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# Special Materials for Concrete Pavement Surface Repair and Maintenance



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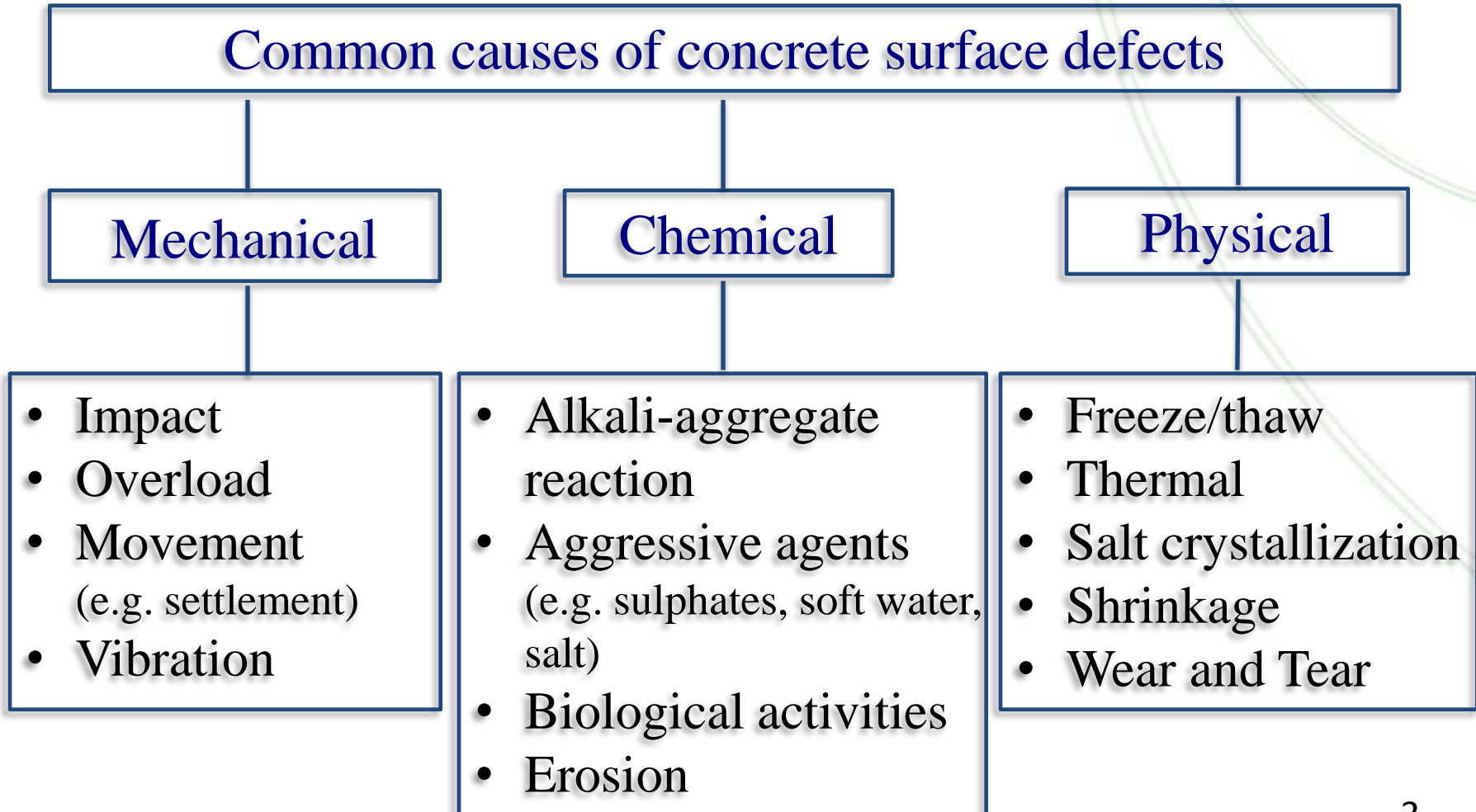
# 1. Introduction

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- ❑ Concrete pavements deteriorate over time, due to
  - exposure to severe weather conditions,
  - excessive traffic loading
  - thermal cracking of the concrete, etc.
  
- ❑ Conventional concrete pavement repair practice - reconstruction
  - needs long time and costly
  - generates air pollution and noise
  - causes traffic congestion
  - generates more wastes.
  
- ❑ Resurfacing is a practical way for most of the concrete pavement repair and maintenance, because
  - concrete pavement is still structurally sound
  - repair and maintenance are normally done when the defects are only at the surface.

## 2. Common Causes of Concrete Pavement Surface Defects

### 2.1 Common causes of concrete surface defects



## **2. Common Causes of Concrete Pavement Surface Defects**

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### 2.2 Main Causes of seaport concrete pavement defects

#### Mechanical Cause:

- Wear and Tear
- Impact
- Overload
- Vibration

#### Physical and Chemical Cause:

- Thermal
- Shrinkage
- Erosion

## 3. Causes of Concrete Pavement Surface Repair Failure

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### 3.1 Mechanical Cause

- Wear and Tear
- Impact
- Overload
- Vibration



## 3. Causes of Concrete Pavement Surface Repair Failure

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### 3.2 Repair Material Cause

- High early strength
  - ✓ High modulus of elasticity
  - ✓ Low flexibility and toughness
  - ✓ Low cracking resistance
  - ✓ Susceptible to fracturing from impact loads
  
- Low adhesion to substrates – debond
  
- Incompatibility with substrates

## 3. Causes of Concrete Pavement Surface Repair Failure

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### 3.3 Application Cause

- Substrate surface preparation
- Repairing method
- Curing
- Workmanship



## 4. Concrete Pavement Surface Repair Failure Process

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### 4.1 Local Debond

Caused By:

- Poor adhesion
- Incompatibility
- Wear and tear
- Impact and vibration

## 4. Concrete Pavement Surface Repair Failure Process

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### 4.2 Crack

Caused By:

- **Local Debond**
- Overload
- Wear and tear
- Impact and vibration
- Differential shrinkage
- Thermal shock



## 4. Concrete Pavement Surface Repair Failure Process

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### 4.3 Pop Out

Caused By:

- **Cracks**
- **Overload**
- **Wear and tear**
- **Impact and vibration**
- **Differential shrinkage**
- **Thermal shock**



## **4. Concrete Pavement Surface Repair Failure Process**

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### **4.4 Debond and Crack in Surrounding Areas**

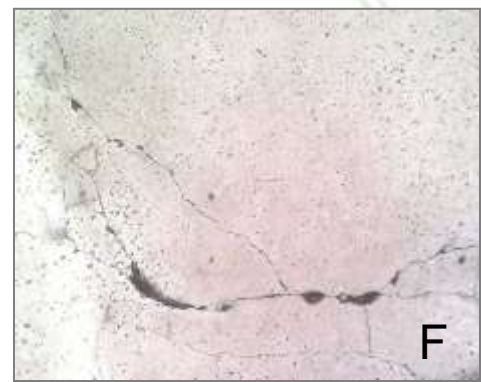
Caused By:

- Wear and tear
- Impact and vibration



## 4. Concrete Pavement Surface Repair Failure Process

### 4.5 Examples of Concrete Pavement Surface Repair Failure



**3 months after application in heavy traffic areas**

## 5. Special Concrete Pavement Surface Repair Mortar

### 5.1 Requirements for Concrete Pavement Surface Repair Mortar

- Good adhesion to substrate
- Good compressive strength
- Good flexural strength
- Good skid resistance

As site closing time is limit, **short setting time** (High early strength) is also an important requirement.

## 5. Special Concrete Pavement Surface Repair Mortar

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### 5.2 Chemilink SS-132 – for concrete pavement surface rejuvenation

#### Features:

- Two part product → powder + liquid polymer
- Specially designed for concrete pavement thin surface repair → 3-10mm
- Fast Setting → open to traffic early
- High final strength (35-50MPa/28days) → suitable for high loading situations
- High bond strength → not easy to de-bond
- High impact and crack resistance
- High abrasion and chemical resistance
- Good workability and easy to apply

## 5. Special Concrete Pavement Surface Repair Mortar

### 5.2 Chemilink SS-132 – for concrete pavement surface rejuvenation

#### Typical Technical Data

Properties	Chemilink™ SS-132
Compressive Strength at 2 hours	8~15MPa
Compressive Strength at 4 hours	15~25MPa
Compressive Strength at 1 day	20~30MPa
Compressive Strength at 3 days	25~35MPa
Compressive Strength at 28 days	35~50MPa
Setting Time:	< 40 minutes



## 5. Special Concrete Pavement Surface Repair Mortar

### 5.2 Chemilink SS-132 – for concrete pavement surface rejuvenation

#### Application



Substrate preparation



Pouring



Spreading



Brooming the surface



Finished wet surface



Finished dry surface

## 5. Special Concrete Pavement Surface Repair Mortar

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### 5.3 Chemilink SS-133

– for concrete pavement surface and patch repair/restoration

#### Features:

- Two part product → powder + liquid polymer
- Designed for 10mm<thickness<30mm concrete pavement surface repair
- High early strength (10-15MPa/2h)→ open to traffic early
- High final strength (35-50MPa/28days) → suitable for high loading situations
- High bond strength → not easy to de-bond
- High impact and crack resistance
- High abrasion and chemical resistance

## 5. Special Concrete Pavement Surface Repair Mortar

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### 5.3 Chemilink SS-133

– for concrete pavement surface and patch repair/restoration

#### Typical Technical Data

Properties	Chemilink™ SS-133
Compressive Strength at 2 hours	10~15MPa
Compressive Strength at 4 hours	15~25MPa
Compressive Strength at 1 day	20~30MPa
Compressive Strength at 3 days	25~35MPa
Compressive Strength at 28 days	35~50MPa
Setting Time:	< 40 minutes

## 5. Special Concrete Pavement Surface Repair Mortar

### 5.3 Chemilink SS-133

– for concrete pavement surface and patch repair/restoration

#### Application



Substrate Preparation



Mixing



Spreading



Finished Surface

## 5. Special Concrete Pavement Surface Repair Mortar

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### 5.4 Chemilink SS-123 – for deep hole or thicker layer

#### Features:

- Designed for deep hole or thicker layer (>30mm) of concrete pavement repair
- High early strength (30~40MPa/1hour) → open to traffic early
- High final strength (45-65MPa/28days) → suitable for high loading situations
- High impact and crack resistance
- High abrasion and chemical resistance
- Good workability and easy to apply

## 5. Special Concrete Pavement Surface Repair Mortar

### 5.4 Chemilink SS-123 – for deep hole or thicker layer

#### Typical Technical Data

Powder mixed with water only

Properties	Chemilink™ SS-123
Compressive Strength at 1 hour	30~40MPa
Compressive Strength at 2 hours	35~45MPa
Compressive Strength at 4 hours	35~50MPa
Compressive Strength at 1 day	40~55MPa
Compressive Strength at 7 days	40~60MPa
Compressive Strength at 28 days	45~65MPa
Setting Time:	< 40 minutes

## 5. Special Concrete Pavement Surface Repair Mortar

### 5.4 Chemilink SS-123 – for deep hole or thicker layer

#### Typical Technical Data

Powder mixed with water and aggregate(5-20mm), powder/aggregate =1:1

Properties	Chemilink™ SS-123
Compressive Strength at 1 hour	40~50MPa
Compressive Strength at 2 hours	45~55MPa
Compressive Strength at 4 hours	45~60MPa
Compressive Strength at 1 day	60~75MPa
Compressive Strength at 7 days	60~80MPa
Compressive Strength at 28 days	65~85MPa
Setting Time:	< 40 minutes

## 5. Special Concrete Pavement Surface Repair Mortar

### 5.4 Chemilink SS-123 – for deep hole or thicker layer

#### Application



Deep hole



Mixing powder with water



Add aggregate, mixing



Pour into deep hole



Finished surface(wet)



Finished surface(dry)



## 6. Conclusions

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1. Concrete surface repair is a system, and the success of the repair is affected by many factors, like loading condition, environment, substrate preparation, performance of repair materials and workmanship
2. Chemilink has abilities to design and manufacture different repair materials based on their performance required
3. Based on different damage scenarios, Chemilink has developed a series of products for repair of concrete pavement surface.



**Thank You for Your Attention!**

