Waterproof silicone adhesive sheet for civil engineering and construction

ShinEtsu
Shin-Etsu Silicone

Catpad™

New Technology Information System of the Japanese Ministry of Land, Infrastructure and Transport and Tourism
NETIS Registered TH-140017-VR, TH-190004-A in Japan

On roads, railways and bridges

Silicone adhesive sheets for innovat and construction applications

Numerous advantages, achieving high reliability

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In waterways and water tanks
ive applications to civil engineering
Outstanding waterproofing
Easy installation
Long-term durability
At the box culvert junction

Construction example

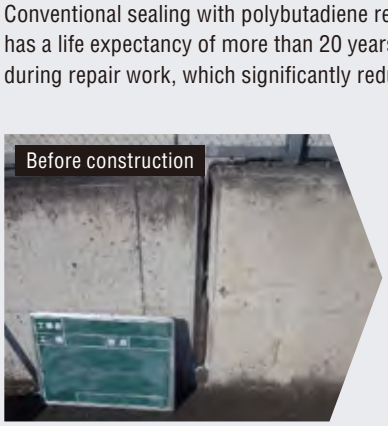
Waterproof silicone adhesive sheet for civil engineering and construction which combines excellent material properties with ease of application for a long lasting and durable finish.

Bridges

■Waterproof cover on the concrete barrier curb of the viaduct (joint gap)

(New Technology Information System NETIS TH-140017-VR Registered Method of the Japanese Ministry of Land, Infrastructure, Transport and Tourism in Japan)

Conventional sealing with polybutadiene resin degrades typically 3 to 5 years, Catpad has a life expectancy of more than 20 years. In addition, primers are not required during repair work, which significantly reduces working time.



It is recognized for its superior weather resistance when used on highways, roads and general construction in Japan.

Waterproof cover on the concrete barrier curb of the viaduct

Maintains flexibility even in winter.

Waterproof cover on the median strip gap

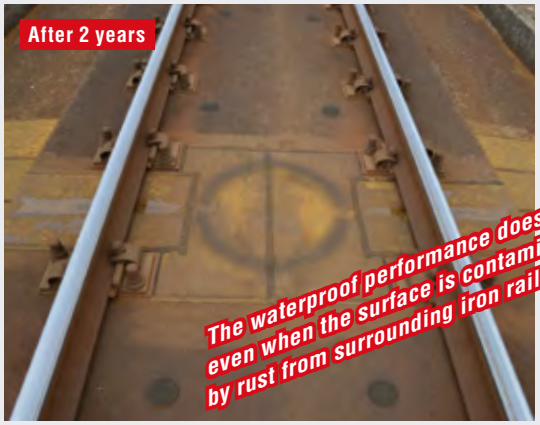
When applied to the median joints on intersecting roads, railways and bridges, Catpad shows superior weather resistance and durability compared to conventional polybutadiene resin, PVC and urethane waterproofing sheet.

Waterproof gap cover between road bridge and pedestrian bridge

The system accommodates the differential movement of the carriageway and the pedestrian bridge maintaining a weatherproof seal and preventing water leaks.

■Waterproof seal at the joint of a railway viaduct slab track

It can be applied to the concrete surface of the slab track without primer, and the ease of application minimizes disruption and allows for application at night. It exhibits excellent durability and fatigue resistance to vibrational movements caused by running railway vehicles.



Waterproof and corrosion protective cover on the steel jacketing of RC column of seismic retrofitting

Catpad can be applied to both the coated steel and mortar without a primer. It will accommodate the combined movement of each substrate resulting from the difference in expansion coefficients of each material for long periods. Changes or an increase in corrosion can be checked by using Catpad Clear.

Waterproofing between the old column and the new concrete jacketing prevents rainwater penetration into the joint of the concrete jacketing. Long-term seismic resistance can be expected.

Waterproof cover of joint in seismic reinforced concrete jacketing of viaduct

Bridges

Anti-corrosion seal to protect against salt damage of wires

When used as a wrapping, prolonged anti-corrosion protection can be expected.

Tunnels

Waterproof seal on the outside joint of the precast box culvert

It can also be buried in soil.

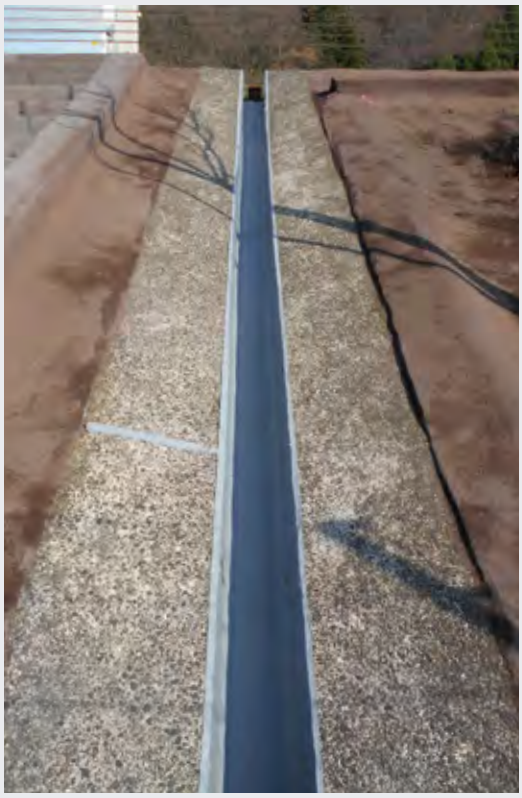
Countermeasures against water leaks and icicles in snow shelters

Adopted to seal joints on metal roofs which experience large expansion and contraction movements, the unique properties of silicone confirm resistance against ultraviolet light and extremes in temperature.

Water facilities

■Drainage ditch (For applications where there is constant water flow, first apply the primer, air dry, then apply the sealant and then apply the Catpad)

Covering the drainage channel on the slope of a highway



When normally replacing or repairing a U-ditch, heavy equipment such as a crane is required. This is no longer the case when the repairs are carried out using Catpad.

Construction of a drain joint

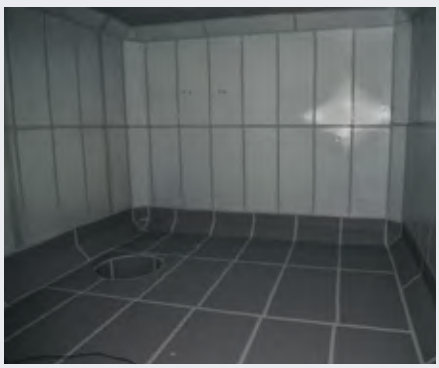
When compared to conventional mortar repairs, Catpad requires no mixing and is easy to apply without the need for specialist training. Once installed, it has a minimal curing time and can accommodate joint movement.

Construction of concrete drains in a factory

In response to the revision of the Water Pollution Control Law in Japan (applied in 2015), measures were taken to prevent the leakage of pollutants into the ground.

■Water tank

Application to the floor and walls of fire cisterns



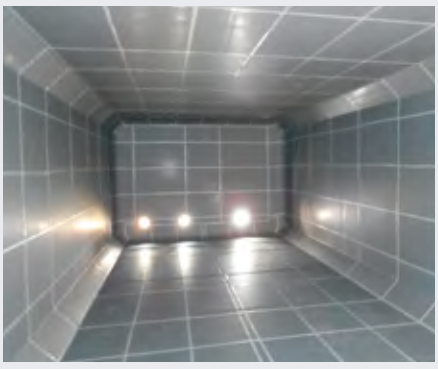
Sheet edges are covered and sealed with Cat-Tape Clear.

It was effective in preventing water leakage from cracks in the plain concrete fire cisterns.

Example of partial repair of fire cisterns

Small-scale or partial repairs can be performed by municipal officials.

Full attachment to inner surface of hot spring water storage tank



It successfully prevented deterioration and protected the water storage tank from potential damage caused by hot spring water.

Roofs, walls, and other general applications

Application examples related to public facility management areas

A pedestrian bridge (urine marking area)

Rust occurs in areas where pet frequently urinate. Durable rust prevention can be achieved by applying Catpad-Cloth.

Prevention of rust in pedestrian bridge stair area

Catpad-Cloth was applied to the side wall of these steps. It prevented the formation of rust and prevented water from being trapped or stagnating from the flow of rainwater from the upper stages.

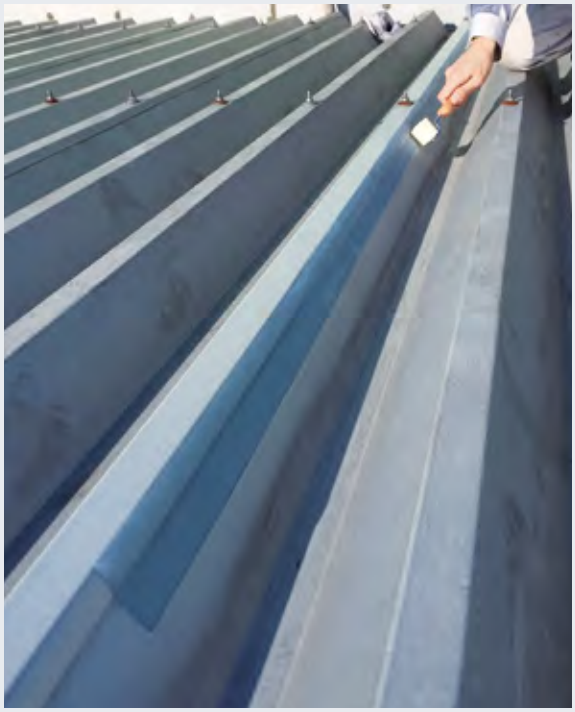
Waterproof cover of the street transformer base

Prevents infiltration and freeze-thaw damage of street transformer base buried in snow for more than 3 months in winter.

Leakage seal of domed roof

Catpad manages and accommodate changes in the material substrates due to variation in temperature and the effects of UV enabling a long-term durable applications.

Leakage seal of folded plate roof

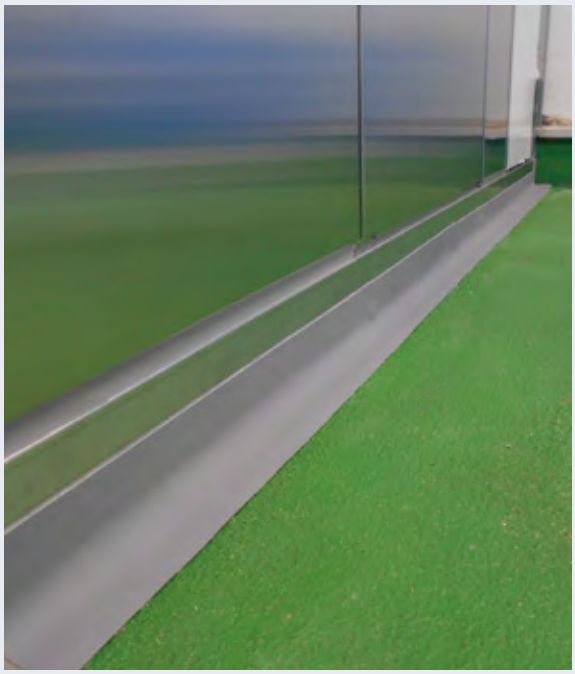


Immediately following its application, Catpad is able to accommodate movement and stop water ingress.

Waterproof cover at the coping joint

Water infiltration into metal junctions of buildings as a result of movements from expansion and contraction from freeze-thaw can be prevented.

Insect repellent countermeasures at food factories



It bridges and forms a permanent seal in joints or gaps in food and healthcare factories and buildings where safety and hygiene are important, in addition to waterproofing, it can be used to prevent the ingress of insects, dust and other contaminates.

Repairing aged block walls

Applying Catpad all over the existing block wall surface, waterproofing, freeze-thaw damage prevention, and cleanliness were achieved.

Waterproof silicone adhesive sheet for civil engineering and construction

Catpad™

Catpad is a waterproof silicone adhesive sheet used in civil engineering and construction applications.
It combines excellent workability and reliability and does not require the use of primer.
It has long-term durability when used in a wide range of applications, including bridges, tunnels, roofs, joint intersections, expansion and connection joints.

Patented (No. 5765268) in Japan

Catpad™

Allows for inspection of the repair and confirmation of appearance and aging

Catpad™ Clear

Enhanced with Glass Cross

Catpad-Cloth

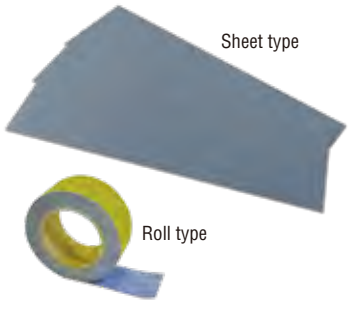
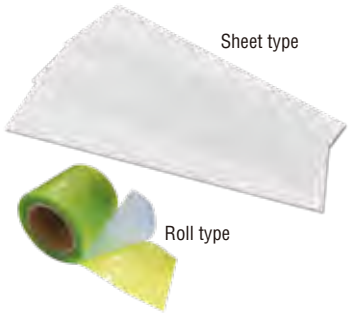
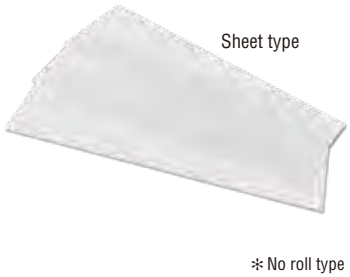
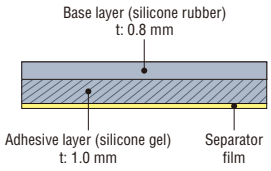
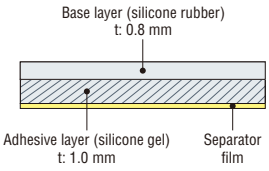
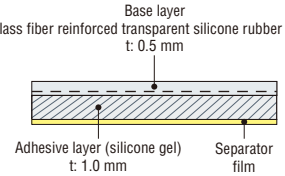
- **Excellent resistance to extreme changes in temperature, stable performance over a wide temperature range of -40°C to 180°C.**
- **Silicone offers excellent durability and weather resistance.**
- **Excellent seal and waterproof performance over a long period of time.**
- **It sticks well to most materials such as metallics and concrete.**
- **It will not cause corrosion or deterioration of metallic, concrete, etc.**
- **Excellent flame resistance, no fire spread or carbonization even after more than 5 minutes exposure from a direct flame from a warning flare.**
- **Excellent workability, matches the shape of the waterproof surface, and can be easily cut on site for repair.**
- **It is a product with high safety and low environmental impact.**

■ Various certifications

- New Technology Information System of the Japanese Ministry of Land, Infrastructure and Transport and Tourism NETIS Registered TH-140017-VR, TH-190004-A
- New Technologies Registry 1701015 of Bureau of Construction, the Tokyo Metropolitan Government
- New Technology Registry a-17057 of Civil Engineering Department, Ibaraki Prefectural Government
- Metropolitan Expressway New Technology Information (Bridges) Silicone Adhesive Sheets
- New Technologies Registry 1801014A, 1901008A of Civil Engineering Department, Fukuoka Prefectural Government
- New Technology Registration 20201002 of Construction Department, Hokkaido Government

Maintains water repellency over a long period of time.

■ General properties

Parameter \ Product name	Catpad	Catpad Clear	Catpad-Cloth
Type			 ✻No roll type
Structure			
Features	General type	Transparent type	Glass fiber reinforced type
Appearance	Gray	Transparent	White transparent
Reinforcement layer	None		Glass fiber
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
Tackiness	Self-sticking		Self-sticking
Hardness Base layer type A	55		70
Hardness Adhesive layer Asker CSR2	< 15		< 15
Tensile strength* MPa	10.0		70.0
Tear strength* Crescent type kN/m	50		250
Elongation at break* %	800		2
Operating temperature range °C	-40 to 180		-40 to 180
Breakdown voltage kV	30 <		20 <
Low molecular weight siloxane %	0.83 (Σ D_3-D_{10})		0.27 (Σ D_3-D_{10})

✻Measured value of the substrate layer

(Not specified values)

Silicone adhesive tape for finishing edges

Cat-Tape™ Clear

Cat-Tape Clear is a putty-like adhesive tape that extends the life expectancy of an application when used to finish the edges and overlapping sections of the Catpad.

Cat-Tape™ Clear

- **Cat-Tape Clear cures and bonds in 24 hours after application, and bonds strongly to both Catpad sheets and mortar foundation surfaces.**
- **Caulking gun and masking tape are not required due to the ease of application.**
- **Can be used to bridge gaps and joints without casing discoloration or staining due to its putty-like consistency.**
- **Less waste, which is better for the environment.**

■ Effects of Cat-Tape Clear

The use of Cat-Tape Clear on the edges and overlapping sections of the Catpad increases the reliability of waterproofing.

- **Prevents movement during large deformation.**
- **Offers protection and prevents dust and contaminates from contacting the adhesive layer.**
- **Prevents peeling or lifting of the edges due to external forces.**

■ Test Methods

Prepare two samples, the first using Catpad without Cat-Tape Clear and the second using both Catpad and Cat-Tape Clear on two mortar plates.
Pull the 50 mm gap to the 75 mm position at a tensile speed of 50 mm/min. and hold for 10 minutes (Autographs manufactured by Shimadzu Corp.). It was further pulled to 100 mm position and held for 10 minutes to confirm the state.

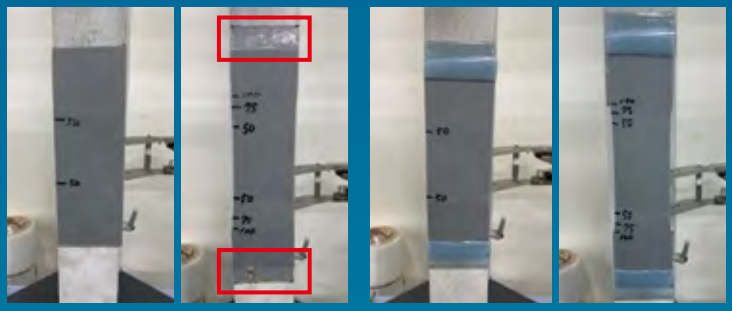
■ Test results

When experiencing an extention of 50 mm to 100 mm (movement of 50 mm) in an application not using Cat-Tape Clear the adhesive layer at the edge of the Catpad becomes exposed. When using the Cat-Tape Clear at the edge the Catpad it remained in its original position and held firmly in place with no exposure of the adhesive layer.
When large movements are expected, the adhesive layer of the Catpad may become exposed, and so the use of Cat-Tape Clear should be considered to prevent this.

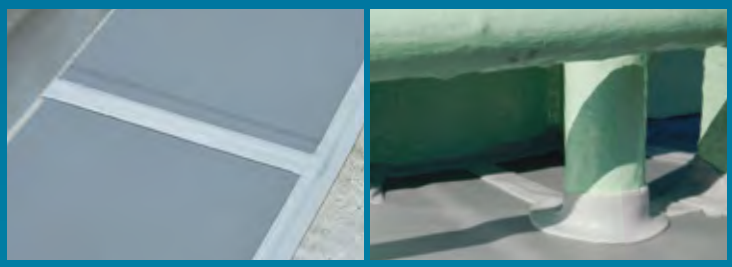
Comparison without Cat-Tape Clear (left) and with Cat-Tape Clear (right) when the gap of 50 mm is pulled to 100 mm

Without Cat-Tape Clear, the adhesive layer is exposed

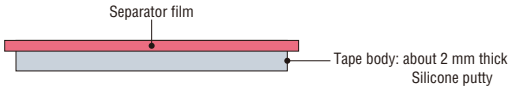
With Cat-Tape Clear, the edge is not exposed



■ Example of end treatment of a Catpad



■ General properties

Parametor \ Product name		Cat-Tape Clear	
Type			
Structure			
Color	Separator film	Pink	
	Tape body	Transparent	
Standard size	mm	25×3,000	
Test items after curing (silicone rubber)		Measured value	Environmental conditions (curing days)
Hardness Type A		45	23°C/50% RH (8 days)
Tensile strength	MPa	5.4	
Elongation at break	%	730	
Tear strength Angle type	kN/m	16	
Adhesive (between mortar)*	N/cm	22	23°C/50% RH (8 days)
		17	40°C/95% RH (8 days)
Adhesive (between Catpad)*	N/cm	47	23°C/50% RH (8 days)
Adhesive (between Cat-Tape Clear)*	N/cm	65	23°C/50% RH (12 days)

* 180 degree peel, tape width: 10 mm

(Not specified values)

Product Lineup and Package

Type \ Product name	Catpad	Catpad Clear	Catpad-Cloth
Sheet type  ※ Don't place the sheet type package vertically when transporting or storing.	300×1,000 mm (10 sheets/package)	300×1,000 mm (10 sheets/package)	—
	Packing dimensions: D360×W1,110×H60 mm Weight including products: 9 kg		
	400×1,000 mm (10 sheets/package)	400×1,000 mm (10 sheets/package)	400×1,000 mm (10 sheets/package)
	Packing dimensions: D470×W1,110×H60 mm Weight including products: 12 kg		Packing dimensions: D470 × W1,110 × H60 mm Weight including products: 11 kg
Roll type 	50×3,000 mm (20 pieces/Packing)	50×3,000 mm (20 pieces/Packing)	—
	Packing dimensions: D360×W530×H150 mm Weight including products: 10 kg		
	100×3,000 mm (10 pieces/Packing)	100×3,000 mm (10 pieces/Packing)	
	Packing dimensions: D360×W530×H150 mm Weight including products: 10 kg		

Cat-Tape Clear
25×3,000 mm (10 pieces/package)
Packing dimensions: D200×W340×H180 mm Weight including products: 3 kg

Packaging

With one wrap in one aluminum moisture-proof pack

Packing image

NOTE) Packing are subject to change without notice.

■ **Procedure**

step 1

Application surface preparation

The application area is cleaned by high powered water jet, shot blasting or by other mechanical means such as a grinder.

※ Ensure that the surfaces are clean, dry and free of dust and other contaminates prior to the application.

Remove the oil or dust from the application surface and check that there is no adhering material on the palm.

step 2

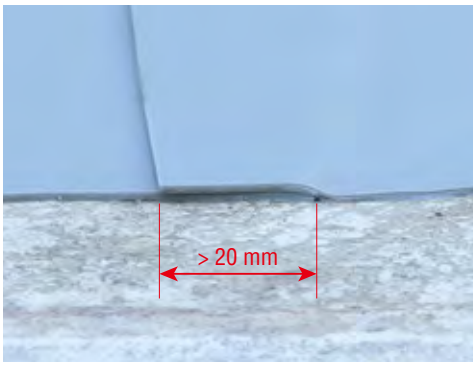
Preparation of Catpad

Dimensions can be adjusted on-site with a cutter. After cutting, remove the separator film. The gap width should be 1/3 or less of the seat width.

step 3

Application of Catpad

Carefully apply the sheet from top to bottom to avoid stretching. After applying, press the sheet by hand or suitable tool. Sheet overlaps should be at least 20 mm. These edges should be finished with Cat-Tape Clear as described in step 4.



step 4

Seal with Cat-Tape Clear

With the pink separator film facing up, press down the product thoroughly with a roller or the fingertips.Then, slowly remove the separator film by pulling in a 180 degree direction. It reacts with moisture in the air to facilitate curing and adhesion. Use up about 30 minutes after opening the package.

Curing and bonding in approximately 24 hours

The Cat-Tape Clear reacts to harden and adhere. Following a curing time of 24 hours, the application is complete.
Avoid touching the material during this time.The curing time will increase in a low temperature environment.

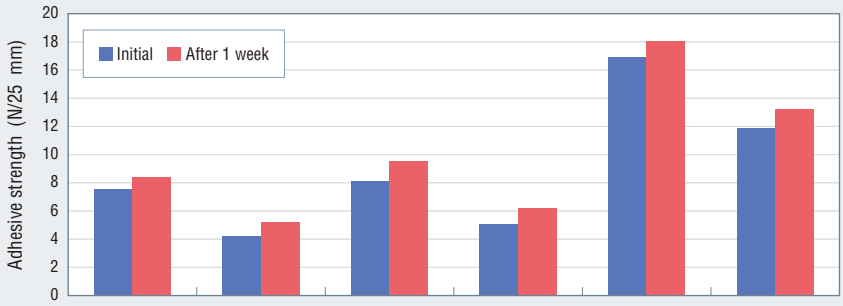
● **Sealing of step 4 can also be performed with SEALANT MASTER 300-G. The edges seal with sealant over 2 mm thick.**

Adhesive strength

Adhesion test Strong adhesion to a variety of materials.

■ Test results

Good adhesion was confirmed to all substrates used in the trial with an increase in adhesive strength one week after the initial application.

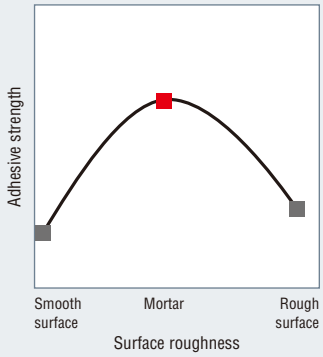


Substrates	Carbon steel plate	Epoxy paint	Stainless steel (surface brushed)	FRP	Mortar	Asphalt concrete
Surface roughness Ra μm	0.29	0.40	0.49	0.50	NA	NA
Degree of roughness	Small	Small	Small	Small	Medium	Large

● Ensure that all surfaces are completely dry and free of all contaiminants prior to the application of Catpad.
Full adhesion will not develop if there is contact with water on the adhesive surface before it has fully cured.

Following application, lift one edge slightly to confirm the string like appearance of the adhesive layer and no less adhesion.

■ Relation between adhesion and surface roughness (only image)



It exhibits high adhesive strength to moderate roughness.

■ Test conditions

- Test specimens Catpad length 200 mm x width 25 mm
- Test methods 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.
  Peel test according to the adhesive tape test method for JIS C 2107 (test speed: 300 mm/min)

Lap sheer tensile test Able to accommodate significant movement.

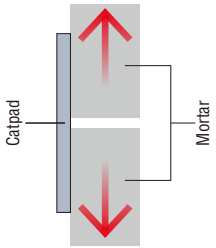
■ Test results

Catpad

Single sheet application

Applied surface	Time	Maximum tensile force N/40 mm	Displacement at maximum tensile load mm
Mortar	After 20 min	30.2	42.6
	After 4 days	70.3	80.3
	After 8 days	73.4	85.6

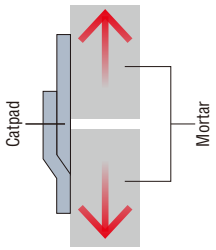
✻ Displacement value is that recorded at the point of maximum test force. (Not specified values)



Example of overlapping on the joint

Applied surface	Time	Maximum tensile force N/40 mm	Displacement at maximum tensile load mm
Mortar	After 20 min	23.2	32.6
	After 4 days	60.4	68.7
	After 8 days	61.6	70.3

(Not specified values)

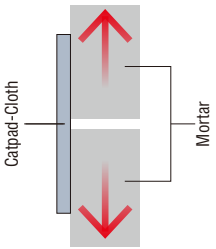


Catpad-Cloth

Single sheet application

Applied surface	Time	Maximum tensile force N/40 mm	Displacement at maximum tensile load mm
Mortar	After 20 min	84.0	53.0
	After 4 days	92.0	55.0
	After 8 days	88.0	56.0

(Not specified values)



■ Test conditions

- Test specimens Catpad and Catpad-Cloth length 60 mm x width 40 mm
- Substrates Mortar
- Test methods A Catpad or Catpad-Cloth was applied to two hemi-sections of mortar, then lap shear tensile adhesive strength was measured with tensile machine (autogragh mfd. by Shimadzu Corp.), starting from a zero span (tensile speed: 50 mm/min).

Crack-bridging test Excellent crack-bridging performance.

■ Test results

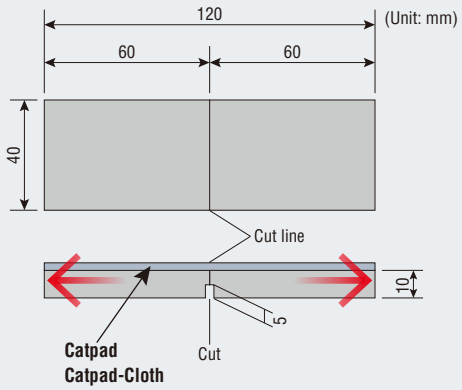
Catpad and Catpad-Cloth could follow the displacement more than 40 mm without rupture.

Displacement at maximum tensile load

Conditions \ Test specimens		Catpad	Catpad-Cloth
Single sheet on joint	mm	40.8	49.9
Overlapping application on joint	mm	55.6	44.7

(Not specified values)

■ Test specimen



■ Test conditions

- Test specimens: Catpad and Catpad-Cloth
- Substrates: Mortar
- Test methods: JSCE-K 532-2013: 7
  Measured according to the crack following test method for surface coating materials.
  Two cut mortar test pieces are butted together with zero span between them,
  and then Catpad or Catpad-Cloth is applied like a bridge across two substrates.
  The mortar test pieces are then pulled apart horizontally at 5 mm/min,
  and the product is checked for breakage or separation.
- Testing laboratory: Japan Paint Inspection and testing Association (JPIA)

Adhesion strength test Strong adhesion even in the perpendicular direction.

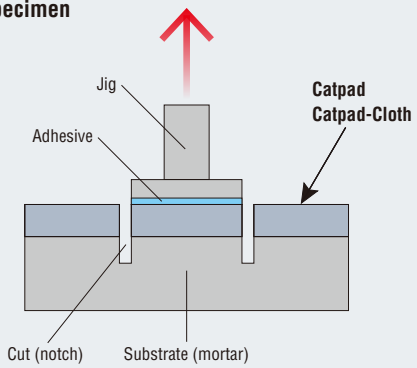
■ Test results

The products showed excellent adhesive strength.

Parameter \ Test specimens	Catpad	Catpad-Cloth
Adhesion strength N/ mm²	0.10	0.09
Maximum tensile load N	155	148
Breakage point	Break at interface between test substrate and adhesive layer of Catpad	Cohesive failure in adhesive layer of Catpad

(Not specified values)

■ Test specimen



Breakage conditions of Catpad

Breakage conditions of Catpad-Cloth

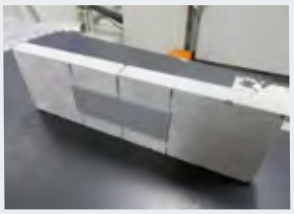
■ Test conditions

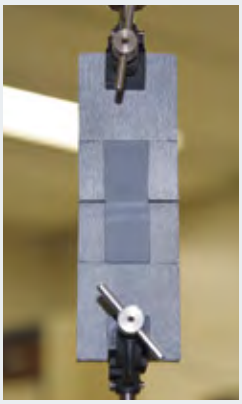
- Test specimens: Catpad and Catpad-Cloth
- Substrates: JSCE-K 531-2013: 6
  Adhesion strength test of surface coating, test method compliant test piece of
  4.1 Standard condition test specimen (mortar)
- Test methods: JSCE-K 531-2013: 6
  Adhesion strength test of surface coating, and measurement according to
  the test method of 4.1 Standard condition test specimen.
  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 1500-2000 N/min and the maximum tensile load
  and adhesive strength are determined.
  The points of breakage and conditions of the product are also examined.
- Testing laboratory: Japan Paint Inspection and testing Association (JPIA)

Fatigue test Stands up to vibration over long periods.

■ Test results

Product showed exceptional fatigue resistance, without any failure or slippage over 20 million cycles.





■ Test conditions

- Test specimens: Catpad and Catpad-Cloth
  Length 60 mm × width 20 mm
- Substrates: A JIS mortar test piece (length 150 mm x width 50 mm, thickness 10 mm) is cut
  in half longitudinally, then Catpad or Catpad-Cloth is applied such that it bridges two pieces.
- Test methods: 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.

Flame resistance

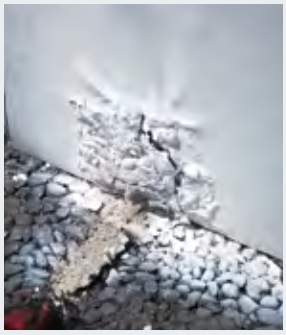
Flame resistance test Combustion does not spread even when product is in direct contact with the flame of a flare.

■ Test progression and results

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

After 2 minutes
The sheet burns but does not support the passage of flame and remains noncombustible. There is no spread of flame or combustion 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 Length 500 mm x Width 300 mm
- Test methods:
  1. Two test blocks (W360 mm x H600 mm x T50 mm, 30 kg in weight) 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.
  4. The edges are sealed with SEALANT MASTER 300-G.
  5. The flare is ignited, and the flame is brought in contact with the sample where it spans the gap.
  6. 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.

Testing according to NEXCO standards

■ 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 conbustion has not spread.
This is evidence of the product's exceptional fire resistance.

■ Test conditions

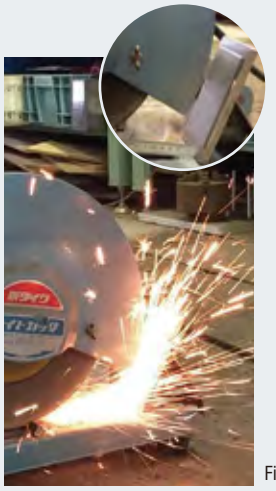
- Test pieces: Catpad-Cloth
  Length 600 mm x Width 900 mm
- Test methods: NEXCO Test Methods
  Test in accordance with Test Method 738-2011
  (Spread of combustion of tunnel retention materials).
  Heating time is 10 minutes and the gas used is LPG.
- Testing laboratory: Japan Testing Center for Construction Materials (JTCCM)

Fire resistance performance demonstrated by Catpad-Cloth

- NEXCO tunnel fire spreading test — Pass
- Fire Resistance Performance Test
  4.9 Non-flammability Performance Test Method
  Gas Hazard Test — Pass

Spark resistance test Catpad is almost unchanged by direct sparking.

■ **Test methods and results**



Surface observations using a digital microscope

Blank | 20 seconds x 2 times | After washing

After the test, there was iron filling (rust or iron oxide) on the Catpad surface. Once it was washed with alcohol, no change was evident.

■ **Test conditions**

- Test pieces: Catpad length 100 mm x width 50 mm
- Test methods: It makes a spark from iron round bar by a cutting machine manufactured by Yamabiko corp.

Fix the Catpad 15 cm apart from the machine to generate sparks, and observe the surface.

As part of ongoing maintenance rail grinding machines run to maintain the desired rail surface. Synthetic rubbers deteriorate due to sparks generated during grinding, but Catpad is hardly affected.

Electrical Characteristics

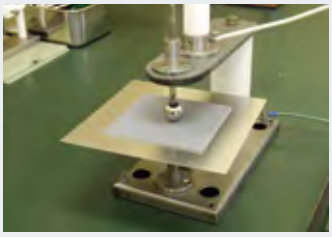
Dielectric strength test Product shows excellent dielectric properties and is electrically stable.

■ **Test results**

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

(Not specified values)

Condition of electrodes (image)



■ **Test conditions**

- Test pieces: Catpad or Catpad-Cloth (100 mm square)
- Test methods:
  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).
  3. Measure the applied voltage at which dielectric breakdown occurs.
- Testing laboratory: Analysis Center, Hitachi Chemical Techno-Service Co., Ltd.

Catpad-Cloth push-out test

Testing according to NEXCO standards

Textile sheet glue push-out test to prevent the peeling of concrete tunnels

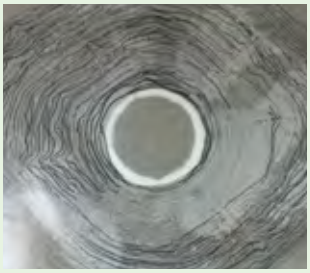
Catpad-Cloth conforms to NEXCO standards (measures against small peeling pieces) and the net-based and gutter-based methods.

■ **Test progression and results**

Conditions / Test pieces	Maximum load (displacement 10 mm to 50 mm) N	Displacement at maximum load (displacement 10 mm to 50 mm) mm	Maximum load (displacement ≥10 mm) N	Displacement from maximum load (displacement ≥ 10 mm) mm
Sample 1	651	50	875	82
Sample 2	706	50	888	78

Minimal required value: P=500 N D ≤50 mm

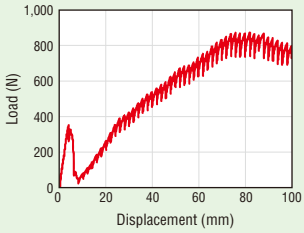
(Not specified values)



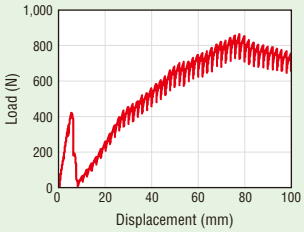
State after the test of the test specimen 1

■ **Displacement-load curve**

Sample 1



Sample 2



■ **Test conditions**

- Test pieces: Catpad-Cloth
  Two sheets of 600 mm Length x 400 mm width and thickness 1.5 mm were prepared.
  — One shall be test sample 1 and one shall be test sample 2.
- Test methods: NEXCO Test Methods
  Seventh Edition Tunnel Related Test Methods (July 2013) Test Methods 734-2011
  Measurement according to "Push-out test of a textile sheet glue for prevent the peeling of concrete tunnels."
  The test is measured by Model 5582 Instron Japan.
- Testing laboratory: Japan Testing Center for Construction Materials (JTCCM)

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 (equivalent to 17 years*), however adhesion improved.

* Converted value from the ultraviolet irradiation dose

Parameter \ Time		Initial	After 1,750 hours (equivalent to 6 years)	After 5,000 hours (equivalent to 17 years)
Tensile strength	MPa	10.0	10.3	10.5
Elongation at break	%	800	700	560
Adhesion	N/50 mm	8.2	10.5	11.1
Thickness	mm	1.79	1.73	1.74

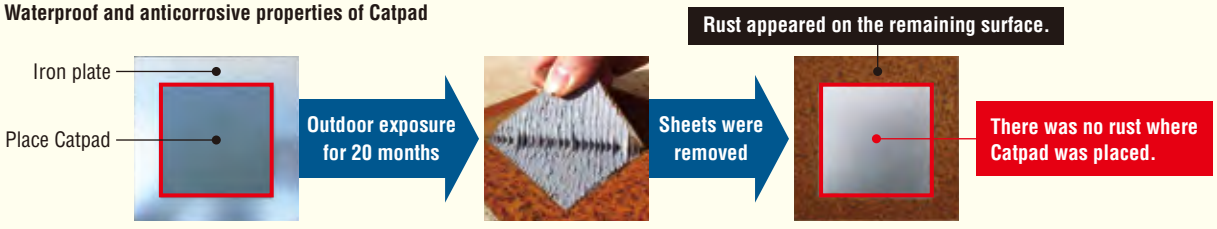
(Not specified values)

■ **Test conditions**
- Test pieces: Catpad length 150 mm x width 50 mm
- Substrates: Stainless steel (SUS-304)
- Test methods: Place Catpad on stainless steel plate and seal the outer edges. 120 min/1 cycle on a sunshine weather meter, water sprayed for 18 min during light source irradiation. 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.

Waterproof and anticorrosive properties of Catpad



■ **Test conditions**
- Test pieces: Catpad 100 mm square
- Substrates: Iron plate (SPCC)
- Test methods: Place Catpad by hand in iron plate center, and leave for 20 months outdoors.

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

■ **Test results** Even following 2 years exposure, the area where Catpad was applied showed no rust. Rust did occur in all surrounding areas around the Catpad sample, however.

Waterproof and anticorrosive properties of Catpad

■ **Test conditions**
- Test pieces: Catpad 100 mm square
- Substrates: Iron plate (SPCC)
- Test site: Kashima, Ibaraki Prefecture
- Test methods: 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	Diionized Water	5% NaCl aq	5% NaOH aq	12% HCl aq
Appearance		—	No change	No change	No change	No change
Change in hardness	Point	55	-5	-5	-13	-5
Change in tensile strength	%	10 MPa	+4	+6	-15	+2
Weight change	%	—	±0	+0.5	-0.1	+0.5

(Not specified values)

The water repellency of rainwater is maintained after three and a half years of construction.

■ **Test conditions**
- Test specimens: Catpad based on JIS K 6249
- Test methods: Catpad base material samples were immersed for 1 week in each of the above liquids. The samples were then removed and their physical properties were measured within 15 minutes after removal, in accordance with JIS K 6249.

Handling precautions

1. Take care to prevent contact with solvent and oils, as these substances may degrade the physical properties of the sheets.
2. If sheets tear or come up after construction, these sections can be repaired using Catpad and Cat-tape or Sealant Master 300-G.
3. 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.
4. Take care to apply silicone sealant correctly.
   If the sheets are not bonded properly with silicone sealant, water can get in.
5. After construction, bulges may occur because of air trapped between the sheet and the foundation below.
6. This product is not a low-molecular-weight siloxane reduction type.
   Do not use it for electronic applications.
7. Do not place this product directly in contact with food and beverage.
8. When disposing of the product, read the SDS and process it in accordance with the law.
9. Keep out of reach of children.
10. Please read the Safety Data Sheet (SDS) before use. SDS can be obtained from our Sales Department.

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