PROGRESS REPORT OF SEISMIC EVALUATION AND RETROFIT OF OLD BUILDINGS LOCATED ALONG THE SPECIFIC EMERGENCY TRANSPORTATION ROADS IN TOKYO

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17th U.S.-Japan-New Zealand Workshop on the Improvement of Structural Engineering and Resilience
Introduction

More than 20% of earthquakes measuring magnitude 6 or stronger have been recorded in Japan, which comprises only 0.25% of the Earth's landmass. There is a high possibility that the Capital Tokyo will be struck by a big earthquake, the Government's Earthquake Research Committee compiled a report that predicts that the probability of occurring earthquake is 70% on areas around Tokyo between 30 years from 2007.
Introduction

Japanese seismic codes were revised fundamentally in 1981.

There are currently known facts that old buildings constructed before 1981, which is called an old seismic building, had emerged as poor seismic performance on previous earthquakes.

The owners of old buildings should carry out seismic evaluation, seismic retrofit design and retrofit renovation.
Introduction

Tokyo will host the Olympic games in July 2010, many people will visit Tokyo from Japan and abroad.

Tokyo have the responsibility to secure many people against attack by earthquakes until TOKYO 2020.
0. Seismic Adequacy of Old Buildings in Japan

In Japan, there was the Act for Promotion of Rehabilitation for Earthquake-Resistant Structures, which was enacted based on the lesson from the Kobe Earthquake of 1995. The purpose of this law is to protect the lives, bodies and property of citizens from being damaged such as collapse of building by earthquakes, and to improved safety of buildings with facilitating seismic retrofit renovation of old buildings, thereby contributing to improvement of public welfare.
1.1. Specification of Emergency Transportation Roads

Tokyo Metropolitan Government set “Seismic Retrofit Promotion Plan of Tokyo” to promote retrofitting buildings located along emergency transportation roads in Tokyo.

Basic philosophy:
“Realization of the safest and the most secure city Tokyo in the world, for big earthquakes”
1.2. Purpose of This Law

to maintain the function of Capital
to protect the lives, bodies and property
of citizens

from being damaged by earthquakes
directly under areas around Tokyo
1.2. Purpose of This Law

Emergency transportation roads are key to sustain escape, firefighting, rescue operations, emergency medication, transportation of emergency relief supplies and recovery and rehabilitation activities just after earthquake.

With proceeding seismic retrofit renovation of old buildings located along the roads, we can secure the function of Capital.
1.3. The Specific Emergency Transportation Roads

Tokyo Metropolitan Government officially designated 1000 km as for the specific emergency transportation roads from total of 2000 km.

These roads lead up to key harbor, airport, Tokyo Metropolitan Government headquarters and disaster prevention center to play a central role of emergency measure, and buildings located along these roads should have good seismic capacity.
1.4. Purpose of Rate of Seismic Buildings

Rate of seismic buildings =
(buildings by the new standards + seismic buildings by evaluation + seismic buildings by retrofit)

All Buildings

<table>
<thead>
<tr>
<th>Time</th>
<th>March 2020</th>
<th>March 2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical Target</td>
<td>90% as rate of seismic buildings and to minimize buildings of high-risk collapse</td>
<td>100% as rate of seismic buildings</td>
</tr>
<tr>
<td>Attitude</td>
<td>Accessible state to destination such as local disaster prevention base from outside Tokyo by taking a detour, through the specific emergency transportation roads just after earthquake</td>
<td>Accessible state at the shortest distance through the specific emergency transportation roads just after earthquake</td>
</tr>
</tbody>
</table>
1.5. Buildings located along the specific emergency transportation roads

#1 The buildings which are located along the specific emergency transportation roads

#2 The buildings which were built before May 1981, what are called old seismic buildings

#3 The buildings which have the height of about half or more of the road width
1.6. Third Phases of Duty to Owner

Phase 1  Duty to report
Owners have duty to report about implementation status of seismic evaluation and retrofit renovation.

Phase 2 Duty to carry out
Owners have duty to carry out seismic evaluation

Phase 3 Duty to effort
Owners have duty to effort of seismic retrofit renovation, if buildings have not good seismic performance
1.7. Agreement on Cooperation with the Concerned Organizations

The Metropolitan Government has concluded an agreement on cooperation with the concerned three organizations, for the supporting system to owners.

The Japan Structural Consultants Association as JSCA is one of them, which has cooperated in rating for seismic evaluation of these old buildings.
2. Progress Data Report

This is new report about seismic state in June 2018
The data is referenced from “Tokyo Seismic Portal Site”

Rate of seismic buildings = 84.3%
3.1. Public Financial Support of Seismic Evaluation

Period: The financial supports *basically have finished* by 2016, but some are effective *until March 2019*

Rate: *Full amount in some cases*
### Example of public financial support

<table>
<thead>
<tr>
<th>Building use</th>
<th>Office</th>
<th>Condominium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Story</td>
<td>5 stories</td>
<td>10 stories</td>
</tr>
<tr>
<td>Total floor area</td>
<td>500 m²</td>
<td>1500 m²</td>
</tr>
<tr>
<td>Subsidy</td>
<td>1,800,000 JPY</td>
<td>4,115,000 JPY</td>
</tr>
<tr>
<td></td>
<td>16,000 USD</td>
<td>37,000 USD</td>
</tr>
<tr>
<td></td>
<td>24,000 NZD</td>
<td>55,000 NZD</td>
</tr>
</tbody>
</table>
4. Investigation Technique for the Case of Reinforced Concrete Buildings

If building's design drawings are lost for old buildings,

Engineers investigate present of state including shape of buildings by:

- Span and Story Height
- Seismic Elements of Column, Girder and Wall
- Structural Plans
- Reinforcing-Bar Arrangement of Typical Members
- Concrete Compressive Strength by Cylindrical Test Piece taken off over three pieces per each floor

Engineers must restore to revised structural drawing, get the minimum information for seismic evaluation.
Investigation by Non-Destructive Test

Engineers Investigate

By Radar with Electromagnetic Wave

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Investigation by Non-Destructive Test

Turn Out The Number of Main Rebar, and Pitch of Hoop

Marking of Rebar Arrangement

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Investigation by Destructive Test

Hollow with Core Boring Machine

Turn Out the Diameter and Material of Rebar

Inspection

<table>
<thead>
<tr>
<th></th>
<th>Estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Rebar</td>
<td>X:6-D25,Y:5-D25</td>
</tr>
<tr>
<td>Hoop @93~105</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Rebar</td>
<td>X:6-D25,Y:5-D25</td>
</tr>
<tr>
<td>Hoop D13@100</td>
<td></td>
</tr>
</tbody>
</table>

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5. Feedback for Citizens

The Metropolitan Government operates the website “Tokyo Seismic Portal Site”

They expect that owners get notices and initiatives, by wide announcements of this information, which have serious effects on rescue operations, emergency medication, transportation of emergency relief supplies at earthquake.

The site has given a public notice of the numbers of building located along the specific transportation roads which has not carried out seismic evaluation, and names and addresses of buildings against owners who have not proceeded out seismic evaluation for no justifiable reason.

The names and addresses will be deleted, when The Metropolitan Government recognizes that the owners made a start on seismic evaluation.
Tokyo Seismic Portal Site

Public Announcement of Results of Seismic Evaluation

Why Seismic Retrofitting?

Go Forward with Seismic Retrofitting!

Tokyo Efforts

Seismic Retrofitting Subsidy System

Provide Against Earthquake at Some Future Point!
耐震フォーラム
2018年度
耐震キャンペーン
～首都直下地震への備え～
10月12日（金）13:00～16:30
東京都議会議事堂1階 都民ホール

第1部「地震計から学ぶ」

第2部「実際を実験・施設物の耐震化」

防災体験・耐震キャンペーン
2018年度
耐震改修パスツー
～首都直下地震への備え～

9月21日（金）11:45～17:50（予定）
定員：30名

10月27日（金）12:00～17:50（予定）
定員：20名

11月9日（金）11:45～17:50（予定）
定員：20名

12月7日（金）11:45～18:00（予定）
定員：30名

お問い合わせ・お申込み→2018年度耐震キャンペーン事務局
TEL:03-8281-8804 FAX:03-8503-0800 E-mail:kenko@spaprett.co.jp www.kengo.co.jp

东京都主催
structural Engineer

東京都主催
6.1. New Approach; Visualization

The construction site has display of “Under Retrofit”.

The Metropolitan Government expects the momentum for retrofit renovation will grow, by citizen’s attention on the sign of progressing condition of retrofit renovation on a daily basis.
6.2. Door-to-Door Campaign

The Metropolitan Government have tried to spread the importance of retrofit renovation and the subsidy system.

The Metropolitan Government have made door-to-door visits to owners who have not carried out retrofit renovation after seismic evaluation after June in 2016, in cooperation with the municipality and the concerned organizations.

As a result, the various reasons are recognized why the seismic retrofits have not being proceeded by uses or ownership patterns.

These reasons include the construction cost and decline in building functions, stagnation by lack of knowledge how to proceed, and non-cooperation of tenants.
6.3. Creation and Proposal of Committee

The Metropolitan Government created the committee up for promotion of retrofit renovation.

They revealed the need for acceleration of retrofit renovation and proposed specific promotions, based on the result of door-to-door campaign.

These promotions include that public announcement of building name, new responsibility for owners, supporting measures for building possessors such as lessee or tenant, in addition to owners.

Measures for possessors have never happened before and shall be new steps.
7. Reference of approach outside of Tokyo

Tokyo and the surrounding region have just started discussing about establishment of the consultative organization in which carry out to retrofit buildings located along emergency transportation.

Osaka Prefectural Government specified the roads distance of 260 km in 2013, as to proceed to retrofit renovation on a priority basis for to secure the functionality when earthquake is occurred, just like Tokyo.

Ministry of Land, Infrastructure, Transport and Tourism in Japan summarizes that the backward situation of the seismic assessments results of large-scale buildings is obliged by the seismic promotion law. Of the total of 10,600 prefectures, there were about 1,000 buildings with a seismic intensity of 6 or more and high risk of collapse, and about 700 buildings with a risk of collapse were found. About 100 buildings were reported as yet unreported.
Conclusion

The rate of seismic buildings is 84.3% in the end of June 2018.

The number of seismic buildings is certainly increased more than our previous report, but seismic retrofit renovation is not over yet although 6 years have passed.

Many seismic evaluations and retrofit renovations do not proceed so much on short period.

We must keep up proceeding to retrofit, therefore to protect the lives, bodies and property of citizens from earthquake and to secure the building’s functionality.

We hope that Tokyo Metropolitan Government shall lead for any further cooperation with the municipality and the concerned organizations, proceed to retrofit buildings located along the emergency transportation roads as fast as possible and produce a steady progress of successful results for resilient Tokyo.
Thank you for your attention
3.2. Public Financial Support of Seismic Retrofit Design

Period: Necessary to undertake by March 2019

Rate: Full amount of seismic retrofit design in some cases
3.3. Public Financial Support of Seismic Retrofit Renovation

Period: Necessary to start seismic retrofit design before March 2019

Rate: 90% of amount in some cases
3.4. Tax Incentive

Owners (finished retrofit renovation of certain conditions are filled) can get tax incentive

- Income Tax
- Corporate Tax
- Fixed Asset Tax
- City Planning Tax
- and so on