

JSSI HISTORY

30 years history of the JSSI

JSSI was established in 1993. Prior to its establishment, many companies had been involved in seismic isolation structures in the Japanese building field, and worked to establish an association and popularize seismic isolation structural technology. Since 2000, it has also been involved in vibration control structural technology, and has become a national designated performance evaluation organization. JSSI has many committees that are very active, and it also engages in international exchange.

The Early Period

In 1960, the Great Buddha of Kamakura was seismically isolated by Irie Miyake Architects & Engineers and Shimizu Corporation, and in 1963, a special provision was made to the law regarding restrictions on buildings in urban planning areas, making it possible to build buildings over 31 meters height. On June 16, 1964, the Niigata earthquake occurred (M7.5). In 1965, Matsushita Kiyoo and Izumi Masatetsu reported "Seismic Isolation Method as a Method of Earthquake-Resistant Design of Buildings".

In the first period in the 1970s, pioneers of seismic isolation structures such as Prof. Hideyuki Tada and Dr. Shoichi Yamaguchi realized seismic isolation buildings as their own facilities. Prof. H. Tada began researching ways to absorb seismic energy and limit damage to buildings as a way to reduce damage to buildings during earthquakes. He noticed that G. C. Delfosse of the CNRS in France was conducting similar research, and traveled to France to propose a joint research project, but the discussion did not come to fruition, so he decided to continue the research on his own. Then he called on his classmate Dr. S. Yamaguchi and they began working together.

In the early 1970s, it became possible to obtain observational records of earthquake ground motions, and it became possible to analyze how buildings would shake.

In 1971, the dollar shock hit, and also the oil shock hit Japan in 1973. Around 1975, engineers and researchers began to develop seismic isolation systems as a new earthquake resistant method. The term "seismic isolation" had not yet been clearly defined, and the idea was to somehow prevent the transmission of seismic forces to buildings, or to somehow cut off the seismic energy before it entered structures.

In the late 1970s, about 10 people, including Prof. Hiroshi Akiyama, Shinya Amano, Prof. Masatetsu Izumi, Prof. Hajime Umemura, Prof. Hideyuki Tada, Dr. Takayuki Teramoto, Dr. Shoichi Yamaguchi, and Prof. Akira Wada, began to meet at the Tokyo Kenchiku Engineers Research Inc., in Tokyo.

From around 1978, many experiments on "seismic isolation devices" were conducted in the Tada Laboratory at Fukuoka University.

In 1982, Prof. H. Tada and Dr. S. Yamaguchi designed Japan's first seismically isolated house, the Yachiyodai Housing (ϕ 300 natural rubber laminate), in Chiba Prefecture, and completed it in 1983.

At this time, the design document was submitted to the Low-Rise Concrete Committee of the Building Center of Japan (chairman Prof. Yasutoshi Sonobe, members Prof. Masaya Murakami, Prof. Takao Nishikawa, and others) and approved, with the condition that an actual house operation experiment would be conducted six months later. After that, the Seismic Isolation Structure Research Group (chairman Prof. Seiji Nakano) was established and the Sawada Miki Memorial Hall (ϕ 435 natural rubber laminate) was built.

In addition, people involved in seismic isolation systems began to hold frequent meetings, and in addition to the aforementioned members, Yoshiaki Ehara, Nagahide Kani, Yorimichi Katano, Masaru Sukagawa, Mitsuru Sugisawa, Dr. Hisakazu Takeda, Mitsuo Nakayama, Hiroshi Hayami, Yoshikatsu Miura, and Prof. Masaru Yamazaki also held discussions. This led to a further acceleration of research and development of seismic isolation in the general construction companies.

In 1980, the yen appreciated and trade friction began. In 1981, through an introduction from Dr. Yoshikazu Kitagawa, Dr. S. Yamaguchi and his colleagues visited the William Clayton Building, named after New Zealand's first architect. At this time they met R.G. Tyler, who was researching steel materials, and got the idea for steel

dampers.

In 1984, the Tada Laboratory constructed a two-story reinforced concrete seismic isolation building at the Unitika Toyohashi Plant and subjected it to vibrations. This was the first experiment to see actual behavior directly.

The laminated rubber bearings used at that time were $\phi 300$ natural rubber bearings and used square steel bar dampers, and these were also served as an operational tests.

The Building Center of Japan began assessing seismic isolation structures in 1985.

Around that time, Prof. H. Tada, Dr. S. Yamaguchi and others tried to set up a committee on seismic isolation systems within the Architectural Institute of Japan (AIJ), but Prof. Sukenobu Tani, then chairman of the Structural Standards Committee, and others felt it was premature, so it was decided to set up a subcommittee, and the Subcommittee on Seismic Isolation Systems was established in 1986.

The subcommittee consisted of about 40 members, including Prof. H. Tada, Dr. S. Yamaguchi, Aizawa Satoru, Prof. Akiyama Hiroshi, Yoshihisa Atobe, Mao Iizuka, Prof. Tatsuji Ishimaru, Obata Manabu, Prof. Tsuneo Okada, Nobuyuki Ogino, Nagahide Kani, Yorimasa Katano, Prof. Jun Kanda, Prof. Shigeya Kawamata, Dr. Y. Kitagawa, Haruyuki Kitamura, Masayuki Kimizuka, Prof. Tadaki Koh, Ikuo Shimoda, M. Sukagawa, Tetsuo Suzuki, Prof. Mineo Takayama, Dr. Toru Takeuchi, Dr. T. Teramoto, Masaki Todo, Tsuguo Torii, Susumu Nakagawa, Kiyoshi Nagai, Prof. Sumio Nagahashi, Ichiro Nishikawa, Prof. Toshio Nishimura, Yasunori Hashimoto, Hisami Hasegawa, Kunio Hayakawa, Teruo Matsutani, Yoshikatsu Miura, Mitsuo Miyazaki, Prof. Hideo Moriya, Prof. M. Yamazaki, Toshikazu Yoshizawa, Prof. Akira Wada, and Atsushi Watanabe, and they engaged in lively discussions on the design, construction, and maintenance of the buildings and equipment.

In the same year, the "Tohoku University Seismic Isolation Demonstration Test Building" was constructed at Tohoku University Campus. The bubble period began around 1986.

In 1989, the consumption tax was raised to 3%, and the "Design Guidelines for Seismic Isolation Structures" was published.

Founding of the JSSI

In 1988, the founding of the Seismic Isolation Structure Association was proposed to the Seismic Isolation Structure Subcommittee of the Architectural Institute of Japan, but it was shelved as it was premature.

The bubble economy collapsed around 1991.

After that, by the energetic activities of Mitsuru Sugisawa, the first Association (JSSI) Founding Preparatory Meeting was held in June 1992, with 13 people participating. This year, the Founding Preparatory Working Group was launched as a preparation period for the founding of the Association, and Mitsuru Sugisawa was particularly dedicated to organizing the name of the Association, the significance of its founding, operations, membership types, membership fees, articles of incorporation, inspection, performance evaluation, maintenance, and patent-related matters for seismic isolation devices, as well as creating an Association pamphlet.

The following spring, 1993, the draft of the founding prospectus, organization, articles of incorporation, operating rules, business plan, budget, officers, committees, and secretariat was finalized.

The founding general meeting of JSSI and board of directors meeting were held on June 17, 1993, at the Steel Building with 44 attendees.

Prof. H. Umemura was elected as President, Hitoshi Kunigo, Dr. S. Yamaguchi, and Dr. T. Takeda as Vice-President, and the JSSI was launched with 39 directors and 2 auditors. In addition, Prof. A. Wada was elected as technical committee chair, T. Takayuki as standardization committee chair, M. Sukagawa as public relations committee chair, Dr. S. Yamaguchi as steering committee chair, and Toshihisa Hatayama as commissioned accountant. The minutes of the meeting were signed by T. Teramoto and N. Kani. There were 48 full members, 8 academics, and 3 associate members.

Activities after establishment

After the establishment, it was decided to set up several committees to grasp the current state of seismic isolation technology and develop it for the future.

The technical committee (chairman: Akira Wada) set up the Isolator WG (chief: Mineo Takayama), Damper WG (chief: Nobuyoshi Murai), Schematic Design WG (chief: Yasuyoshi Hitomi), and Superstructure/Foundation

WG (chief: Hiroshi Yamamoto), as well as the Standardization Committee (chairman: Takayuki Teramoto), Apartment Complex Special Committee (chairman: Yoshinao Yamatake), Maintenance and Management Business Committee (chairman: Yoshikatsu Miura), and Business Planning Committee (chairman: Nagahide Kani). In addition, as public relations activities are essential for the spread of seismic isolation, the Public Relations Committee (chairman: Masaru Sukagawa) immediately began its activities and published the first issue of the journal.

In order to run the association, an Executive Committee (chairman: Yamaguchi Shoichi) was established, and members of the committee included Akiyama Hiroshi, Atobe Yoshihisa, Arita Koki, Ogawa Yuichiro, Ogura Keiji, Obata Manabu, Ono Tetsuro, Kani Nagahide, Sukagawa Masaru, Sugisawa Mitsuru, Suzuki Tetsuo, Sera Kosaku, Teramoto Takayuki, Nishikawa Ichiro, Harada Naoya, Miura Yoshikatsu, Miyazaki Mitsuo, Murai Nobuyoshi, Yamatake Yoshihisa, and Wada Akira.

The second phase

The second phase began around 1990, and the Toshin 24 Omori Building (now Villa Omori Building), a mid-story seismic isolation building with fireproof coating on the seismic isolation device, was constructed in front of JR Omori Station.

In 1991, Prof. H. Tada, Prof. M. Takayama, and Keiko Morita carried out a compression fracture test on an actual laminated rubber bearing using an 8,000-ton press machine at Mitsubishi Heavy Industries Nagasaki Shipyard & Machinery Works.

Seismically isolated condominiums began to appear.

In 1994, the JSSI organized tours at the Showa Electric Wire & Cable Sagami-hara Plant and the Bridgestone Yokohama Plant, where engineers learned about the manufacturing process of laminated rubber bearings.

This led to tours later becoming one of the JSSI's activities.

Survey of seismically isolated buildings in the Northridge earthquake

In April 1994, the JSSI received information that seismic isolation structures had been effective in preventing earthquakes in the Northridge earthquake in the United States, and decided to send its first survey team to the site. About 20 people went there to survey existing and under-construction seismic isolation buildings.

Team leader Prof. A. Wada, deputy leader Dr. S. Yamaguchi, Naoyuki Iwabe, Kaoru Ueno, Fumiya Osugi, Yasuyuki Onsho, Hironobu Kato, N. Kani, Sumio Kawaguchi, Prof. Satsuya Soda, Mitsuo Nakayama, Yasunori Hashimoto, Rie Hirabayashi, Yasuyoshi Hitomi, Ichiro Nishikawa, Mitsuo Miyazaki, Dr. Keiko Morita, and Prof. M. Yamazaki visited EERC, Richmond.

At the EERC, JSSI party exchanged information with Masahiko Higashino, Masayoshi Nakajima, Prof. James Kelly, Ian Aiken, Peter Clark, Andrew Whittaker, Anoop Mokha, Roland Sharp SEAONC (Structural Engineers Association of Northern California), Ronald Mayes, DIS and visited Oakland City Hall, San Francisco Main Library, and the U.S. Court of Appeals. The next day, party visited the Kaiser Computer Center and USC University Hospital, which continued medical activities even after the earthquake, and spoke with medical personnel. Party visited the Emergency Operation Center, Fire Command & Control Facility, and Kerckhoff Hall UCLA Campus, and then visited the Veterans Affairs Medical Center, which is currently undergoing seismic retrofitting, and met with the hospital director. He spoke passionately about "This seismic retrofit is being carried out for the sake of our hospitalized patients, their families, and their descendants."

JSSI party met with doctors at Olive View Hospital, which has a seismic-resistant structure that sustained significant damage from the earthquake, and asked them about the situation during the earthquake.

Seismic Isolation Forum

The first Seismic Isolation Forum was held in August 1994 at the AIJ Hall, inviting researchers from the United States. The forum was hastily organized at the suggestion of Prof. H. Tada, and the organizers Prof. H. Akiyama and K. Morita worked hard to prepare and successfully hold the forum.

From the US side, Dr. I. Aiken and Peter Clark from the James Kelly Laboratory at the University of California, and David Volkinburg from DIS, a laminated rubber manufacturer, gave speeches.

At this time, the seismic isolation retrofit plan for the 28-story Los Angeles City Hall was also explained.

Lectures were given from the Japanese side by Chair Prof. K. Umemura, Dr. S. Yamaguchi, N. Kani, Prof. H. Tada, A. Wada, H. Yamamoto, Prof. M. Takayama, Nobuyoshi Murai, and Yasuyoshi Hitomi, and also a Japan-US panel discussion entitled "Approach to Seismic Isolation Structures" was held with Dr. S. Yamaguchi as moderator, and included Yoshinao Yamatake, Dr. Mitsuru Uryu, Shigeo Minewaki, Prof. M. Takayama, and three others from the US.

In 1994, the Matsumura Gumi Technical Research Institute-Research Building and the Ministry of Posts and Telecommunications West Building were constructed in Kobe.

Prof. Masaru Kikuchi also presented a "Model of the Restoring Force of Laminated Rubber Bearings."

Around this time, the country was forced to respond to the IT revolution in an era of declining birthrates and an aging population.

The third phase

In 1995, the Southern Hyogo Prefecture Earthquake (M7.3) occurred. The seismic isolation buildings in Kobe City proved effective. In autumn of this year, the number of seismic isolation buildings increased rapidly.

Prof. A. Wada, H. Yamamoto and others took the lead in holding "Introduction to Seismic Isolation Structures" seminars nationwide.

The Construction Working Group (Chief: Kiyoshi Tanaka), the Maintenance Committee (Chair: Yoshikatsu Miura), the Special Committee on Infrastructure Development for JSSI (Chair: Tetsuo Suzuki) to solidify the foundation of the JSSI, the Business Planning Committee (Chair: N. Kani), and the Apartment Complex Special Committee (Chair: Yoshihisa Yamatake) to promote seismic isolation of condominiums were established.

In 1996, the first seismic isolation hospital, "Hoshigaura Hospital," was completed in Kushiro City.

At the Central Research Institute of Electric Power Industry, Dr. Katsuhiko Ishida and others conducted a fracture experiment on a $\phi 1600$ laminated rubber bearing in the "FBR Seismic Isolation System Verification Test."

The Committee on Incorporation (Chairman: Manabu Obata) was established, and the JSSI decided to aim to become an incorporated association instead of a voluntary organization.

The Technical Standards Manual Development Working Group (Chief: Masayuki Kimizuka), the Software Development Working Group (Chief: Naoya Harada), and the Architectural Details Working Group (Chief: T. Teramoto) were established.

In preparation for the design of seismically isolated buildings, Technical Standards Preparation Committee (chair: Prof. A. Wada, committee members: Kani Nagahide, Prof. Masaru Kikuchi, M. Sugisawa, Prof. M. Takayama, Kiyoshi Tanaka, Takayuki Teramoto, Ichiro Nishikawa, Yasuyoshi Hitomi, Y. Miura, Tatsuji Yamazaki, H. Yamamoto, T. Yoshizawa and others) was established, and they quickly created the "Technical Standards for the Design of Seismic Isolation Structures (Draft)." This became the basis for the later Ministry of Construction Notification No. 2009, 2000.

Maintenance Standards Working Group (Chief: Yasukazu Nakamura) and Maintenance Project Working Group (Chief: Juichi Kimura) were also established.

In April 1996, the Project Planning Committee dispatched the second US Seismic Isolation Structure Investigation Team to visit buildings under construction or completed with local engineers to learn about the design concepts and construction methods of American seismic isolation structures, and to contribute to the future development of seismic isolation structures in Japan.

The team consisted of 30 members, including Prof. A. Wada, Yoshihisa Atobe, Hiroshi Okashiro, Yasuyuki Onsho, Naoki Kato, N. Kani, Hiroyuki Kyoshima, Koji Kubo, Miwa Saito, Hajime Saito, Shigenobu Suzuki, Satsuya Soda, Prof. M. Takayama, Shiro Tatara, Kiyoshi Tanaka, Toru Tsuchihashi, Seiji Tomishima, Tsuguo Torii, I. Nishikawa, Shunji Makihara, Nobufusa Yanagisawa, and H. Yamamoto.

They visited the Kaiser Data Center, the San Fernando Law & Justice Center designed by Prof. James Kelly, the San Bernardino County Medical Center by Saif Hussain, SHA, the Santa Clara County Civic Center, and San Francisco City Hall by Paul Rodler, Forell/Elsesser.

On the last day, they had a technical exchange with US engineers. Participants were Dr. Andrew Whittaker and

Dr. Ian Aiken from UCB/EERC, Dr. Ron Mayes, president of DIS, Paul Rodler and Mason Walters from Forell/Elsesser, Roland Sharpe and Jane Sharpe from SEAONC, Chris Rojahn from ATC, and Saif Hussain from SHA.

In 1997, when the consumption tax was raised to 5%, a construction site tour was held for Uniheim Yamazaki, with eight seismically isolated apartment buildings in Shimamoto-cho, Mishima-gun, Osaka Prefecture. This was the first such tour in the Kansai region, and 145 people attended. A tour was then held in Rokko, and continues to this day.

The Maintenance Standards Working Group presented a "Draft Maintenance Standards for Seismically Isolated Buildings." The Committee on Incorporation submitted an "Application for Incorporation" to the Building Guidance Division of the Ministry of Construction.

In 1998, the first seismically isolated retrofit in Japan was carried out at the National Museum of Western Art (completed in 1959). The first seismic isolation questionnaire for residents of Uniheim Yamazaki conducted.

The JSSI organized "Investigation of seismically isolated Structures in Italy."

This was the same year that ICHIJO Co., Ltd. began selling seismically isolated houses.

In 1999, Placed in site Specimen Development WG of the Technical Committee' (Chief: Kunio Hayakawa) conducted "Questionnaire on Placed in site Specimens.

Vibration Analysis Software WG (Chief: Naomi Sakai), Design Example Creation WG (Chief: Hikaru Hirama), Laminated Rubber Bearings WG (Chief: Prof. Taiji Matsuda), Damper WG (Chief: Osamu Tsujita), Media WG (Chief: Yoshihisa Atobe) to enhance JSSI HP, Building and Equipment Design WG (Chief: Takashi Ukita), and Seismic Isolation Housing Committee (Chair: Akinobu Nakazawa) for the development of seismic isolation of detached houses were also established. Dissemination subcommittee (Chair: Masaru Kikuchi) was also established to train engineers and held permanent training course about four times a year.

Performance Evaluation WG of Technical Committee (Chief: Naoyuki Iwabe) and Experimental WG (Chief: Prof. M. Takayama) conducted "Offset Shear-Tension Tests of Laminated Rubber Bearings".

Kazuhiko Kasai visited the office and requested the establishment of the Response Control Committee, consulting with Dr. S. Yamaguchi and Dr. T. Takeda, vice presidents.

The committee became the Response Control Committee (Chair: Prof. Kazuhiko Kasai) in February 2000, and Prof. Akira Nishitani, Nagahito Kibayashi, Yuichi Kimura, Yoshihito Saito, Dr. Toru Takeuchi, Yasukazu Tsuji, Dr. Ichiro Nagashima, Hiroshige Mori, and others began vigorous activities.

In 2001, the Response Control Committee was established as a subcommittee of the Technical Committee, and in March of the same year, the Viscoelasticity WG (Chief: Kazuhisa Ishikawa) was formed.

In March of the same year, the Viscoelasticity WG (Chief: Kazuhisa Ishikawa), the Quality Standards Subcommittee for Vibration Control Members (Chair: Masahito Kibayashi), the Design WG (Chief: Y. Tsuji), and the Active Vibration Control Evaluation Subcommittee (Chair: Prof. Akira Nishitani), the Viscous WG (Chief: Sumio Kawaguchi), the Vibration Control Member Analysis WG (Chief: Prof. K. Kasai), the Basic Design WG (Chief: Dr. Toru Takeuchi) and the Passive Vibration Control Evaluation Committee (chair: Prof. K. Kasai) were formed in April. (In August, the Oil WG (Chief: Toshiaki Kamei) and the Steel WG (Chief: Yasuhiro Nakata) expanded their activities in rapid succession.

Establishment of Incorporated Association

In 1999, as a result of the Incorporation Committee, the JSSI under the Guidance Division of the Housing Bureau of the Ministry of Construction became the last incorporated association.

At this time, the directors of the voluntary association were split in two, with directors, auditors, and trustees, and each regular member had one vote.