

Report of the JSME Research Committee on the Great East Japan Earthquake Disaster

Preface

The Tohoku Region Pacific Coast Earthquake and following tsunami, which occurred on March 11th 2011, caused unprecedented devastation in Japan, especially to the Tohoku and North Kanto regions. This event has become known as the Great East Japan Earthquake disaster.

Furthermore, the earthquake and tsunami seriously damaged the Fukushima Daiichi Nuclear Power Plant (NPP), resulting in the meltdown of the fuel in the reactor core, the destruction of the nuclear reactor buildings due to hydrogen explosions and large-scale release of radioactive materials into the environment, which has destroyed the lives of people living in that area. A catastrophe of this extremity has never before been experienced by Japan.

This disaster was unique in the following ways:

- The magnitude of the earthquake was enormous at M9.0.
- The scale of the tsunami caused by the earthquake was huge.
- An extensive area was affected and a great number of people suffered as a result.
- Previously unencountered challenges were met in tackling the NPP incident and controlling the release of the radioactive materials.

The Japan Society of Mechanical Engineers formed the following two committees soon after the earthquake under the direct leadership of the executive committee:

- Committee on emergent damage analyses, surveys and proposals
- Committee on long-term proposals

The members of both committees have been working from the viewpoints of:

- What the engineers and researchers who engage in mechanical engineering can learn from the disaster;
- How they can put this into practice in the future.

There were many areas to be assessed and many subjects to be addressed. In order to do this job effectively, the JSME established eight working groups (WGs) in the first committee and four in the second. In this report the authors focus their attention on the activities of the first committee, hereafter referred to as the “JSME Research Committee on the Great East Japan Earthquake Disaster”.

The committee consists of the following eight WGs:

WG0: Characteristics of the Earthquake and Tsunami

WG1: Damage to Machines and Equipment and Good Practices for Seismic Countermeasures

WG2: Understanding the Mechanism of Tsunami-induced Damage to Machines and Structures Based on Mechanical Analysis

WG3: Application of Robot Technologies to the Disaster Sites

WG4: Analysis of Traffic and Physical Distribution Systems within the Disaster Areas

WG5: Damages to Energy Infrastructures

WG6: Codes and Standards Issues and Future Perspective

WG7: Crisis Management for Earthquakes, Nuclear Power Plant Accidents and Other Events

The investigation policy is such that:

- Investigations should be conducted ethically and the findings should be made accessible to all.
- Damage caused by the earthquakes and/or tsunami are investigated.
- Questionnaires and interviews are used alongside information published by the government, TEPCO, and other companies and organizations.
- Good practices to implement in the future are determined.
- Messages to the public and the JSME members should be prepared as quickly as possible.

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The committee began its activities at the end of March, 2011. Each WG worked with great motivation and gathered many data about the damages sustained. They also determined the lessons that have to be learned from the disaster and how to incorporate them into our practices in the future. The final report (in Japanese) was published at the end of July 2013 under the following title:

“Report on the Great East Japan Earthquake Disaster -Mechanical Engineering Volume-”, by the Joint Editorial Committee for the Report on the Great East Japan Earthquake Disaster, Japan Society of Mechanical Engineers, 2013.

The present report, written in English, is a summary of the above Japanese report. It has been written so that people overseas can understand what we have learned from the disaster. In the first chapter, these lessons, which are the products of the work of WG0 to WG7, are summarized in the form of four proposals. In the following chapters, the contributions of each WG are discussed in more detail.

We, the authors, appreciate the efforts of the committee and WG members whose names are listed in the Japanese report. We would also like to express our thanks to all who cooperated with us during our research, the members of the executive committee, and the office staff of JSME for their support throughout.