

**Zeitschrift:** IABSE structures = Constructions AIPC = IVBH Bauwerke  
**Band:** 10 (1986)  
**Heft:** C-37: Protective structures: Part I  
  
**Artikel:** Shed against stone fall to protect railroad (Japan)  
**Autor:** Japanese National Railways  
**DOI:** <https://doi.org/10.5169/seals-19869>

### **Nutzungsbedingungen**

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

### **Conditions d'utilisation**

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

### **Terms of use**

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

**Download PDF:** 19.08.2025

**ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>**



## 10. Shed against Stone Fall to protect Railroad (Japan)

**Owner:** Japanese National Railways (JNR)  
**Design and Construction:** JNR, Asahikawa Division  
**Work's duration:** 4 months  
**Service Date:** 1985

### Dimensions:

**Structure:** length 87.3 m, width 6.6 m, height 7.15 m  
**Railway Curve:** R=301 m and transition curve  
**Concrete of Retaining wall:** 5.0 m<sup>3</sup>/m  
**Concrete of Upper Slab:** 1.2 m<sup>3</sup>/m  
**Concrete of Foundation:** 1.4 m<sup>3</sup>/m  
**Steel Protective Frame:** 1220 kgf/m<sup>3</sup>

### Introduction

This area, situated in the center of Hokkaido, the northernmost island of Japan, suffers from severe cold weather with annual snowfall totaling more than 13 m. Blizzard and avalanche caused by snow cornice sometimes bring heavy damages. In the midst of winter, temperature lingers below zero and early spring climate brings repeats of thawing and breezing.

This stone shed is constructed on the railroad connecting Asahikawa and Abashiri, having been under construction from 1915 to 1923.

Frequent stone fall and avalanche occur at the construction site of the railroad along the river on the skirts of Mt. Daisetu. The mountain slope is barren and ruined. The dimensions of the slope is 50 degrees in gradient, 40 m in length and 30 m in height.

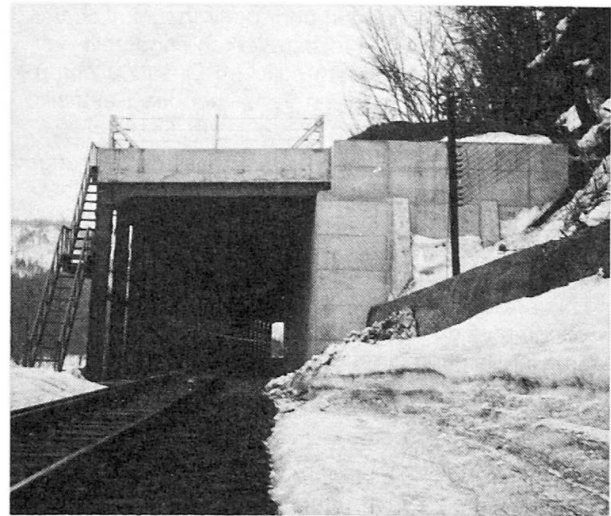
### Design

This stone shed was designed with reference to the JNR Manual for Preventative structures against stonefall. This structure is composed of reinforced concrete retaining wall and steel protective frame. The stability and strength of each section of the wall were checked against the composed force of the dead load, the earth pressure of the backfill, the lateral force of earthquake, snow weight, and load of falling stones.

The load of falling stones, assumed to affect the wall through the backfill, was calculated as of 20.1 tf for vertical load and 28.7 tf for lateral load, considering the slope gradient, the length of the slope and the estimated stone weight.

The steel frame of H-beam (H390×300 ×10×16) with 3 m pitch was also designed against the same falling stone load.

The joint of the frame at the concrete base and the top of retaining wall was designed as a pin support.



### Construction of Structure

#### Retaining Wall

Mountain side of the slope was excavated firstly, followed by the setting of the base concrete and wall concrete with designed compressive strength of 210 kgf/cm<sup>2</sup>.

Human guards and alarm devices assured the safety of the construction executed on and near the railroad.

#### Earthwork

Temporary railroad crossing made the transport of the backfill material possible. The backfill was well compacted.

#### Steel Protective Frame

Factory fabricated members were assembled by the use of truck crane. Special care was taken in designing the joints of the frame with the base and the wall to ensure easy construction. The frame was painted once in shop and twice on site.

#### Covering Upper Slab

Wave shaped steel plate was placed, followed by the concrete placement, the setting of expansion joints and water stop. Watertight seat was spread over the covering upper slab. Finally surcharge cushion fill was placed.

#### Drainage Works

Drainage pipes were set for the sake of drain of backfill.

(JNR)

Reference: «Manual for Preventative Structures against Stonefall» 1978.3 JNR

