber.

Test Data ③

- The effects of the termiticide contained in the anti-termite sealing and putty are tested.



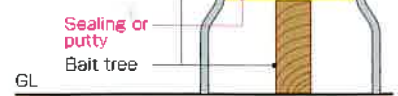
Termite Prevention Performance Tests (Indoor and Outdoor Tests)

● Indoor Test Results

Test Area No.	Perforation (mm)	Fatality Rate (%)	Remarks
Sealing with Termiticide (Thickness: 5 mm)	1	Not perforated	100%
	2	"	"
	3	"	"
Sealing without Termiticide (Thickness: 5 mm)	1	Perforated	0%
	2	"	"
	3	"	"
Putty with Termiticide (Thickness: 6 mm)	1	Not perforated	100%
	2	"	"
	3	"	"
Putty without Termiticide (Thickness: 6 mm)	1	Perforated	0%
	2	"	"
	3	"	"

● Outdoor Test

Example of Specimen



GL

● Outdoor Test Results

Specimen	After Lapse of One Year	After Lapse of Two Years
Sealing with Termiticide	There are only nibbled marks on the surface	Same to the left
Sealing without Termiticide	Numerous predation marks on the surface / predation and termite path in progress	Same to the left
Putty with Termiticide	There are only nibbled marks on the surface	Same to the left
Putty without Termiticide	Numerous predation marks on the surface / predation and termite path in progress	Gnawed and perforated

● Anti-termite Sealing

Termiticide Residual Concentration of after Accelerated Immersion Test

- Termiticide Residual Concentration (ppm) after Accelerated Immersion Test Using Solutions in Different pH (Heating temperature during accelerated immersion test: 65° C)

Test Period and pH of Aqueous Solution	Initial Concentration	1 Month	3 Months	6 Months	12 Months (equivalent to 10 years)	Residual Concentration
Acidic Solution (pH 4)	1,025	1,014	958	808	765	74.6%
Neutral Solution (pH 7)	1,025	1,017	1,002	997	923	90.1%
Alkaline Solution (pH 13)	1,025	1,007	973	913	856	83.5%

- Termiticide Residual Concentration (ppm) after Water Immersion Test (Normal temperature during immersion test: 25° C)

Test Period and pH of Aqueous Solution	Initial Concentration	1 Month	3 Months	6 Months	12 Months (equivalent to 10 years)	Residual Concentration
Neutral Solution at Normal Temperature (Acidic pH 7)	1,023	1,022	1,022	1,021	1,021	99.8%

Decrease and eluviation of the termiticide by the water immersion tests at a normal temperature were not observed substantially.

● Anti-termite Putty

Termiticide Residual Concentration of after Accelerated Immersion Test

- Termiticide Residual Concentration (ppm) after Accelerated Immersion Test Using Solutions in Different pH (Heating temperature during accelerated immersion test: 65° C)

Test Period and pH of Aqueous Solution	Initial Concentration	1 Month	3 Months	6 Months	12 Months (equivalent to 10 years)	Residual Concentration
Acidic Solution (pH 4)	1,002	1,014	958	808	695	69.4%
Neutral Solution (pH 7)	1,002	1,017	1,002	997	856	85.4%
Alkaline Solution (pH 13)	1,002	1,007	973	913	793	79.1%

- Termiticide Residual Concentration (ppm) after Water Immersion Test (Normal temperature during immersion test: 25° C)

Test Period and pH of Aqueous Solution	Initial Concentration	1 Month	3 Months	6 Months	12 Months (equivalent to 10 years)	Residual Concentration
Neutral Solution at Normal Temperature (Acidic pH 7)	1,016	1,006	969	986	986	97.0%

Decrease and eluviation of the termiticide by the water immersion tests at a normal temperature were not observed substantially.