

## RTRI Develops a New Method to Prevent Fouled Ballasted Track from Subsiding

RTRI developed **Ballast-Stabilizing Method** to prevent track subsidence using mixture of ultra-fast hardening cement and polymer as repair material. By repairing deteriorated ballasted track with this method, track subsidence will be prevented and the frequency of maintenance work can be lowered, which will lead to cost reduction.

### 1. Background

Under repeated train running, the ballast of ballasted track (a track supporting sleepers with ballast) is crushed and abraded into fine particles and they might become muddy with rainwater and be pumped up onto the track surface (Fig. 1).

The ballast filled with a lot of mud cannot keep sufficient strength to support train load. As a result, the subsidence of the track is accelerated by train running and more frequent tamping is required. Replacing ballast with new one will solve the problem but it takes a lot of cost, as the expense of ballast disposal is incurred in addition to the expenses of purchasing and transporting ballast. So far, a variety of low-cost repair methods to prevent track subsidence have been developed and introduced. However, these methods cannot be easily applied because some of them require sleepers to be removed or cannot be applied with machine tamping.

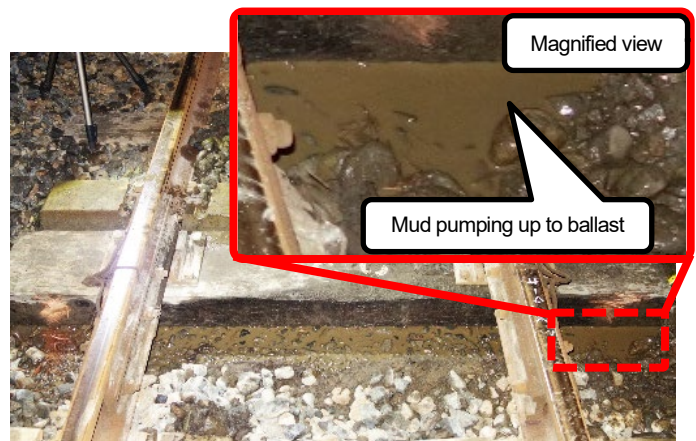


Fig. 1 Deteriorated ballast

### 2. Outline of the Low Strength Stabilization

Ballast and powdery repair material (mixture of ultrarapid hardening cement and polymeric material (Fig. 2)) are mixed and tamped at the repair work site. Mixed with the material, the deteriorated ballast is stabilized and track subsidence will be prevented.

- In case of the smaller-scale repair site where only hand-held ballast tampers are available, part of the ballast is drilled and the repair material is poured in advance, and then tamped. (Fig. 3)

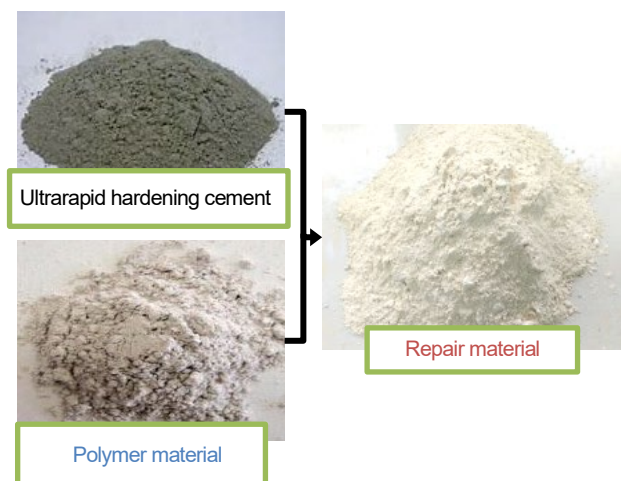


Fig. 2 Repair material

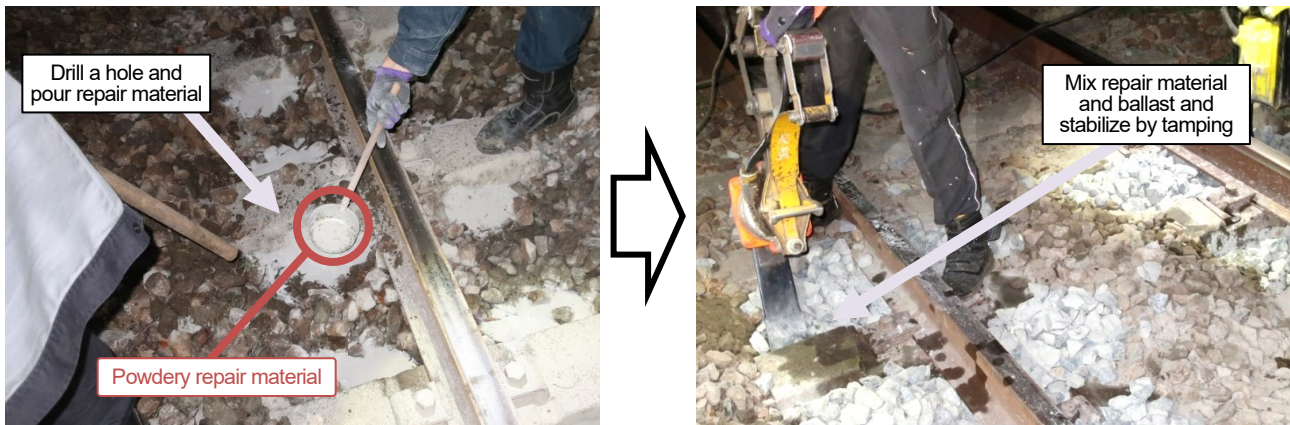


Fig. 3 Repair work with ballast stabilizing method using a hand-held tamper

- In case that the repair work is done with tamping machines, digging ballast is unnecessary. The material is just spread on the ballast surface.
- Since the polymer material improve the muddy condition of ballast layer by absorbing water and clumping fine soil particles immediately after the repair work, the ballast strength can be recovered and train operation can be resumed quickly. Subsequently, ultrarapid hardening cement hardens in a few hours and keeps sufficient strength of the track to prevent track subsidence for a long time.
- If the track starts subsiding again after the repair work is done with this method, it is possible to repair the section either with a conventional method or repeat this method. In the latter case, subsidence prevention effect will be higher.
- We conducted ballast stabilizing repair of the section that has subsided 20 mm 3 months after conventional repair work was done. It was confirmed that subsidence remained within 5 mm even after 6 months passed (Fig. 4).
- Since the cost of this method is about 10% of that of ballast replacement, it can be widely applied to major and local lines and is expected to contribute to reducing the maintenance cost and further improving ride comfort.
- This method is also useful for preventive maintenance to increase strength of ballasted roadbed where dirt flows in by floods and landslides.

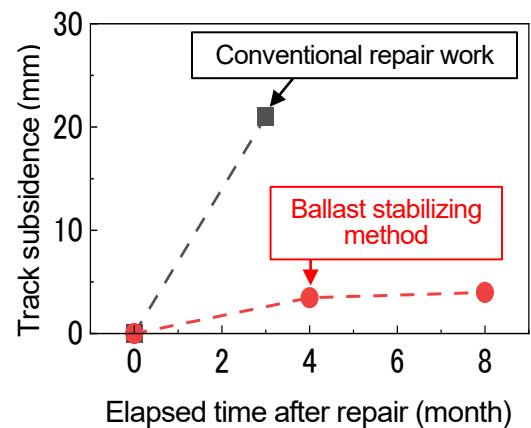


Fig. 4 Comparison of subsidence amount (Repair work with multiple tie tamper)

### 3. Launch date

The repair material was released by Kowa Kasei Co., Ltd. on August 31, 2022.