

Catpad™ & Cat-tape™

ShinEtsu

Shin-Etsu Silicone

Silicone Adhesive Sheets for Protecting Outdoor Tanks
Against Rainwater Penetration at the Annular Plate/Base Plate Interface



Used without a primer, meaning significantly shorter work times

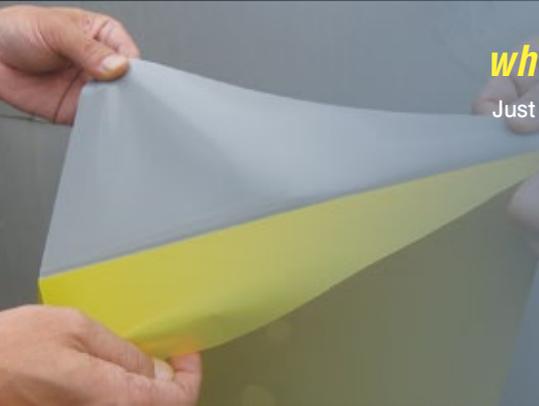
Catpad™ HNS-200

Introducing a silicone adhesive sheet that is easy to work with and provides reliable protection for preventing penetration of rainwater into outdoor storage tanks.

Our silicone adhesive sheets “Catpad HNS-200” were developed for application at the bottom of outdoor storage tanks to prevent infiltration of rainwater. They can be used for waterproofing and rustproofing the bottom plates of these tanks (United States Patent No: US 9,611,614 B2 Waterproofing Method for Outdoor Tank). This product conforms to the “Guidelines for measures for preventing infiltration of rainwater (25 Dec. 1979)” issued by the Fire and Disaster Management Agency of Japan.

Sheets are adhesive backed, which makes the work of the application more efficient!

Just press down onto the application surface, and the silicone gel adhesive will stick like gum.



Adhesive strength of Catpad



Adhesive force of Catpad-cloth

Heat and cold resistant	Sheets provide consistent performance over a wide temperature range. (–40°C to +180°C)
Durable and weather resistant	Sheets are made of silicone material which is highly durable and weather resistant.
Waterproof	Sheets stay airtight and waterproof over prolonged use.
Adhesive	Sheets adhere well to metal, concrete and most other materials.
Non-corrosive	Sheets will not cause corrosion or deterioration of metal or concrete.
Flame resistance	No spread of combustion or carbonization even after being placed in direct flame of flare for 5 min.
Cutable	Sheets are easy to cut on site to fit the shape of the surface being waterproofed.
Safety-Environmental properties	Made of silicone, so the product is highly safe and gentle to the environment.

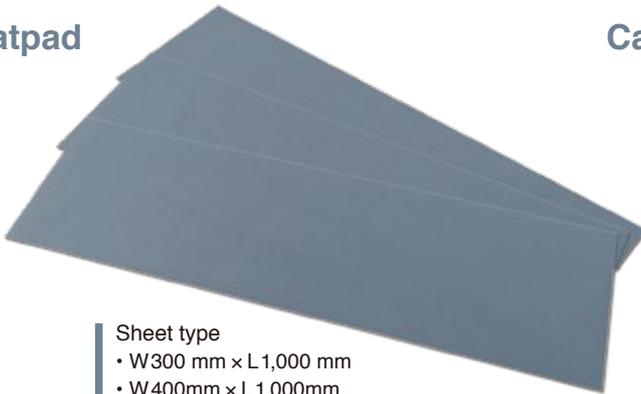
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Catpad

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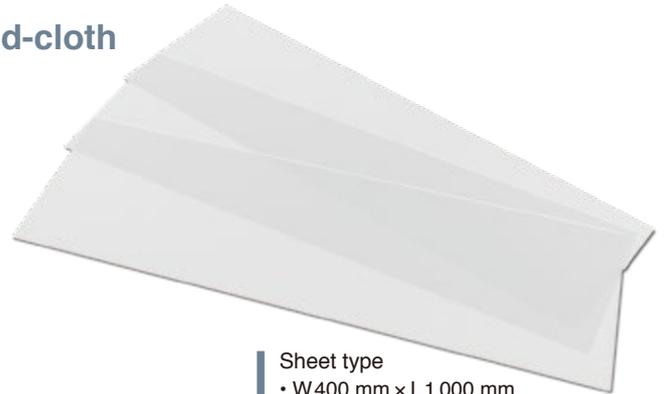
Catpad



Sheet type
 • W300 mm × L 1,000 mm
 • W400mm × L 1,000mm
 (Package: 10 sheets)

Roll type
 • W50 mm × L3,000 mm (Package: 20 rolls)
 • W100 mm × L3,000 mm (Package: 10 rolls)
 * Useful if Catpad has to be applied up sides of tank.

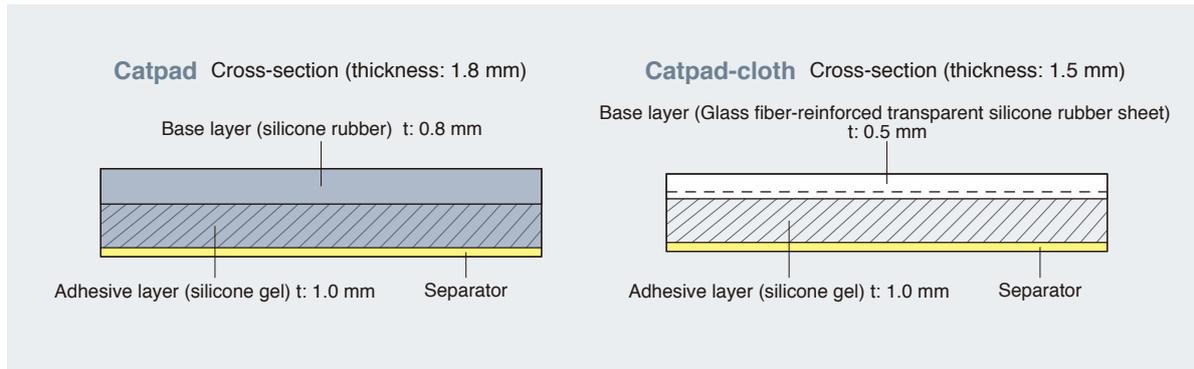
Catpad-cloth



Sheet type
 • W400 mm × L 1,000 mm
 (Package: 10 sheets)



Structure



General properties

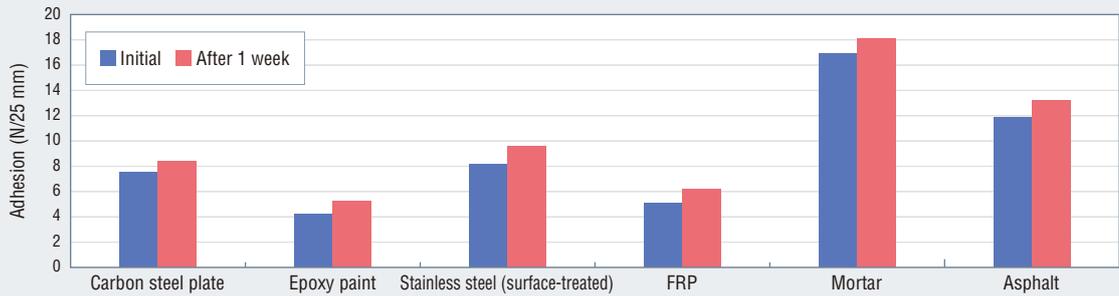
Product		Catpad HNS-200	Catpad-cloth HNS-200B
Parameter			
Features		General type	Glass fiber-reinforced type
Appearance		Gray	White transparent
Reinforcing layer		Non	Glass cloth
Standard size	mm	Sheet type: 300×1,000 400×1,000 Roll type: 50×3,000 100×3,000	Sheet type: 400×1,000
Thickness	mm	1.8	1.5
Adhesive		Self-sticking	Self-sticking
Hardness Durometer A		55 (Adhesive part: Asker CSR2 <15)	70 (Adhesive part: Asker CSR2 <15)
Tensile strength	MPa	10	70
Tear strength	kN/m	50	250
Elongation at break	%	800	2
Use temperatures	°C	-40 - 180	-40 - 180
Dielectric breakdown voltage	kV	30<	20<
Flame resistance UL94		HB equivalent	—
Low-molecular-weight siloxane %		0.83 (Σ D ₃ -D ₁₀)	0.27 (Σ D ₃ -D ₁₀)

(Not specified values)

Adhesion test Powerful adhesion to a variety of materials.

Test results

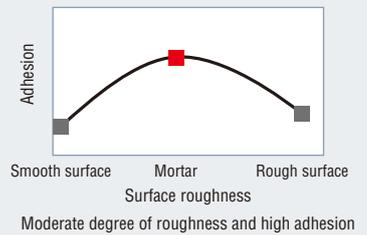
Adhesive sheet adhered firmly to all substrates used in the trial. In addition, adhesion increased a week later.



Surface roughness Ra μm	0.29	0.40	0.49	0.50	NA	NA
Roughness of degree	Small	Small	Small	Small	Medium	Large

- Will not develop adhesion if water is squirting or seeping continuously from the adherend. Be sure the adherend is sufficiently dry before applying Catpad

Correlation between Surface Roughness and Adhesion



Test conditions

- Test pieces: Catpad HNS-200 W25 mm \times L200 mm
- Substrates: Carbon steel plate, Epoxy paint, Stainless steel (surface-treated), FRP, Mortar, Asphalt
- Test method: It adheres to each surface and is measured with the Autograph Testing Device which is made by Shimadzu Corp. after resting indoors for 20 minutes and outdoors for a week. (Test speed: 300 mm/min)

Lap shear test Able to accommodate significant movement.

Test results

Catpad

Single sheet applied to JIS mortar

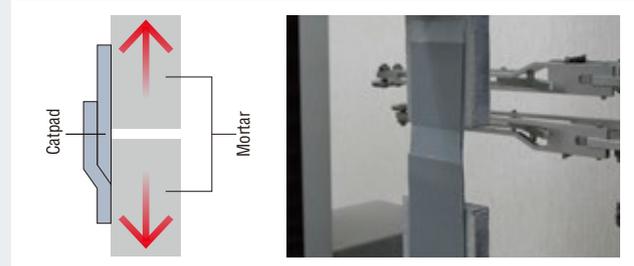
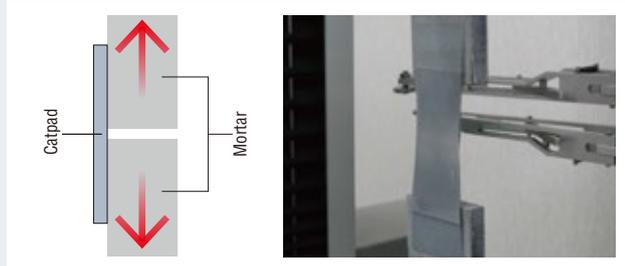
Application surface	Time	Maximum test force N/40 mm	Displacement mm
Mortar	After 20 min.	30.2	42.6
	After 4 days	70.3	80.3
	After 8 days	73.4	85.6

* Displacement value is that recorded at the point of maximum test force. (Not specified values)

Adhesive strength of overlapping joints

Application surface	Time	Maximum test force N/40 mm	Displacement mm
Mortar	After 20 min.	23.2	32.6
	After 4 days	60.4	68.7
	After 8 days	61.6	70.3

* Displacement value is that recorded at the point of maximum test force. (Not specified values)

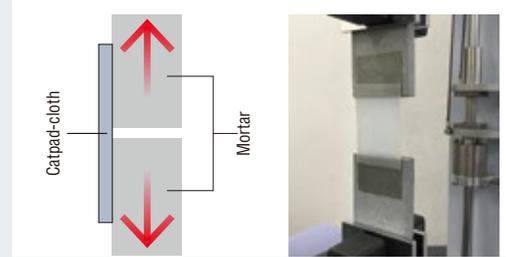


Catpad-cloth

Single sheet applied to JIS mortar

Application surface	Time	Maximum test force N/40 mm	Displacement mm
Mortar	After 20 min.	84.0	53.0
	After 4 days	92.0	55.0
	After 8 days	88.0	56.0

* Displacement value is that recorded at the point of maximum test force. (Not specified values)



Test conditions

- Test pieces: Catpad HNS-200 and Catpad-cloth HNS-200B W40 mm \times L60 mm
- Substrates: JIS mortar
- Test method: A Catpad or Catpad-cloth sample was applied to two hemi-sections of mortar, then lap shear adhesive strength was measured using an Autograph (mfd. by Shimadzu Corp.), starting from a zero-span condition. (Test speed: 50 mm/min)

Crack-bridging test Excellent crack-bridging performance.

Test results

Catpad and Catpad-cloth separated from the mortar without breaking.

Displacement at time that maximum tensile strength was recorded

Conditions	Test pieces	Catpad	Catpad-cloth
Single sheet applied	mm	40.77	49.85
Overlapping sheets	mm	55.55	44.66

(Not specified values)

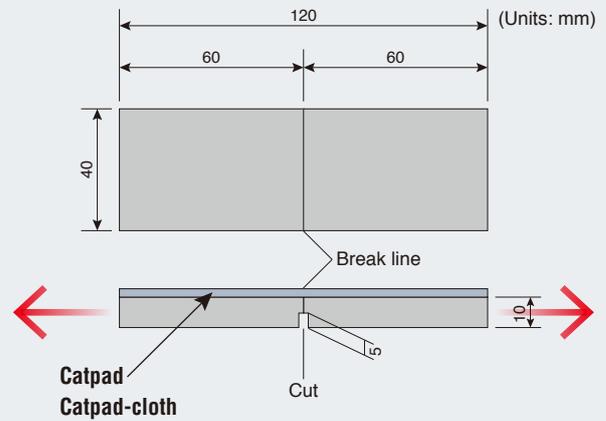
Test conditions

- Test pieces Catpad HNS-200 and Catpad-cloth HNS-200B
- Substrates Mortar based on JSCE-K 532-2013
- Test method JSCE-K 532-2013

Two cut mortar test pieces are butted together so there is zero span between them, then a Catpad or Catpad-cloth sample is applied to form a bridge across the surfaces. The mortar test pieces are then pulled apart horizontally at 5 mm/min, and the product is checked for breakage or separation.

- Test body Japan Paint Inspection and testing Association (JPIA)

Form of a test piece



Adhesion strength test Powerful adhesion even in the perpendicular direction.

Test results

The products showed excellent adhesive strength.

Parameter	Test pieces	Catpad	Catpad-cloth
Adhesion	N/mm ²	0.10	0.09
Maximum tensile load	N	155	148
Breakage point		Broke at interface between substrate and adhesive layer	Cohesive failure in adhesive layer

(Not specified values)

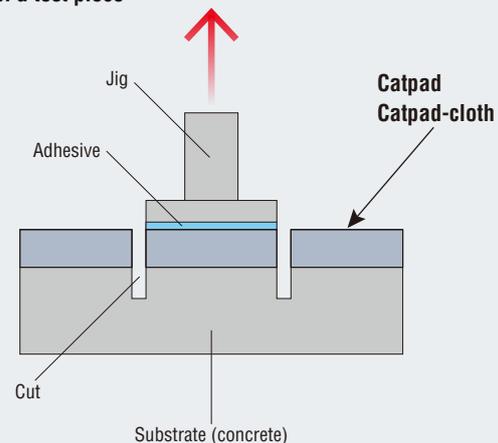


Breakage conditions of Catpad



Breakage conditions of Catpad-cloth

Form of a test piece



Test conditions

- Test pieces Catpad HNS-200 and Catpad-cloth HNS-200B
- Substrates JSCE-K 531-2013
- Test method JSCE-K 531-2013

A jig is fixed to the back of a Catpad or Catpad-cloth sample that is stuck to a mortar test piece. The jig is pulled up vertically at 1,500–2,000 N/min, and the maximum tensile load and adhesive strength are determined. The points of breakage and conditions of the product are also examined.

- Test body Japan Paint Inspection and testing Association (JPIA)

Weathering test Product remains elastic and in good condition even after equivalent of 17 years' exposure.

Test results

There was no damage to the sheet surface. It remained in good condition. Elongation at break decreased after 5,000 hours, however adhesion improved.

Parameter	Time	Initial	1,750 h (equivalent to 6 years)	5,000 h (equivalent to 17 years)
Tensile strength	N/mm ²	8.0	9.7	10.3
Elongation at break	%	400	350	280
Adhesion	N/50 mm	8.2	10.5	11.1
Thickness	mm	1.79	1.73	1.74

(Not specified values)

Test conditions

- Test pieces Catpad HNS-200 W50 mm × L150 mm
- Substrates Stainless steel (SUS-304)
- Test method Place Catpad on stainless steel plate and seal the outer edges.
Measured after 1,750 hours (equivalent to 6 years) and 5,000 hours (equivalent to 17 years)

Outdoor exposure test Helps to prevent rust.

Test results

There was no rust where the Catpad was placed. However, rust appeared on the remaining surface.



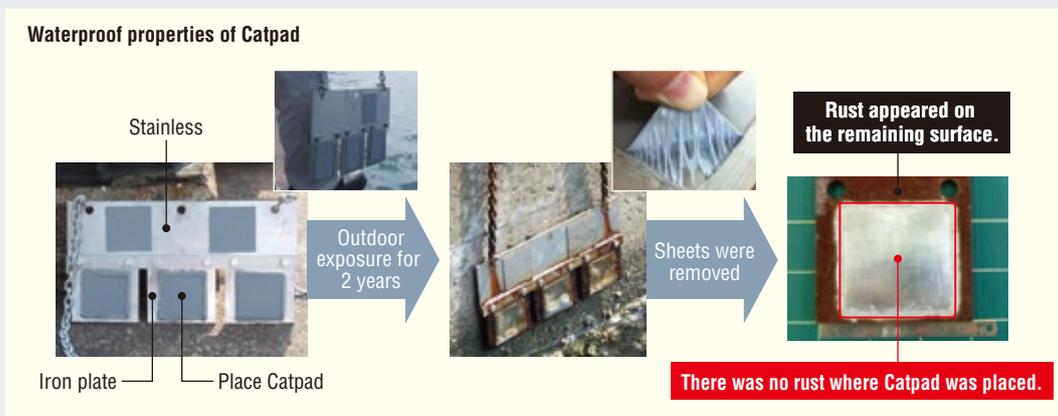
Test conditions

- Test pieces Catpad HNS-200 100 mm square
- Substrates Iron plate (SPCC)
- Test method Place Catpad by hand in iron plate center, and leave for 6 months outdoor.

Salt exposure test Product helps prevent rust caused by exposure to sea water.

Test results

Even after being left exposed for two years, the area where Catpad was applied showed no rust, whereas rust did occur around the Catpad sample.



Test conditions

- Test pieces Catpad HNS-200 W100 mm × L100 mm
- Substrates Iron plate (SPCC)
- Test location Kashima, Ibaraki Prefecture
- Test method Catpad samples were applied by hand in the center of steel plates, which were hung from a wharf just above the waterline and left for a period of two years.

Water/Saltwater/Alkali/Acid resistance tests Almost no change in performance was observed.

Test results

There were slight changes in hardness and tensile strength, but changes in weight were minimal, and almost no absorption was observed.

Parameter	Conditions	Initial	Water	5% salt water	5% caustic soda	12% hydrochloric acid
Appearance		—	No change	No change	No change	No change
Change in hardness	Point	70	-7	-7	-15	-6
Change in tensile strength	%	8.0 MPa	+7	+10	-19	+3
Weight change	%	—	±0	+0.5	-0.1	+0.5

(Not specified values)

Test conditions

- Test pieces Catpad HNS-200 based on JIS K 6249
- Test method Samples of the base material of Catpad were immersed for 1 week in water, 5% salt water, 5% caustic soda and 12% sulfuric acid. The samples were then removed and their physical properties were tested within 15 minutes of removal, in accordance with JIS-K 6249.

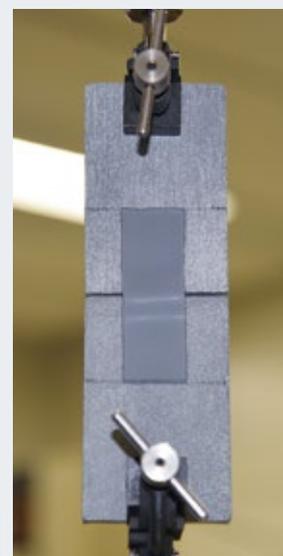
Fatigue endurance test Stands up to vibration over long periods.

Test results

Product showed exceptional fatigue resistance, with no failure or slippage over 20,000,000 cycles.

Test conditions

- Test pieces Catpad HNS-200 and Catpad-cloth HNS-200B
W20 mm × L60 mm
- Substrates JIS mortar
- Test method A JIS mortar test piece (W50 mm × L150 mm, T10 mm) is cut in half longitudinally, then Catpad or Catpad-cloth is applied such that it bridges the two pieces. Samples were placed on a fatigue endurance tester and the two blocks were pulled apart from a zero-span position to create a 1.5 mm gap from top to bottom. The blocks were then moved 1.0 mm up and down from the starting point (amplitude: 2.0 mm) at a frequency of 10 Hz for 20 million cycles, and the samples were checked for fatigue failure, slippage and separation.



Dielectric strength test Product shows excellent dielectric properties and is electrically stable.

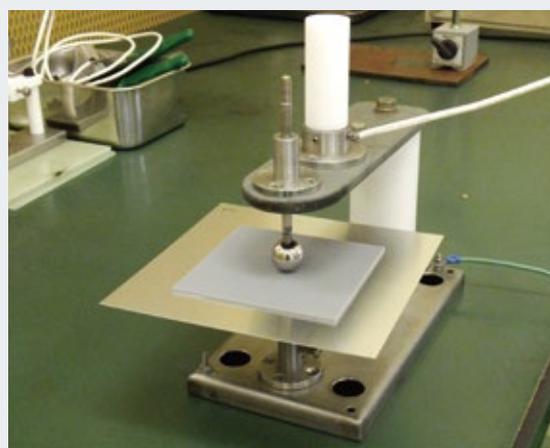
Test results

Test pieces	Dielectric breakdown voltage kV
Catpad	33.6
Catpad-cloth	26.1

(Not specified values)

Test conditions

- Test pieces Catpad HNS-200 or Catpad-cloth HNS-200B (100 mm square)
- Test method (1) A Catpad or Catpad-cloth sample is stuck to an aluminum sheet.
(2) The sheet is sandwiched between two electrodes (High voltage side: 20 mm (DIA) ball electrode; Low voltage side: aluminum plate electrode). The sample is placed in insulating oil, and the voltage is increased at a rate of 2.0 kV/sec (AC 50 Hz) to determine the applied voltage at which dielectric breakdown occurs.
- Test body Analysis Center, Hitachi Chemical Techno Service Co., LTD.



Condition of electrodes

Flame resistance test

Combustion does not spread even when product is in direct contact with the flame of a flare.

Test progression and results



Flare ignition

The flare is ignited and the flame is pressed against the sheet.



After 2 minutes

The sheet burns where it is in contact with the flare, but combustion has not spread even after 2 minutes.



After 4 minutes

There is deformation of the sheet near the part that is in contact with the flare, but combustion has not spread even after 4 minutes.



After 5 minutes 40 seconds

Flare stops burning.

The area that was in direct contact with the flame has been incinerated, but combustion did not spread. This is evidence of the product's exceptional flame resistance.

Test conditions

- Test pieces Catpad HNS-200 W300 mm × L500 mm
- Test method
 - (1) Two test blocks (W360 mm × H600 mm, T50 mm) are positioned side by side and separated by a 50 mm gap.
 - (2) The mortar surface is painted with a urethane paint.
 - (3) Catpad is applied so as to bridge the gap between the blocks, and the edges are sealed with Sealant Master 300-G.
 - (4) The flare is ignited, and the flame is brought in contact with the sample where it spans the gap.
 - (5) The condition of the sample is observed for the 5 minutes (approx.) it takes for the flare to burn out.

Appearance of sample after completion of flame resistance test



Front

Back (magnified)

Fire resistance test

The product shows exceptional fire resistance.

Test progression and results



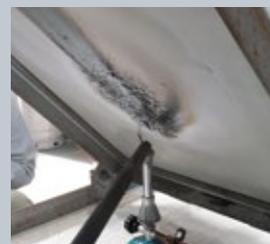
Before ignition



Right after start of combustion



After 7 minutes



After combustion ends

The area in direct contact with the flame has been incinerated, but combustion has not spread. This is evidence of the product's exceptional fire resistance.

Test conditions

- Test pieces Catpad-cloth HNS-200B W900 mm × L600 mm
- Test method NEXCO test method
 - Tested in accordance with test method 738-2011 (Spread of combustion of tunnel retention materials).
 - Heating time is 10 minutes, and the gas used is LPG.
- Test body Japan Testing Center for Construction Materials (JTCCM)



Catpad-cloth

No caulking gun or masking tape required.

Cat-tape™

Silicone adhesive tape for finishing of edges and overlapping sections of Catpad sheets.



Cat-tape cures and bonds in 24 hours after application, and bonds strongly to both Catpad sheets and mortar foundation surfaces.

Can also be used to fill gaps, due to its putty-like consistency.

Less waste, which is better for the environment.

Packaging/Standard product size

● Packaging

10 bags per package
(Each roll comes in an aluminum moisture-proof pack)



● Standard product size

Cat-tape
W25 mm × L3,000 mm

Comes with a pink separator film on one side. Pull off the separator film after applying the product to the substrate.

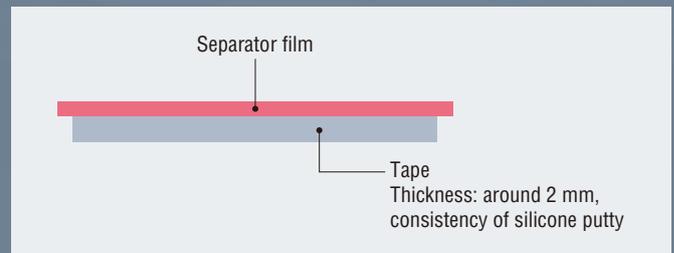


■ General properties

● Before curing (consistency of silicone putty)

Color	Separator film	Pink
	Tape	Light gray

■ Structure



● After curing (silicone rubber)

	Parameters	Conditions	Curing time	Measured value	Remarks
Physical properties	Hardness	23°C/50%RH	8 days	45	JIS K 6249, A type
	Tensile strength			5.4 MPa	JIS K 6249
	Elongation			730%	
	Shear strength			16 kN/m	JIS K 6249, Angle type
Adhesion	On mortar	23°C/50%RH	8 days	22 N	Pulled off in 180° direction, tape width: 10 mm
		40°C/95%RH		17 N	Pulled off in 180° direction, tape width: 10 mm
	On Catpad	23°C/50%RH	8 days	47 N	Pulled off in 180° direction, tape width: 10 mm Pulled off with a jig using around 50 N of force.
	On Cat-tape		12 days	65 N	Pulled off in 180° direction, tape width: 10 mm

(Not specified values)

Construction example and advantages of using Cat-tape

Cat-tape is designed for use with Catpad, and is used in many locations.

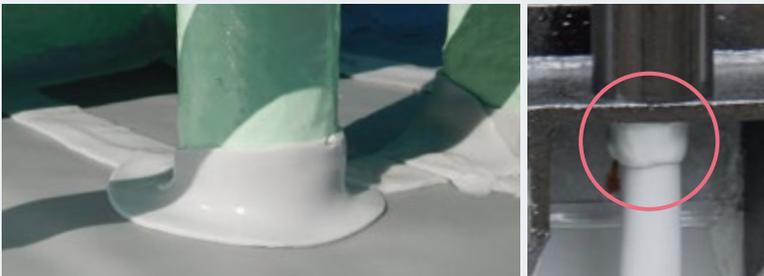
Construction example using Cat-tape

■ Sealing of overlapping sheets of Catpad on outdoor tanks



Shin-Etsu Silicone S COAT-57 has been used to eliminate low spots.

■ Waterproofing of the bases of anchor bolt shafts & tops of boxes around outdoor tanks.



Advantage:

Cat-tape is easier to work with than silicone sealants, and creates a finished look.

■ Adhesion and sealing of joints between sheets applied to walls of underground water tanks for firefighting.



Advantage:

Sealing of edges of sheets and butt joints between sheets is easy, and construction took less time.

■ Bonding and sealing of edges of Catpad sheets applied to metal cover around bottom of outdoor tank to prevent corrosion.



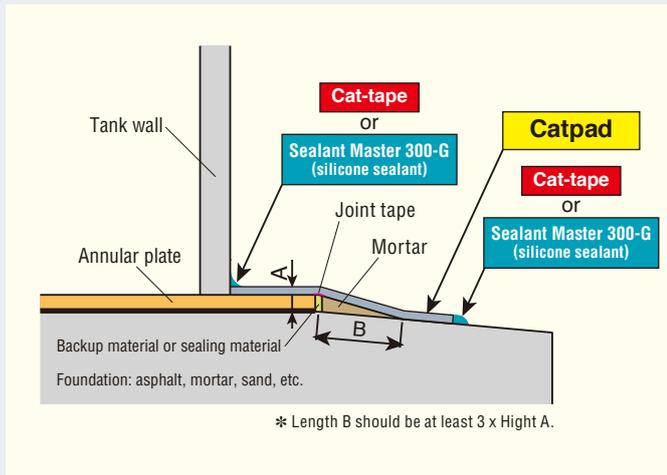
Advantage:

Construction of a large outdoor tank (diameter: 60 m) took less time.

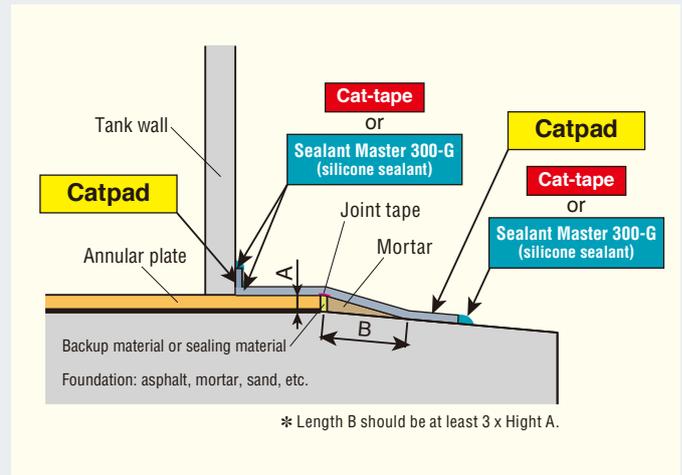
Catpad construction guide

Sectional diagram of standard construction scheme

■ If covering the level surface of the foundation only:



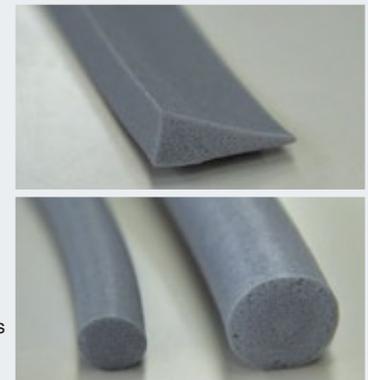
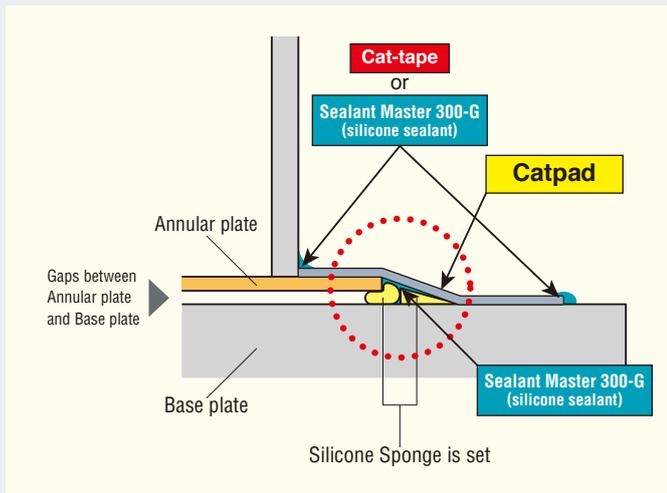
■ If covering a portion of the tank wall:



■ Silicone Sponge is set:

It is useful to use that using Silicone Sponge* back-up and Sealant Master 300-G instead of mortar to fill the gaps between the annular plate and the base plate. In this case, all materials are made of silicone rubber, so that annular plate movements can be absorbed by soft materials.

* For Silicone Sponge, please contact our sales division.



The silicone sponge material is a closed-cell foam, so it absorbs almost no water.

Test results

Condition	Change in weight
at room temperature water	< ±1%
at 50°C water	< ±1%
at 85°C and 85% humidity	< ±1%

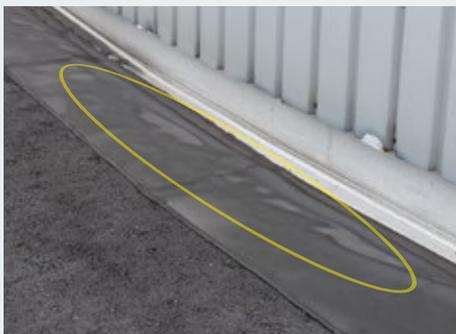
Test method

Silicone sponge samples were subjected to different sets of conditions for 1,000 hours, then removed from the chamber. After 30 minutes, the weight changes of the samples were measured.

Potential problems with Catpad after construction

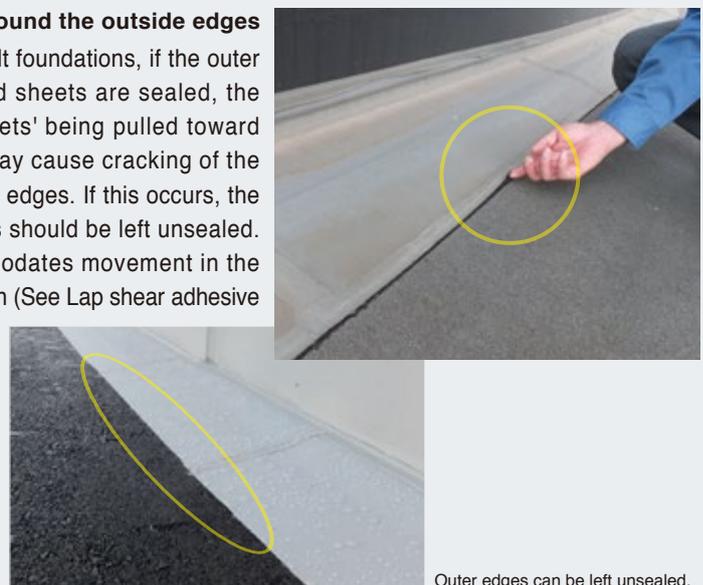
■ Wrinkles

Because Catpad is a thin, high-strength rubber sheet, tank movement after construction may cause bulging or wrinkles in some spots. This does not, however, affect the product's ability to prevent infiltration of rainwater.



■ Pulling up around the outside edges

On fragile asphalt foundations, if the outer edges of Catpad sheets are sealed, the force of the sheets' being pulled toward the inner side may cause cracking of the foundation at the edges. If this occurs, the outermost edges should be left unsealed. Catpad accommodates movement in the sideways direction (See Lap shear adhesive strength on p.4).



Outer edges can be left unsealed.

Construction examples

Catpad used in construction of 60 m diameter tank Shintech Louisiana, LLC (USA)



Actual "Catpad" Application Slope created using silicone sponge backup and Sealant Master 300-G
(See Construction Guide on p.11)

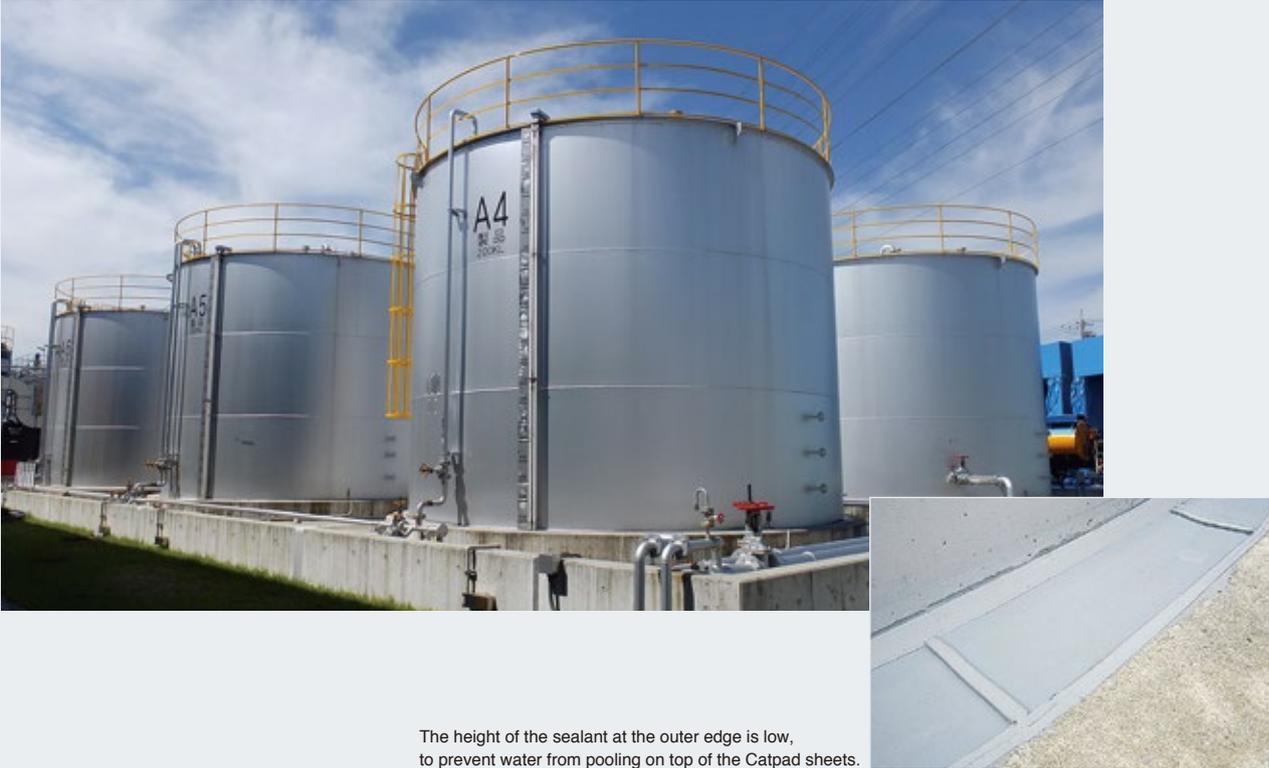


Finished view after construction



Foundation is mortar, so edges have been sealed using Sealant Master 300-G.

Catpad and Sealant Master 300-G used on a mortar foundation for smaller tanks.



The height of the sealant at the outer edge is low, to prevent water from pooling on top of the Catpad sheets.

Catpad applied such that it covers part of the tank wall.



Installation in which the outer edge is left unsealed.



Catpad, Catpad-cloth and Cat-tape used to protect metal cover against corrosion.



Installation in which Catpad partly covers the wall of the foundation for a small tank.



Catpad remains flexible even at below-freezing temperatures.

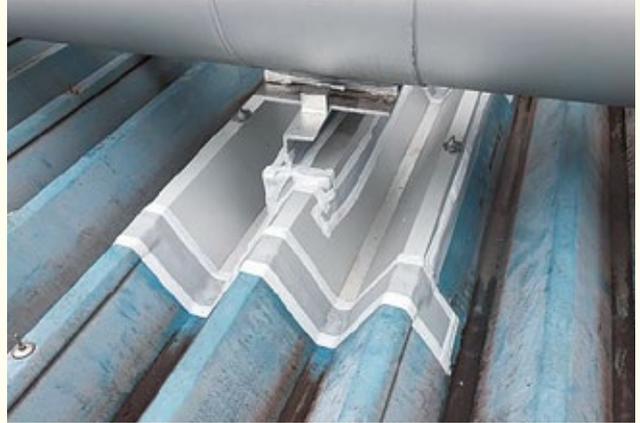


Uses that do not involve tanks

Repair of flat roof to stop leaks.

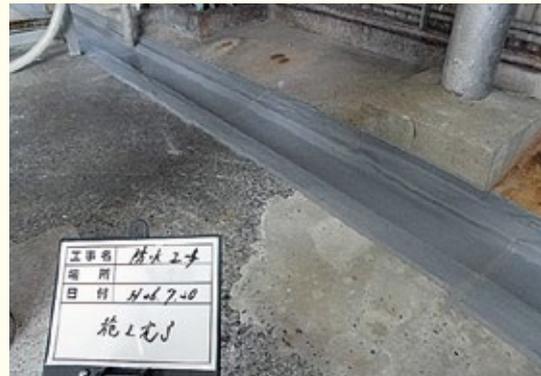


Catpad used to prevent leaks on a different type of roof.



Repair of a concrete drainageway inside a plant building.

This was done to prevent pollutants from leaking into the ground, aimed at compliance with the revised Water Pollution Prevention Act (enacted in 2015).



Handling precautions

1. **It is necessary to refer to the construction guide.**
2. If it's cold and the separator film is hard to remove, warming up the product can help.
3. Take care to prevent contact with solvent and oils, as these substances may degrade the physical properties of the sheets.
4. If sheets tear or come up after construction, these sections can be repaired using Catpad and Cat-tape or Catpad and Sealant Master 300-G.
5. After application, do not place heavy or sharp objects on top of the sheets.
After construction, the sheet should not be subjected to strong impacts or walked on.
6. Take care to apply silicone sealant correctly. If the sheets are not bonded properly with silicone sealant, water can get in.
7. After construction, bulges may occur because of air trapped between the sheet and the foundation below.
8. This product is not a low-molecular-weight siloxane reduction type. Do not use it for electronic applications.
9. **Do not place this product directly in contact with food and beverage.**
10. After removal, the product can be disposed of with regular waste materials. (Product turns to SiO₂ when burned.)
11. Keep out of reach of children.
12. Please read the Safety Data Sheet (SDS) before use. SDS can be obtained from our Sales Department.

Silicone Division Sales and Marketing Department III

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