1 INTRODUCTION

An earthquake with a magnitude of 7.3 (CWB) occurred at 1:47 AM, (local time) on 21 September 1999, in the central part of Taiwan. The epicenter was 150km south-west of Taipei, 23.85 at the north latitude and 120.81 at the east longitude, and the depth was about 6km. According to the statistics by The Fire Department of Taiwan on 6 October the number of casualties, injuried and missing people are 2295, 8731 and 92, respectively. It was also reported that more than 12,000 buildings and houses were damaged and about the half of which totally collapsed. This earthquake was officially named as The 1999 Ji-Ji earthquake, since the epicenter located nearby the city of Ji-Ji in Nanto prefecture.

The Japan Society of Civil Engineers organized a damage survey team and dispatched it to the affected area during 1 to 8 October for the investigation into the damage and collection of Information and data. This report outlines the findings of this investigation undertaken by the JSCE team on the various aspects of the earthquake disaster in the central part of Taiwan.

At the beginning of the report the tectonics and the seismicity are briefly introduced, and the characteristics of the recorded earthquake ground motions were discussed from the view point of the fault rupture mechanism. The ground motions at more than 500 stations were observed, including the area close to the fault. These observed records can provide valuable and instructive information for the future study of the fault rupture mechanism and ground motions in the near field of the fault.

The members of JSCE team traced the surface faults and investigated into the damage to bridges, dams, buildings and other industrial facilities caused by the fault movements. The vertical gap of the surface fault is estimated as 3.0~7.0m.

Ten road bridges were totally collapsed and more than 30 bridges suffered comparatively light damage, which needed repairments after the earthquake. It can be guessed that the most govermetial factor of the serious damage to the bridges is differential ground displacements in vertical and horizontal directions caused by the surface faulting.

A cable-stayed bridge under construction was seriously damaged in the epicentral area.

A long period component of the earthquake motion largely amplified the dynamic response of the bridge.

A concrete gravity dam with a height of 25m was totally collapsed by the surface faulting. The vertical gap of the surface fault was estimated as about 9m at the site of the dam. The total collapse of the dam, which was directly caused by the fault movement is the first experience in the world. This will rise a new technical as well as social subject of the earthquake resistance of infrastructures against surface fault displacements.

Lifeline systems such as electricity, water supply and gas also suffered severe damage. Slope failures collapsed transmission towers of electricity, while the surface rupture damaged a number of facilities of a main switchyard for the electricity distribution.

Facilities of Taichung port were damaged mainly due to soil liquefaction. The quaywalls moved towards the sea 1.6m at the maximum and the ground behind the quaywalls subsided about 1.0m. The foundations of belt conveyors and buried pipes were broken by differential ground displacements.

A numerous number of huge slope failures which occurred in the mountainous area buried villages and valleys, resulted in loss of many lives. It was reported that the slope failures created two lakes. However, the whole scope of the slope failures is not clear at the present time, because any detailed and total survey in the mountainous area as not been carried out.

Taiwan and Japan has a long history of cooperation in earthquake engineering and many joint research projects have been carried out in the academic field for earthquake disaster mitigation. All of the members of the JSCE team wish to strengthen the partnership in the earthquake engineering between Taiwan and Japan through the cooperation for the investigation into this earthquake disaster and through future joint research.