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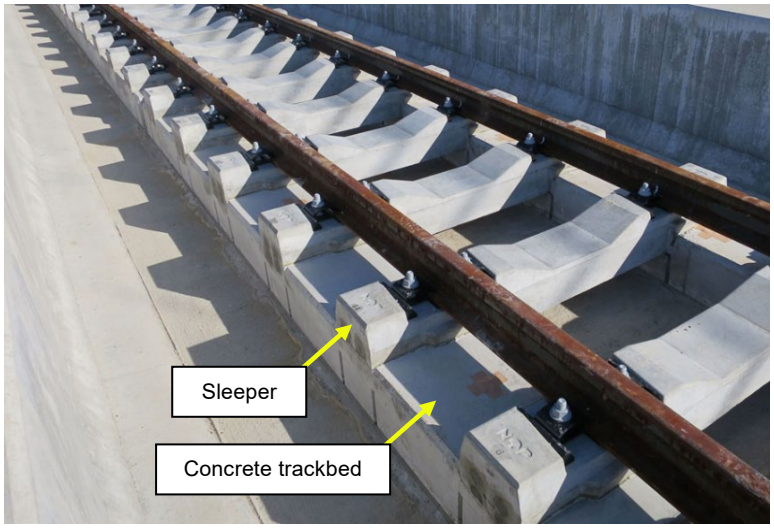
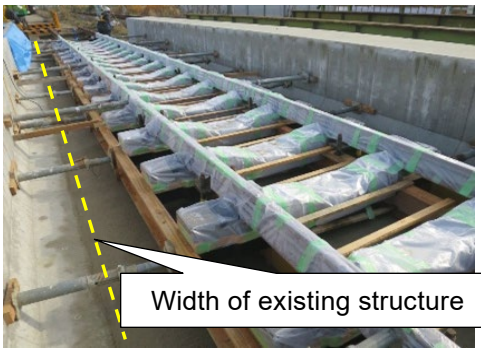
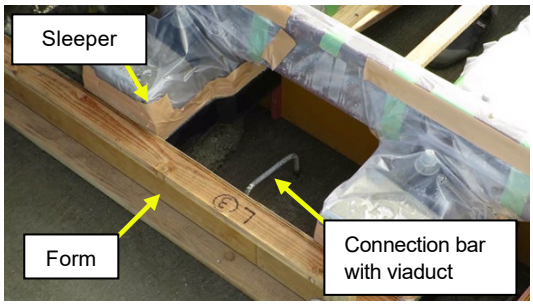
RTRI Develops a Solid-bed Track Equipped with Resilient Sleepers Using the Shear-key to Achieve Efficient Construction Work

RTRI has developed a new solid-bed track equipped with resilient sleepers using the shear-key to achieve the efficient construction work (Fig. 1).



Constructed track





After formwork

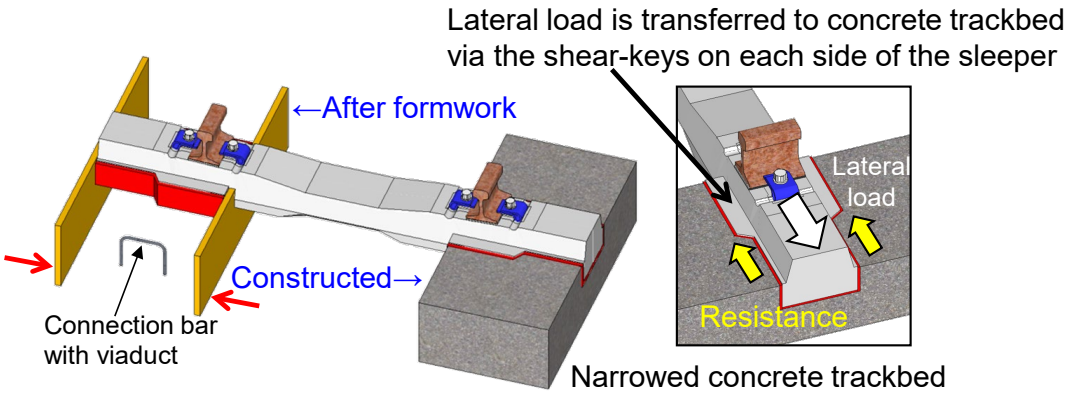
Solid-bed track equipped with resilient sleepers using the shear-key

【Outline】

Solid-bed track equipped with resilient sleepers (STR) is one type of ballastless tracks where under sleeper pads are installed beneath sleepers which are directly supported by the concrete trackbed. RTRI has developed a new STR using the shear-key on each side of the sleepers to resist lateral load, to achieve the efficient construction work. Major points of this development are as follows (Fig. 1).

1. By introducing the shear-key on each side of the sleepers to resist lateral loads, the new STR has narrowed concrete trackbed.
2. By introducing the short-fiber-reinforced concrete to the concrete trackbed, additional reinforcing bars except the connection bar with viaduct have become unnecessary.
3. Its formwork workability has been made simpler so that accurate shapes of concrete track bed can be determined only by pressing the form to the end of sleepers and shear keys.

Since the workload to construct this new STR is smaller than the existing STR, its **construction periods can be shortened by more than 40%**. In addition, as its construction cost can also be reduced , **the cost of the concrete trackbed and of the entire track can be cut by 60 % and 20%** respectively.



・The formwork is adjusted by being pressed to the sleeper
→Improved form workability
・Application of shear-keys and short fiber reinforced concrete
→No need for reinforcing bar except for the connection bar with viaduct

Fig. 1　Newly developed structure

【Field construction】

This STR was already adopted in the actual construction site in the end of 2016. We will prepare a handbook for its design and construction in half a year, and will further promote its practical use.

【Background of development】

The concrete trackbed supports the wheel load, and the lateral load transmitted from the sleeper. STR is not only effective for saving on maintenance work, but also useful for reducing structure borne noise and ground vibration.

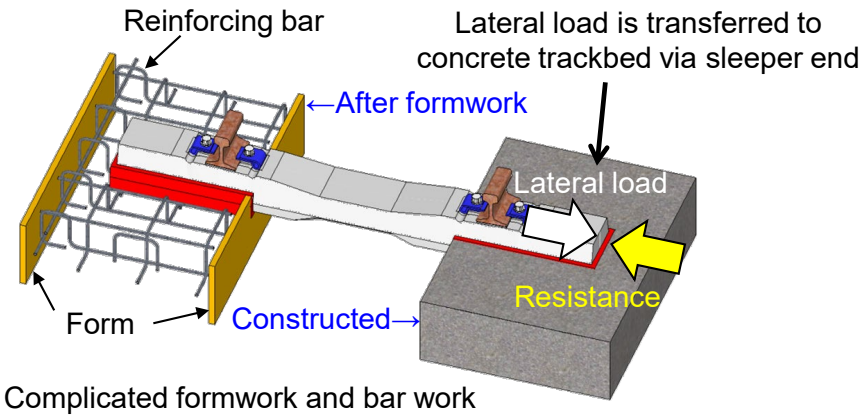


Fig. 2　Existing structure

Therefore, STR has mainly applied on the viaduct in the urban area and the small soil covering tunnel which is laid just under the densely populated area.
The Existing structure that RTRI developed in 1998 has also been widely introduced on JR and other private railway lines and the total length of track has amounted to 60 km. However, as the concrete trackbed is made of reinforced concrete, construction take a long time because of the need to manage the complex arrangement of reinforcing bars and the preparatory formwork (Fig. 2). Also, construction costs are relatively high. In order to increase the speed of construction and reduce the construction cost, RTRI has developed a new STR.

We have performed full-scale track model tests and non-linear FEM analysis and confirmed this track has sufficient performance to bear train load. Through the track motor car running test and the impact hammer vibration test, we have also confirmed that it has the same vibration reducing performance as the existing structure.