

Sabo Dam made of Wire Net in Nigori-zawa Torrent in Otari Village, Nagano, Japan

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1 .Background

Nigori-zawa torrent is one of the tributaries of, the first grade river, in terms of river management legislation, Hime River situated in Otari village in Nagano Prefecture.

The torrent is highly prone to disasters due to debrisflow discharge. The catchment area is characterized by the following hydrological parameters;

Area 3.06 km²

Torrent length 4.0km

Vertical drop 880m

Average bed gradient 1/4.5 (12 degree)



The torrent is also featured by it's location, the east side of the Itoigawa-Shizuoka Fault Line and the center part of the Fossa Magna, the large tectonic belt which runs north to south at the center part and divides the Japanese archipelago into two, the north-east half and the south-west half.

The mountain bodies in the catchment area are therefore composed of variety of rocks and heavily fractured. Because of this geological feature, the area is landslide prone, so that the projected quantity of the unit sediment discharge is as large as 200,000 m³.

With regard to the debrisflow discharge, the one taken place in 1955 had required a single life, but debrisflow had taken place frequently in 1982, 1995, 1999 and 2001. Especially, the one taken place in 1995, the discharge was so large, as much as 120,000 m³, that the impacts on local communities were serious.

The National Railway line which links Ohmachi city with Itoigawa city had been



Photo-1 Whole view of the basin

disrupted for two years.

The Sabo project had been launched immediately after the disaster in 1955 and ended with by 1999 building as many as, in addition to specific structures for landslide prevention, 14 check dams and consolidation dams. As a result, as much as 89 percent of hazardous mobile materials have come to be controled, but, taking into account recent trend in high intensity precipitation in this area, it is decided that hazardous mobile materials be checked further efficiently by adding the screening function to existing structures. The screening function can be materialized by remodeling existing dams from solid type to slit type.

The remodeling practices however require longer work periods and specific safety measures to cope with abrupt discharge of a debrisflow, so that it was needed to build specific structures which ensure higher safety environment and earlier completion.

The Wire Net Method was adopted, among many other options proposed through internet, as the most appropriate mean to meets the requirements mentioned above.

2 .The Wire Net Method

The Wire Net method had been developed and implemented by Ministry of Construction in 1973, but the method has not been used because it was thought that the nets was not tough enough against debris flow. The method has however advantage in work period and site codition. The method is featured by simplicity in terms of structural design, materials, construction process and safety management so that the method had been improved by adding rings and employed at Kamikami-Hori torrent of Mt.Yake dake and Dashihara torrent of Mt.Tateyama All the cases demonstrate that the wire net method is effective enough successfully checking debrisflows.



Photo-2 Checking the debris flow in Kamikami-Hori torrent of Mt. Yake dake
(Photo supply: Hokuriku Regional construction Bureau, Ministry of Land, Infrastructure and Transport)

3 .Some Engineering Ingenuities

In order to make a design which fits well topographical and geological conditions of the Nigori-zawa site, some engineering ingenuities were exercised as follows based on the cases made by Ministry of Construction;

- 1) steel towers were hoisted at both sides of the torrent in order to anchor the main wire. The main wire can therefore be attached and removed at will for maintenance practices of the wire net and removal of accumulated debris.
- 2) deep piles used for anchoring helped reduce concrete volume and avoid unnecessary deformation in the torrent landscape.

4 .Dimension of the Wire Net

1) Size

Dam Height: 5.0 meters

Dam Length: 28.9 meters

Height of the Anchor Tower: 20.8 meters

2) Materials

Main Wires: 7 units, 85 meters long and 33.5 mm in diameter

Rings: 210 units, 1.2, 1.6 and 2.0 meters in diameter

Steel Towers: 5.7 tons

Concrete Volume: 240 cubic meters

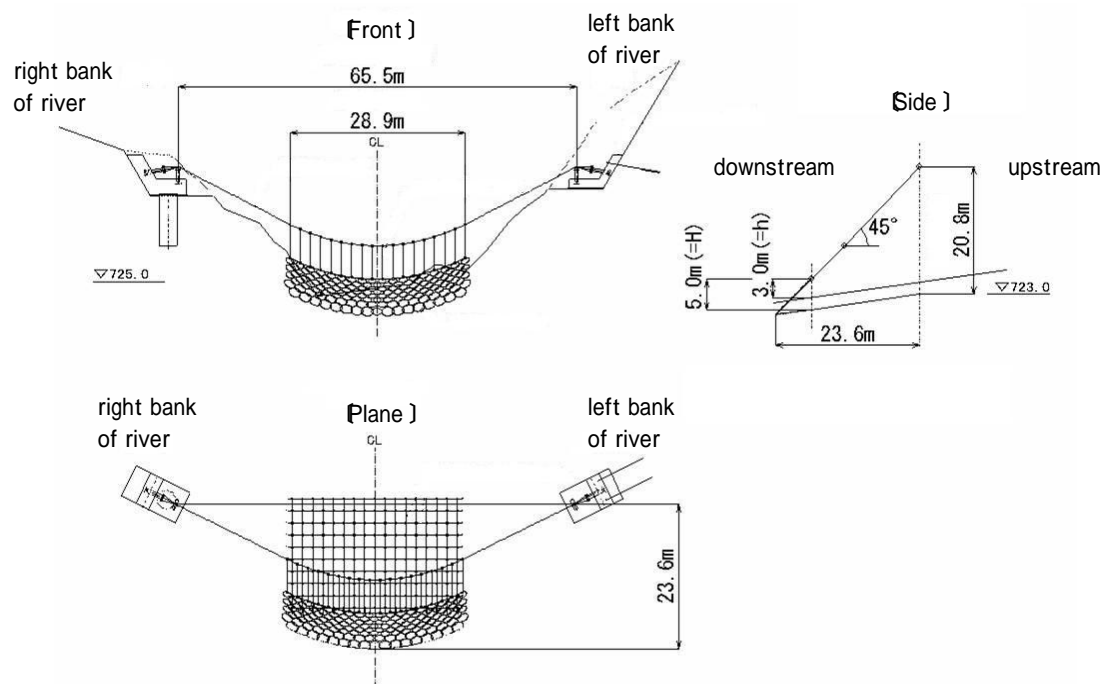


Figure-1 Structure of Sabo dam made of Wire Net

5 .Construction Process

The work period was from August 2003 to August 2004, but construction work had been suspended during the period from January to May due to snowfall. The real work period was therefore 7 months. The Wire Net method had helped shorten the work period, especially the work period on the torrent bed within 2 weeks. The construction work had been smooth and safe.



Photo-3 Sabo dam made of Wire Net

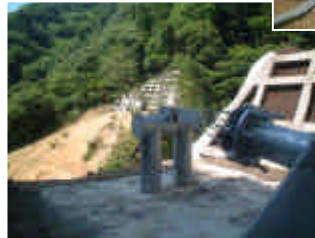


Photo-5 Side of the torrent



Photo-4 Rings

6 .Conclusion

The wire net had checked small debris flow in August 2007, one year after the completion of the work and is expected to successfully check larger debris flows in the future.



Photo-6 Checking debris flow in Nigori-zawa