

Tohoku Chapter, Architectural Institute of Japan
Reconnaissance Report (10) of Tsunami Height in Arahama District, Sendai City
The 2011 off the Pacific Coast of Tohoku Earthquake
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Reporter

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1. Introduction

This report is the continuation of AIJ Tohoku Chapter Report (9) released on March 28, 2011. This report explains the damage of Sendai Municipal Arahama Elementary School, which is located only 800 m from the coast.

2. Direction of Tsunami Waves

The direction of tsunami wave flow was determined by the following observation:

- (1) The damage of hand rails on the water breakage embankment (Photos 1 to 3);
- (2) The falling direction of electric poles (Photos 4 and 5);
- (3) The bent direction of steel anchors used in the foundation of a washed timber house (Photos 6); the house above the foundation must be moved by the tsunami wave and bent the anchor bolts in the foundation; and
- (4) The observed overflow items left on buildings (Photos 7 and 8).

From the above observation, the direction of tsunami wave flow was determined to be normal to the coast line.



Photo 1: Hand rails on the embankment suffered no damage in the direction parallel to the tsunami wave and heavy damage normal to the wave.



Photo 2: Tsunami wave flew normal to the coast line.



Photo 3: The fracture at the base of a hand rail.



Photo 4: All electric poles fell in the same direction, normal to the coast line. Concrete block masonry wall normal to the tsunami flow did not fail.



Photo 5: All electric poles fell in the same direction, normal to the coast line.



Photo 6: All anchor bolts on the surface of foundation were bent in the direction normal to the coast line.



Photo 7: All outflow items remain on the face normal to the coast line.



Photo 8: The bent direction of anchor bolts and face direction on outflow materials coincided.

3. Height of Tsunami Wave

The tsunami wave height reached as high as 4 m at the Sendai Municipal Arahama Elementary School (Photo 9). The tsunami wave height was estimated to be 4 m from the water traces on steel houses (Photos 10 and 11).



Photo 9: Tsunami wave height was estimated to be 4 m at Arahama Elementary School.



Photo 10: Tsunami wave reached the second floor of a steel skeleton house.



Photo 11: Tsunami wave reached the second floor of a steel skeleton house.

5. Reinforced Concrete Buildings near the Coast

Several reinforced concrete buildings remain standing near Sendai Municipal Arahama Elementary School; Building A (Photos 12 and 13), Building B (Photos 14 and 15), and Building C (Photos 16 and 17).;



Photo 12: North side of Building A



Photo 13: West side of Building A, approximately 900 m from the coast.



Photo 14: North side of Building B; approximately 900 m from the coast



Photo 15: East side of Building B, no opening facing the tsunami flow.



Photo 16: East side of Building C, facing to the tsunami flow.



Photo 17: South side of Building C, approximately 400 m from the coast.