

The phenomenon of the floating riverbank collapse by water scouring

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Received 12 December 2013; Accepted 12 February 2014

Abstract: Incline free face riverbank collapse can be seen in many river of China, which can lead many damage of people and engineering, so it need to be studied. The first step of the further study is well classified the types of the collapse. One of the new types is Incline free face riverbank collapse, which is introduces in this paper.

Key words: Riverbank collapse; Scouring; Riverbank crack; Incline free face

Under the river affection, the shore dike is scoured by the river, so the river becomes wider and wider with the riverbank collapse, which are many collapse types mentioned in literatures^[1]. Scientists and researchers did some researches on the collapses by the mechanics analysis, and made great achievements. But a kind of collapse type shown in Fig. 1 is not concerned in previous researches, which needed to be studied. By the research in the paper, the new collapse type can be added into the whole collapse research, and it is probably that the mechanism opened out can solve some problems. In this research, many advices and suggestions can be given in the riverbank reinforced and collapse prevention.

The riverbank collapse generally exists in Yangtze River, Yellow River and Han River etc. The riverbank collapse is treated as a typical disaster, including (a) collapse threatening the river dike safety, (b) collapse threatening the safety of building and farmland, (c) sediment from collapse leading to the riverbed evolution, (d) effecting to the shipping.

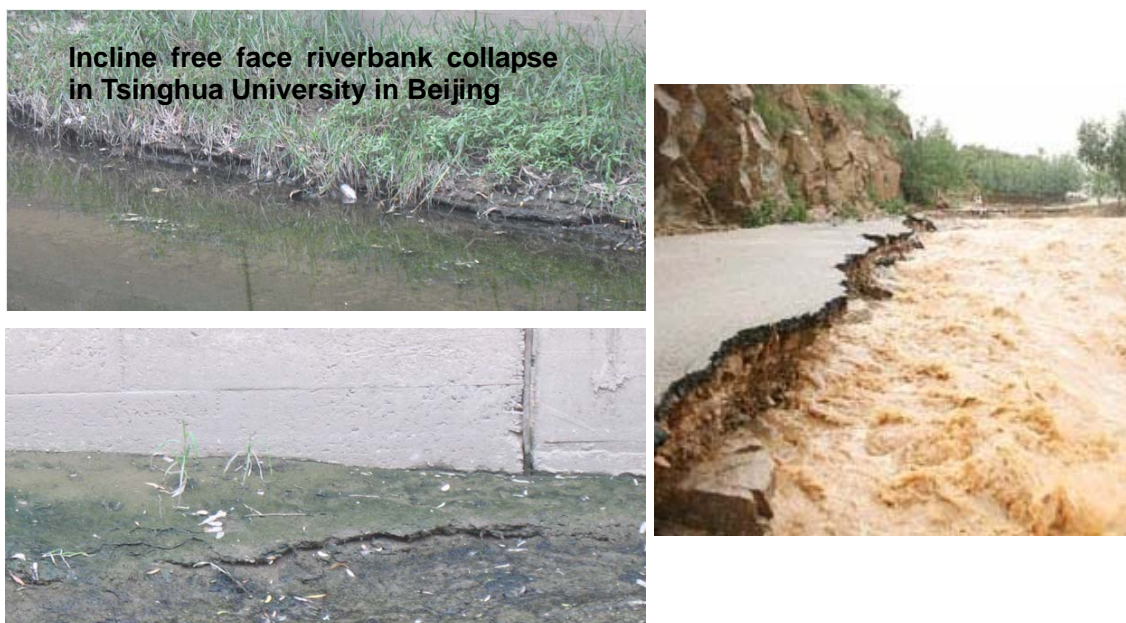


Figure 1 Riverbank crack/collapse from scouring

The riverbank collapse is result from the combined affection by the incoming runoff and sediment, the

river channel scour and siltation evolution, the riverbank soil, the geological structure and so on. The river bank soils are the internal factor, while the conditions of river water are the external factor. Nowadays, researches about the mechanism of many factors affecting the collapse are little, but many achievements are about the mechanism of different factors effecting on the collapse, including the flow intensity, the changing of river water level, the river channel scour and siltation evolution, the soils conditions and so on.

From the size of collapse body and collapse form, the river collapses can be divided into Pit-type Slide, strip slide, slip slide and wash slide as shown in Fig. 2 [2].

And from the river channel form, river slope, disaster form and so on, the river collapse can be divided into the top eroded collapse, the lateral eroded collapse, the deep eroded collapse and the local eroded collapse [2].

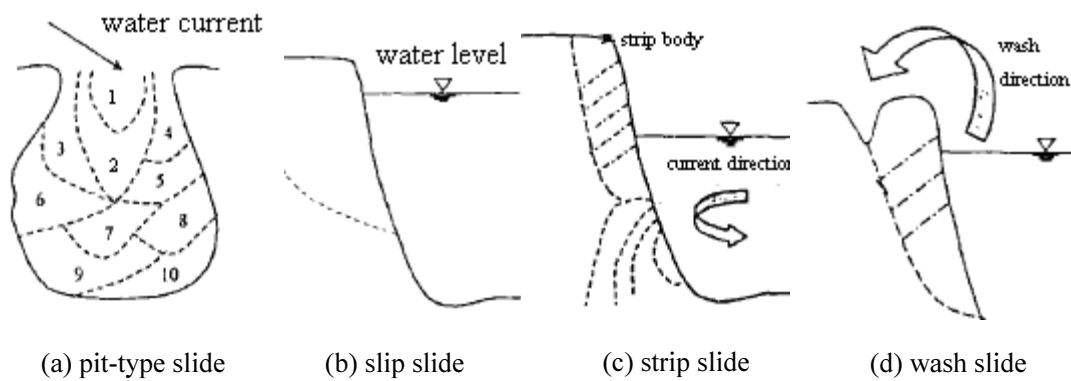


Figure 2 Typical collapse class

But a kind of collapse shown in Fig. 3 is a new type.

When the river foot is scoured, the top river bank is in cantilever state and its body is big. The body is large enough to landslide. The drop collapse is divided into three types, as shown in Fig. 3.

(a) Shearing collapse:

When the weight of the soil body in cantilever state is more than the anti-shear strength, the soil body slides from the shear surface AB (Fig. 3 (a))

(b) Rotating collapse:

When the weight moment of the soil body in cantilever state is more than the anti-tense moment, the soil body rotates and collapses (Fig. 3 (b)), which is shown in experiments and natural river.

(c) Tensing collapse

When the tensile stress from weight of the soil body in cantilever state is more than the anti-tense strength, the soil body collapses (Fig. 3 (C)).

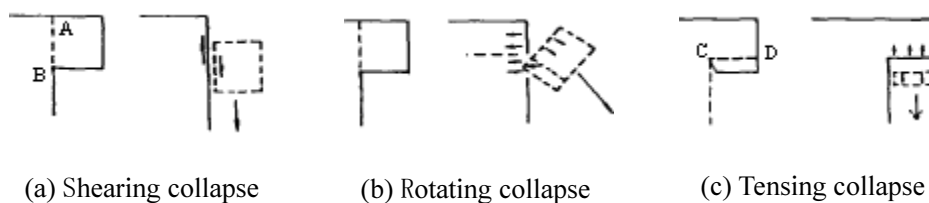


Figure 3 Drop collapse types

But the previous researches and literatures have not given the mechanics analysis.

In geotechnical engineering field, many serious of great achievements are made, including the calculating

method about slope stability, such as circular slip algorithm ^[3], strength reduction algorithm ^[4], back-analysis ^[5], Monte Carlo-grads method ^[6] and so on; including many factors, such as earthquake ^[7-9], rain storm ^[10, 11], current ^[12, 13], and so on; Slope monitor and test method, such as remote sensing ^[14], GIS ^[15, 16], map comparison ^[17] and so on.

In Fig. 1, the slope toe is scoured leading to the slope in cantilever state. Some part of the slope collapses with river going on scouring, and a concave appears, about which few researches are, and which leads to researchers difficult in understanding. And in slope slide fields, the phenomena in the Fig. 1 is not concerned, especial about the mechanics analysis, so the research is needed, which can be added into the systemic researches.

Acknowledge: This work is supported by the National Natural Science Foundation of China (No.: 51179177; 50709015), the Fundamental Research Funds for the Central Universities (No.: 2011YXL053), Beijing Higher Education Young Elite Teacher Project(No.: YETP0655), the Yellow River Key Laboratory of the Ministry of water resources of sediment (No.: 2010005), China Postdoctoral Science Foundation (No.: 200801081; 20070410531) and PICC Property and Casualty Insurance Company Limited.

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