

Study Trip Report on  
**HIYORIYAMA PARK and ISHINOMAKI TAX OFFICE**

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### **Introduction**

This technical report shows the observed damages which were caused by the 2011 off the Pacific coast of Tohoku Earthquake in three sites visited during the study trip organized for the IISEE training course by BRI and JICA. The visit was realized on September 6th, 2011, six month after the great earthquake.

The damages found were mainly due to the tsunami which destroyed several towns located along the coast line, including industrial facilities, houses, hospitals, schools, among others. The sites visited are following:

### **1. Hiyoriyama Park**

The Hiyoriyama Park is located on the top of a high hill, 56-meter-high, in the center of Ishinomaki City. The park was a gathering and evacuation place for many of the local population on the day of the disaster, March 11th. Many people witnessed from this vantage point as the tsunami took over their town.

From that point, we could see a huge area that had been devastated by the tsunami such as Minato area and surrounding areas of Ishinomaki. The difference in tsunami damage was quite clear. The view from Hiyoriyama Park to the left side of Ishinomaki Port was protected by a seawall, so it did not suffer heavy damage. The right side of Ishinomaki Port, including the district of Kadowaki-cho, suffered devastating damage. We were able to see toppled homes and bare foundations.



**Photo 1.** (left) The area on the left side of Ishinomaki port was protected by the seawall and suffered minor damage. (center) The view of Ishinomaki port. (right) The area devastated by the tsunami.

### **2. Liquefaction on the site of Ishinomaki Tax Office**

Liquefaction is one common disaster due to earthquakes. The typical phenomena of liquefaction are water spraying and sand emitting. If liquefaction occurs in some sites, the foundation soil will lose one part or even total bearing force, and uneven settlement of the soil will take place. Then the foundation will get damaged. Thus the buildings and structures will incline or overturn as some buildings were damaged in the 1964 Niigata earthquake of Japan (Photo 2).

During the 2011 Tohoku Earthquake, many places had liquefaction phenomena, e.g. the



**Photo 2.** Liquefaction in 1964 Niigata Eq. (USGS)

site of the Ishinomaki tax office where the typical phenomena of liquefaction occurred. The office building inclined about an angle with 1/80 (Photo 3), and the ground in front of the building became out-of-flatness due to the uneven settlement of foundation soil (Photo 4). The foundation soil became more close-grained due to liquefaction and larger settlement occurred, so some RC water tanks (Photo 5) and other facilities cropped out the ground (Photo 6).



**Photo 3.** Inclined building



**Photo 4.** Out-of-flatness ground



**Photo 5.** Outcropping RC water tank



**Photo 6.** Outcropping steel facilities

### **3. Ishinomaki city**

Ishinomaki City, Miyagi Prefecture, is located approximately 45 km to the northeast of Sendai City (Japan Times, March 14<sup>th</sup> 2011). Due to the 2011 off the Pacific coast of Tohoku Earthquake, this city was totally destroyed, mainly by tsunami.

The more important income of this city is from the fishing activity, due to its location in the coast line, in front of the Pacific Ocean. All the facilities dedicated to the fishing activity were severely damaged by the tsunami. According to the report from the Port and Airport Research Institute, the tsunami height was 5 m at Ishinomaki Harbor, and 16 m at Ogatsu-machi, Ishinomaki City (Architectural Institute of Japan, April 15<sup>th</sup> 2011). The Tsunami traveled around 600 meters inland and destroyed around 80% of the houses (Japan times, March 18<sup>th</sup> 2011). Most of them were wooden houses which were totally destroyed by the earthquake and the following tsunami (Photo 7 and 8).



**Photo 7.** View of the Ishinomaki City, 6 month after the great earthquake.



**Photo 8.** Severe damage caused by Tsunami to a wooden house in Ishinomaki city

The important structures, like hospital (Photo 9) and School (Photo 10), in this city were severely affected by the earthquake and then struck by the following great tsunami. These structures are indispensable in the case of emergency; the hospital to attend the injured people and the school can be used as a shelter.



**Photo 9.** Hospital in Ishinomaki city severely damaged by earthquake and tsunami



**Photo 10.** Kadowaki elementary school, completely destroyed, also due to fire.