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Report

Damage survey after The 2016 Kumamoto Earthquake

-Confirmation of tough Implant structure-

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[The 2016 Kumamoto Earthquake]

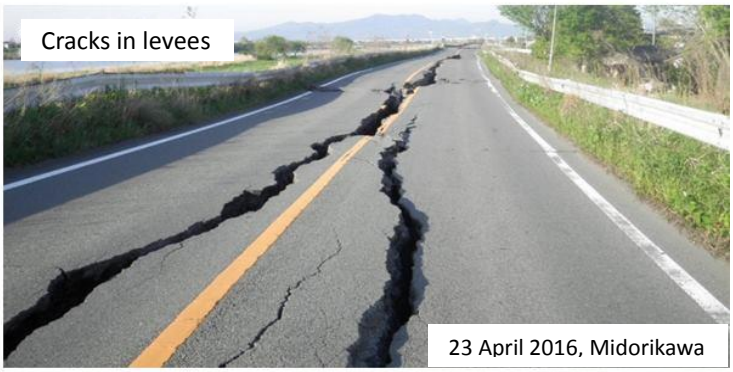
The great earthquakes more than seismic intensity-Magnitude- 7 by Japan Meteorological Agency occurred twice in Kumamoto Prefecture in Kyushu Island in this April and severe damages were induced. For example, there were a lot of collapses of wooden houses, cracks in levees, large-scale slope falls, collapse of Aso bridge and etc. (See left photo).

It was the first case that two great earthquakes more than Magnitude 7 within few days occurred in Japan.

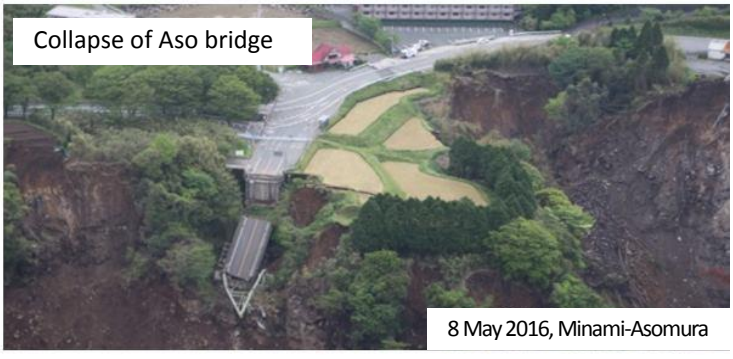
[Damage observation by survey team]

The field damage survey team investigated earthquake damages induced by The 2016 Kumamoto Earthquake in this April, especially of Implant structures (See Reference) constructed in Kumamoto Prefecture, for 3 days from May 23 to 25, because a lot of Implant structures were constructed in Kumamoto Prefecture. Dr. Kusakabe, Chairman of IPA led the team and 10 members including IPA and JPA (Japan Press-in Association) joined. Comprehensive investigation was done by the IPA and JPA joint team in order to investigate from the point of design, construction and maintenance.

Source: Ministry of Land, Infrastructure, Transport and Tourism, Kyushu Regional Development Bureau

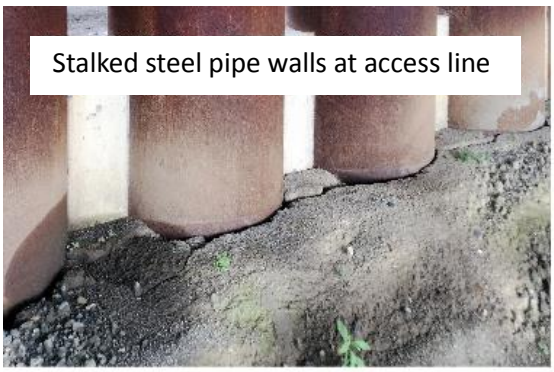

Cracks in levees
23 April 2016, Midorikawa

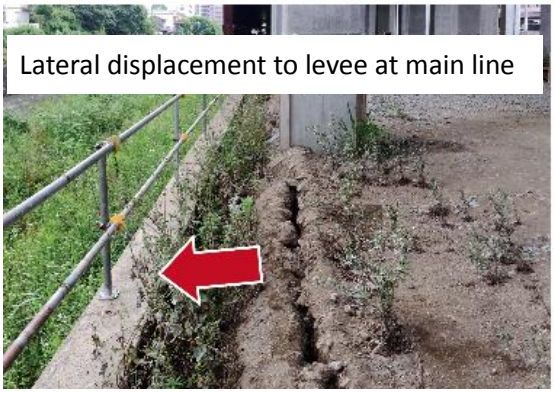

Large-scale slope falls
18 April 2016, Minami-Asomura


Collapse of Aso bridge
8 May 2016, Minami-Asomura

[Reference / Implant structure]

The Implant structure consists of a structural member that is combined with a frame and foundation that are embedded into the ground where they are securely supported by the ground. The structure carries horizontal and vertical loads, using “the scale of the allowable structural member” and “the depth of penetration into the ground”.





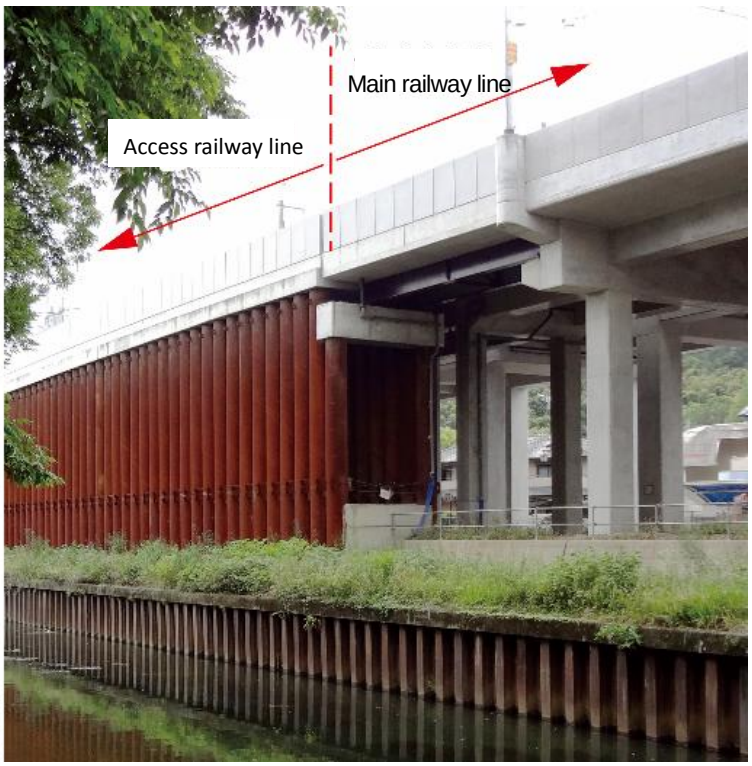


Photo 1

The typical example of earthquake damages is a viaduct construction site of local railway and Kyushu Shinkansen (Bullet train) between Fukuoka Prefecture and Kagoshima Prefecture near Kumamoto station of JR Kyushu Railway Company. The slight cracks on the ground surface in access railway line were investigated at the site of continuous steel pipe walls of diameter 800 mm. However main body of Implant structures had no damage, though levee walls and soils adjacent to main railway line deformed largely laterally (See photo 1).

At the discharge channel sites in east area in Kumamoto Prefecture, there were no damage at the levees reinforced by concrete sheet piles and embankment levees have some damages (See photo 2).

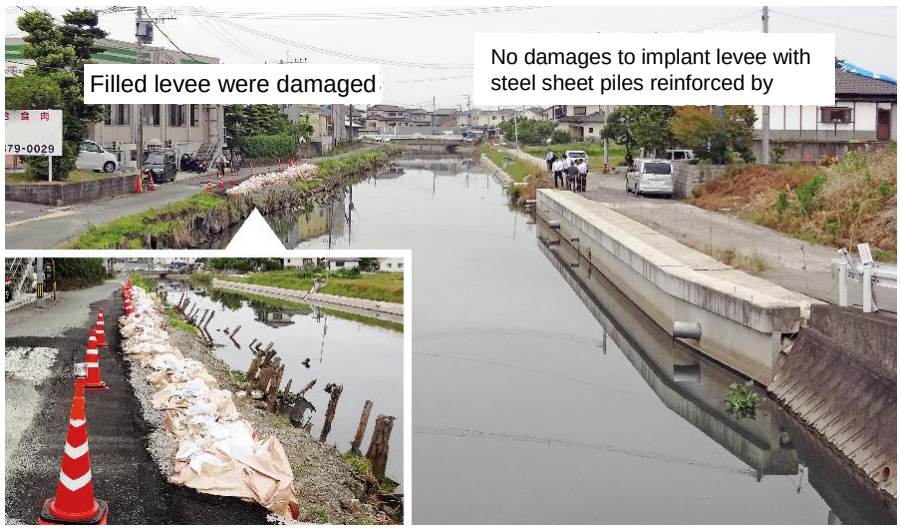


Photo 2

Dr. Kusakabe pointed out that “We confirmed expected results against earthquake occurrence for steel sheet piles and steel piles. In case of levees and dikes reinforced by steel sheet piles, etc., collapse mechanism was concentrated in no reinforced portions and total collapse was avoided. In order to expand the above mentioned effectiveness, we like to examine scientifically structure types, depth of penetration into the ground and etc. and proceed to specify in design method.”

The team will summarize in survey report and disclose in Web site and etc. in near future and include this survey results in Technical seminars or workshops organized by JPA and IPA in order to demonstrate the advantages of Implant structures.