Internal Ex-Post Evaluation for Technical Cooperation Project

conducted by China Office: October 2017

Country Name	**Human Resource Development Project for Seismic Engineering and Construction of Buildings**
People' Republic of China	

I. Project Outline

Background	A big earthquake occurred in Sichuan Province, China on May 12, 2008, which caused more than 87,000 deaths and missing people, damage of 6,020,000 houses collapsed, and many of the victims were under the wreckage of the collapsed buildings. In the Japan-China summit held in June of the same year, both countries agreed on the cooperation in the areas of (1) health and welfare, (2) society and culture, (3) industry and employment, (4) disaster prevention, and (5) community development, based on the experience of the Great Hanshin-Awaji Earthquake of Japan. With regard the area of community development, there were issues such as (a) the national standard for seismic construction which were not sufficiently reflected in the actual design, (b) insufficiency of the seismic technicians and (c) lack of building regulations for appropriate design which enables appropriate construction works. Under such circumstances, technical support for capacity building of seismic technicians and government officers was requested to the Government of Japan from the Government of China.		
Objectives of the Project	Through development of the curriculum and materials for dissemination of seismic techniques and capacity building of trainers, the project aimed at deepening technicians and related government officers' understandings on seismic techniques, thereby contributing to developing a system for disseminating seismic technologies for buildings which are critically in need of seismic measures in the country, especially rural areas.		
	Overall Goal: The diffusion system of seismic technologies for buildings such as residences, schools and hospitals which are critically in need of aseismic measures in the country, especially in rural areas is developed. Project Purpose: Seismic technicians and related government officers deepen understandings on aseismic techniques through the trainings conducted by the project.		
Activities of the project	1. Project site: Whole country 2. Main activities: Training of trainers for dissemination of aseismic techniques, development of the curriculum and materials, development of the proposals for revision of seismic related guidelines, etc. 3. Inputs (to carry out above activities) as of the terminal evaluation Japanese Side 1) Experts from Japan: 40 persons (5 long-term and 35 short-term) 2) Training in Japan: 305 persons 3) Equipment: PC and other office supplies, etc. 4) Operation cost. Chinese Side 1) Staff allocated: 19 persons 2) Land and facilities: Office space and equipment, communication, electricity, vehicles, etc. 3) Operation cost.		
Project Period	June 2009 to May 2013	Project Cost	(ex-ante) 420 million yen, (actual) 483 million yen
Implementing Agency	Ministry of Housing and Urban-Rural Development (MHURD), China Architecture Design & Research Group (Hereinafter referred to as "Design Group"), China Institute of Building Standard Design & Research (Hereinafter referred to as "Standard Institute")		
Cooperation Agency in Japan	Housing Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, Building Research Institute, Building Center of Japan, Asian Disaster Reduction Center, Tokyo National Research Institute for Cultural Properties, etc.		

II. Result of the Evaluation

[Special perspectives considered at the ex-post evaluation]

- Since revision of the guidelines on seismic reinforcement techniques and seismic design is planned around 2020, it was not appropriate to verify achievement of Indicator 2 of the Overall Goal set in PDM "Fact and contents of revision of necessary seismic related guidelines" at the time of the ex-post evaluation. Therefore, at the ex-post evaluation, the future prospect for the revision of related guidelines is analyzed. As supplementary information for Indicator 2, it was investigated at the ex-post evaluation if the "Recommendations for revision drawn by the project were referred to in the revision process", which was proposed as an alternative indicator at the Terminal Evaluation.

1 Relevance

<Consistency with the Development Policy of China at the time of ex-ante evaluation and project completion>

In the "Wenchuan Earthquake Comprehensive Recovery and Reconstruction Plan" (2008), improvement of housing environment by strengthening disaster prevention capability was taken up. In the "Disaster Prevention and Mitigation Plan in Urban and Rural Buildings based on the 12th Five-Year Plan" (2011-2015), policies include seismic measures for buildings in the rural area and reinforcement of schools, hospitals and big public buildings. Thus, the project objectives were relevant with policies of the government of China at the time of the ex-ante evaluation and project completion.

<Consistency with the Development Needs of China at the time of ex-ante evaluation and project completion>

There were great needs for ensuring earthquake resistance at townships and towns (local government levels), as dissemination and application of seismic techniques for both new and existing buildings were slow. Although measures were being taken for schools and hospitals by the government, there were issues related to dissemination of seismic design, assessment and reinforcement of low- and middle-rise buildings including houses, especially in the rural area. There were still great needs for capacity building of the professionals for dealing with these issues at the project completion.

<Consistency with Japan's ODA Policy at the time of ex-ante evaluation>

In the Japan-China Summit Meeting conducted in April 2009, it was confirmed that Japan would provide assistance for reconstruction under the "One Overall Plan and Five Pillars ((i) Health and Welfare, (ii) Society and Culture, (iii) Industry and Employment, (iv) Disaster Prevention and (v) Reconstruction)", based on Japan's experience from the Great Hanshin-Awaji Earthquake.

Thus, the project was relevant with Japan's ODA policy for China at the time of the ex-ante evaluation.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement for the Project Purpose at the time of Project Completion>

The Project Purpose was achieved. 9,538 persons, more than twice as many as planned, completed general training courses as per each profession. Participants' understandings are judged mostly high based on the questionnaire result, which showed 2.67 for training difficulty, 2.05 for contents clarity and 2.11 for applicability (1 is the best under 5-point scale). On the other hand, there are a few voices which say they still wanted to learn further to apply the learnings in actual works, though they understood the outline. The original cascade method for capacity building (Those trained in the trainings in Japan function as trainers of core trainings, and then those trained in the core training function as trainers of general trainings) was partially changed. Specifically, those trained in the trainings in Japan functioned as trainers in most of the general trainings[1]. It is because 10-day core trainings were not sufficient to develop trainers of general trainings. The other reason is that there was a request to receive general trainings directly from those trained in Japan so as to learn Japanese seismic techniques.

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have mostly continued. 50-79% of the participants of general trainings have continued the work in each organization. According to the Standard Institute, in China, seismic design and assessment and reinforcement works can be conducted only with techniques clearly conforming to the government's guidelines. Judging from the fact that these works have been conducted, it can be said that structural engineers and related administrators who completed general trainings have sustained the gained seismic knowledge and techniques in each organization. The Standard Institute has continuously organized training, symposiums and China-Japan technical exchanges on seismic techniques, and a total of 1,243 engineers have participated in these activities. Furthermore, it has annually conducted 4-5 exchange activities regarding the elderly care model, housing for the elderly, housing parts, interior integration[2], etc. in collaboration with the Urban Renaissance Agency of Japan. Besides, Hangzhou City of Zhejiang Province and the Department of Housing and Urban and Rural Areas of Shandong Province each provided 10 and 19 engineers and researchers with training opportunities in Japan, respectively.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

It is judged that the Overall Goal has been achieved. The number of the cases of seismic design, construction, management and reinforcement conducted by the trained persons could not be confirmed because it was difficult to contact each of their organizations. However, training outputs have been utilized in their works (seismic reinforcement techniques for reinforced concrete buildings with shear panels and brace filling, etc.) and contributed to development of the diffusion system of seismic techniques for public buildings. And, administrative orders for application and dissemination of seismic buildings and vibration control have been developed by the training participants' initiatives in Xinjiang Uighur Autonomous Region, Shandon Province, Sichuan Province, Shanxi Province, which apply Japan's techniques and concepts on seismic design and damping and formats for emergency assessment after earthquakes. Furthermore, it is planned that the national standard "Standard of Architectural Seismic Design," which is being drafted in July 2017, will reflect the project outputs ((i) Methods of design and calculation of the junction of seismic isolation bearings are added in the annex; (ii) Use of the response spectrum method and time history response analysis method[3] are suggested, applying the overall model of seismic structure, etc.) Also in the three national standards which will be revised, the project outputs related to seismic assessment and reinforcement techniques will be partially applied.

<Other Impacts at the time of Ex-post Evaluation>

No negative impact has been confirmed in the natural and social aspects at the time of the ex-post evaluation.

<Evaluation Result>

In light of the above, the project purpose was achieved and the effects have mostly continued. The Overall Goal has been achieved, and several positive impacts have been confirmed. Therefore, the effectiveness/impact of the project is high.

Achievement of the Project Purpose and Overall Goal

<table>
<tr><th>Aim</th><th>Indicators</th><th>Results</th></tr>
<tr><td>(Project Purpose)
Seismic technicians and related government officers deepen understandings on aseismic techniques through the trainings conducted by the project</td><td>1. Number of the trained persons in the country (by profession and rank) and result of the training completion</td><td>Status of achievement: Achieved. (Mostly continued.)
(Project Completion)
- 9,538 persons received general training, against the planned 4,700. The breakdown number by profession was as follows. The breakdown by rank was not available because they were not separately recorded.
<table>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th><th>Total</th></tr>
<tr><td>Seismic design and reinforcement</td><td>6,479</td><td>491</td><td>108</td><td>44</td><td>1,381</td><td>0</td><td>0</td><td>8,503</td></tr>
<tr><td>Administration, Disaster prevention</td><td>97</td><td>17</td><td>262</td><td>7</td><td>5</td><td>3</td><td>0</td><td>391</td></tr>
<tr><td>Quality control for construction</td><td>0</td><td>0</td><td>72</td><td>454</td><td>0</td><td>0</td><td>0</td><td>526</td></tr>
<tr><td>Conservation of historical buildings</td><td>33</td><td>0</td><td>0</td><td>0</td><td>0</td><td>9</td><td>76</td><td>118</td></tr>
<tr><td></td><td>6,609</td><td>508</td><td>442</td><td>505</td><td>1,386</td><td>12</td><td>76</td><td>9,538</td></tr>
</table></td></tr>
</table>

[1] 279 and 324 were trained in the training in Japan and core trainings, respectively. Among them, 35 and 9 functioned as trainers of general trainings, respectively.

[2] Simultaneous conduct of the framework construction and interior work.

[3] Method to calculate the response acceleration, velocity and displacement of each floor, by modeling the building with its weight, spring and attenuation and giving ground motion accelerating over time on the surface.

		A: Structural design engineers of the Institute of Architectural Design, Urban Planning Design Institute and Science Institute of Architecture B: Persons in charge of construction chart examination of the companies of construction chart examination and Construction Chart Examination Affairs Office C: Administrators of Seismic Buildings Affairs Office, Department of Earthquake, Department of Civil Disaster Prevention and Department of Urban Planning D: Persons in charge of construction quality control of the construction quality management stations E: Structural engineers of the management companies, contractors and consulting companies F: University researchers G: Officers in charge of protection of cultural properties and construction - Training participants answers in the questionnaire indicated 2.67 for training difficulty, 2.05 for contents clarity and 2.11 for applicability (1 is the best under 5-point scale). (Ex-post Evaluation) - 50-79% of the participants of the general trainings remain in the same organization, while almost all of the participants of the core trainings remain in related works. - The Standard Institute judge that structural engineers and related administrators have sustained sufficient seismic knowledge and techniques in each organization, since seismic design, assessment and reinforcement works cannot be conducted without techniques which satisfy the guidelines.
(Overall goal) The diffusion system of seismic techniques for buildings such as residences, schools and hospitals which need aseismic measures are critical in the country, especially rural areas	1. Fact and number of the cases of seismic design, construction, management and reinforcement conducted by the trained persons.	Status of achievement: Achieved. (Ex-post Evaluation) - Training participants have applied the learnings in their present current works including the following: 1. Knowledge and techniques were utilized for seismic assessment and reinforcement works of more than 300 schools in Fuzhou City and Ningde District, Fujian Province. 2. Seismic isolation techniques learned from the training were applied in seismic design of two houses in Fuzhou City, Fujian Province as part of the Fuzhou New Continent Project I. 3. Administrative orders were issued through the local administrative sections based on the learning from the training on construction quality control. - The number of the cases of seismic design, construction, management and reinforcement could not be confirmed.
	2. Fact and contents of revision of necessary seismic related guidelines <Supplementary indicator> Recommendations for revision drown by the project are referred to in the revision process	Status of achievement: Achieved. (Ex-post Evaluation) - The project experience is expected to be incorporated in the national standard, "Building Seismic Isolation Design Standard" which is being drafted as of July 2017, related to isolation structural design and isolation buildings. - The project experience will be reflected in part of the "Standard on Architectural Seismic Assessment Techniques" and "Guidelines on Architectural Seismic Reinforcement" which will be revised after 2018. - Administrative orders for application and dissemination of seismic buildings and vibration control have been developed by the training participants' action in Xinjiang Uyghur Autonomous Region, Shandong Province, Sichuan Province, Shanxi Province, etc.

Source: Terminal Evaluation Report, information provided by the Standard Institute.

3 Efficiency

Both the project cost and period exceeded the plan (ratio against the plan: 115% and 133%, respectively). The principal reason is that the change from the cascade training method required necessity of more capacity building of the trainers, receipt of more trainees in Japan and dispatch of more experts in certain areas. Therefore, the project efficiency is fair.

4 Sustainability

<Policy Aspect>

Seismic reinforcement of housings and public buildings is described as part of the policies in the "Disaster Prevention and Mitigation Plan in Urban and Rural Buildings based on the 13th Five-Year Plan" (2016-2020).

<Institutional Aspect>

MHURD is in charge of trainings of administrators, and the Standard Institute and Exploration and Design Association of each region undertake training of engineers on seismic design and assessment/reinforcement. Thus, demarcation of the related institutions for capacity building of structural engineers and related administrators is clear. The Design Group trains its engineers. Training plans are made for the new employees and existing personnel. New employees are encouraged to acquire qualifications and participate in technical trainings, and chances are given to existing personnel who have a certain experience such as assignment in major posts, promotion and participation in advanced trainings. Training officers are assigned in each of MHURD, Standard Institute (5 persons) and Design Groups (2-3 persons). Although the number of the officers at MHURD could not be confirmed, these numbers are sufficient because the programs are conducted as planned, according to the Standard Institute. Participants of the trainings in Japan and core trainings including administrators at the national and provincial levels have continuously functioned as master trainers (trainers of core and general trainings) and core trainers (trainers of general trainings and those in each organization). The number of the trainers could not be confirmed, but it is sufficient, according to the Standard Institute.

<Technical Aspect>

Master trainers interviewed at the ex-post evaluation have several working experiences as trainers of core trainings and conduct a

comparative analysis on seismic design standards and methods of China and Japan. According to the Standard Institute, both master trainers and core trainers have sufficient knowledge and techniques as trainers on seismic design, assessment/reinforcement, emergency assessment, judging from the fact that they have a firm theoretical foundation and much working experience and that they are registered in the professionals list in each region. With regard to the participants of general trainings, continuous learning opportunities are given to registered structural engineers by the Exploration and Design Association of each province and city every year, in order to sustain their knowledge and techniques. Furthermore, even after the project completion, engineers and administrators of China have continued technical exchanges with the Japan Structural Consultants Association (JSCA) and several private companies. Training materials developed by the project have been used since the project completion. Some additions will be made by the Standard Institute based on the national standards to be issued.

<Financial Aspect>

The Design Group and Standard Institute are privatized institutions and their main budget sources are contract incomes from the public works. Their financial data are not publicly disclosed. The Design Group's budget for capacity building is based on training plans and its financial situations, and 90% is secured. Trainings of administrators are based on the plans of MHURD and the Department of Housing and Urban-Rural Development of each province and city, of which the finance section covers training expenses. Regarding the Standard Institute, their budget is sufficient since they send their engineers to trainings, symposiums and exchange activities. Training fees are collected based on the regulations. They are cheaper than those provided by other private companies and organizations, but they cover necessary expenses because the Standard Institute also receives subsides from the national government.

<Evaluation Result>

In light of the above, no problem has been observed in terms of the policy, institutional, technical or financial aspects. Therefore, the sustainability of the effectiveness through the project is high.

5 Summary of the Evaluation

Trainers were developed and more than twice as many administrators and engineers were trained in the project. Training participants have applied the learnings in the work and sustained the gained knowledge and techniques through trainings and technical exchange activities. Also, the project outputs have been reflected in the national standards and administrative orders at the local level. Thus, it can be judged that the diffusion system of seismic techniques has been developed. Therefore, the project effectiveness/impact is high. Demarcation of the related institutions for capacity building of structural engineers and related administrators is clear. Trainers have sustained their knowledge and techniques, and also budgets for capacity building have been secured. Thus, the sustainability is high. Regarding the efficiency, both the project cost and period succeeded the plan.

Considering all of the above points, this project is evaluated to be highly satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing agency:

- The Standard Institute has provided trainings as planned with not only fees collected from the participants but also subsidies from the national government at the time of the ex-post evaluation. Even if training budgets will not be sufficient in the future, it is not very realistic to increase the fees, because it may cause a decrease of training applicants. In such a case, it is suggested to keep the present training fees.

Lessons learned for JICA:

- Even after the project completion, the Standard Institute has not only provided trainings in the country but also continuously communicated with Japanese related companies and organizations to organize technical exchanges. In this background, first, there are still great needs for introduction of Japanese techniques in the seismic architecture area. Second, the relationship between Chinese and Japanese personnel was good during the project. In particular, the Project Manager was involved in the project during the whole period and deeply understands seismic techniques and related organizations in Japan. Another strength is that long-term trainees in Japan have worked in the same position and can communicate with Japanese personnel in Japanese. Third, for Japanese private companies, keeping communication with related organizations in China may bring business chances. Thus, in order to ensure technical sustainability, it is effective (i) to implement activities during the project period with collaboration and technical exchanges with private companies, industry groups and research institutes after the project completion in mind, (ii) to seek for support and cooperation other than ODA, and (iii) to select counterpart personnel and trainees from those who will surely keep working after the project completion.
- The cascade method for capacity building originally expected in the project is that those trained in the trainings in Japan would have functioned as trainers of core trainings, and then those trained in the core training would have functioned as trainers of general trainings. However, this method was partially changed; those trained in Japan became in charge of most of the trainers of general trainings.. It was because only 10-day core trainings were not sufficient to develop the capacity as trainers of general trainings. The other reason was that there was a request to receive general trainings from those trained in Japan in order to learn Japanese seismic techniques. Accordingly, the number of participants of general trainings increased more than expected, and the participants could enrich their understanding. Furthermore, it resulted in the use of seismic technique in practice and its diffusion. Based on this project experience, when a cascade training method is planned, it is necessary to not only focus on transfer of techniques, but also clarify qualifications required for trainers and then carefully examine how to train the trainers in order to meet the needs of training participants and to make the trainings effective. If it turns out that the cascade method does not work, it is important to make necessary changes flexibly in the early stage of the project in order to achieve project objectives.

Japan-China Technical Exchange Conference on Building Structure (October 2015, co-organized by the Standard Institute and JSCA)

5th Anniversary of Commencement of the Project/Technical Exchange Conference on Building Damping and Isolation (May 2014, organized by the Design Group and sponsored by Standard Institute and JICA)