Waterstop for sheet piles

ADEKA ULTRA SEAL®

A-50

ASAHI DENKA

Waterstop for sheet piles

ADEKA ULTRA SEAL A-50

Steel sheet piles are widely used for shore protection works, bridge abutments, earth retaining walls and coffer dams.
With the advancement of construction technologies, concerns over the problems of safety, water pollution, and pumping costs have grown.
This has resulted in a demand for a product with a higher water sealing ability.
ADEKA ULTRA SEAL A-50 is a revolutionary new waterstop system.
Perfect sealing can be achieved due to its unique water swelling characteristics.

Growing demand for perfect seals for sheet piles.

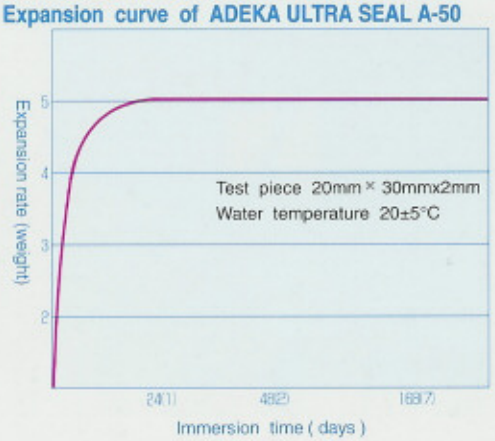
Problems caused by water leakage in sheet pile construction

Safety:
Disasters from ground subsidence may occur
Drainage:
For environmental protection, leaked water cannot be drained into rivers and seas, also when ground improving additives are used, water treatment facilities for drainage will be needed.
Economic efficiency:
High leakage will require water draining systems with increased capacity resulting in higher maintenance and running costs.
Construction site:
Safe and comfortable working environment cannot be secured.

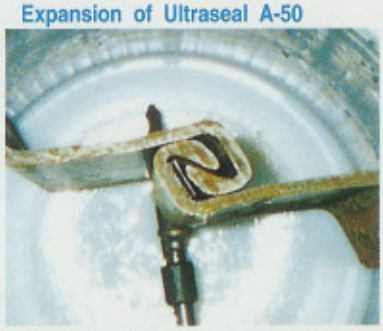
Waterstopping mechanism

ADEKA ULTRA SEAL A-50 is a totally new, simple and easy water stopping system. When in contact with water, it expands to 5 times its volume in 24 hours and fills the gaps of the interlocking section of sheet piles. It withstands more than 50 metres of hydrostatic head.

Expansion curve of ADEKA ULTRA SEAL A-50



Expansion of Ultraseal A-50



Before soaking in water, thickness:3mm

After soaking in water for 24 hours

Outstanding Waterstopping Abilities
ADEKA ULTRA SEAL A-50

Characteristics

1 Cured rubber films expand when in contact with water and withstannd more than 50meters of hydrostatic head.

2 Because of its strong adhesive strength, the rubber stays firmly in place on a sheet pile even when it is driven into the ground.

3 ADEKA ULTRA SEAL A-50 expands in the interlock sections of sheet piles which have been already driven in the ground.

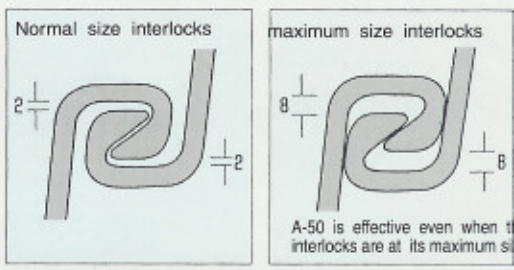
4 Since ADEKA ULTRA SEAL A-50 does not contain any solvents it makes application easy and even. It is environmentally safe.

5 The cured rubber does not pollute water.

6 Different from other gelled products,the cured rubber can be easily removed by blowing with an air jet because it loses its adhesiveness in contact with water.

Hydrostatic head test 5kg/cm²

Gaps of interlock section of sheet piles,



7 It is an organic product which does not contain any solvents. A large amount of storage (2,000 liters) is possible, compared with conventional products.

Composition, Properties

ADEKA ULTRASEAL A-50 is a liquid rubber which expands when in contact with water. It is free from low boiling point solvents. After curing in air, it becomes a stable polymeric rubber.

Properties before curing (liquid rubber state) JIS=ASTM

Appearance	Eye measurement	Clear liquid
Specific gravity	25°C by a hydrometer	1.05±0.05
Viscosity (CP)	25°C B type balance	1100±250
Tackfree	20°C 60% RH	Less than 20hours
Curing time	20°C 60% RH	Less than 60hours

Properties after curing (rubber state) JIS=ASTM

Curing	HS-A	20
Tensile strength	kg/cm	More than 47
Elasticity	%	More than 1,000
100% tensile stress	kg/cm	3.7
300% tensile stress	kg/cm	6.1
500% tensile stress	kg/cm	8.8
Strength against tearing	kg/cm	11

For the use in cold weather districts, add 500 grams of curing stimulator S-10, to 15kg of ADEKA ULTRASEAL A-50.
Properties of cured compound are same with ones of A-50.

Installation Procedures

1 Preparations

Place blocks as spacers between each pile to allow access for the application of A-50.

2 Cleaning of interlock sections

Clean off rust, dirt, and debris from the interlock section with a small sander or wirebrush. Remove bumps at the welded sections.
Blow off dust and debris with an air gun.

Chipping

Sanding

Air jet cleaning

3 Application

Apply tape on both ends of sheet piles.
Pour ADEKA ULTRASEAL A-50 approx 5mm thick.

Taping to the end

Pouring A-50

4 Curing and driving

After applying ADEKA ULTRASEAL A-50, cover sheet piles with waterproof sheets prevent moisture collection.
Drive sheet piles into the ground using conventional equipment.

Storing

Driving sheet piles

Repair works

Sheet piles are sometimes repeatedly pulled up and driven down at construction site, especially when driving in solid rock . Detachment ADEKA ULTRASEAL A-50 may occur, but repair work can be done simply and easily.

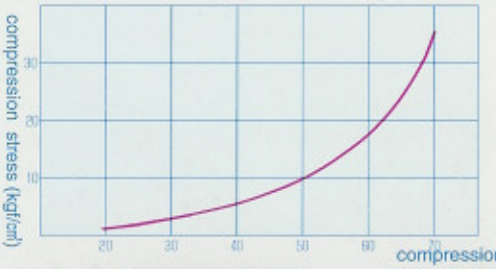
Basic procedures

Repair work with ADEKA ULTRASEAL KM (KCH) string (expansion rate : 4 times)

Insert KM(KCH) String which is approx. 1.2 times the width of the gap in diameter along the seam between the sheet piles.

Speed of expansion upon contact with water (volume expansion rate %)

Relationship between compression rate and compression stress



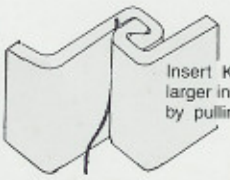
Basic properties of KM series

Tensile strength (Kg.f/cm)		more than 20
Elasticity	(%)	more than 550
Expansion rate	(Wt%) Soaked in the water	

Water stopping ability after 5 days in the water

Interlock space	0.5	1.0
Hydrostatic head (Kgf/cm)	17.0	9.5

ADEKA ULTRASEAL KM- string



Insert KM-string about 1.2 times larger in diameter than the openi by pulling it down.

State of water leakage

Insertion of KM - String

Compression of repair work

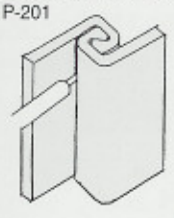
Supplementary repair

Repair with cartridge type ADEKA ULTRASEAL P-201 (expansion rate : 2 times)

After the active leak has been stopped by ADEKA ULTRA SEAL KM(KCH) string, additional precautionary repair can be performed. Inject P-201 in the interlock gap above the KM(KCH) repaired area with a caulking gun.

Injection of P-201

ADEKA ULTRA SEAL P-201



Basic properties of P-201 before curing

Appearance	Paste
Specific gravity (20°C)	1.22
Application speed (5°C)	Less than 30 seconds
Application speed (20°C)	Less than 20 seconds
Slump (23°C)	3 mm >
Tack free (20°C 60%RH)	10 hours >

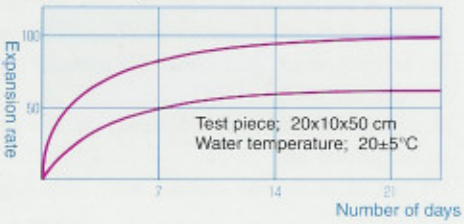
After curing

Hardness (Shor A)	28
Tensile strength (Kgf/cm)	25
Elasticity (%)	1750
Tearing strength (Kgf/cm)	12

Tensile adhesive property of P-201

	Plate glass	Aluminium plate	Mort
50% tensile stress (Kgf/cm)	3.9	3.8	3
Maximam tensile stress (Kgf/cm)	14.5	14.5	1
Elongation (%)	540	595	5

Expansion upon contact with water



Applications of ADEKA ULTRASEAL A-50

Wharf

Cofferdam

Utility tunnel

Caisson

Packaging of ADEKA ULTRASEAL A-50

18kg can

Precautions for handling

Keep away from fire. (ADEKA ULTRASEAL A-50 falls under the petroleum group in the hazardous product category No.4 of the Fire Services Act.)
Do not handle with bare hands and avoid contact with skin. If contact occurs, wash with soap and water. Get medical attention if required.

In case sheet piles are hard to remove

Reverse the steps for driving into the ground.
Remove dirt and loosen rusted sections and joints by driving sheet piles into the ground before trying to pull them up.
Drive in the sheet pile adjacent to the one which to be pulled out.
Do not stick to one certain spot. Try other spots.

Retaining wall

Bridge piers

Retaining wall

Bridge piers

Examination of The ADEKA ULTRASEAL A-50

Results of water examination

Site of sampling
The sampling date 20th Nov. '91 Weather : previous day fine
the day of sampling fine
Sampling to be tested ADEKA URTRASEAL A-50 solution
Ite ms checked All

Item	Specification	Analysis
Temperature	-------	------
Water temperature	-------	------
Nitrogen nitrate and Nitrogen nitrite	Less than 10	Below 0.02
Chroline ion	Less than 200	1.4
Consumption amount of potassium permanganate	Less than 5	3.5
Ordinary bacteria (The number of colonies in 1m litter)	Less than 100	------
Colom bacilli	Should not be detected	------
Ionic cyanide	Should not be detected	Not detected
Mercury	Should not be detected	Not detected
Organic phosphorus	Should not be detected	Not detected
Copper	Less than 1.0	Below 0.01
Iron	Less than 0.3	Below 0.05
Manganese	Less than 0.3	Below 0.01
Zinc	Less than 1.0	Below 0.005
Lead	Less than 0.1	Below 0.01
Hexavalent Chromium	Less than 0.05	Below 0.02
Cadmium	Less than 0.01	Below 0.005
Arsenic	Less than 0.05	Below 0.005
Fluorine	Less than 0.8	Below 0.15
Calcium, magnesium, and others	Less than 300	Below 5
Evaporation residue	Less than 500	9
Phenol and others	Less than 0.005 of phenol	Below 0.005
Anion surfactant	Less than 0.5	Below 0.2
Value of pH	5.8 < 8.6	6.9
Smell	Normal	Normal
Taste	Normal	Normal