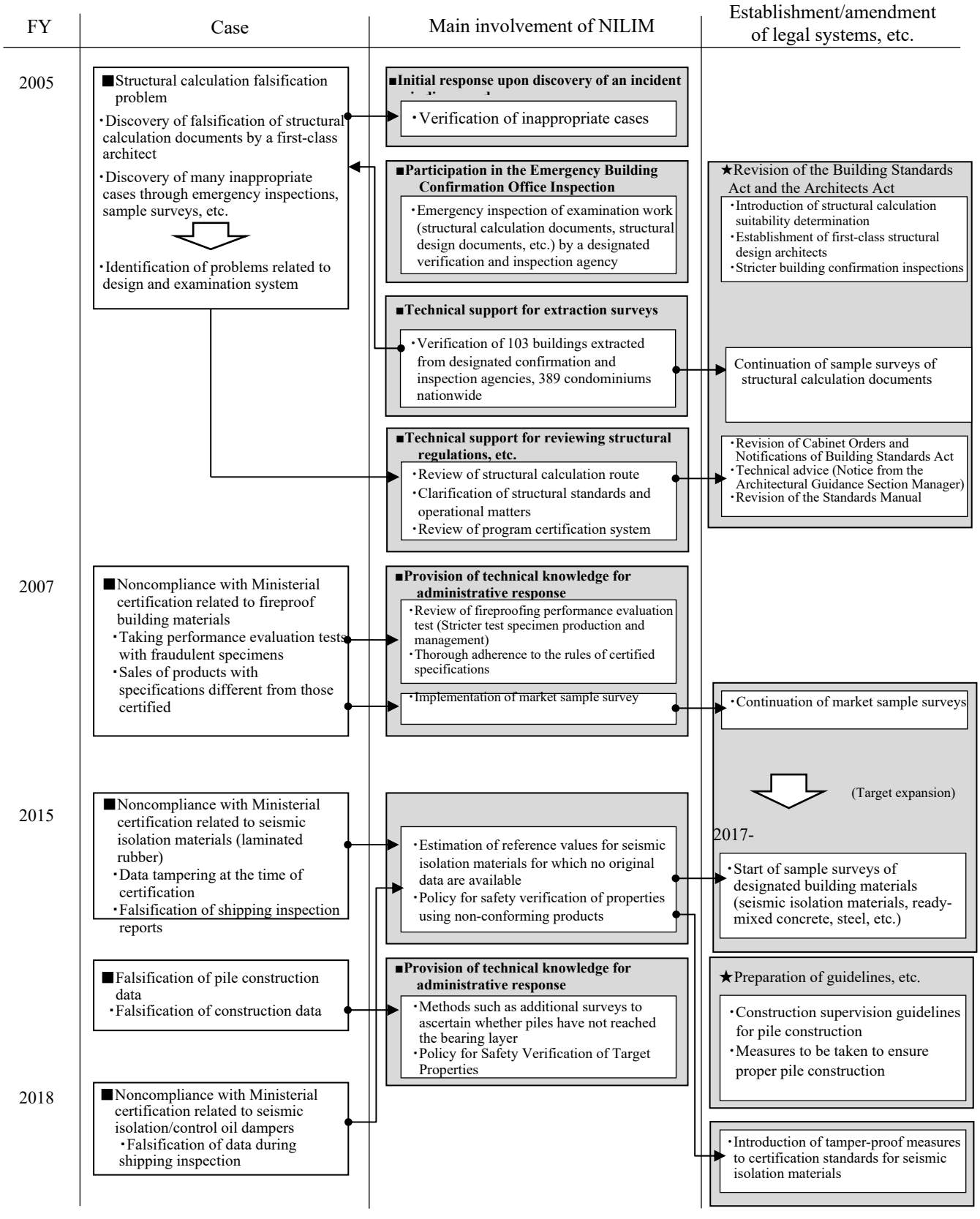
Compliance with building standards (technical assistance in responding to noncompliance cases)

1. Outline of Research and Activities



The Building Standards Act establishes a wide range of technical standards as the "minimum standards" for buildings, including general structures (lighting, soundproofing, hazardous substances, etc.), structural strength, fireproofing, evacuation facilities (smoke exhaustion, emergency stairs, etc.), building equipment, etc. In principle, new buildings and renovations must comply with these standards.

In particular, technical standards for structures and fireproofing are important standards that directly affect the lives of people who use the building. Since the establishment of NILIM, a number of incidents such as structural calculation falsification, noncompliance with Ministerial certifications related to fireproof building materials and seismic isolation materials, and falsification of pile construction data have been uncovered through emergency inspections, sample surveys, and so on. These incidents became major social problems because they started with buildings used for condominiums and structural members widely distributed in the market, which affected many households and spread to many other buildings.

After each of the above incidents was uncovered, MLIT was required to take prompt and appropriate administrative action with regard to the following matters.

① Verification of individual cases (identification of nonconformity criteria, organization of conformity judgment criteria, and confirmation method of "immediate safety")

② Understanding the scope of impact of the problem (e.g., sample survey, screening, safety verification policy, etc.)

③ Consideration of measures to prevent recurrence (review of standards and operations, etc.)

NILIM has been providing technical expertise to MLIT when making decisions at various stages at the request of the Ministry, and has continued to provide technical support to ensure that the effectiveness of measures to prevent recurrence is maintained on an ongoing basis. In providing technical support, we have always collaborated with the Building Research Institute.

2. Main research results

(1) Problem of falsified structural calculations (2005)

[Discovery of the incident and emergency inspection]

In 2005, a first-class Kenchiku-shi (architect) and structural designer falsified the calculations attached to the building permit applications, resulting in the construction of numerous condominiums, hotels, and other structures with low reinforcing steel and other structural capacity problems. NILIM provided technical support for the verification of the structural calculations and structural design documents at the request of the Housing Bureau of MLIT from the early stages of the case. After the public announcement of the problem, NILIM building structure researchers participated as members of the Emergency Building Inspection and Inspection Headquarters established by the Housing Bureau, and provided support for emergency inspections (structural calculation documents, structural design drawings, etc.) at the private sector inspection agencies designated by MLIT.

[Sample survey and issue ripple effects]

In addition, a sample survey of the structural calculation sheets was conducted for those with relatively severe design conditions in order to determine the extent of the impact of the problems in this case. NILIM, in cooperation with academic experts and structural practitioners, checked the calculation contents of 103 buildings extracted from designated confirmation and inspection agencies and 389 condominiums and other buildings nationwide against the documents and recalculations. As a result, only about 1% of the buildings were judged as not being earthquake resistant, but about 24% and 13% of the buildings were found to have errors in the structural calculations, even if they were earthquake resistant. Most of these "errors" were caused by modeling of structural calculations that did not match the actual conditions, which had been left to the judgment of the designers, etc. The issue of how to prevent inappropriate judgments by structural designers, in addition to the prevention of falsification, was also raised.

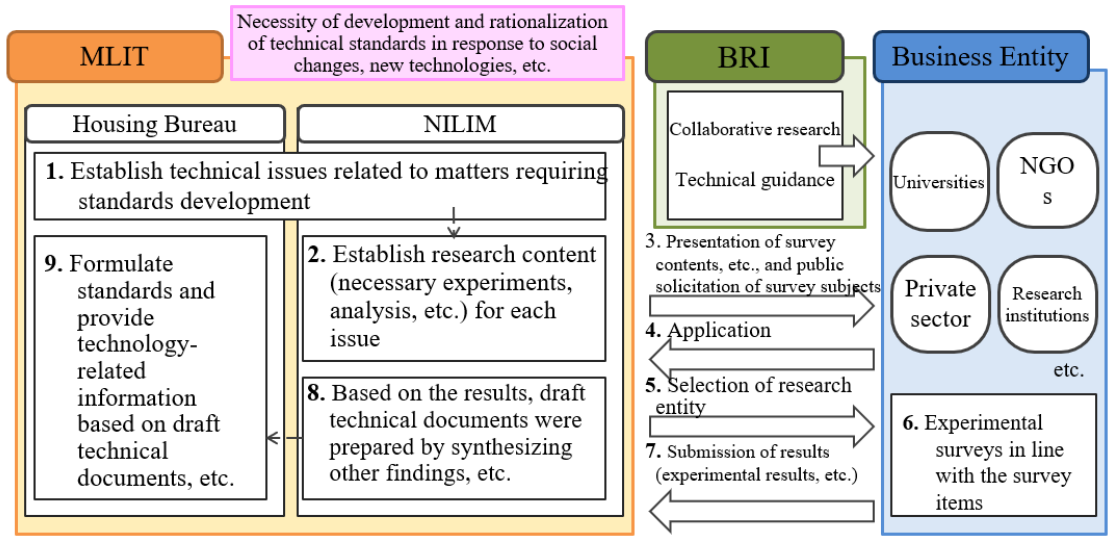
The revision of technical standards necessary for appropriate structural calculations was also discussed in the Building Standard and Examination Guidelines Review Committee established by the Housing Bureau. In order to clarify the concept of the regulations and eliminate any blurring of judgment, it was decided to comprehensively organize the descriptions in the many notices and standard commentaries that had been in operation up to that point and incorporate them into the structural standards. In addition, a new certification system was established to prevent falsification by using an integrated calculation program. NILIM provided full cooperation in the study, and concrete work was carried out based on the basic policy of "allowing structural design methods that have been properly implemented in the past to be followed as they are, and eliminating only those that are inappropriate."

[Continuation of sample surveys and creation of a project to promote building standard development]

Furthermore, a system to periodically extract structural calculation documents for recalculation and other checks (structural calculation document sample survey) has been developed, and items that are easily misunderstood by designers or for which information for proper design is lacking are being sorted out.

In the process of clarifying the regulations, it also became clear that there were items for which there was insufficient research accumulation to answer many questions in structural design. In order to accumulate and organize the necessary technical knowledge, the Housing Bureau established the "Building Standard Development Promotion Project" in FY2008. In this project, the Housing Bureau and NILIM solicit applications for the necessary experiments and other data and technical expertise to be collected for the development of building standards, as shown in the figure below, and provide fixed-amount subsidies for the cost of these activities. NILIM is in charge of setting technical issues related to matters that need to be standardized in the implementation of the project, setting specific survey contents for each issue, and preparing draft technical standards by synthesizing the results of the issues and other findings.

Business Flow



Flow chart of the project to promote the development of building standards

(2) Ministerial certification noncompliance issues related to fireproof building materials (2007)

[Outline of the case]

In 2007, a manufacturer of fireproof building materials was found to be taking performance evaluation tests with fraudulent specimens and selling products with specifications that differed from those approved by the Ministry.

[Involvement of NILIM]

NILIM provided technical expertise in reviewing fireproof performance evaluation tests (tightening the production and

management of test specimens) and in enforcing the rules for certification specifications, in cooperation with the Subcommittee on Fireproof Certification established by the Housing Bureau.

In addition, NILIM continues to provide technical advice in sample surveys including selecting survey targets, attending surveys and tests, analyzing survey results, and determining the validity of the results.

(3) Ministerial certification noncompliance issues related to seismic isolation materials and components (2015, 2018)

[Outline of the case]

The issue of noncompliance with Ministerial certification for seismic isolation materials and components, which came to light in 2015 and 2018, is a case in which a person in charge of the manufacturing company rewrote the data at the time of authorization for laminated rubber bearings and the data at the time of the shipment inspection for seismic isolation/control oil dampers, respectively, and falsified the consistency with past production data. In both cases, in addition to the problem of the certification system that failed to detect the falsification, the standard values of the performance (stiffness and damping) of the shipped products differed from those in the Ministerial certification, and therefore, the identification of the materials actually installed in individual buildings and their standard values (deviation from the range of variation in the certified values) became a problem when verifying the safety performance.

[Involvement of NILIM]

NILIM also collaborated with the Third-Party Committee on Seismic Isolation Materials and the External Expert Committee on Seismic Isolation Materials and Seismic Response Control Members established by the Housing Bureau, and provided technical expertise in developing policies for safety verification of properties where nonconforming products were used, and in estimating the reference values for seismic isolation materials for which the original predisguised data were not available.

In addition, to prevent recurrence, the introduction of measures to prevent falsification of test data has been positioned in the certification standards, and from FY2021, only seismic isolation materials that have undergone such improvement measures may be used in newly constructed seismic isolation buildings. NILIM also provided technical expertise on these operations.

(4) Falsified data on pile construction (2015)

[Outline of the case]

In the pile construction data falsification issue that came to light in 2015, insufficient bearing capacity (i.e., the base of piles not reaching the bearing layer) was initially suspected based on a phenomenon that appeared to be building settlement, but as the safety verification process proceeded, it was discovered that personnel at the pile construction company had misused the construction data for confirming that the piles reached the bearing layer and the construction status of the pile base. Here, problems with the multilayered contracting system of the construction industry (lack of decision-making rules between the parties), which is not limited to individual properties, were also pointed out.

[Involvement of NILIM]

NILIM also collaborated with the “Task Force on Foundation Gouging Problems” established by the Land and Construction Industry Bureau and the Housing Bureau of MLIT, and provided technical expertise in the formulation of methods for additional investigation to determine whether the piles had reached the bearing layer, evaluation methods for the investigation results, and safety verification policies reflecting those results in structural calculation modeling, etc., as well as in determining the validity of the results of analysis, etc. reported by the operator to MLIT.

3. List of Related Reports and Technical Documents

1) Enforcement of structural notifications related to laws that partially amend the Building Standards Act, etc. to ensure the safety of buildings (technical advice) (June 20, 2007; August 10, 2007) Partially revised, Kokushu Directive No. 1335
https://www.mlit.go.jp/jutakukentiku/build/kensetu.files/18kaisei/jogen03.pdf

2) Summary of measures to prevent recurrence of inappropriate fireproofing certification (draft) (December 11, 2008, Fireproofing Certification Subcommittee, Basic System Subcommittee, Building Subcommittee, Social Infrastructure Development Council)
https://www.mlit.go.jp/common/000029129.pdf

3) Third-party committee report on seismic isolation materials (July 29, 2019)
https://www.mlit.go.jp/common/001098850.pdf

4) External Expert Committee Report on Seismic Isolation and Damping Materials (March 27, 2019)
https://www.mlit.go.jp/common/001282396.pdf

5) Regarding the immediate safety verification method in the investigation of buildings using seismic isolation/control oil dampers manufactured by KYB Co., Ltd. and Kayaba System Machinery Co., Ltd. (December 19, 2018, Housing Bureau of the Ministry of Land, Infrastructure, Transport and Tourism) Guidance Division Administrative Contact)
https://www.mlit.go.jp/common/001266288.pdf

6) Interim report of the task force on the foundation pile construction issue (December 25, 2015)
https://www.mlit.go.jp/common/001114896.pdf