

NS Joint (Overlaid Joint Using Continuous Fiber Sheet)

1. Introduction

Diverging, merging, or widened sections of expressways feature longitudinal joints in their road surfaces. Elastic material, such as rubber, is used for many of those joints. Because the skid resistance of such rubber surface is less than that of the asphalt mixture used for the surrounding surfaces, there are possibilities that a motorcycle, for example, might slip on the joint especially when it is wet. Therefore, the development of a joint which offers better running stability is in need.

In urban areas, there is a considerable number of cases in which houses are built very closely to expressway bridges. It has become a major problem in terms of maintenance and management of expressways to take environmental measures to reduce the noise and vibrations produced by the lateral joints. To resolve this problem, Nippon Steel Composite Co., and Nippon Steel Corporation have co-developed the NS Joint.

2. Characteristics

The NS Joint method was developed as a solution to the problem mentioned above. Unlike the girder coupling method which requires large-scale work, the NS joint method only requires a simple procedure on the joints and paving material at the joint. Removing the existing joints renders the paved surface continuous. Therefore, this method not only reduces the noise and vibrations produced by the lateral joints, but it also reduces the risk of motor vehicle accidents.

Fig. 1 shows the basic structure of the overlaid joint using continuous fibers (product name: NS Joint) that was developed as a new overlaid joint method. The NS Joint consists of poly-p-phenylene-bezobisoxazole (PBO) fiber sheets, special expansion resin mortar, steel plates, and anchors. Since it is produced and thoroughly inspected at the factory, its stable quality is assured. In terms of joint clearance, the load is supported by PBO fiber sheets, which afford high strength and excellent shock resistance. At the work site, it is bonded with special resin mortar and completely overlaid with high-permeability paving material.

The salient features of the NS joint are as follows.

- (1) Load-bearing type, using high-strength continuous fiber sheet.

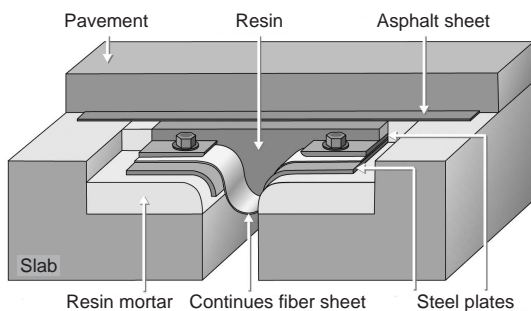


Fig. 1 NS Joint imitative chart

- (2) Water and rut resistance, using high- durability resin mortar.
- (3) Speedier work execution.
- (4) Safer and comfortable finish with completely overlaid joints.

3. Applications

The prototype of the NS Joint was first adopted for the Metropolitan Expressways and Hanshin Expressway in 2000. At that time, a joint replacement project was planned for paving repair work on the Himeji Bypass (in the Shikama district), which was managed by the Himeji River and National Highway Office. In order to minimize the necessary traffic control and noise that is generated during replacements, the joint slice method that was developed by Nippon Steel Corporation was adopted. Conversely, the existing joints were replaced with overlaid joints which effectively reduced the noise and vibrations produced by motor vehicles running along the road. As a result of an overall evaluation of various overlaid joints (such as size, performance, amount of expansion/contraction, joint clearance, workability, etc.), the Himeji River and National Highway Office adopted the NS Joint. **Photo 1** shows some of the field work at the Himeji Bypass. The NS Joint and the surrounding road surface were overlaid with the same highly permeable paving material at the same time. Therefore, it affords drivers a better ride with no differences in road level or irregularities on the road surface. It was confirmed as effective means for reducing the noise and vibration produced by vehicles running along the road.

The NS Joint was adopted again on Himeji Bypass in 2004. The total length of the bypass employing NS joints is now 313 meter. It is registered in the New Technology Information System (NETIS) of the Ministry of Land, Infrastructure, and Transportation (Registration #: KK-040053). This method is fast gaining a reputation as an effective means for improving road structures.

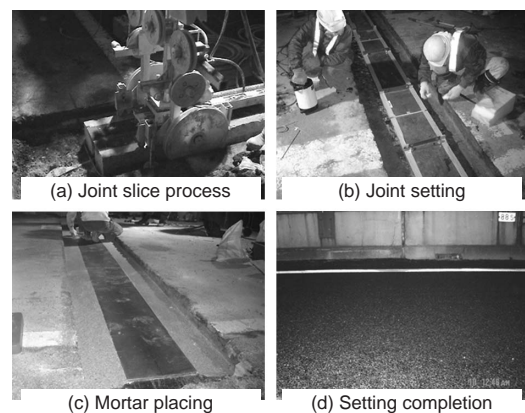


Photo 1 Installation situation on the site

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