Chembase Treatment System (CTS)

Liquefaction (earthquake) resistant sub-base layers

Product: Chembase® C-SSSB1 | Research and development

“It costs you nothing to find out how much you can save.”

What is liquefaction?

Firm ground turns fluid

Water-saturated sediment temporarily loses strength and acts as a fluid, like wet sand at the beach.

Triggered by shaking

Earthquake shaking raises water pressure until soil grains lose contact with one another.

Usually temporary

The loss of strength is usually temporary and is most often caused by an earthquake.

MOST SUSCEPTIBLE

- **Reclaimed land**
- **Shallow water tables**
- **Near sea or rivers**
- **Loose sandy, silty soils**

How liquefaction happens

1. **Loose, saturated soil**
   The spaces between soil particles are completely filled with water.

2. **Shaking squeezes the grains**
   Grains are pushed together and press on the trapped water.

3. **Pore pressure rises**
   Rising water pressure pushes the grains apart.

4. **The soil flows**
   Grains lose contact, the soil loses strength, and structures sink or lean.

Two types of liquefaction

Flow liquefaction

Static equilibrium is destroyed by static or dynamic loads in a soil with low residual strength, and the soil flows.

Cyclic mobility

Repeated loading causes lateral spreading and ground oscillation.

Earthquake hazards

Ground shaking

Can severely damage buildings, bridges and dams.

Tsunami

Sea waves generated by the earthquake.

Landslides and rockfalls

Cliffs and sloping ground are destabilised.

Subsidence and spreading

The ground settles or spreads sideways.

Liquefaction

Saturated soil loses its strength.

Softer soils amplify shaking

Seismic waves slow and grow as they enter soft ground.

Historic examples of liquefaction: Niigata 1964, Loma Prieta 1989 and Canterbury 2010–2011.

Five ways to improve the ground

1. Replacement: swap susceptible soil for suitable gravel
2. Densification: compact the soil
3. Solidification: bind the soil particles together
4. Reinforcement: add strength to the soil mass
5. Drainage: relieve pore-water pressure

The liquefaction potential index rates a whole soil column in a single value.

One product, supplied in two parts

PART A

Polymer-Stabiliser

+

PART B

Activator

Chembase®
C-SSSB1

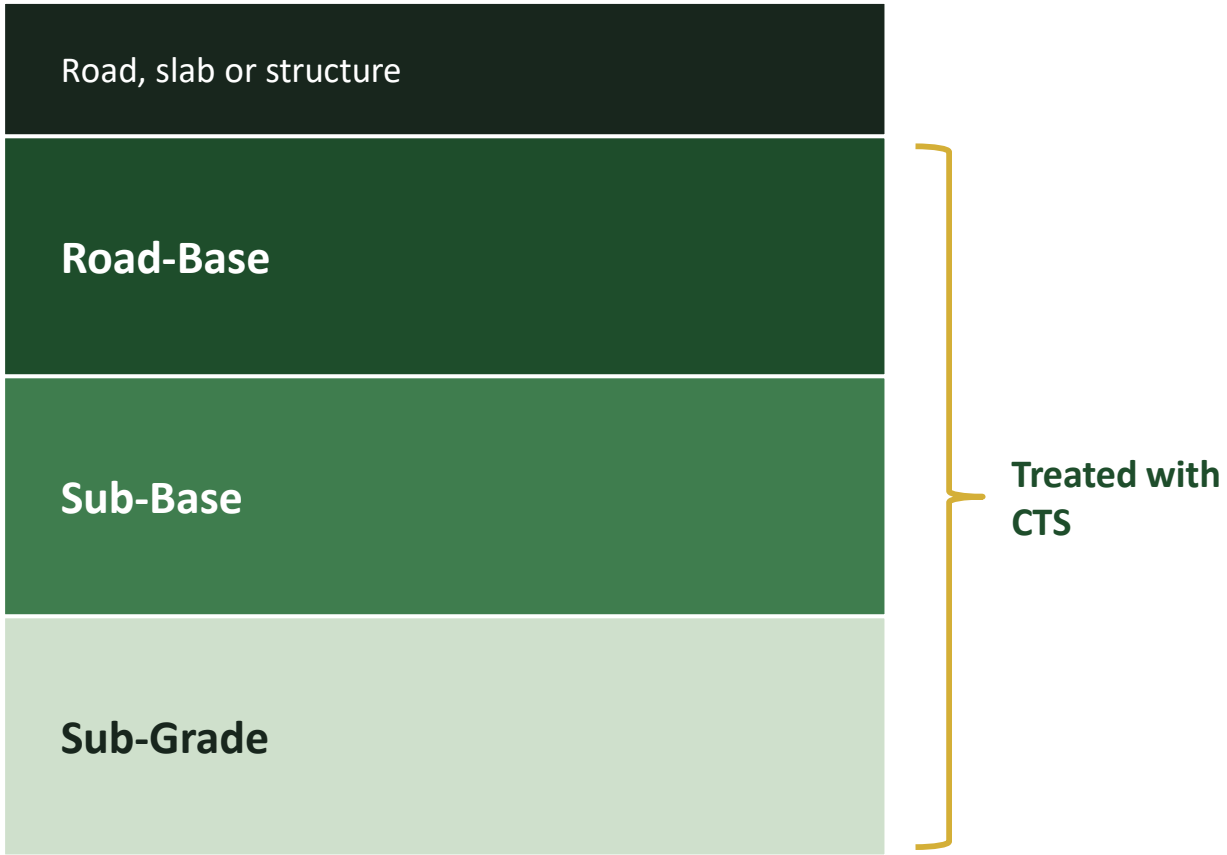
Five characteristics
combined in one product

A simplified range

- Five different chemistry characteristics are now combined into a single Chembase product.
- The application and treatment methods stay the same.
- The same characteristics, benefits and advantages are retained.

Naming: CTS stands for Chembase Treatment System. Chembase is also known as Chembase International and Chembase International Group.

Where CTS works: the base layers



Indicative cross-section

CTS modifies the properties of the existing soil to improve performance and durability.

- **Greater strength**
- **Higher load-bearing capacity**
- **Resistance to moisture-related issues**

Chembase and conventional road construction work together.

From stabilised layers to lower costs

1. **Stabilised base layers**
   CTS stabilises the road-base, sub-base and sub-grade.

2. **Less water, fewer potholes**
   Water leakage and potholes are reduced in the treated area.

3. **Less maintenance**
   The treated area needs less ongoing repair.

4. **Lower cost, longer life**
   Reduced costs and greater longevity for the treated area.

Performance benefits of treated layers

CBR increase

Raises the California Bearing Ratio (CBR), a standard measure of soil strength.

Water resistance

Treated layers resist water, limiting moisture-related damage.

Liquefaction resistant

Treated soil resists liquefaction, the loss of strength in saturated ground.

Freezing-condition tolerance

Tolerates freezing conditions.

Oil and petroleum barrier

Prevents oil and petroleum penetrating the treated soil.

Longevity

A long service life for the treated area.

Practical and environmental benefits

On site

Workable in any weather
Application is not held up by conditions.

Stable once diluted
The diluted product will not oxidise.

Re-compactable
Treated soil can be re-compacted (20 years).

Savings
Less maintenance and reduced costs.

Safety and sustainability

Safe to use
Product-safe and environmentally safe.

Waste plastic and glass
Shredded plastic or stained glass added to treated soil increases CBR.

Ash waste
Ash added to treated soil increases CBR.

Saltwater
Saltwater can replace fresh water, and increases CBR.

Brick pavements
Can be used in brick pavement manufacturing.

What CTS does against liquefaction

Tested by UNSW

CTS research and development has been successfully tested by the University of New South Wales.

Higher CBR

The stability of the treated area substantially increases its California Bearing Ratio.

Gravel plus CTS

Susceptible soil is replaced with gravel and treated with Chembase Stabiliser, Activator and lime powder.

Roads, sites and foundations

Applies to road base layers, construction sites and subdivision building foundations.

It costs you nothing to find out how much you can save

Talk to Chembase about treating your road-base, sub-base and sub-grade layers.

INDEPENDENT UNIVERSITY REPORTS

Reports from The University of Sydney and UNSW (University of New South Wales) are available at www.chembase.com.au

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