

**Denka**

# **SPECIAL CEMENT ADDITIVES CATALOGUE**

**DENKA | DIPL | DCSM**





# Denka

Headquartered in the heart of Tokyo, Denka was established in 1915 and has a history of over a century as one of Japan's most established chemical companies. Denka's business is divided into 5 major categories; Elastomers and Performance Plastics, Infrastructure & Social Solutions, Electronics & Innovative Products, Living & Environment Products, and Life Innovation.

Based on our corporate slogan "Possibility of Chemistry", we strive to expand the possibilities of chemistry to create new value and contribute to sound social development.

# CONTENTS

<b>Our Business</b>	... 4
<b>CSA Technology</b>	... 5
<b>Our Products</b>	... 6 - 7
<b>Denka &amp; Estop Products</b>	... 8 - 11
<b>Crack Resistance</b>	
CSA series / CSA #20	... 12 - 13
Power CSA Type-S / Type-R	... 14 - 15
<b>Tunnelling</b>	
Natmic Z-AF	... 16
Natmic AF-S	... 17
PF Mortar Type-K / Subshot K	... 18
Subshot Mortar-N / S	... 19
<b>Soil Improvement</b>	
ES series	... 20
Microcement	... 23
<b>Repair</b>	
Quickset series	... 24
Supercement series	... 25
<b>Quick Hardening</b>	
SC-1	... 28
Beform	... 29
Fine CSA-N	... 29
Cosmic RD-M	... 30
<b>Non-shrink Grout</b>	
Pretascon series	... 32
<b>Precast</b>	
Σ series	... 36
CSA #20	... 38
Fine CSA-N	... 39
<b>Product List</b>	... 40







# OUR BUSINESS

## DENKA SPECIAL CEMENT ADDITIVES

DENKA first entered the special cement additives market in 1964 with “DENKA CSA”; an expansive additive used to impart resistance to cracking in cement. We then developed and introduced numerous other special cement additives; successfully improving upon the inherent shortcomings of plain cement and establishing our position as a leading special cement additive maker.

## DENKA INFRASTRUCTURE TECHNOLOGIES PTE LTD

To market more effectively to the ASEAN and other related regions, we established a base in Singapore; Denka Infrastructure Technologies Pte. Ltd. (DIPL), in January 2014. From here, DIPL manages sales activities in Singapore, Malaysia, Indonesia, Taiwan, Thailand, Vietnam and India. To further augment our business functions, DIPL has manufacturing bases in Malaysia (and most recently Indonesia) to supply goods faster at lower cost.

We continue to adapt and better our technological capabilities to meet the burgeoning demands for civil and architectural growth.

## DENKA CONSTRUCTION SOLUTIONS MALAYSIA SDN BHD

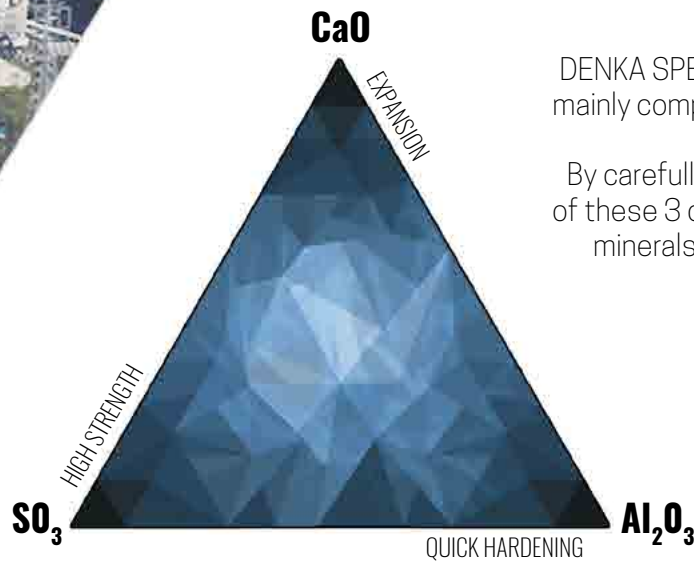
To complement Denka’s line of special cement additives, we acquired Denka Construction Solutions Malaysia Sdn. Bhd. (DCSM), formerly known as Estop Sdn. Bhd., in 2015. DCSM carries a comprehensive range of waterstops, surface treatments, cementitious and epoxy grouts and repair products, waterproofing as well as flooring products.

DCSM is based in Malaysia, with branch offices in Singapore, Indonesia and Hong Kong.

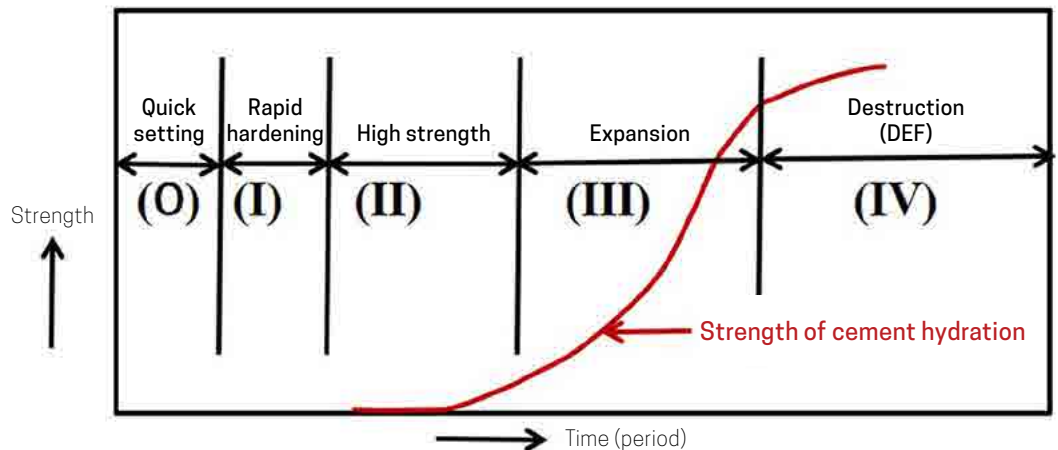
# DENKA TECHNOLOGY

DENKA SPECIAL CEMENT ADDITIVES are mainly composed of **CaO**, **SO<sub>3</sub>**, and **Al<sub>2</sub>O<sub>3</sub>**.

By carefully controlling the composition of these 3 components, creating special minerals obtained specific properties and characteristics.



## Time period of Ettringite formation and development of function

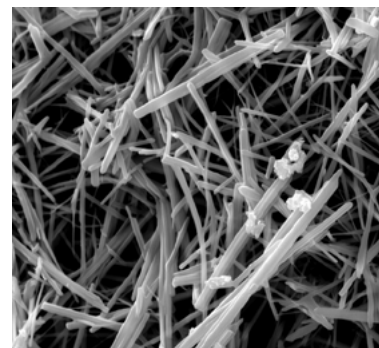


The characteristics of Denka Special Cement Additive is the control of the generation timing of Cement hydrate - **Ettringite**.

Function differs with time period of Ettringite formation. Rapid hardening occurs when Ettringite forms at first stage.

### Formation of Ettringite ( $3\text{CaO}-\text{Al}_2\text{O}_3-3\text{CaSO}_4-32\text{H}_2\text{O}$ )

- Needle Crystal with high water content
- Crystal; length order of  $\mu\text{m}$



SEM observation  
Magnification x 20,000



## **SEMI RIGID**

Cosmic RD-M

## **CRACK RESISTANCE**

CSA series

## **AIRPORT REPAIR**

Quickset, Supercement

## **ACCELERATOR**

Natmic Z-AF  
Natmic AF-S

## **INJECTION GROUTING**

ES series  
Microcement

## **SPRAY MORTAR**

PF Mortar  
Subshot K, Subshot Mortar



# OUR PRODUCTS

DENKA SPECIAL CEMENT ADDITIVES are applied in many aspects of construction. They enhance the inherent properties of concrete; improving its durability, appearance, strength, etc.

## PRECAST

CSA series  
Fine CSA-N

## PILES

$\Sigma$  series

## GROUT

Pretascon series

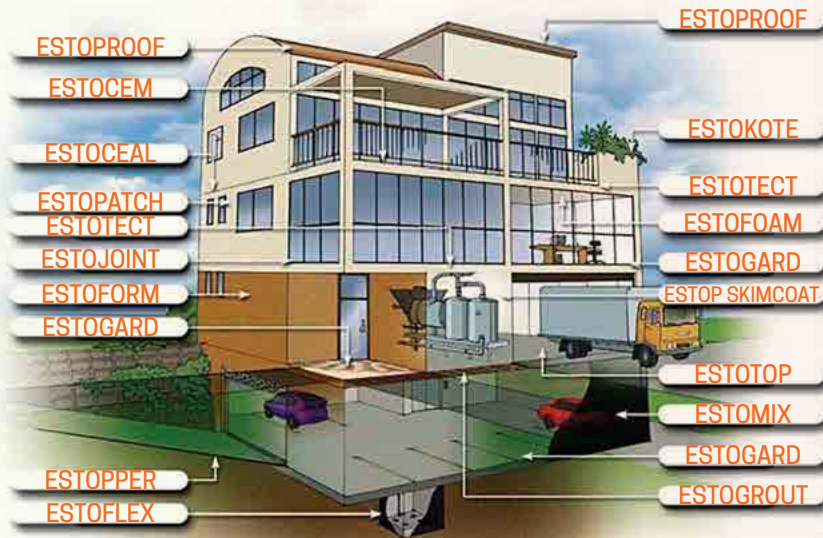
## ROAD REPAIR

Quickset, Supercement

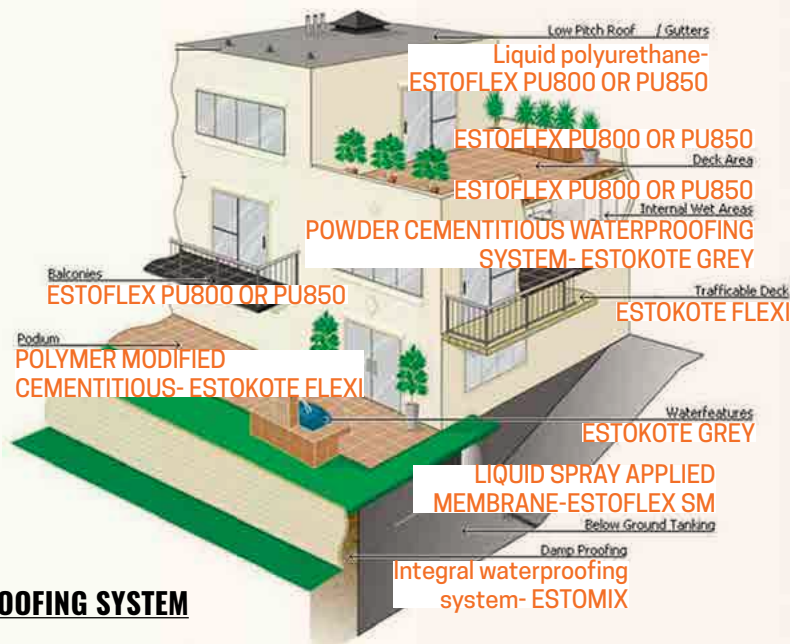


# ESTOP PRODUCTS

DENKA also distributes ESTOP Building materials such as Waterproofing and Flooring Products, Waterstops, Surface Treatments, Cementitious and Epoxy Grouts and Repair products.



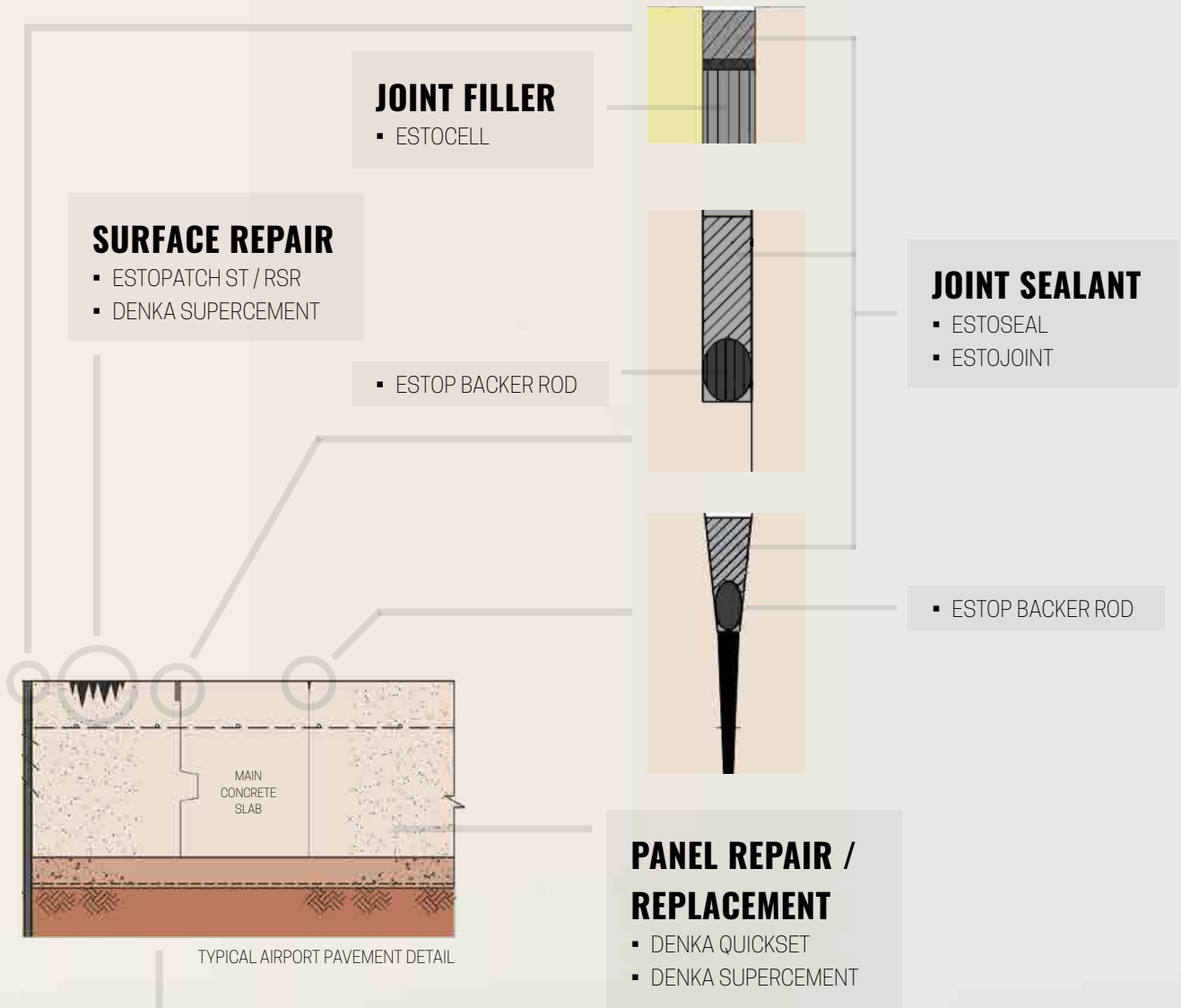
## BUILDING MATERIALS



## WATERPROOFING SYSTEM



# AIRPORT PAVEMENT



# WAREHOUSE / FACTORY

## REPAIR

- ESTOPATCH ST
- ESTOPATCH RSR

## WATERPROOFING

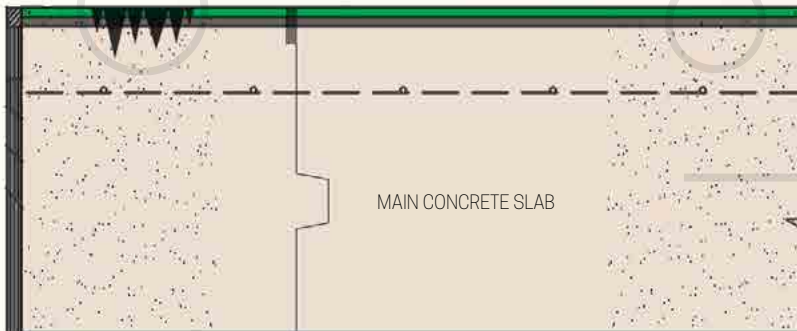
- ESTOFLEX
- ESTOPROOF
- ESTOKOTE

## FLOORING / COATING

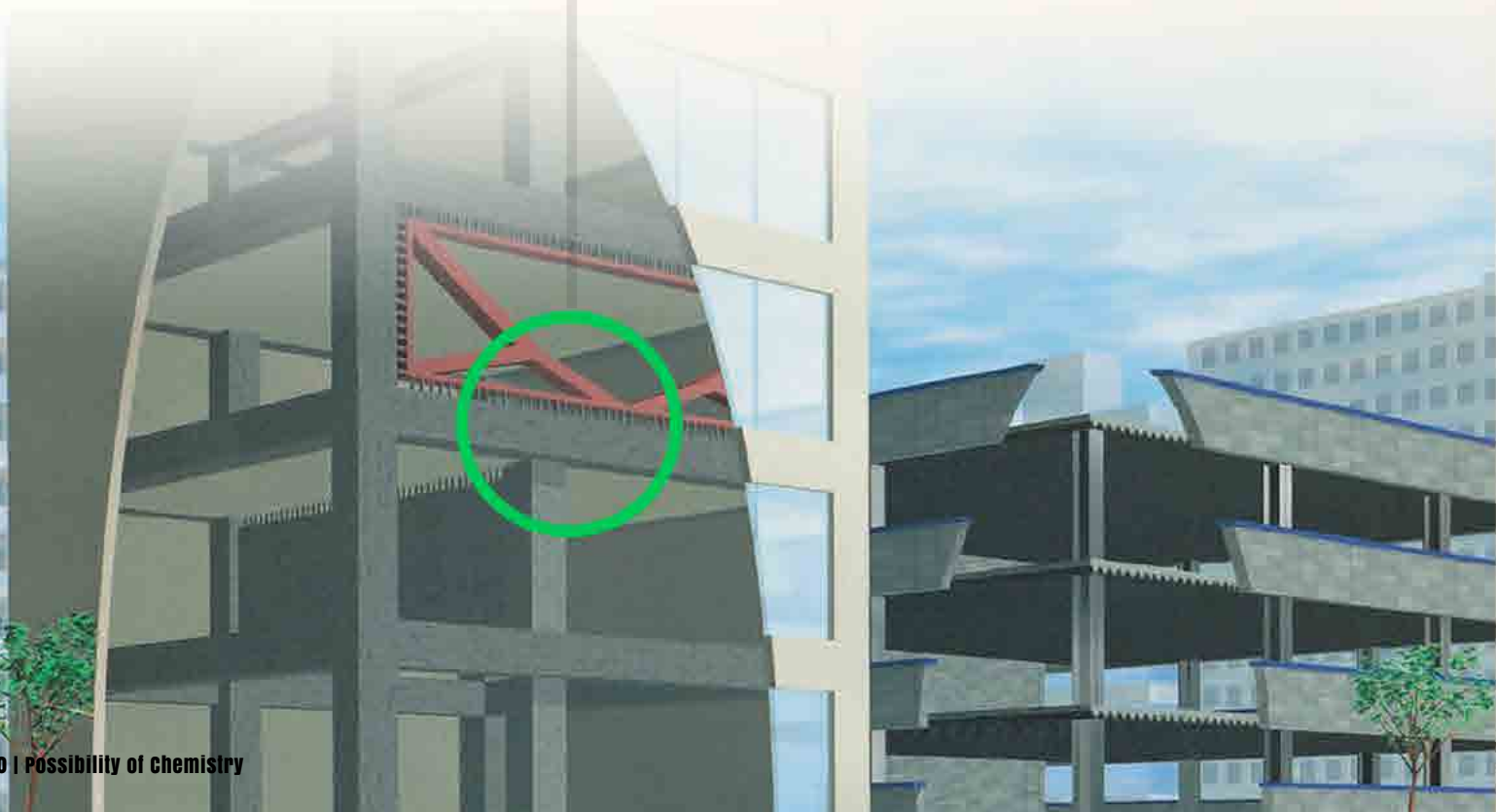
- ESTOGARD
- ESTOCEM
- ESTOTECT

## CRACK RESISTANCE

- DENKA POWER CSA TYPE-S
- DENKA POWER CSA TYPE-R



TYPICAL WAREHOUSE SLAB DETAIL





# TUNNELLING

**SHOTCRETE ACCELERATOR**

- DENKA NATMIC Z-AF
- DENKA NATMIC AF-S

**JOINT SEALANT / WATERPROOFING**

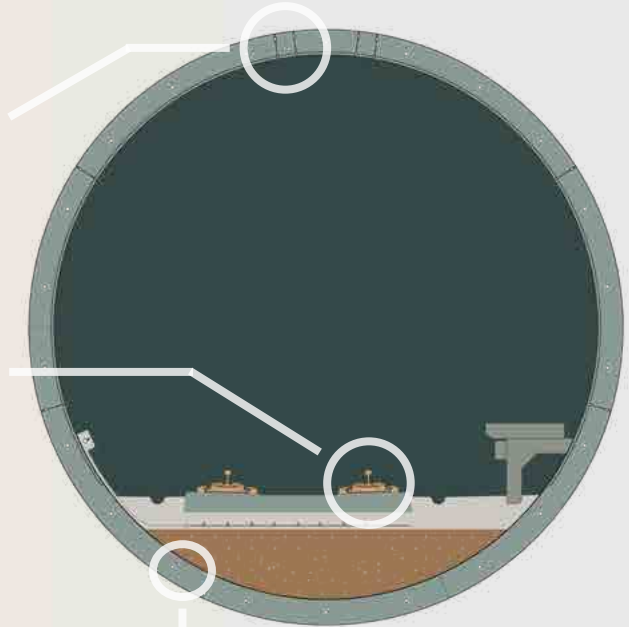
- ESTOSEAL / ESTOJOINT
- ESTOPROOF / ESTOFLEX

**PREMIX DRY MORTAR**

- DENKA PF MORTAR
- DENKA SUBSHOT SYSTEM

**MACHINERY BASE GROUTING**

- DENKA PRETASCON
- ESTOGROUT



TYPICAL TUNNEL DETAIL

**SOIL STABILISATION**

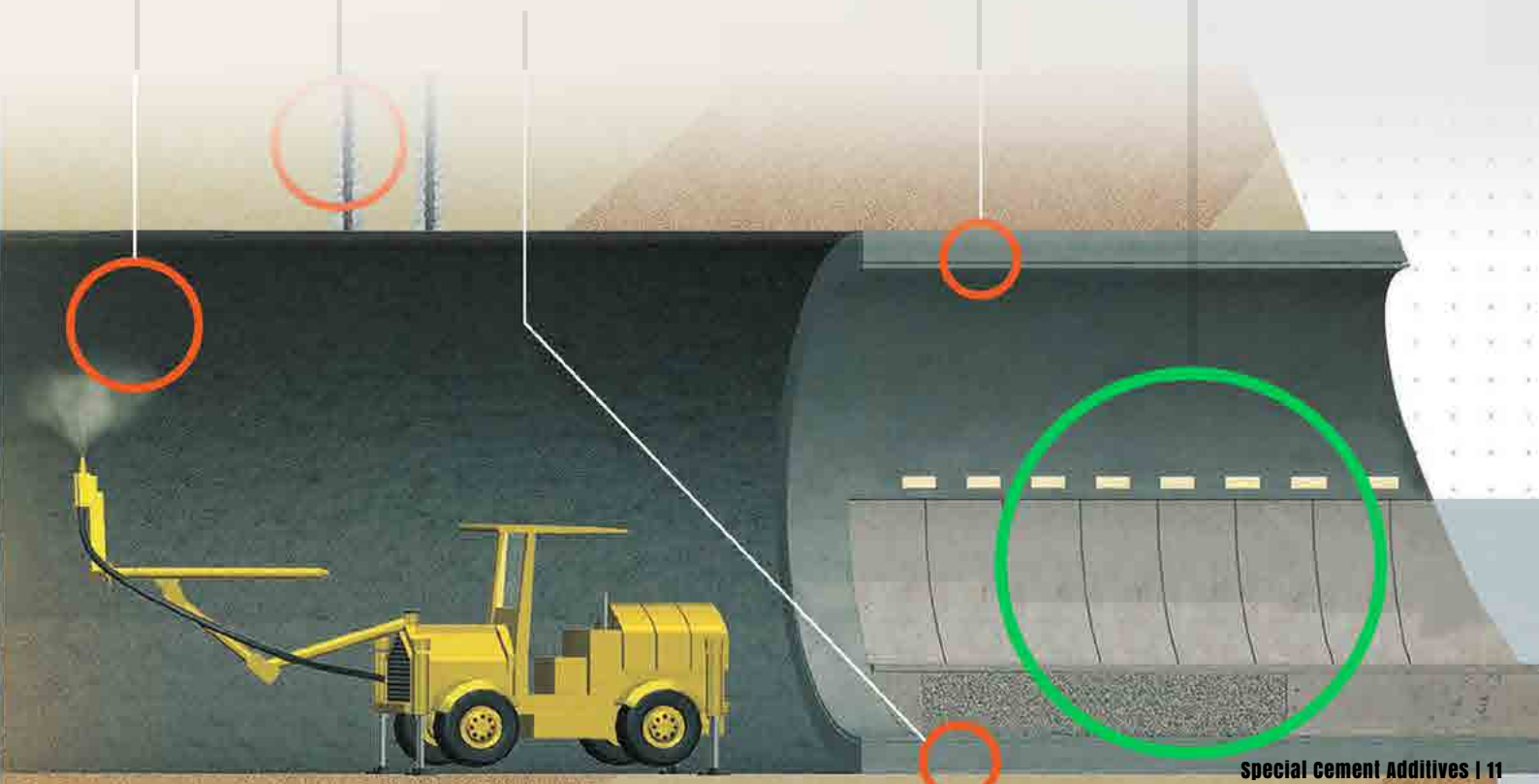
- DENKA ES
- DENKA COLLOIDAL CEMENT
- DENKA COLLOIDAL SUPER

**PRECAST**

- DENKA CSA #20
- DENKA FINE CSA-N
- DENKA Σ SERIES

**BASE CONCRETE**

- DENKA CSA SERIES



# CRACK RESISTANCE

## CSA SERIES

CSA #20  
POWER CSA TYPE-S  
POWER CSA TYPE-R



# CSA SERIES

## Description

With the tendency of concrete to shrink and crack, water or air ingress into the concrete interior causes rebar corrosion; affecting durability and appearance. The CSA series comprise special cement additives that reduce shrinkage to mitigate the above issues by virtue of their expansive nature; with CSA #20 being the first special cement additive developed in 1964, with an annual production of 120,000 MT.

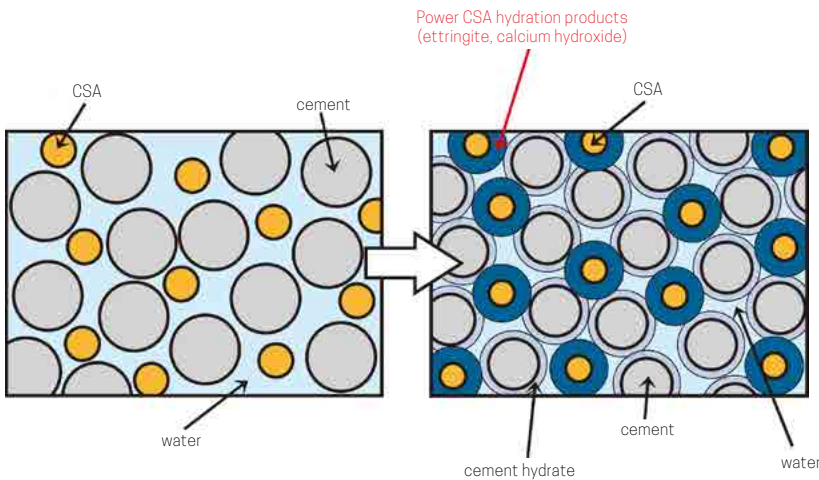
## Features

- Shrinkage compensation, reduces joint spacing
- Increase water-tightness

## Grades

- CSA #20
- POWER CSA TYPE-S
- POWER CSA TYPE-R

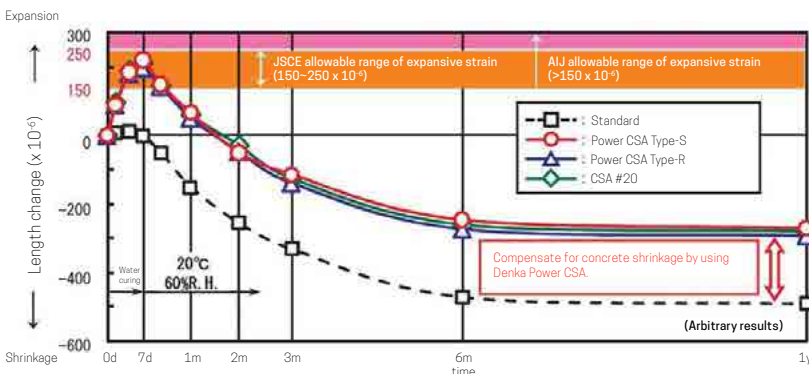
## CSA Expansion Diagram



Restrained expansion shrinkage test

## Length change (in accordance to JIS A 6202: 1997 Appendix 2, Method B)

By using CSA, concrete shrinkage can be compensated for; and cracking can be mitigated. The three(3) grades' shrinkage compensation property are nearly equivalent.



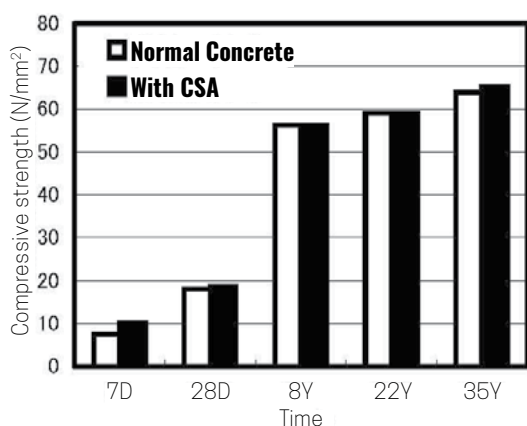


# CRACK RESISTANCE

## CSA SERIES

CSA #20  
POWER CSA TYPE-S  
POWER CSA TYPE-R

## CSA SERIES



### Properties of Denka CSA Concrete for 35 Years

With more than 50 years of history since CSA was first developed, we have conducted a test to show the properties of Denka CSA concrete for 35 years.

Results shown that the compressive strength in Denka CSA concrete remains unchanged for over 35 years.

\* Testing building location at our production / laboratory plant at Omi, Japan.



## CSA #20

### Description

Expansive additives that mitigate drying shrinkage; mainly for precast products.

### Applications

- Dry-mix mortar
- Precast concrete products
- Ready-mix concrete

### Features

- Shrinkage compensation, thereby preventing cracking caused by drying shrinkage
- Increases water-tightness

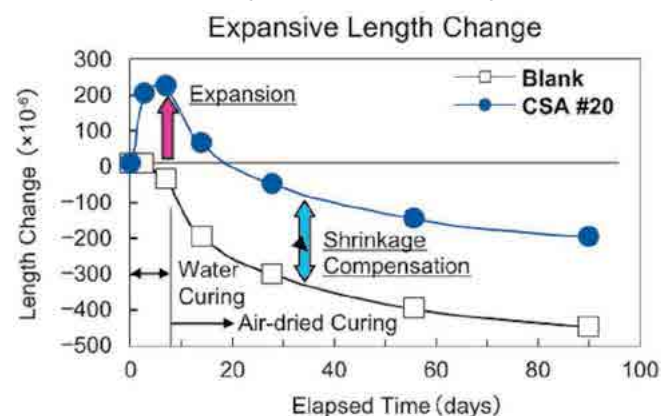
### Dosage

- 25kg/m<sup>3</sup> to replace corresponding cement



Scan here for our TDS

### Technical Data (arbitrary values)



# CRACK RESISTANCE

## CSA SERIES

CSA #20  
POWER CSA TYPE-S  
POWER CSA TYPE-R

## POWER CSA TYPE-S

### Description

High performance expansive additives that mitigate drying and autogenous shrinkage. Suitable for concrete thickness of  $\leq 300\text{mm}$ .



Scan here for our TDS

### Applications

- Floors, composite / deck slabs
- Walls, columns
- Pavement
- Sewers, tunnel

### Dosage

- 20kg/m<sup>3</sup> to replace corresponding cement

Crack reduction observed with Power CSA usage

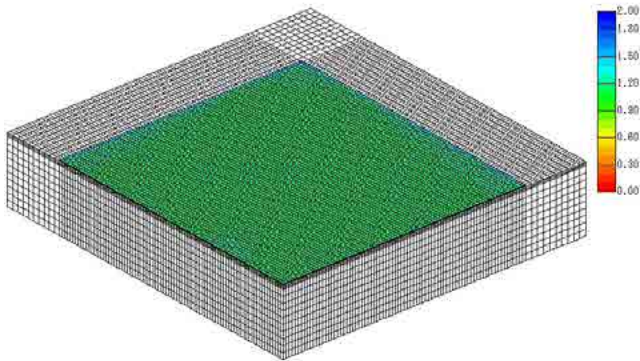


Without Power CSA

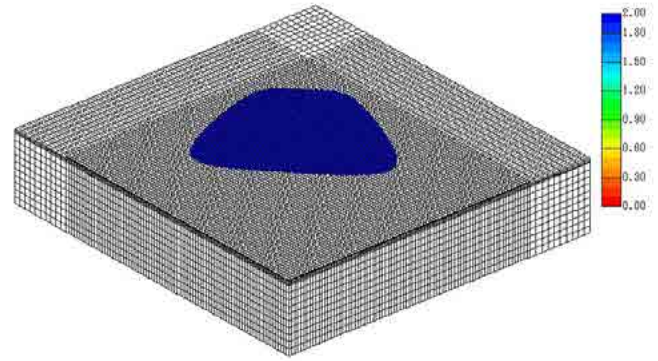


With Power CSA

### Calculation of Crack Index on Slab



Design	Crack Index	Possibility of Crack (%)
Standard concrete	0.88	70.1



Design	Crack Index	Possibility of Crack (%)
With PCSA	1.50	11.6

### Crack Index calculation based on Nonlinear thermal stress Analysis Program - ASTEAMACS

ASTEAMACS (ASTEAM-MAss Concrete Structure Analysis system) is a \*FEM system for the simulation of transient thermal conduction and stress analysis for concrete structures.

\* Finite element method (FEM)



## POWER CSA TYPE-R

### Description

Hydration heat suppression, high performance expansive additives that mitigate drying, autogeneous, and heat shrinkage. Suitable for concrete thickness of  $\geq 300\text{mm}$ .



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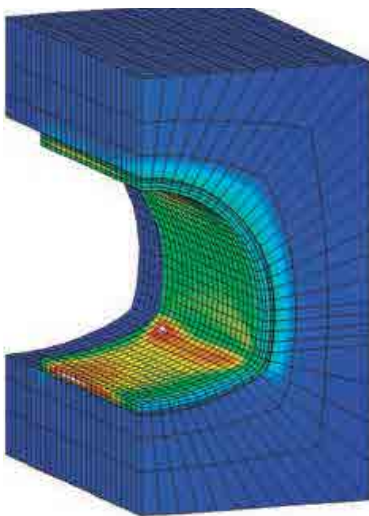
### Applications

- Mass concrete structures (sewers, underground spaces)
- Machinery foundations
- High fluidity concrete

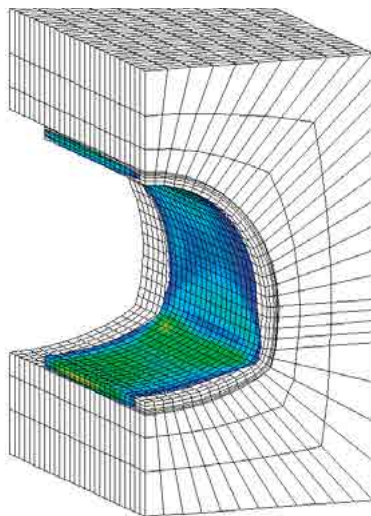
### Dosage

- $20\text{kg/m}^3$  to replace corresponding cement

### Calculation of Crack Index on Precast



NON ADDITIVE CONCRETE



USING POWER CSA TYPE-R

## NATMIC SERIES

NATMIC Z-AF  
NATMIC TYPE AF-S

# NATMIC Z-AF

## (POWDER TYPE)

### Description

Alkali-free powder accelerator for sprayed concrete based on calcium sulfoaluminate and can be used in civil engineering works such as road and railways tunnels. It is applied when initial rock support is needed or where a permanent lining will be placed. NATMIC Z-AF can be used with GGBS (environmental friendly).



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### Features

- Quick setting time, very high initial strength
- Development of superior compressive strength; excellent long-term durability
- Good bonding to ground surface; low rebound
- Alkali free (alkali ion content is less than 1%)

### Applications

- Rock support in underground spaces
- Slope stabilization

### Compressive strength (arbitrary values)

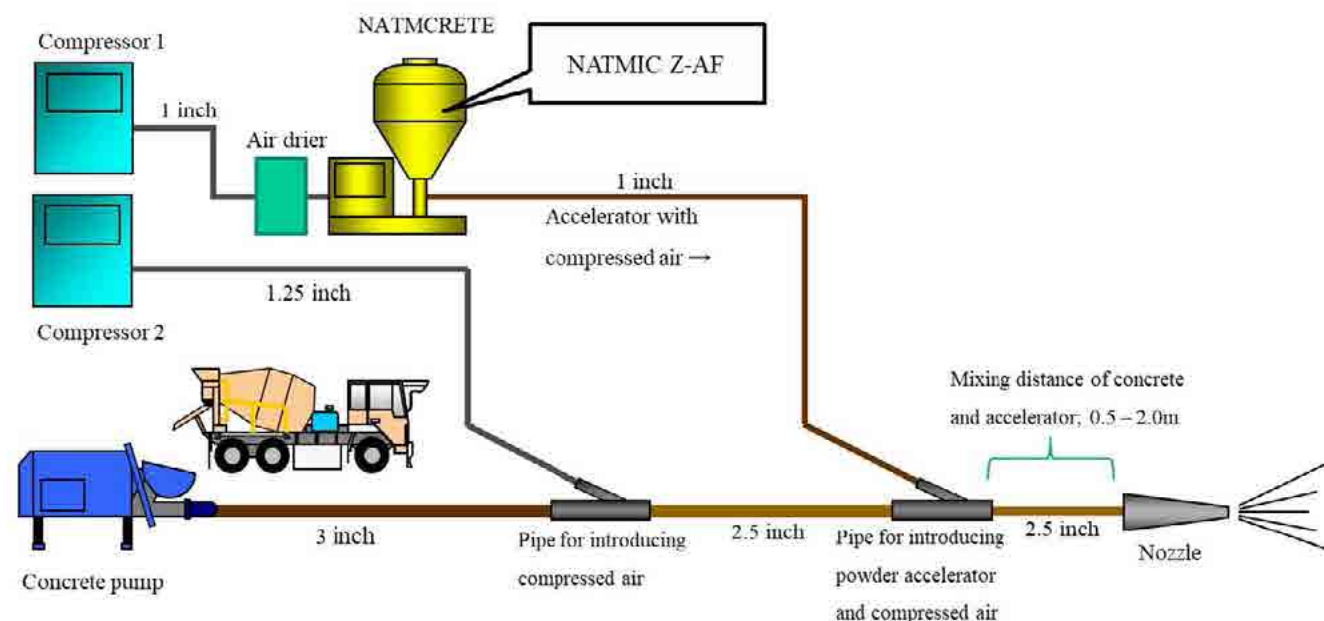
W/C	S/A	Unit content (kg/m <sup>3</sup> )				SP (Cement x %)	NATMIC Z-AF (Cement x %)
		Water	Cement	Sand	Gravel		
0.45	0.60	203	450	998	673	0.9	10

W/C : Water-cement ratio, S/A : Sand-aggregate (sand and gravel) ratio

Cement : Ordinary Portland Cement

SP : Superplasticizer based on polycarboxylate

### Natmic Spray System (Powder)



# NATMIC AF-S (LIQUID TYPE)

## Description

Alkali-free liquid accelerator for shotcrete used in civil engineering works such as road and railway tunnels, headraces, and mines.

## Features

- Quick setting time; high initial strength
- Development of high compressive strength; excellent durability
- Low dust emissions, low dust rebound
- Alkali free (alkali ion content is less than 1%)

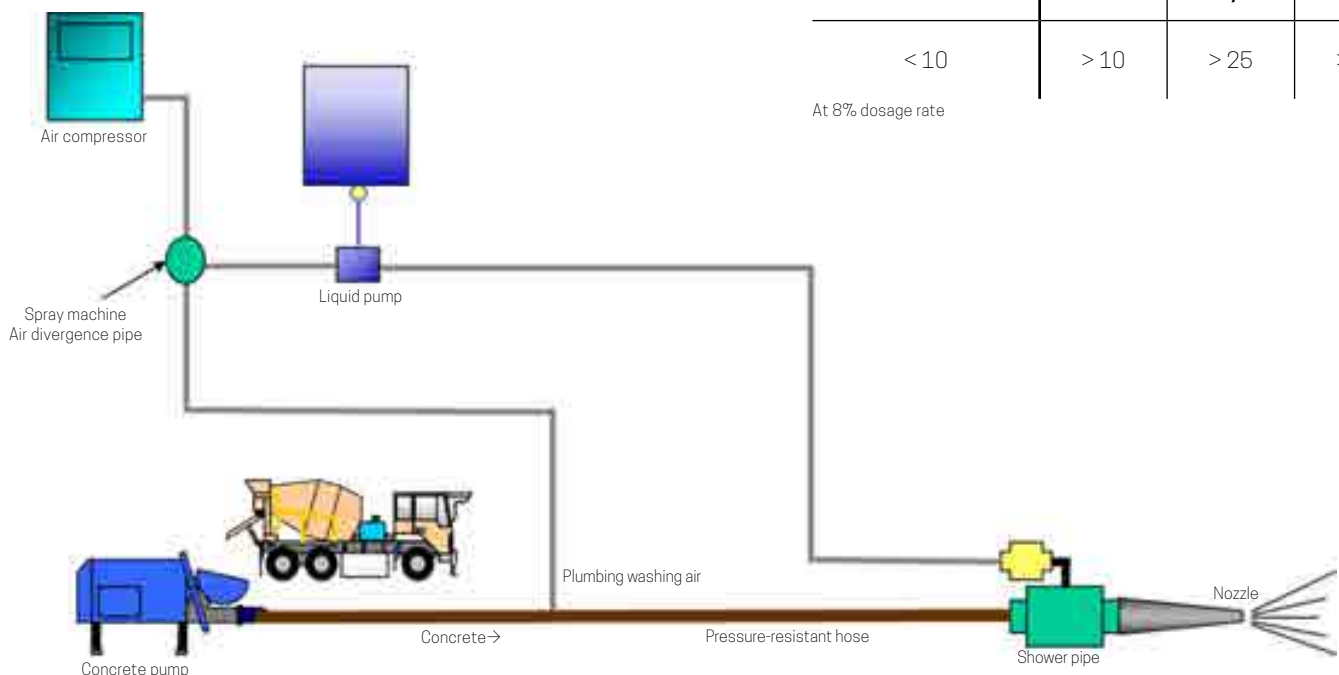
## Applications

- TBM tunnel lining
- NATM tunnel lining
- Slope stabilization

## Dosage

- 3 ~ 12% by cement weight

## Natmic Spray System (Liquid)



Scan here for our TDS



## Setting Properties (Mortar)

Initial setting time (mins)	Compressive strength (MPa)		
	24 h	Day 7	Day 28
< 10	> 10	> 25	> 35

At 8% dosage rate



## MORTAR SERIES

PF MORTAR TYPE-K / SUBSHOT K  
SUBSHOT MORTAR-N / S

# PF MORTAR TYPE-K / SUBSHOT K

### Description

Premixed spray-type dry mortar; consisting of cement, size-controlled aggregates, special cement additives, and a short synthetic fiber. It is used in conjunction with DENKA SUBSHOT K, a liquid accelerator. Spraying of DENKA PF MORTAR TYPE-K requires a spray system equipped with continuous mixing and pumping equipment (G4 pump).



Scan here for our TDS

### Features

- Quick-setting
- Low dust generation; rebound
- Early and long-lasting compressive / bond / flexural strength
- Excellent resistance to inflow
- Compact system design

### Dosage (mix ratio)

PF Mortar Type-K (kg/m <sup>3</sup> )	Water (kg/m <sup>3</sup> )	SUBSHOT K (kg)
1,770	354	88.5 (5% Type-K)

### Technical Data (arbitrary values)

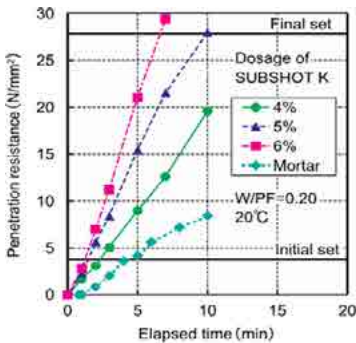


Figure 1 Quick-setting property

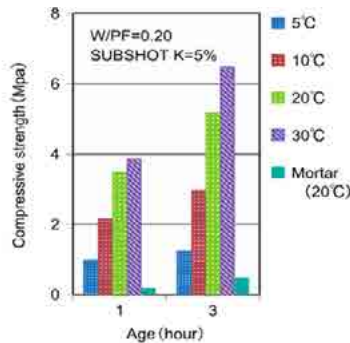


Figure 2 Early strength development

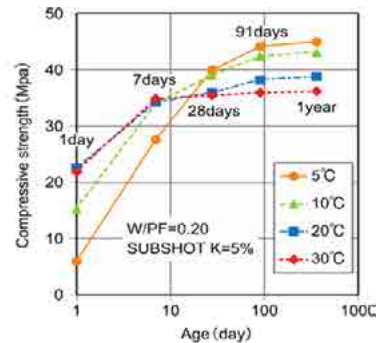
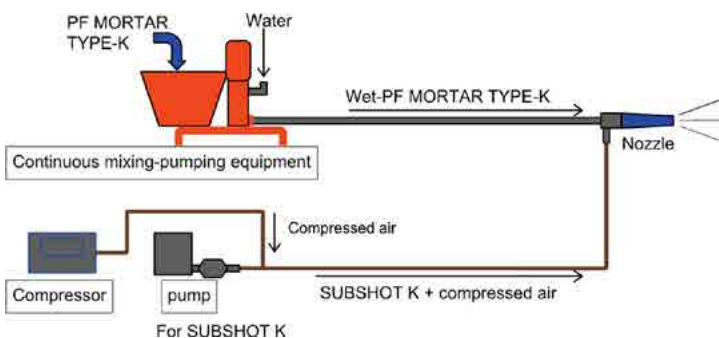


Figure 3 strength development from 1 day to 1 year



PF Mortar spray system in use

### PF Mortar Spray System



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# SUBSHOT MORTAR-N / S

## Description

Pre-mixed sprayed mortar with dust-suppression functionality. SUBSHOT MORTAR-N is to be used in conjunction with liquid accelerator, DENKA NATMIC AF-S; while SUBSHOT MORTAR-S can be used as-is or in conjunction with DENKA NATMIC AF-S.

## Features

- Fast setting, early strength
- Minimized dust generation and rebound
- Excellent compressive / bond / flexural strength
- Compatible with both wet and dry shotcreting (Subshot Mortar-N only)
- Compatible with dry shotcreting only (Subshot Mortar-S)

## Applications

- Tunnel repair
- Support for small cross-section tunnels
- Slope stabilization

## Technical Data (arbitrary values)

Initial setting time (mins)	Compressive strength (MPa)	
	12 h	Day 28
< 10	> 10	> 35

## Dosage (mix ratio)

Grade	Unit quantity (kg/m <sup>3</sup> )	Yield / Coverage	Water	Denka Natmic AF-S (kg/m <sup>3</sup> )
Subshot Mortar-N	25	12.8 ℓ / bag	12 ~ 14% (3 ~ 3.50kg)	2 ~ 4% (0.5 ~ 1.0kg)
Subshot Mortar-S	25	13.7 ℓ / bag	12 ~ 14% (3 ~ 3.50kg)	2 ~ 4% (0.5 ~ 1.0kg)



Scan here for our TDS (Type-N)



Scan here for our TDS (Type-S)



Spraying Subshot Mortar

# SOIL IMPROVEMENT

## ES SERIES

ES  
ES-L

## ES SERIES

### Description

Environmentally-friendly, durable cement-based rapid hardening accelerators used in soil injection grouting. By means of ettringite formation as well as significant augmentation of hydration properties of alite and belite in cement, rapid strength development is achieved. The gel time of ES can also be adjusted by using DENKA SETTER, a retarding agent that suppresses hydration of ES or cement via ion sequestration.

### Features

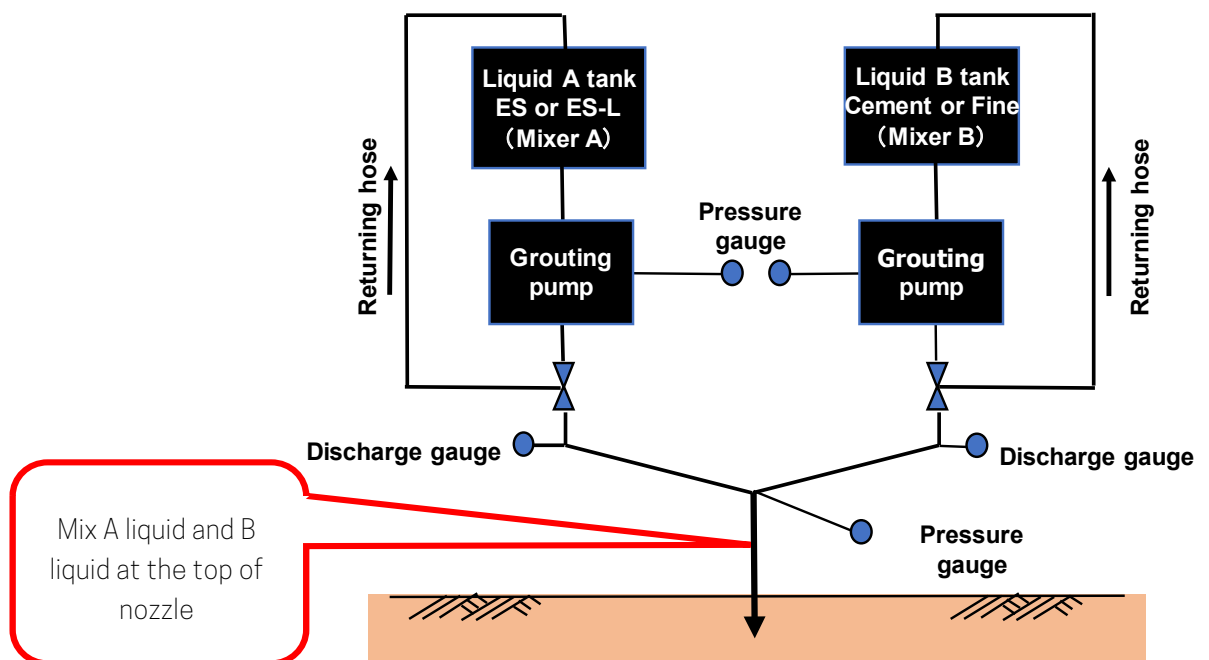
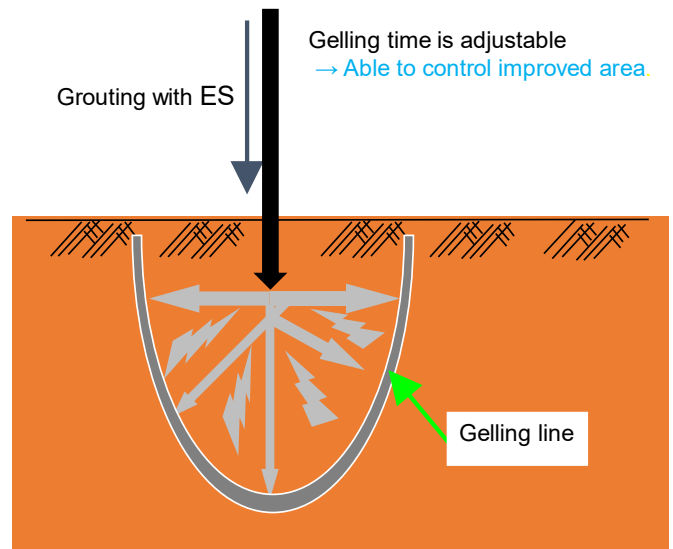
- Low alkalinity allowing for rapid hardening
- Superior homogenized strength and durability
- Adjustable gelling time with DENKA SETTER
- Immobilizes hexavalent chromium in the soil via ettringite formation
- Permeation grouting possible by combination with ultra-fine cement

### Applications

- Soil stabilization
- Water leakage countermeasures
- Permeation grouting

### Grades

- ES
- ES-L





### Description

Rapid hardening grout accelerator with gelling time of 2 ~ 10 minutes (with DENKA SETTER D100).



Scan here for our TDS

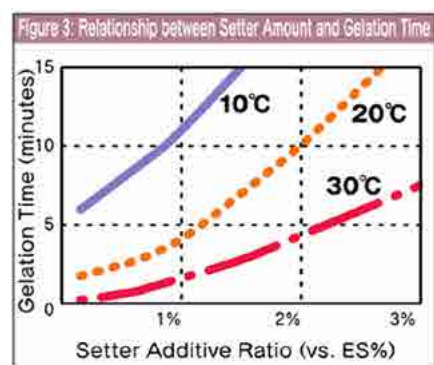
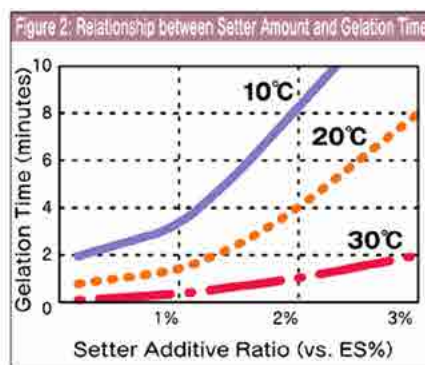
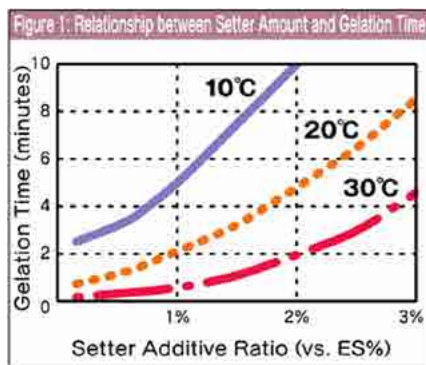
### Dosage (mix ratio)

Mix No.	MIXER B - Cement mix (kg/500ℓ)			MIXER A - Accelerator mix (kg/500ℓ)			Remarks
	Main material	Water	Dispersant	Accelerator	Water	Retarder	
1	OPC	300		ES	75	Arbitrary	Standard injection
2		400			474		
3	Microcement <sup>1</sup>	300	474		-		Standard injection
4		300	431				
5	Super fine microcement <sup>2</sup>	300	400		200		431

<sup>1</sup> Denka Colloidal Cement  
<sup>2</sup> Denka Colloidal Super

### Technical Data (arbitrary values)

Gelation time as a function of setter ratio



# SOIL IMPROVEMENT

## ES SERIES

ES  
ES-L

## ES-L

### Description

Rapid hardening grout accelerator with gelling time of 10 minutes ~ 2 hours (with DENKA SETTER D300).



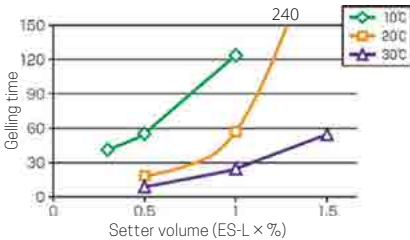
Scan here for our TDS

### Dosage (mix ratio)

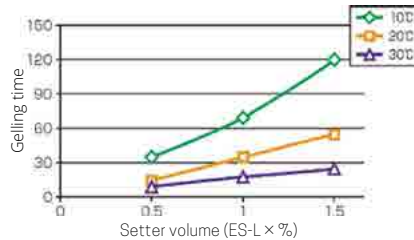
Cement	Mixer B - Cement mix (kg/500ℓ)			Mixer A - Accelerator mix (kg/500ℓ)		
	Cement	Water reducer	Water	ES-L	Water	Retarder
Blast furnace cement type B	300	0	401	75	474	Setter D300 × 0.5 ~ 1.5%
Ultrafine cement (Colloidal Cement)	300	0	400	75	474	
Super ultrafine cement (Colloidal Super)	250	C × 1%	415	50	485	

### Technical Data (arbitrary values)

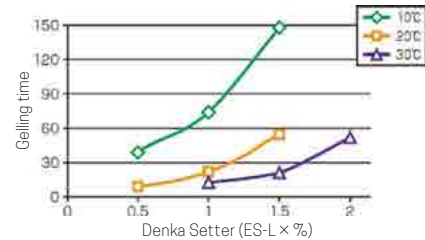
Gelation time as a function of setter ratio



Gel time of BB cement as a function of setter volume



Gel time of Colloidal Cement as a function of setter volume



Gel time of Colloidal Super as a function of setter volume



ES injection to the tunnel face



ES injection to ground for reservoir repair

# MICROCEMENT

## COLLOIDAL SUPER COLLOIDAL CEMENT

### Description

Micro-fine grouting material purposed for rock and soil grouting; and can be used in conjunction with DENKA ES.



Scan here for our TDS

### Features

- Environmentally-friendly
- High permeability into soil
- Resistant to cement segregation
- High strength
- Water resistance

### Applications

- Tunneling
- Soil stabilization
- Consolidation of weak ground

### Technical Data (arbitrary values)

Physical properties

Type	Specific Gravity	Blane value	Particle size distribution ( $\mu\text{m}$ )	
	( $\text{g}/\text{cm}^3$ )	( $\text{cm}^2/\text{g}$ )	Max.	Avg.
COLLOIDAL SUPER	2.98	9000	10	4
COLLOIDAL CEMENT	3.02	6000	40	8
OPC	3.15	3200	100	20

Particle size parameters

Type	D50	D95	D99
COLLOIDAL SUPER	< 4 $\mu\text{m}$	< 8 $\mu\text{m}$	< 10 $\mu\text{m}$
COLLOIDAL CEMENT	< 6 $\mu\text{m}$	< 25 $\mu\text{m}$	< 40 $\mu\text{m}$
OPC	< 20 $\mu\text{m}$	< 70 $\mu\text{m}$	< 90 $\mu\text{m}$



# REPAIR

## QUICKSET SERIES

QUICKSET S30  
QUICKSET B120

# QUICKSET S30 / B120

## (CEMENT TYPE)

### Description

Super quick hardening cement used especially in emergency works where construction time is limited.

### Features

- High crack resistance by shrinkage compensation and ettringite formation
- Reduces slump loss
- Various grades available depending on required handling time

### Applications

- Highways, railways, bridges
- Airport
- Concrete foundation

### Grades

- **QUICKSET S30** (20 ~ 30N/mm<sup>2</sup> in 2 ~ 3 hours)
- **QUICKSET B120** (20 ~ 30N/mm<sup>2</sup> in 6 ~ 8 hours)

\* Both products are non-High Alumina Cement (HAC)



Scan here for our TDS  
(Quickset S30)

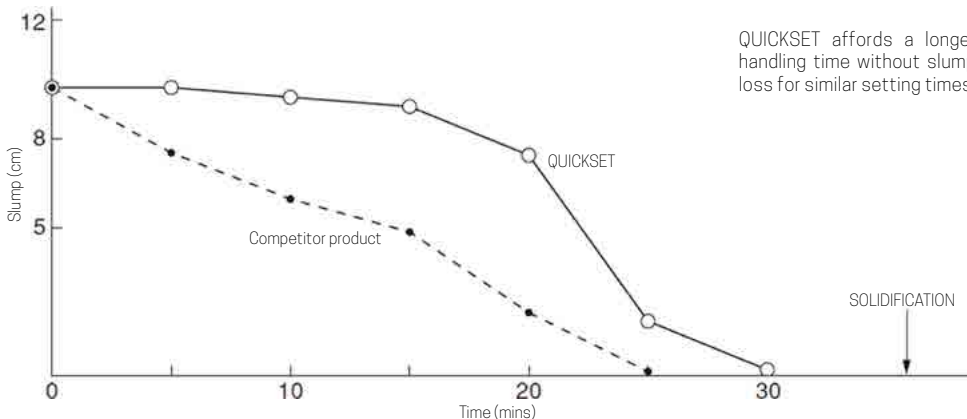


Scan here for our TDS  
(Quickset B120)



Repairing with QUICKSET

Setting performance



# SUPERCEMENT SC30 CONCRETE

## (CONCRETE TYPE)

### Description

Ultra-quick hardening concrete which consist of three component materials. Most suitable for emergency works where construction time is limited.

#### Component A

Mixture of powdered ordinary Portland cement, calcium sulfo aluminate and selected sand

#### Component B

Aggregate

#### Component C

Liquid part which contains water and liquid admixture



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### Features

- Easy to mix and apply
- 30N/mm<sup>2</sup> strength obtainable in 3 hours
- High early strength enables early operation
- Excellent hydration activity
- Achieved of good initial strength
- Good cost performance than resin concrete
- Can be applied to wet conditions

### Applications

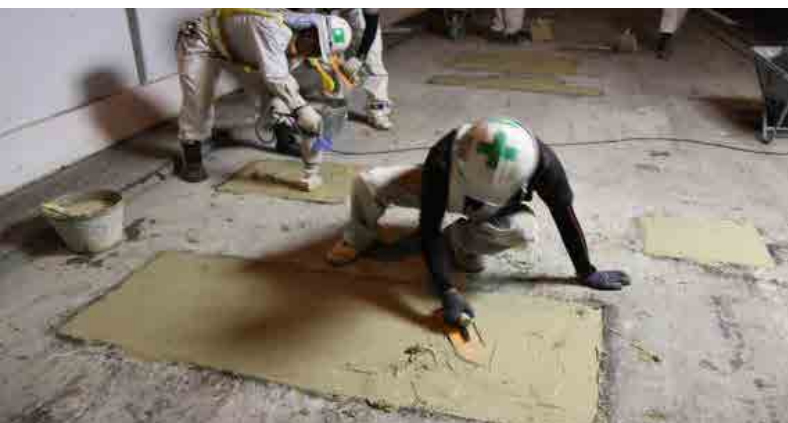
- Road, railway, harbors, bridge
- Emergency construction works
- Airport

### Coverage

- 1 set for 25L concrete / 40 sets for 1m<sup>3</sup>

### Physical Properties (arbitrary results)

Compressive strength (N/mm <sup>2</sup> )				Tensile Strength at 28 days (MPa)	Setting Time (mins)
3 hours	1 Day	7 Days	28 Days		
> 30	> 40	> 45	> 50	3.0	> 15



Patching by Repair Concrete



Mixing at site

## SUPERCEMENT SERIES

SUPERCEMENT SC30 CONCRETE  
 SUPERCEMENT S30 GROUT

# SUPERCEMENT S30 GROUT

## (GROUT TYPE)

### Description

Ultra-quick hardening non shrink grout. The addition of a controlled amount of clean water produces a free-flowing precision grout. In addition, the low water requirement ensures high early strength and long-term durability. SUPERCEMENT S30 GROUT is most suitable for emergency works where construction time is limited.



Scan here for our TDS

### Features

- Excellent flow and flow retention
- 30N/mm<sup>2</sup> compressive strength obtainable in 3 hours
- Shrinkage compensation and good crack resistance
- High early strength enables quick operation
- Good cost performance than resin mortar
- Can be applied to wet conditions



Repairing for expansion joint of bridge

### Applications

- Bridges
- Airport
- Highway

### Coverage

- 1 bag for 14.34L grout
- 70 bags for 1m<sup>3</sup>

### Physical Properties (arbitrary results)

	Compressive strength (N/mm <sup>2</sup> )				J <sub>14</sub> Flow (sec)	Setting Time (mins)	Initial Expansion (%)
	2 hours	3 hours	1 day	28 days			
Specification	-	>30	>40	>50	6 - 12	15 - 60	0.0 - 0.8
Typical results	30.1	38.5	53.0	76.8	6.2	30	0.10





# ESTOPATCH RSR

## Description

Two component polymer modified fast setting patching material which suitable to be used for concrete, asphalt, and semi-rigid pavement repair application. Exhibits good flowability, elasticity and bonding with existing pavement.



Scan here for our TDS

## Features

- Good flow ability & workability
- Easy to mix and apply than resin products
- Quick setting (<180 mins in 30°C)
- User friendly and cost effective
- Good adhesion to the road
- Non-primer require



## Applications

- Loading bay area
- Parking area
- Factory floor

## Physical Properties (arbitrary results)

	Setting Time (mins, 30°C)	Flowability, after mixing (mm)	Pull-off Strength (N/mm <sup>2</sup> )
Specification	< 180	160 - 250	1.0 ± 0.4
Test example	42	226	1.08

## Coverage

- 0.37m<sup>3</sup> at 5mm thick



Existing uneven floor



Mixing of Estopatch RSR



Finished application

# QUICK HARDENING

## SC-1 BEFORM FINE CSA-N

# SC-1

### Description

Amorphous calcium-aluminate based quick hardening accelerator.



Scan here for our TDS

### Applications

- Self-leveling mortar
- Non-shrink grout
- Repair mortar
- Dry-process shotcrete

### Features

- Excellent initial strength (10 ~ 30MPa achievable in 3 hours)
- Excellent crack resistance
- Handling time adjustable to between 10 mins ~ 1 hour

### Physical Properties (arbitrary results)

Binder		Retarding agent (Denka Setter D-200) (% of SC-1)	Handling time (mins)	Compressive strength (MPa)		
OPC (%)	SC-1 (%)			3 h	6 h	24 h
100	0	-	300	-	-	32.0
85	15	0.39	28	17.9	21.5	53.8
80	20	0.52	29	29.2	34.1	57.9
75	25	0.62	27	34.6	43.7	59.9

Binder / Sand = 0.67  
Water / Binder = 0.3

# BEFORM

### Description

Quick hardening additive used to reduce the need for steam curing. Also effective as a hardening accelerator in wet-type construction materials.



Scan here for our TDS

### Features

- Excellent initial strength (10 ~ 30MPa in 6 hours)
- Excellent crack resistance
- Adjustable handling time (20 minutes ~ 2 hours)

### Applications

- Quick-hardening grout
- Self-leveling material
- Quick-hardening repair mortar

### Physical Properties (arbitrary results)

Binder		Retarding agent (Denka Setter D-300) (% of BEFORM)	Handling time (mins)	Compressive strength (MPa)		
OPC (%)	BEFORM (%)			3 h	6 h	24 h
100	0	-	300	-	-	32.0
90	15	0.26	55	7.1	15.4	35.9
85	20	0.26	56	11.4	24.4	45.4
75	25	0.28	68	16.3	37.5	73.2

Binder / Sand = 0.67  
Water / Binder = 0.3

# FINE CSA-N

FINE CSA-N is used as a quick hardening agent to reduce steam curing. Refer to page 35 under Precast for details.



# QUICK HARDENING

## COSMIC RD-M

# COSMIC RD-M

### Description

Quick-hardening cementitious grout for semi-rigid pavement. It has excellent flow, flow retention, and strength development property; enabling rapid installation and early road operation. This material is suitable for flexible asphalt concrete pavement to ensure longer durability of the road.



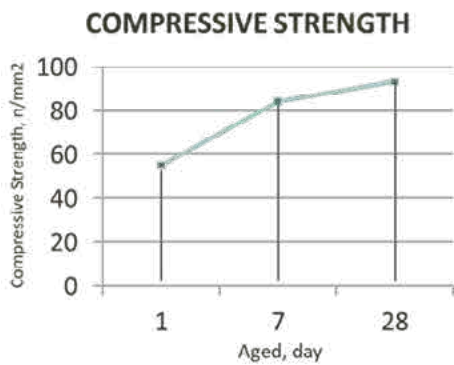
Scan here for our TDS

### Features

- Easy to mix and apply
- Suitable for pumping or pouring over a large range of application consistencies and temperatures
- Good strength development

### Applications

- Bus depot / Terminal
- Bus-only lane (bus stop)
- Heavy traffic road junction



\*Example of Compressive strength trend for Denka Cosmic RD-M

### Physical Properties (30°C)

Flow value by P-Funnel (S) *ASTM C939	10 - 14
Initial Setting Time (hours) *EN 196-3	< 6
Compressive Strength ( $N/mm^2$ ) *BS EN 12390	1 day > 40 28 days > 90
Flexural Strength (MPa) *BS EN 12390	28 days > 6

### Field Applications



For Bus Depot



For Road Junction / Bus Lane



For Road Junction

# NON-SHRINK GROUT

## PRETASCON SERIES

PRETASCON TYPE-M / TYPE-1R  
HIGH PRETASCON TYPE-I, II / TYPE-H



# PRETASCON SERIES

### Description

Premixed, non-shrink grout materials used in anti-earthquake reinforcement works, machinery base foundations, expressways etc. Spaces of approximately a few millimetres to 30 centimetres can be completely filled; serving the important purpose of conveying loads from complex upper installations to the substructure foundation.

### Features

- Excellent fluidity
- Non-shrinkage
- High strength, durability
- Ease of usage
- Economical

### Grades

- **PRETASCON TYPE-M** (machine installation)
- **PRETASCON TYPE-1R** (enhance fluidity)
- **HIGH PRETASCON** (rapid strength)



# PRETASCON TYPE-M

### Description

Premixed, non-shrink grout for use in machine installation.

### Applications

- Grouting under heavy machinery
- Steel structure foundations
- Building reinforcement



Scan here for our TDS

### Dosage

- 1,900kg per m<sup>3</sup>, mixed with 296ℓ of water

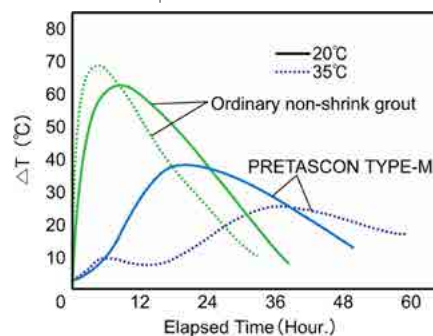
### Features

- Thickness up to 200mm

Curing temp. (°C)	Water (kg/bag)	Bleeding (%)	Expansion at 28 days (%)	Setting time		Compressive strength (MPa)		
				Initial	Final	Day 3	Day 7	Day 28
Specification	3.9	0.00	0.0 - 0.8	7h 30min	8h 30min	≥ 20	≥ 35	≥ 45
30	3.9	0.00	0.0 - 0.8	7h 30min	8h 30min	50.4	53.4	68.0

### Physical Properties (arbitrary results)

Adiabatic temperature rise



Reduced heat of hydration suppresses shrinkage and cracking due to heat.



# NON-SHRINK GROUT

## PRETASCON SERIES

PRETASCON TYPE-M / TYPE-1R  
HIGH PRETASCON TYPE-I, II / TYPE-H

# PRETASCON TYPE-1R

## Description

Premixed, non-shrink grout with enhanced fluidity to ensure complete filling of spaces.

## Applications

- Standard grout work
- Large volume/surface area foundations
- Long-distance pumping

## Dosage

- 1,875kg per m<sup>3</sup>, mixed with 330ℓ of water

## Features

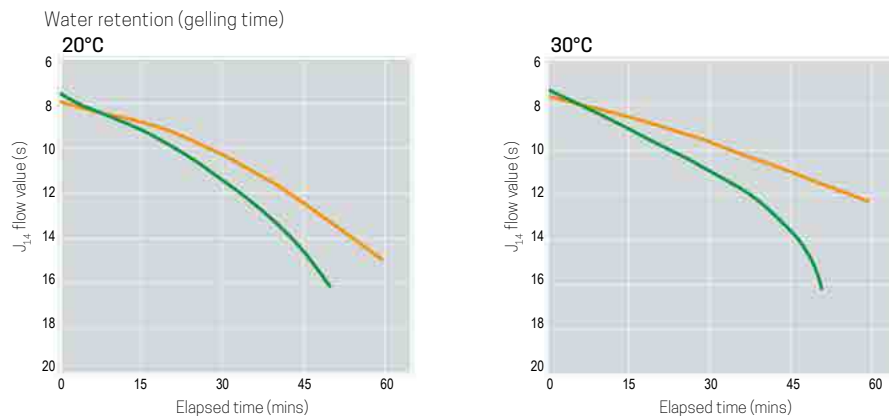
- Dual expansion
- Thickness up to 100mm



Scan here for our TDS

## Physical Properties (arbitrary results)

Curing temp. (°C)	Bleeding (%)	Expansion at 28 days (%)	Setting time		Compressive strength (MPa)			
			Initial	Final	Day 1	Day 3	Day 7	Day 28
Specification	0.0 - 0.0	0.0 - 0.8	1h 00min	10h 00min	-	> 39.2	> 44.1	> 53.9
30	0.00	0.53	4h 00min	6h 00min	44.1	56.5	61.8	69.6



J<sub>1,4</sub> flow values show improved fluidity over a longer time.



Grouting the base of heavy machinery with Pretascon

# NON-SHRINK GROUT

## PRETASCON SERIES

PRETASCON TYPE-M / TYPE-1R  
HIGH PRETASCON TYPE-I, II / TYPE-H



## HIGH-PRETASCON (TYPE-I, II)

### Description

Ultra-fast hardening non-shrink grout for use in emergency works or cold climates.

#### HIGH PRETASCON TYPE-I

Ultra-fast hardening non-shrink grout (rapid strength development, thickness up to 100mm)

#### HIGH PRETASCON TYPE-II

Ultra-fast hardening non-shrink grout (excellent crack resistance, thickness up to 200mm)



Scan here for our TDS

### Applications

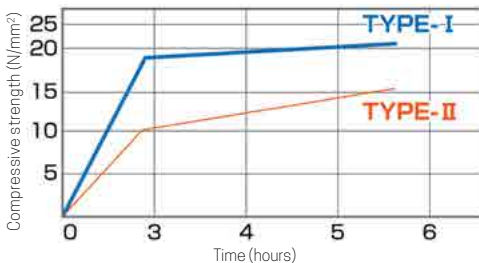
- Cold climates
- Emergency works where construction time is limited
- Civil / architectural structure maintenance

### Dosage

- Type-I: 1,875kg per m<sup>3</sup>, mixed with 319ℓ of water
- Type-II: 1,950kg per m<sup>3</sup>, mixed with 286ℓ of water

### Physical Properties (arbitrary results)

Initial strength (20°C)



Grade	Curing temp. (°C)	Compressive strength (MPa)					
		3h	6h	Day 1	Day 3	Day 7	Day 28
Type-I	5	12.0	15.3	22.3	40.0	47.2	54.2
	20	19.0	21.4	35.2	46.2	53.0	63.5
	30	22.0	24.0	39.2	50.0	55.5	66.0
Type-II	5	7.2	10.8	17.3	31.2	40.0	48.2
	20	11.0	15.2	25.4	37.8	45.4	56.0
	30	12.1	16.3	28.4	40.2	48.0	57.8

# NON-SHRINK GROUT

## PRETASCON SERIES

PRETASCON TYPE-M / TYPE-1R  
HIGH PRETASCON TYPE-I, II / TYPE-H

# HIGH-PRETASCON (TYPE-H)

## Description

Ultra-fast hardening non-shrink grout for use in emergency works or cold climates; with long-term durability in civil and architectural construction.



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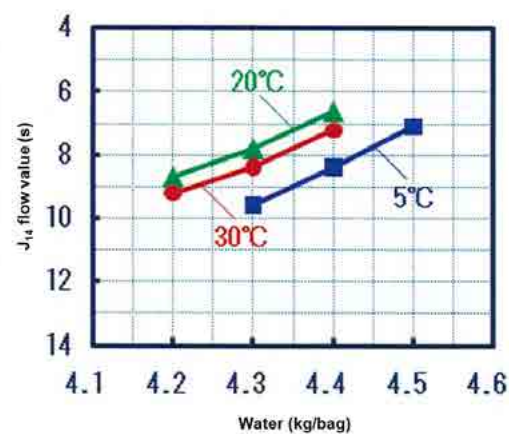
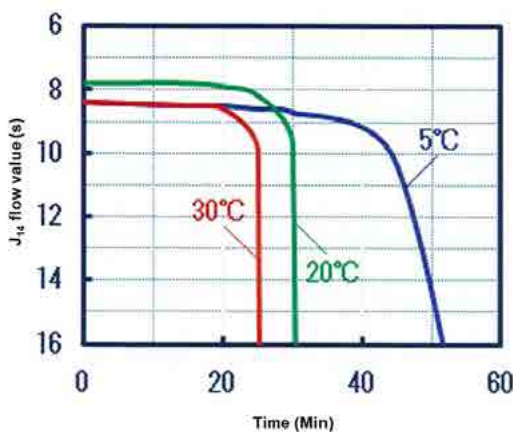
## Features

- Suitable for use in cold climates or emergency works. Hardening in 20 ~ 30 minutes.
- Enhances integration with existing structures.
- High durability. With proper curing, required strength can be attained 3 hours after concrete placement.
- Useable in subzero temperatures. Hardens even at -10°C to result in quality grout.
- Thickness up to 100mm.

## Applications

- Cold climates conditions where grouting is required.
- Maintenance and reinforcement works where construction time is limited.
- Civil / architectural structure maintenance

## Physical Properties (arbitrary results)



Curing temp. (°C)	Bleeding Ratio (%)	Expansion Ratio (%)	Gelling Time (mins)	Compressive strength (MPa)						
				1h	2h	3h	Day 1	Day 3	Day 7	Day 28
5	0	+ 0.17	45	5.0	26.8	29.2	41.2	48.6	52.7	63.8
20	0	+ 0.20	30	22.4	35.6	39.3	43.5	50.7	53.4	65.6
30	0	+ 0.22	25	26.3	35.0	37.1	42.1	47.9	50.8	61.2

\*Data of 30°C is using the retarder "DENKA D500 Setter" (Dosage = Product x 0.2%)



# PRECAST

## Σ SERIES

Σ1000  
Σ2000  
Σ80N

## Σ SERIES

### Description

Cement additives that enhance ettringite as well as calcium silicate hydrate formation; allowing for the production of high-strength concrete products.

### Features

- High-strength concrete obtainable
- Enhances resistance to freezing / thawing
- Allows for rapid production of concrete products to increase delivery efficiency

### Grades

- Σ1000
- Σ2000
- Σ80N

## Σ1000

### Description

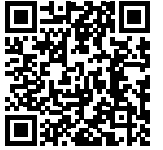
Compressive strengths of up to 85MPa obtainable in short periods (~72h).

### Applications

- Concrete piles
- Spun pipes
- Box culverts

### Dosage

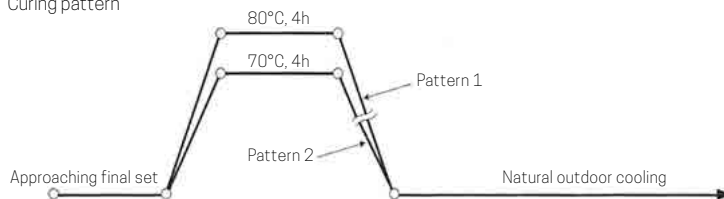
- 7 ~ 10% by cement weight



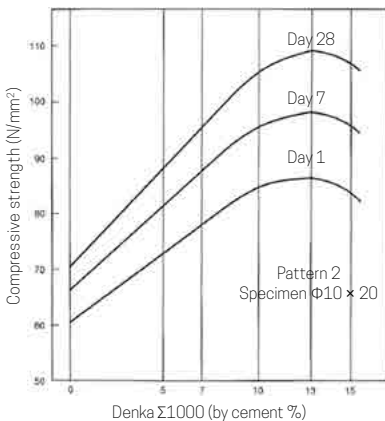
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### Physical Properties (arbitrary results)

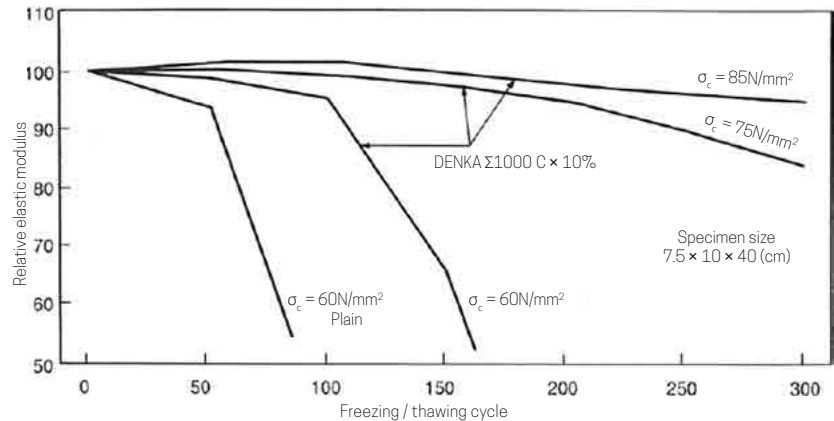
Curing pattern



Correlation of compressive strength to Σ1000 dosage



Resistance to freezing / thawing (tests done in accordance with ASTM C-666)



## Description

Compressive strengths of up to >80MPa obtainable.

## Applications

- High-strength pillars, bridges
- Chemically pre-stressed piles, poles

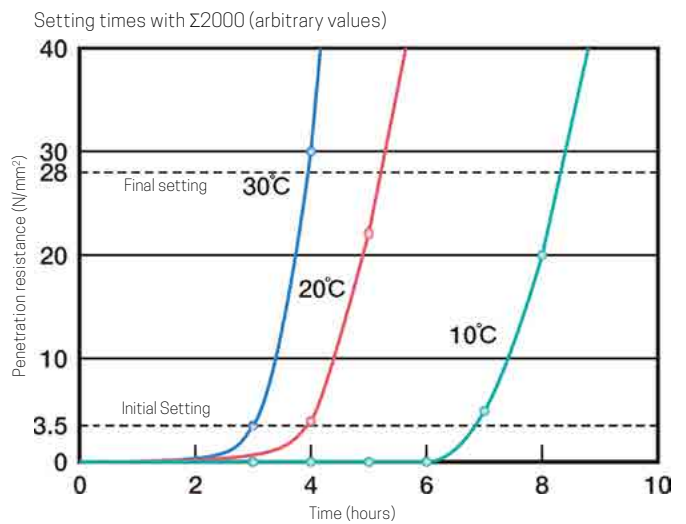
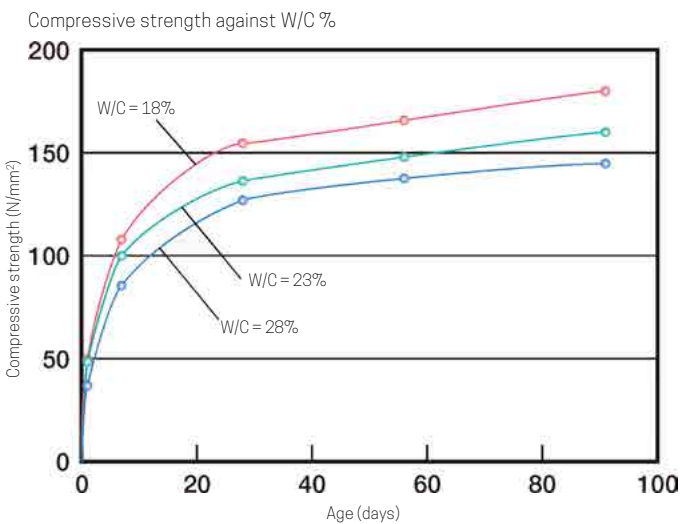
## Dosage

- 5 ~ 15% by cement weight (maximum of 100kg/m<sup>3</sup>)



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## Physical Properties (arbitrary results)



# PRECAST

## Σ SERIES

Σ1000  
Σ2000  
Σ80N

## Σ80N

### Description

Compressive strengths of 60 ~ 90MPa even at low cement quantities.

### Applications

- Standard piles for high-rise buildings
- Tunnel inverters
- Bridge foundation slab



Scan here for our TDS



### Dosage

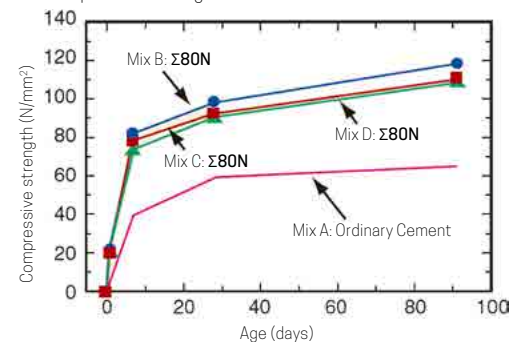
- ~10% by cement weight

### Typical Mix Proportions

Mix No.	Slump (cm)	Air content (%)	Mix proportion (kg/m <sup>3</sup> )					Air-entraining water reducer (kg/m <sup>3</sup> )
			Water	Cement	Σ80N	Sand	Agg.	
A	12	4.5	175	492	-	690	960	4.9
B			175	492	49	638	960	5.1
C			145	370	37	790	1000	4.5
D	23		145	370	37	790	1000	5.3

Denka Σ80N is used in replacement of sand (10%).  
The use of an air-entraining water reducer is necessary.

Compressive strength of various mixes with Σ80N



With Denka Σ80N, high strength can be achieved at reduced cement amounts.

## CSA #20

CSA #20 is widely used in precast concrete.  
Refer to page 11 under Crack Resistance for details.



# FINE CSA-N

### Description

Fast demoulding additive for precast concrete.

### Features

- Enhances strength development
- Shorter production cycle
- Reduces cracking and drying; augmenting durability

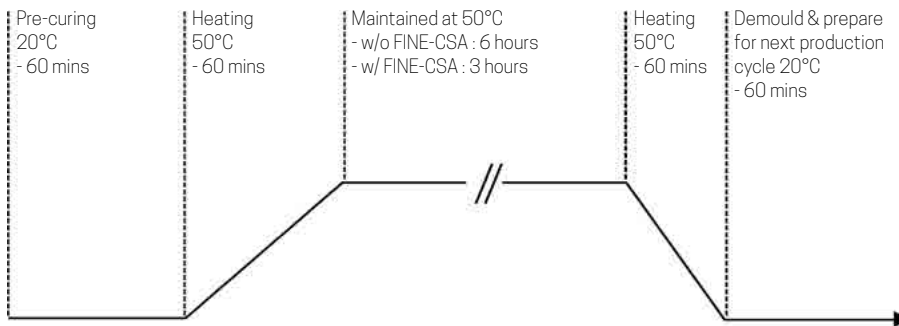
### Applications

- Fast removal of steel moulds
- Ecological concrete containing granulated blast furnace slag, fly ash, etc.

### Dosage

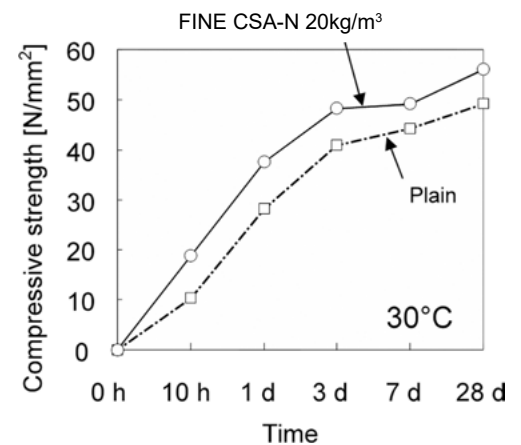
- 25kg/m<sup>3</sup> to replace corresponding cement

### Curing Cycle



Scan here for our TDS

### Technical Data (arbitrary values)



### Field Applications



Framework



Concrete pouring



Finished product

# PRODUCT LIST

## DENKA BEFORM / COSMIC / SC-1

Product	Main Features / Applications	Page
BEFORM	Quick hardening, excellent initial strength	29
COSMIC RD-M	High strength mortar for Semi-Regid Pavement	30
SC-1	High early strength	28

## DENKA CSA / POWER CSA

Grade	Main Features / Applications	Page
CSA #20	Chemical pre-stress, mitigates cracks in general structure	13
POWER CSA TYPE-S	Concrete slabs etc.	14
POWER CSA TYPE-R	Sewage facilities etc.	15

## DENKA ES

Grade	Main Features / Applications	Page
ES	Adjustable gelling time of seconds ~ 10 mins	21
ES-L	Adjustable gelling time of 10 mins ~ several hours	22

## DENKA FINE CSA-N

Grade	Main Features / Applications	Page
-	Increases production efficiency of precast concrete	39

## DENKA MICROCEMENT

Grade	Avg. Particle Size	Blaine Finess (cm <sup>2</sup> /g)	Page
COLLODIAL CEMENT	8μm	5500 ~ 6000	23
COLLODIAL SUPER	4μm	> 9000	23

## DENKA NATMIC

Grade	Main Features / Applications	Page
NATMIC Z-AF	Powder accelerator	16
NATMIC AF-S	Liquid accelerator	17

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## DENKA PF MORTAR / SUBSHOT MORTAR

Components	Main Features / Applications	Page
PF MORTAR TYPE-K	Low dust generation, low rebound	18
SUBSHOT MORTAR-N / S	Fast setting, early strength	19

## DENKA SUPERCEMENT

Grade	Main Features / Applications	Page
SUPERCEMENT SC30 CONCRETE	Ultra-quick hardening concrete for emergency works	25
SUPERCEMENT S30 GROUT	Ultra-quick hardening non-shrink grout for emergency works	26

## DENKA Σ (SIGMA)

Grade	Curing	Target Strength	Page
Σ1000	Normal	-	36
	Steam	85 ~ 100N/mm <sup>2</sup>	
Σ2000	Normal	85 ~ 100N/mm <sup>2</sup>	37
	Steam	100 ~ 150N/mm <sup>2</sup>	
Σ80N	Normal	60 ~ 90N/mm <sup>2</sup>	38

## ESTOPATCH RSR

Grade	Main Features / Applications	Page
-	Good flowability & workability	27

## DENKA QUICKSET

Grade	Main Features / Applications	Page
QUICKSET S30	20 ~ 30N/mm <sup>2</sup> in 2 ~ 3 hours	24
QUICKSET B120	20 ~ 30N/mm <sup>2</sup> in 6 ~ 8 hours	24

## DENKA PRETASCON

Grade	Main Features / Applications	Page
PRETASCON TYPE-M	Massive mortar, machinery base grouting	32
PRETASCON TYPE-1R	Bridge bearing, machinery base grouting	33
HIGH PRETASCON TYPE-I, II	Ultra-fast hardening, emergency works in cold weather	34
HIGH PRETASCON T-H	Long-term durability in civil construction	35

# MEMO

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# MEMO

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