Sabo Dam made of Soil Cement (INSEM Method) in Shishinoe Valley

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Introduction

Shishinoe valley is situated in Suou-Ohshima, Ohshima, Yamaguchi Prefecture and characterized by high vulnerability to debris flow disasters. There is, as a protected object, a facility for disaster-vulnerable populations.

The newly-born town of Suou-Ohshima is consists, in terms of administrative system, of four indigenous towns and is proud of the harvest of mandarin oranges of which share in Yamaguchi prefecture is as much as 80 percent. Mandarin oranges harvested in the town are so sweet that they won the brand-name “Ohshima orange” and have grown to be the major source for income of the residents.

On the centrally, good soil for the oranges is not so advantageous for disaster prevention. The soil consists of heavily-weathered granite which covers the coastal areas of the Seto inland sea and is likely to be transformed to mudflows in case of torrential rainfall.

A check dam (Sabo dam) is required in order to prevent mudflow disasters, but the foundation is not so solid enough to hold the weight of the dam.

The dam was therefore built on the foundation strengthened by in-situ stabilized excavated materials, INSEM, in short.

What is INSEM?

INSEM is a mixture of in-situ excavated materials and cement and is used for sabo structures aiming at reducing construction cost, but, since the method using INSEM requires wider space for mixing work, it is, in general, not applicable for small project in a small valley.

This construction method was considered necessary for weak ground stabilization in the areas of the Abu volcanic belt. The project in Shishinoe valley is therefore the first case in Yamaguchi prefecture

INSEM can be produced by two methods; ISM method using specific machine which mingles cement fluid with in-situ excavated materials together and INSEM method using backhoe and roller vibrator for mixing and compaction cement with in-situ excavation materials.

In the case of Shishinoe project, INSEM method was employed because the method is similar to the one for roadbed stabilization so that a local contractor can employ it.

Construction Work

The project was launched in November 2005 and completed in December 2005.

The criteria for design and both quality and construction management conform with the precedent projects launched by the central government.

In order to avoid fluctuation in the strength and deviation from a target strength, special attention to the quality of in-situ excavated materials especially moisture content was paid.

Due to fair weather, placement work of as much as 1,600 m^3 was completed within one month and the target strength 1.5N/mm^2 was attained. The construction cost was successfully reduced by as much as 70 percent.

Mixture of cement

Spread and smooth

Advantage and disadvantage of the INSEM method

A questionnaire survey addressed to the staff of the Ohshima construction office and the contractor about construction work employing INSEM technology revealed that the method was fairly easy to do.

Furthermore, it is proved that the method has great advantage because it allows to reduce the space for landfill by making the most use of excavated materials for construction and, as a result, to reduce construction cost. The method has however disadvantage because it requires considerable areas of working space and the effectiveness of the method depends on the quality of excavated materials. If the moisture content of excavated material is high, the method is not appropriate because the unit volume of cement must be increased.

Conclusion

Like many other local governments, Yamaguchi prefectural government has suffered from financial hardships. Accordingly, funds for public works have been reduced and the funds for disaster prevention are not exceptions. It is however urgently needed to

undertake comprehensive safety measures to protect human lives and asset by launching both structural and non-structural projects.

In order to put security measures against geological hazards into practice and to make the efficiency the highest, projects have been implemented putting the higher priority on disaster-vulnerable populations, evacuation center and evacuation routes.

New technologies such as double walls and INSEM allow us to achieve the objectives above.

We would like to implement sabo projects by employing INSEM paying much attention to quality of materials, strength of structures and cost efficiency.

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