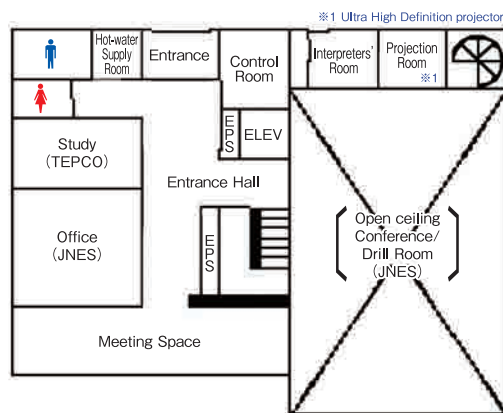


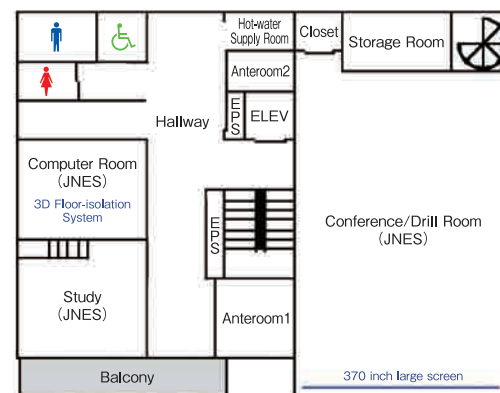
## History

July, 2007	Niigataken Chuetsu-Oki Earthquake (M <sub>JMA</sub> 6.8)
July, 2009	Niigata Institute of Technology (NIIT) was adopted as "The state-of-the-art innovation base management project" by Ministry of Economy, Trade and Industry.
December, 2009	Research Conference was established by NIIT, Tokyo Electric Power Company (TEPCO), Japan Nuclear Energy Safety Organization (JNES)
November, 2010	Nuclear Seismic and Structural Research Center building was completed. JNES established "Kashiwazaki Seismic Safety Center" in NIIT Nuclear Seismic and Structural Research Center. The open tour of Nuclear Seismic and Structural Research Center (organized by NIIT,TEPCO and JNES) The open seminar on nuclear seismic safety(organized by NIIT) The 1st Kashiwazaki International Symposium on Seismic Safety of Nuclear Installations (Organized by JNES/IAEA, Cooperated by NIIT and TEPCO)
December, 2010	The open tour of Nuclear Seismic and Structural Research Center(organized by NIIT)
December, 2011	The IAEA Workshop on Public Communication on Nuclear Safety against External Events (hosted by JNES, Cooperated by NIIT)
November, 2012	The 2nd International Workshop on Seismic Observation in Deep Borehole and Its Applications (Co-Hosted by IAEA/ISSC,OECD/NEA,JNES, Cooperated by NIIT and TEPCO) The open seminar and the open tour of Nuclear Seismic and Structural Research Center (organized by NIIT)
January, 2013	NIIT was registered as a Donor organization by IAEA.
April, 2013	NIIT established "Nuclear Safety Creation Center".

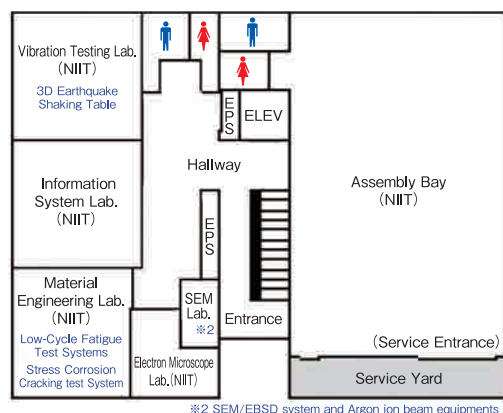
## Floor map



1F



B1



B2

### Contact

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# Niigata Institute of Technology Nuclear Seismic and Structural Research Center



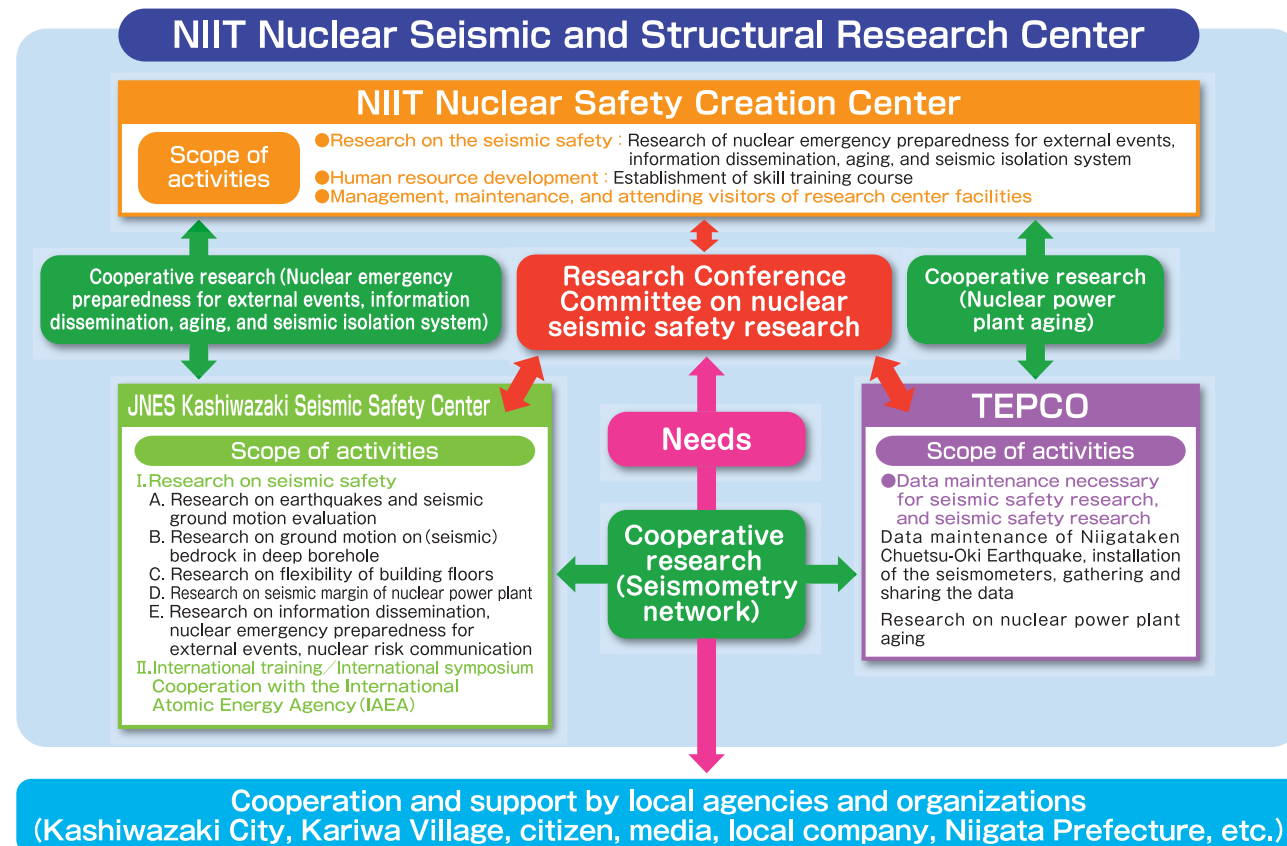
Niigata Institute of Technology Nuclear Seismic and Structural Research Center promotes research of the seismic safety of nuclear installation with cooperation by industrial, administrative and academic sectors (TEPCO, JNES, NIIT), accumulation of the output of research, dissemination inside and outside Japan, development of human resource.

The building and the main R&D facilities of the research center were subsidized by Ministry of Economy, Trade and Industry in FY2009.



# Framework of Nuclear Seismic and Structural Research Center

NIIT Nuclear Seismic and Structural Research Center conducts the most advanced research in the fields such as seismic, structure, etc. concerning nuclear safety, gather and analyze the newest knowledge and information. The center performs international cooperation such as international joint research and promotion of human resource development, and contributes to the development of technologies on nuclear safety.



# Human resource development

In the research center, we perform human resource development of engineers in Japan and overseas, and tour for the general public.



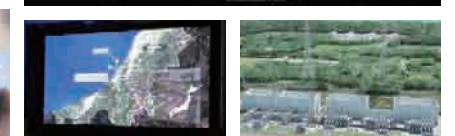
At Conference/Drill room, it is equipped fully with a 370-inch large-sized screen (one set) and a 120-inch screen (two sets), and it can conduct workshop, training, a demonstration, etc. The research center is also equipped with the interpreters' room, an environment able to translate simultaneously in an international conference.



JNES conducts seismic safety training for the nuclear newcomer countries mainly in Asia. As a part of the training, the research center supports activities, such as training using three-dimensional VR (virtual reality), courtesy visit to Kashiwazaki City and Kariwa Village, and tour of TEPCO Kashiwazaki-Kariwa Nuclear Power Station, etc.

## The contents of training and tour

- Training with the image using three-dimensional VR (virtual reality) technology
- Three-dimensional seismic isolation floor system, 3000-m depths earthquake ground motion observation, three-dimensional permanent magnet seismic-waves shaking table, etc.



JNES introduced visual system which can have a virtual experience of the nuclear power plant, such as an inspection by the "walk down"<sup>(note1)</sup>. This system is created by three-dimensional VR (virtual reality) technology. The components of the following 3 themes are combined according to the training purpose, and training with the textures and the massive in accordance with acquisition of the on-site knowledge can be performed with super high-definition image using the 370-inch large-sized screen and Ultra High Definition projector with resolution 4 times as large as High Definition in the Conference/Drill room.

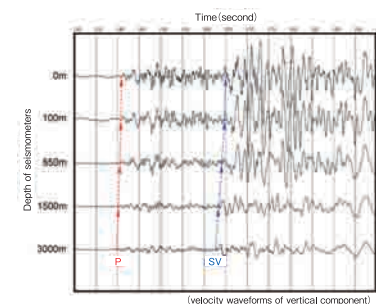
theme I Behavior and assessing the integrity of a nuclear power plant at the time of earthquake  
theme II Patrol and inspection of nuclear power plants immediately after the earthquake  
theme III Implementation of measures and ensure the integrity of equipment after the earthquake

note1 Fact-finding survey by on-site investigation and hearing, etc.

# Research topics

Three organizations cooperate mutually and conduct joint research in the research center.

The center's various activities are planned and advised by the Research Conference and the Committee consisting of outside experts along with plan-do-check-act cycle.



A boring up to depth of 3000 meters has been completed, and observation started since June, 2012. Above figure shows example of seismogram recorded by borehole seismometer.

JNES developed seismic observation system in deep borehole in order to confirm the details of the results obtained from the analysis relating to ground motion amplification found during the Niigataken Chuetsu-oki Earthquake in 2007. JNES research underground structure and physical property of basement using core sampled from deep boring, and propagation property of ground motion using seismograms collected by borehole seismometers. JNES installed 28 seismograph stations in the square 6 km on a side centered at NIIT campus, and is collecting ground motion records.

<Three achievements of state of the art technological development>

- (1) Technology of installing multi seismographs (cascade type seismograph) in one borehole
- (2) The seismograph which can be used under high-temperature and high-pressure (below 150°C, 30MPa) environment
- (3) Seismograph with recordable broadband frequency range



Three-dimensional seismic isolation floor system is installed, and joint research is performed by NIIT and JNES.



It is very important to evaluate the seismic margin of aging components considering loading conditions due to severe earthquakes such as Niigataken Chuetsu-Oki Earthquake. NIIT introduced experimental apparatus such as low-cycle fatigue testing system. NIIT continues to conduct researches cooperating with JNES to advance the evaluation method of crack growth for cracked pipes subjected to severe seismic loads. The outcome of the researches will be used in the seismic safety evaluation of aging components.



IAEA/ISSC head, Sujit Samaddar (left) / NIIT Professor, Eiichi Sato (right).



NIIT expressed participation in IAEA/ISSC's<sup>(note1)</sup> Extra-budgetary programme (EBP), and aim at the application to the local nuclear emergency response in Japan of TiPEEZ<sup>(note2)</sup> at EBP meeting of January, 2013. It is expected that the achievement will be shared globally through IAEA.

note1 International Seismic Safety Centre  
note2 "Protection of nuclear power plants against tsunamis and post earthquake considerations in the external zone" prepared by JNES/IAEA



JNES and NIIT have created information dissemination system (Framework, Means, and Contents) to inform seismic safety information (including risk) accurately and easily understandable manner to local residents (Kashiwazaki-Kariwa residents) and Japanese citizens, taking into consideration of external phenomena hazards, such as an earthquake and tsunami. This system is being developed based on challenges and lessons learned from Chuetsu-Oki Earthquake, Tohoku Region Pacific Coast Earthquake, tsunami and Fukushima Daiichi nuclear disaster.

