
Technological support for damage to the National Route 186 Noboritani Snow Shelter

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Keywords: Disasters caused by heavy rain, road embankment, valley fills, technological support

1. Introduction

In the prefecture of Shimane, record-breaking heavy rain that had started on July 4, 2017, triggered many landslides in the western part of the prefecture. Among them, the collapse of the foundation of the National Route 186 Noboritani Snow Shelter (town of Kanagi, city of Hamada) was found before the dawn of July 5. All road traffic was then stopped. At the request of the prefecture of Shimane, researchers inspected the site on July 7 and provided advice on technical precautions before restoration.

2. Causes of the damage inferred based on on-site investigation

At the snow shelter, the valley side of the embankment collapsed for about 20 meters in height, approx. 20 meters in width, and about 2 meters in depth. Some of the discharge pipes installed inside the embankment were damaged and exposed.

The embankment was valley fills into which water easily penetrated. The inspection of the intake part of the discharge pipes found the accumulation of sediment and driftwood and a trace of a raised water level on the upstream side. Although there was no major change to the pavement surface inside the snow shelter, the inspection found a gap between the asphalt surface and the roadbed.

A possible cause of the damage was that a large volume of water entered the embankment from the discharge pipe joints, which accelerated the outflow of sediment from the embankment or erosion of the top of the slope and triggered the slipping and collapse of the embankment.



Photo 1: The entire view of Noboritani Snow Shelter and damaged section



Photo 2: On-site inspection at Noboritani Snow Shelter

3. Contents of technological support

Additional rain may cause the collapse of the entire foundation. Thus, the researchers advised that the slope and collapsed sections should be covered with blue sheets to prevent them from being directly exposed to rain and to stop the outflow of sediment from the discharge pipes as emergency measures.

The researchers also advised that the reopening of the road needed to be determined after checking the robustness of the road along its entire width, range of loosened embankment, and conditions of the foundation at the snow shelter.

They also advised checking the condition of support structures, such as the depth of H-shaped steel pipes and foundation subgrade of the shelter, to examine conditions of water discharges, such as the soundness of currently installed water discharge functions based on the relationship between precipitation and water basins, and to prevent the inflow of blocking materials to prepare for the possibility that sediment and driftwood would destroy pipe functions.

4. In the end

Based on above advice, the foundation of the shelter was confirmed to be free of deformation, and the remaining embankment was intact, while protective measures were implemented, such as the reinforcement of the collapsed surface. Two-lane traffic was restarted on December 4, 2017, thanks to the restoration work, such as the repairs of discharge pipes and the restoration of the embankment at the collapsed section.