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Key Problems on Debris Flow Control Engineering after Wenchuan Earthquake in China

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Earthquakes occur frequently on the Qinghai-Tibet Plateau and its southeastern margin





Over the past 100 years, more than 30 earthquakes of magnitude 7 and above have occurred in the mountainous areas of southwestern China, especially after the 2008 Wenchuan earthquake, many strong earthquakes such as Yushu, Lushan, Ludian, Jiuzhaigou, and Linzhi have occurred. Extraordinary largescale debris flow disasters frequently broke out in the strong earthquake area, causing significant loss of life and property.



Distribution map of strong earthquakes on the Qinghai-Tibet Plateau in the past 100 years

Extraordinary large-scale debris flow disasters











Beichuan Gully (2008-9-24)



Wenjia Gully (2010-8-13)

Debris Flow Control Engineering



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Shaofang Gully



Although most of the debris flow control engineering are effective, there are still some cases of failed and destruction due to the special nature of the debris flow after the earthquake.





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Characteristics of debris flow after the earthquake





There are many sources of debris flow after the earthquake and it is difficult to identify, especially the cracked rock mass in the upper valley.



Characteristics of debris flow after the earthquake



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Once the huge boulders are converted into part of the debris flow, its content and size have a strong destructive power .

Regulation effect of storage capacity of dam







The main purpose of the large storage capacity debris flow dam is to intercept large boulders. However, before the debris flow occurs, most of the storage capacity is consumed by the fine particles (flood cement and sand deposits) in the flood, and some drain holes are blocked by the trunk. Optimized design of the distribution, number, size, etc. of dam drain holes becomes a key issue.

Dam foundation was damaged by erosion



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Debris flow and flooding over the dam cause the dam protection and foundation erosion to be very serious, leading to dam foundation overhang, overturning, dam collapse, etc., which are the main causes of dam structure damage





the infiltration and erosion of the water flow under the dam



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The gravity dam built on the loose deposit is settled, cracked and deformed due to the infiltration and erosion of the water flow under the dam.

The soil and stone between the the piled dam are eroded by the flood, often causing the piles to be exposed.

Abrasion damage of control engineering







The debris flow channel is abraded due to high-speed flow, and the bottom of the channel is abraded too deep to damage.







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- (1) Accurate identification of loose sources (including seismic rock masses) in valleys and calculation of reserves
- (2) Optimal design of control engineering
- (3) Leave big boulders in the middle and upstream of the trench
- (4) Anti-erosion of dam foundation
- (5) Anti-abrasion corrosion of engineering

Thank you for your attention