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## Staff

### **Architectural Planning/ City Planning**

Jun UENO

Professor / Dr.Eng.

Architectural Planning, Behavior, Environmental Psychology, Community Facilities  
Planning

Rm.27-869

+81-426-77-2814

Tohru YOSHIKAWA

Associate Professor. / Dr.Eng.

City Planning, Spatial Analysis, Geographical Information System

Rm.27-868, +81 426 77 2813 yoshikawa-tohru@c.metro-u.ac.jp

Kenji TAKEMIYA

Associate Professor / Dr. Eng.

Architectural Planning, Environmental Behavior

Rm.9-874, +81-42-677-2795 takemiya-kenji@tmu.ac.jp

Motoki TORIUMI

Associate Professor / Dr. in France (Urban Studies)

Urbanism in Paris (from the Renaissance to today)

Rm.09-867, +81 42 677 2812

Naoki KUROKAWA

Assistant Professor / M. Eng.

History of Western Architecture, History of Landscape Architecture, Preservation of  
Architectural Heritage

Rm. 9-828 +81 426 77 1111 Ext. 4764 el-negro@arch.metro-u.ac.jp

Masumi MATSUMOTO

Assistant Professor

Housing Studies

Rm.9-877, +81 42 677 1111 Ext.4788

### **Architectural Design and History**

Katsuhiko KOBAYASHI

Professor / Dr. Eng.

Theory of Architectural Design, Architectural Design, Modern and Contemporary Architecture

Rm.27-871 +81-426-77-2816

Yukimasa YAMADA

Professor / Dr. Eng.

Japanese Architecture, Asian/Islamic Architecture, Conservation

Rm.9-870, +81 426 77 2815 yyamada@tmu.ac.jp

Masao KOIZUMI

Associate Professor / M. Eng.

Design Practice, Architectural Design, Design Methodology

Rm. 27-872, +81 426 77 2817

Akira KINOSHITA

Assistant Professor / M. Eng.

Theory of Architectural Design, Architectural History, Architectural Design

Rm.27-827 +81 426 77 1111 Ext. 4763

Jun INOKUMA

Assistant Professor / M. Eng.

Architectural Design, Theory of Architectural Design

Takeshi Shiibashi

Research Assistant Professor / Dr. Eng.

Theory of Architectural Design, Architectural Design, Modern and Contemporary Architecture

Rm.27-827 +81 426 77 1111 Ext. 4763

### **Construction Management and Building Materials**

Seiichi FUKAO

Professor / Dr. Eng.

Building Construction, Building System Design

Rm. 27-873, +81 426 77 2818 sfukao@tmu.ac.jp

Yoshinori KITSUTAKA

Professor / Dr. Eng.

Building Materials, Environmental Materials, Durability Evaluation

Rm. 27-775, +81-426-77-2797

Makoto TSUNODA

Professor / Dr.Eng.

Management and Organization of the Building Process, Durable Building System,  
Circulating System for Building Components

Rm.27-767, +81 42 677 2807

Kozo KADOWAKI

Assistant Proffesor / M. Eng

Building Construction, Building System Design

Rm. 27-826, +81 426 77 1111 Ext. 4762 kkad@tmu.ac.jp

Koichi MATSUZAWA

Assistant Proffesor / M. Eng.

Building Materials, Concrete Engineering, Durability Evaluation

Rm.9-730, +81 42 677 1111 Ext.4726 matsuzawa-kouichi@tmu.ac.jp

### **Structural Engineering**

Manabu YOSHIMURA

Professor. / Dr. Eng.

Reinforced Concrete, Earthquake Engineering, Seismic Design

Rm.27-773, +81 426 77 2800

Kazuhiro KITAYAMA

Associate Professor. / Dr. Eng.

Reinforced Concrete, Seismic Design, Earthquake Engineering

Rm.27-771, +81 42 677 2802 kitak@ecomp.metro-u.ac.jp

Jiro TAKAGI

Associate Professor / Ph. D

Structural Design, Steel Structures, Stability

Rm.27-774, +81 42 677 2798 takagi-jiro@tmu.ac.jp

Kazushige YAMAMURA

Assistant Proffesor / M.Eng.

Structural Engineering, Load and External Force

Rm.27-731, +81 42 677 2794 kyamamur@arch.metro-u.ac.jp

Susumu MINAMI

Assistant Proffesor / Dr.Eng.

Structural Engineering, Steel Structure, Fracture Mechanics

Rm.9-727, +81 42 677 1111 Ext. 4723 minami-susumu@c.metro-u.ac.jp

Takaya NAKAMURA

Assistant Professor / Dr. Eng.

Reinforced Concrete

Rm.9-728 +81 426 77 1111 Ext. 4724 takaya@ecomp.metro-u.ac.jp

### **Environmental Engineering**

Noriyoshi ICHIKAWA

Professor. /Dr. Eng.

Building Environment, Water Supply and Drainage System in Buildings

Rm. Akisima campus 306, +81 42 543 3111 Ext. 306

Nobuyuki SUNAGA

Professor / Ph.D.(Dr. Eng.)

Architectural Environment, Passive and Low Energy Architecture, Thermal Comfort

Rm.9-768, Tel: +81 42 677 2805, sunaga-nobuyuki@tmu.ac.jp

Akihiro NAGATA

Associate Professor. /Dr. Eng.

Building Environmental Engineering, Hygrothermal Environment

Rm.27-769, +81-426-77-2804

Satoshi NAKAYAMA

Assistant Professor / Dr. Eng.

Architectural Environmental Engineering, Weather Data, Urban Climate

Rm. 9-734, +81 42 677 1111 Ext. 4732 nakayama@tmu.ac.jp

Tamaki FUKAZAWA

Research Assistant Professor / Ph.D.(Dr. Eng.)

Architectural Environment, Passive and Low Energy Architecture, Thermal Comfort

Rm.9-733, +81 42 677 1111 Ext. 4731, hukazawa-tamaki@tmu.ac.jp

### **Strategic Research Center**

Shigeru AOKI

Professor. /Dr. Eng.

Architectural Design, Refining Architecture

Rm.9-772,+81 42 677 2801

### **Urban space, system and planning**

Itsuki NAKABAYASHI Professor/Dr. Eng.  
City Planning, Disaster Mitigation Planning, Urban Reconstruction Planning,  
Community-based Development  
Rm.9-553, +81 426 77 1111 Ext.4272 nakabasi@comp.metro-u.ac.jp

Hidenori TAMAGAWA Professor/Dr. Eng.  
Urban and Regional Analysis, Urban and Regional Planning  
Rm.9-556, +81 426 77 1111 Ext. 4275 htama@tmu.ac.jp

Fumiko ITO Associate Professor/ Dr. Eng.  
Urban Planning, Urban Analysis, Analysis of Residential Environment, Cost-Benefit  
analysis of public projects  
Rm.9-558, +81 426 77 1111 Ext.4273 itofumi@tmu.ac.jp

Taro ICHIKO Assistant Professor/ Doctor of Urban Science  
Disaster-proof urban planning, Community development for Disaster prevention, Risk  
Management  
Rm.9-152, +81-42-677 1111 Ext. 4231 ichiko-taro@tmu.ac.jp

**Urban society, residents and institution**

Tanji HOSHI Professor/Dr. Med.  
Urban Health, Public Health  
Rm.9-565, +81 426 77 1111 Ext.4278 star@onyx.dti.ne.jp

Masami HAGAI Professor / M. of Law  
Urban Administration, Urban Policy, Local Governance  
Rm.9-560, +81 42 677 2361 Ext. 4163 mhagai@comp.metro-u.ac.jp

Kenji TAKEMIYA Associate Professor / Dr. Eng.  
Architectural Planning, Environmental Behavior  
Rm.9-874, +81-42-677-2795 takemiya-kenji@tmu.ac.jp

Shin AIBA Associate Professor/Dr. Eng.  
City Planning, Community Development, Planning System  
Rm.9-566, +81 426 77 2359 aib@tmu.ac.jp

Kahoruko YAMAMOTO Associate Professor/Ph.D.(Sociology)  
Urban Sociology, Community Study, Migrant Study  
Rm.9-154, +81 426 77 1111 Ext. 4233 kahoruko@tmu.ac.jp

## 2. Overview of Research Activities in 2008

### **Architectural Planning/ City Planning**

**【Jun UENO · Masumi MATSUMOTO】**

Studies for the Development of Sustainable Community and Living Environment for the Elderly

Jun UENO, Masumi MATSUMOTO

For the forthcoming progressive aging society, an improvement in quality of sustainable living environment for the elderly is most important theme for our Japan. Among the series of studies and investigation works based on these points of views, following subjects were accomplished this year.

- 1) Actual Situation of Residents' Daily Living Activities at Unit-Care Nursing Home
- 2) Study for Architectural Planning of Small-Scale Elderly Support Facilities from the Viewpoint of the Activities Program and the Sphere of the Users
- 3) Study on the Changes of the Elderly's ADL and the Utilization of Rooms in Nursing Home

Series of Studies for Regeneration and Revitalization of Tama New Town

Jun UENO, Masumi MATSUMOTO

Tama New Town is the largest New Town in Japan and it progressed 30 year from the first step development. This series of studies aims to research and develop the methods for regeneration and revitalization of living environment of Tama New Town.

- 1) Study on the Social Support System and Community Environment for the Independent Elderly People
- 2) Actual Situation of Life Style of Elderly Who Live at the Housing Estates of Tama New Town
- 3) Study on the Transition and Present States of Neighborhood Shopping Center in Tama-Newtown

Studies on the Architectural Planning and Design for the Educational Facilities

Jun UENO

Concurrent with the change in modern educational philosophy and methodology, the space formation and composition of primary and secondary school should also be reorganized in every aspect. This series of studies aims to develop new concept and conditions for architectural planning of school facilities. Among the series of studies and investigation works based on these points of views, following subjects were accomplished this year.

- 1) Study on the Architectural Planning of the Integrated Compulsory Education School
- 2) Study for the Architectural Design and Planning for the School Complex with the

## Community Facilities

### 3) About the Architectural Planning on Integrated Facility of Kindergarten and Nursery School

Environmental Behavior Studies on the Community Facilities and Urban Open Space  
Jun UENO, Masumi MATSUMOTO

Targeting on the people who stay at the urban open space and who use the community facilities, we are trying the series of Environmental Behavior Studies. From the actual investigation and observation works, we try to extract the order or characteristic tendency in human behavior. Among the series of studies and investigation works based on these points of views, following subjects were accomplished this year.

- 1) Environmental Behaviors Study for People's Activities at Urban Shopping Square
- 2) About the Architectural Planning for Community Center

#### 【Tohru YOSHIKAWA】

Development of Methods for Construction of Community Facilities Network Utilizing Existing Public Buildings

Tohru YOSHIKAWA and Kazuki YANAGISAWA (Japan Society for the Promotion of Science)

This study aims at developing methods for Construction of community facilities network suitable for the information, aged and mature society of Japan. To this end, methods to determine the optimum locations of community facilities utilizing existing public buildings are developed based on an interdisciplinary study. The method was applied to Tama City, which includes the earliest development of Tama New Town, in Tokyo Metropolis. Especially, a new model for distance decay of user distribution of day service centers for the elderly etc. was developed and a survey of web-based reservation systems for public facilities was conducted.

Development of Platform for Sharing Regional Information utilizing ASP for Map Delivery

Tohru YOSHIKAWA and Hidenori TAMAGAWA

The purpose of this study is to support to build social infrastructure for sharing regional information by the Internet in the matured information society for which Japan is heading. To this end, an information platform, which is low-cost, flexible and open, is developed based on ASP for map delivery on the Internet. The practicality of the platform is tested using a collaborative experimental web site with municipalities and residents. Especially, the feasibility of simple methods to send information by mobile phones was analyzed.

#### 【Kenji TAKEMIYA】



### Study on Support System and Care Environment for the Patients with Mental Disease Kenji TAKEMIYA

This study aims at re-arrangement of the mental hospital and support facilities in Japan from users point of view. This year two surveys were conducted,

- 1) Analysis of the characteristics of utilization, inpatient treatment and discharge in a mental hospital
- 2) Analysis of the characteristics of utilization of day-night care unit where discharged patients come and stay during the day.
- 3) Analysis of the utilization of the space and patients' behavior in the wards and day-night care unit.

### Architectural Planning of Health Care Facilities for Patients with Cancer Kenji TAKEMIYA

This study aims at making clear the characteristics of health care facilities for patients with cancer. This year we had two research projects.

- 1) To show the current conditions and issues of the health care facilities for patients with cancer in Japan, field survey and correcting data of the core medical centers were carried out in a local district.
- 2) To show the current conditions and issues of the palliative care team in the core medical center for cooperative treatment for patients with cancer, inside observation, correcting questionnaire, and interview survey were carried out.

### Residential Care System and Milieu for Elderly People and Disabilities Kenji TAKEMIYA

For the progressive aging society, it is important to improve the quality of living environment for the elderly and disabilities in Japan. This year, some remarkable results were got as follows:

- 1) The current situation and characteristics of rental housings for the elderly in Japan.
- 2) The current situation and utilization of the group home and care home for people with intellectual disabilities.

**【Motoki TORIUMI】**

**【Naoki KUROKAWA】**

Naoki KUROKAWA

In the recent study of architectural history, reevaluation of the existing cultural assets and their adaptive reuse are in strong demand. This study presented the recent trends in the adaptive reuse programs in America as observed through on-site researches.

## **Architectural Design and History**

**【Katsuhiko KOBAYASHI · Akira KINOSHITA】**

Analyses on Composition of Modern and Contemporary Architecture

Katsuhiko KOBAYASHI, Akira KINOSHITA and Takeshi Shiibashi

One of the main purposes of architectural design research is to clarify morphological principles that give birth to architectural beauty. For this purpose, it is important and effective to abstract compositional principles and compositional method from existing architectural works and to examine the design principles. In the academic year of 2008, geometrical compositions seen in architectural works of Louis Sullivan, Otto Wagner and so on were analyzed. These studies were published in Summaries of Technical Papers of Annual Meeting and Journal of Architecture, Planning and Environmental Engineering of Architectural Institute of Japan.

Development of Architectural Design Method

Katsuhiko KOBAYASHI and Akira KINOSHITA

In architectural design research, it is also important to apply design principles and compositional methods abstracted by analyses to actual architectural design work. Thereby theory and practice, in other words, basic research and high-level application would be synthesized. In the academic year of 2008, our laboratory made design proposal for Northside Plaza, Himeji Station.

Research on Conversion and Renovation of Existing Building Stocks

Katsuhiko KOBAYASHI, Akira KINOSHITA, Tetsuya MITAMURA, and Takeshi SHIIBASHI

It is becoming one of the most important and social subject in architectural field of Japan to find out and create various methods to revitalize the existing building stocks. In the academic year of 2007, from the viewpoint of architectural design, we published books on conversion buildings located in U.S.A., Italy, France, Germany, Australia and Finland. In the academic year of 2008, we made efforts to develop this investigation.

**【Yukimasa YAMADA】**

Project for Rehabilitation of Modern Collective Housing in Hanoi, Vietnam

Yukimasa YAMADA

Since the 1950s, the government of Vietnam has constructed various types of collective housing estates in Hanoi, some of which were supported by the technical aids from the former Soviet Union and North Korea such as constructing with precast concrete panels. In the subtropical climate, these buildings have been deteriorating functionally, structurally and aesthetically. Every kind of transformation occurs in many apartments influenced by rapid economic and social changes. We made surveys and researches on the project for rehabilitation of collective housing in Trung-Tu District,

Hanoi, collaborated with a research group of Hanoi Architectural University.

#### Surveys and Studies on the Preservation and the Architectural Features of Traditional Timber Structures and Villages in Asia

Yukimasa YAMADA

Since a number of the traditional architecture and villages with historical and cultural values have been disappearing rapidly in the Asian countries, their preservation is an urgent issue. Making surveys and studies from this point of view, in this year, we have reported on actual situations of village churches in the former Bui-Chu diocese, Namdinh province of the northern Vietnam, based on the results from the field survey so far.

#### Surveys and Studies on the Preservation and the Features of Modern Age Architecture in Kanto Area

Yukimasa YAMADA, Satoshi ONO (Yokohama National Univ.) and Ryuta OHASHI (Tokyo Kasei Gakuin Univ.)

Most of historical buildings constructed before Meiji era have been already known their locations and their values on a nationwide scale, but the ones belonging to the period between the Meiji and the early Showa have not yet recognized their cultural values adequately. On the other hands, we can find many restored and activated examples as 'immediate cultural heritages' in connection with establishing the Registered Cultural Properties. Under these circumstances, the government of Tokyo has conducted a survey on the Modern Age Architecture in Tokyo since 2006. In this fiscal year, we have made the surveys in Machida, Tama, Hino, Akirono, Oume and Hinode, and also have reported actual situations of these buildings.

#### Studies on Historic Architecture and Urbanism in the Islamic World

Yukimasa YAMADA

Although numbers of the historic architecture in the Islamic world have their own peculiar features in the architectural techniques and designs, their nature has not yet been understood adequately in Japan, nor has their urbanism as their agglomeration. In a series of our successive studies on the architectural history and urbanism in Islam, we have spoken for the public on the issue of the relationship between Europe and the Islamic world in the medieval period, focusing on the cultural exchange through pilgrimage to sacred places, at the Bridgestone Museum and the Fuchu Citizen's College.

**【Masao KOIZUMI】**

Research on Accessibility of Urban and Architectural Space

Masao KOIZUMI

The First Stage of the Research is to analyze the Relationship between Housing and the City. This Research will be generalized into an Analysis of Relation between Architecture and Urban City.

These Researches will cover Areas such as; Type of Connection and Distance between Housing and the City, an Arrangement of Territories, Strength of the Boundary between Different Territories, etc. These Basic analyses will be developed into Research and Practice of a Design Method concerning Accessibility in an Urban Scale.

Research on Housing Transformation Reflecting the Change of Family

Masao KOIZUMI

Today a Family Style has transformed because of an Increase of Divorce and the rapid Progress of the Aging Society. But still most of the Houses are planned for so called “Nuclear Family”.

The Goal of this Research is to develop a Planning Method for Housings and propose a new Typology, through the Analysis of Contemporary Japanese Family and their Life Style. Collective Housing will be a main Target for this Theme.

### **Construction Management and Building Materials**

**【Seiichi FUKAO · Kozo KADOWAMKI】**

Research on Activation Method of Public Residential Buildings Built in the Mass-housing Era

Seiichi FUKAO and Kozo KADOWAKI

Most of public residential buildings built in the mass-housing era require to be refurbished. In FY2008, we investigated the actual conditions of the housing regeneration construction processes in Japan. We also developed a technology to make a new opening in the precast concrete wall panel of the residential buildings.

Research on the Construction of Multi-unit Residential Building

Seiichi FUKAO and Kozo KADOWAKI

S/I housing, of which building system is designed dividing into two parts: skeleton (or support, structural elements) and infill (interior components), is widely noticed as a promising building system of multi-unit residential building. In FY2008, we investigated the actual conditions of the old residential buildings constructed in S/I system in European countries and in Japan.

Research on Renovation in Detached Houses

Seiichi FUKAO and Kozo KADOWAKI

It is being recognized as important to renovate the deteriorating detached houses to make them withstandable to use more. In FY2008, we estimated the refurbishment

cycles and the reasons of refurbishments of exterior walls of detached houses. These results were published in the AIJ journal.

**【Yoshinori KITSUTAKA · Koichi MATSUZAWA 】**

Influence of the Color Characteristics for the Appearance Evaluation of Corridor or Type Apartment Wall

Yoshinori KITSUTAKA and Koichi MATSUZAWA

Renovation of existing house stocks becomes increasing, but these stocks do not have a good appearance to compare to contemporary housing. In this study, influence of the color characteristics for the appearance evaluation of corridor type apartment wall was investigated. As a result, the impression evaluation changed by changing the combination of hue, chroma and value of wall color and the useful data which could be used for the color planning of the house stock renovation was obtained.

Durability evaluation method of the concrete by using a simple indicator

Yoshinori KITSUTAKA and Koichi MATSUZAWA

Main factors deteriorating the concrete are carbon dioxide and a chloride ion. In order to evaluate those deterioration factors more easily and to find the evaluation technique for the neutralization and the salt damage, the indicators which show color reaction by pH value and a difference of the chloride ion density were adopted. As a result, on the evaluation of the carbon dioxide, more detailed evaluation method compared with conventional technique was established.

Planting method on the ALC panel wall surface

Yoshinori KITSUTAKA and Koichi MATSUZAWA

With the effect of the wall surface planting that was effective for an anti-heating island phenomenon, the effects of the diameter and the depth of holes which were built in auto-craved lightweight concrete panel (ALC) surface on the growth of greens (the general term of vegetables) were examined. As a result, it became clear that the growth of the root was influenced by the depth of hole and the growth of leaf greens was influenced by the diameter of hole. In addition, because of many void structures of the ALC, the soil was kept a water containing condition and this is effective to grow the plants.

Neutralization of Concrete Affected by the Heating

Koichi MATSUZAWA, Yoshinori KITSUTAKA

Concrete structures for power generation and radioactive waste disposal may be subjected to heating action under 65°C for a long period. This paper describes an investigation on the property of cement mortars accelerating the carbonation with high curing temperature. The compressive strength of samples subjected to accelerated

carbonation with 10% CO<sub>2</sub> tends to be higher than those with 0% CO<sub>2</sub>, and samples accelerated at 60°C tend to be higher than those at 20°C. Total pore volume (TPV) of samples subjected to accelerated carbonation with 10% CO<sub>2</sub> and cured 60°C tends to be lower than those with 0% CO<sub>2</sub> due to the effect of the densification of microstructures by carbonation.

**【Makoto TSUNODA】**

**Studies on Activation Technique of Public Building Stock**

Makoto TSUNODA

In Japan, demolition and new construction based on declining in the durability and increased availability of buildings continues to be practiced. This practice is unfavorable from the viewpoint of utilization of the existing building stock. Activation technique is necessary for leading preservation and improvement of the public property. In this study, we clarified the stock management system for existing public facilities pay attention space and management. And the practical uses of stock management system for existing public facilities were considered. Furthermore, the methodology of management system apply to actual conditions were carried out.

**Studies on Conversion Design Technique**

Makoto TSUNODA

The conversion which is one of the effective use techniques has a big restriction in the content compared with the design technique in new building because of design condition for existing building. Because it will not assume the building usage in future, there is a limit in an effective space creation for the existing and future usage. In this year, to clarify the design process of conversions for the old production facilities and to grasp the utilize process by difference in participation on the conversation.

**Research on management and organization of the building regeneration process.**

Makoto TSUNODA

The buildings regeneration, for example addition new value to the exiting building are one way of the long life building. These ideas are easy to understand in the stock society. But, the concrete methodologies are very various. Especially, the values of architecture are affected by the case, so we don't find effective solutions. This year, we pay attention to the value of economics and using out of architectural value, and grasp the strategy for creation the useful social property. Especially, the conditions to put into the value added and to make it possible the regulation system were considered.

**Structural Engineering**

**【Manabu YOSHIMURA · Takaya NAKAMURA】**

## Effect of Side Walls on Seismic Performance of old RC Columns

Manabu YOSHIMURA and Takaya NAKAMURA

This study is intended to answer the question whether the adding of side walls to old RC columns is effective to enhance their seismic performance. For this purpose, ten half-scale model specimens simulating columns designed by the pre-1971 codes with/without side walls were tested until they collapsed. The tests revealed the side-wall adding increased lateral strength but decreased deformability. Then the earthquake response analyses were conducted for three-story model buildings consisting of the tested columns with/without side walls, where the observed load-deflection relations until collapse were used. The side-wall adding was judged as “advantageous” if the ratio of maximum response drift to drift at collapse became smaller than that of the case without side walls. The side-wall adding was “advantageous” in most examples.

## Seismic Retrofit Method for RC Columns Applied from One Side of Columns

Manabu YOSHIMURA and Takaya NAKAMURA

There exist many RC buildings in the center of large cities that are of single span along street and stand with a narrow space between adjacent buildings. Seismic retrofit methods suitable for these buildings were proposed. The methods are as follows, 1) drilling a hole on columns from outside the columns, 2) pouring grout in the hole, and 3) inserting a deformed bar with anchor heads on both ends. The inserted bars, together with the existing hoop, are expected to work as column shear reinforcement. The effect of such retrofit method was experimentally studied for both cases that existing bars were deformed bars and round bars.

## Collapse Test of Old R/C Columns by Pseudo-Dynamic Test Method

Takaya NAKAMURA and Manabu YOSHIMURA

Dynamic responses of old three-story R/C buildings idealized as represented by single column line were studied by the substructure pseudo-dynamic test methods. The tests were conducted until collapse for the specimens simulating the first-story columns failing in shear or shear after flexural yielding. Imaginary mass was introduced so that Seismic Capacity Index,  $I_s$  prescribed by the Standard for Seismic Evaluation of Existing Buildings might result in 0.41 and 0.62. Three earthquake records were used as input motions. The test results associated with "Collapse" such as necessary levels of ground motions, lateral drift and axial deformation were mainly discussed.

**【Kazuhiro KITAYAMA】**

Seismic Behavior of R/C Three-Dimensional Building under Tri-Lateral Loading Retrofitted with Multi-story Steel-braced Frame Adjacent to Pilotis-column under

## Transverse Shear Wall

KITAYAMA Kazuhiro

Two principal subjects mentioned below were studied for estimation of earthquake resistant performance in a reinforced concrete (R/C) building retrofitted with a multi-story steel-braced frame subjected to tri-lateral earthquake excitations. This study focuses on the column tension failure due to bending moment in a R/C sub-assembly with a multi-story steel-braced frame.

Subject A; to investigate seismic behavior of a retrofitted R/C building subjected to in-plane shear, out-plane bending moment and column axial load, and

Subject B; to observe and grasp seismic behavior of a R/C pilotis-column under a shear wall when a steel-braced frame is installed adjacently to the pilotis-column for preventing the column from collapse due to severe axial compression.

Following studies were carried out to resolve these subjects ; tri-lateral static loading test using a plane R/C frame and a three-dimensional R/C building with a pilotis-column which were retrofitted by a multi-story steel-braced frame, tri-lateral static loading analysis using a 3-D R/C building with a pilotis-column retrofitted by a multi-story steel-braced frame and nonlinear three-dimensional finite element analysis of a plane R/C frame retrofitted by a multi-story steel-braced frame under out-plane bending moment. Concluding remarks taken by these studies are as follows.

(1) Lateral resistance of a retrofitted R/C frame subjected to bi-directional horizontal loading was by approximately 10 percent smaller than that without out-plane loading. This was caused by premature compression failure of concrete at the bottom of R/C edge columns subjected to bi-axial bending moment.

(2) When lateral resistance reached the peak, concrete failed in compression at the bottom of not only one R/C edge column retrofitted by a steel-braced frame, which is identical to a pilotis-column, but also another edge column which suffers additional compression due to force transfer derived from restraining effect of a transverse shear wall in the second story on the R/C sub-assembly with a steel-braced frame. Steel vertical chords of a steel-braced frame contributed to prevent two R/C edge columns from axial collapse due to resisting compression force instead of concrete.

(3) In the design for seismic rehabilitation to a R/C building, note that concrete may fail in compression at the bottom of a R/C edge column as well as the pilotis-column retrofitted by a multi-story steel-braced frame which is designed to form column tensile yielding at the base of a I-shaped section consisting of two R/C edge columns as flanges and a steel-braced frame as a web.

## Estimation of Earthquake Resistant Performance for Precast Prestressed Concrete Frame Assembled through Sleeve Joint for Column Longitudinal Bars

KITAYAMA Kazuhiro and MINAMI Susumu

Earthquake resistant performance and seismic behavior will be studied by a



static loading test for a precast prestressed concrete frame, which is constructed by connecting upper and lower precast R/C columns to a precast R/C beam with a sleeve joint for column longitudinal bars. Therefore, five beam-column subassemblage specimens were designed to develop beam flexural yielding which is desirable for actual seismic design of a building, or to fail in shear in a beam-column joint panel to investigate shear strength of a joint panel in a frame constructed by the above-mentioned method. Design and fabrication of the specimens were carried out in 2008. Loading test will be conducted in the next year, 2009.

#### Strain Compatibility Factor for Beam in Prestressed Reinforced Concrete Interior Beam-Column Subassemblage

KITAYAMA Kazuhiro

Bond along a PC tendon contained in beams gives a great influence upon restoring force characteristics of a beam in a prestressed reinforced concrete (called PRC) frame. Flexural ultimate capacity of a PRC beam section can be obtained by a section analysis assuming that plane sections remain plane. Strain of a PC tendon such as a plain bar or wire strands in a PRC beam, however, deviates from the assumption that plane sections remain plane since bond along these PC tendons to surrounding concrete deteriorates prematurely under seismic load reversals. Consequently, strain of such a PC tendon becomes smaller than that of concrete at identical distance from the neutral axis in a beam section. Strain compatibility factor  $F$  was proposed by Muguruma Hiroshi to consider simply such strain deviation from Navier's hypothesis caused by bond deterioration along PC tendons. Values of the strain compatibility factor  $F$  were studied using only simple beam tests, not using a beam-column subassemblage with a PC tendon passing through a beam-column joint panel. Then in this study, values of the strain compatibility factor  $F$  were computed using recent test results of PRC beams in cruciform beam-column subassemblages.

Two cruciform specimens failing in beam flexure were used; one specimen with a sheath tube in a beam section bonded with grout mortar (compressive strength of 65.1 MPa) and another with an unbonded sheath tube. Strain of a PC tendon was measured by a strain gauge attached to the surface of the tendon. Strain of concrete at the same location as a PC tendon was calculated from two displacements, measured by electric transducers, at the top and bottom extreme fiber of the beam section at 50 mm away from the beam critical section. The strain compatibility factor  $F$  was defined as the ratio of strain increment of a PC tendon to that of concrete between successive two loading steps. The strain compatibility factor  $F$  in the beam with a bonded sheath tube was 0.20 at the yielding of the PC tendon, which is relatively less than the value ranging from 0.4 to 0.6 obtained by past simple beam tests. This difference was caused by the slip of a PC tendon within a beam-column joint panel, resulting in less strain than the strain of a PC tendon in a simple beam. The strain compatibility factor  $F$  in

the beam with an unbonded sheath tube converged to 0.03, which is less than the value between 0.1 and 0.2 obtained by past simple beam tests.

## Seismic Capacity Evaluation and Extensive Rehabilitation of Existing Apartment House Made of Precast Reinforced Concrete Wall

KITAYAMA Kazuhiro, TAKAGI Jiro, MINAMI Susumu and KOIZUMI Masao

There are approximately 1.1 million of existing apartment houses in Japan which are made of precast reinforced concrete shear walls (Called WPC). The half of these apartment houses was built approximately 30 or 40 years ago and cannot be conformed to contemporary and various dwelling style. Then, not only the increase or decrease in dwelling area but also extensive rehabilitation, for instance so as to be able of collective housing, are requested to existing WPC apartment houses.

It is necessary to give a new opening to existing PC shear walls or floor slabs to respond to such demand. At the time, it is important to understand earthquake resistant performance in actual WPC buildings before and after such rehabilitation as setting a new opening. Development of seismic retrofit method and performance evaluation when using the method are demanded to supplement degradation of earthquake resistant capacity due to the opening in existing PC shear walls.

Therefore, the second level procedure of seismic capacity evaluation was executed for an existing five-story WPC apartment building to grasp earthquake resistant performance according to Guidelines for Evaluation of Seismic Capacity of Existing WPC Buildings revised in 2008 by Japan Building Disaster Prevention Association. The seismic capacity evaluation was also carried out to the transverse direction of the building when new openings are set in several shear walls. Conclusions drawn from the study are as follows.

- 1) The seismic index  $I_s$  was approximately 0.8 in the longitudinal direction for the first to third stories, dominated by flexural walls. The strength index  $C_{tu}$  at an ultimate drift limit was 0.53 for the third story, the smallest value among whole stories. Strength of shear walls dominated earthquake resistant performance for only the first story. Some ductility was expected above the second story since the seismic index  $I_s$  was decided at the ductility index  $F$  of 1.5.
- 2) The seismic index  $I_s$  in the transverse direction was greater than 1.2 for all stories. The strength index  $C_t$  corrected by vertical distribution of lateral earthquake-induced forces exceeded 0.8 at the ductility index  $F$  of 1.0. This shows that the building has good seismic performance in the transverse direction.
- 3) If a new opening with a width of 950 mm is given to two PC shear walls in the transverse direction for all stories, the seismic index  $I_s$  descended to 0.93, which was the smallest among all stories, from a value of 1.24 without openings for the first story. The seismic index  $I_s$  decreased to approximately 0.93 times of the existing building for the second to fourth story, ranging from 1.00 to 1.27. These  $I_s$  values were significantly

greater than the threshold value of 0.6.

4) When a new opening is set in an existing PC shear wall, flexural and shear ultimate strength for the wall with the opening cannot be taken accurately in some cases by Guidelines for Evaluation of Seismic Capacity of Existing WPC Buildings. This is attributed to the fact that the Guidelines deals tacitly with a “regular” PC shear wall with two horizontal steel-joints called a setting-base at both ends. A new opening divides a PC shear wall into two side-walls, and the each side-wall has only one setting-base at one end. This side-wall is regarded as ”irregular” for the Guidelines.

#### Early Reinforced Concrete Structure in Japan

KITAYAMA Kazuhiro

The building for Yokohama branch of Mitsui Bussan with four stories designed by Endo Oto and completed in 1911 seems to be the first building in Japan which was built by reinforced concrete for whole members. Therefore, structure of the building was researched using bar arrangement drawings and papers written by Endo Oto.

Arrangement of reinforcing bars for R/C beams and columns was basically done according to Hennebique method although Endo Oto seemed to elaborate several details for bar arrangement. For example, a stirrup in a beam was not tie-type as is seen for Hennebique method, but U-shaped involving all longitudinal bars. Though a hoop in a column was made of steel flat bars for Hennebique method, a hoop in a 470 mm-square column for the building consisted of a steel wire with a diameter of 11.7 mm, arranged with center-to-center spacing of 470 mm. Shear reinforcement ratio in a beam was 0.16 % and that in a column was 0.10 % which is half an amount required by the existing building law in Japan, i.e., 0.2%. The ratio of total sectional area of longitudinal bars to gross sectional area for a column was 2.1 % for the first story. However, that for the third and fourth story was 0.7 % which is less than that required by the existing building law, i.e., 0.8%. A hunch reinforced by steel bars was launched at a hinge region of a beam. It seems that sufficient shear strength was afforded to a beam since bent bars for longitudinal reinforcement, which is one of unique characteristics for Hennebique method, were arranged for a beam. On the contrary, there was no consideration to ensure shear strength for a column for lack of the knowledge on the shear resisting mechanism in R/C members to lateral forces induced by earthquake excitations during the first decade of twentieth century.

#### Earthquake Resistant Performance of PRC and PC Beam-Column Subassemblages Failing in Joint Panel Shear after Beam Yielding

KITAYAMA Kazuhiro

For prestressed reinforced concrete (PRC) and prestressed concrete (PC) interior beam-column subassemblages where a beam-column joint panel failed in shear

after beam flexural yielding, two subjects described as follows were studied using past test results conducted by Kitayama Laboratory; simple computation method for shear force input to a beam-column joint panel, and relationship between deformation capacity and the ratio of shear strength to input shear force for a beam-column joint panel. Concluding remarks are shown below.

1) Shear force input to a joint panel derived from beam bending moment divided by a constant lever-arm length in a beam section, i.e., 0.8 times of a beam depth agreed well with that obtained directly by tensile force of beam longitudinal bars and PC tendons up to peak story shear capacity.

2) The distance in a beam section between tensile resultant force within a tensile region of a section and compressive resultant force, which is equal to the lever-arm length in a beam section, decreased from a constant length of 0.8 times of a beam depth after peak story shear force. This was caused by eventual joint shear failure due to excessive compressive damage in joint panel concrete, resulting in the increase in a depth of a beam section suffering compression.

3) Deformation capacity for PRC and PC interior beam-column subassemblages was inferior to that for R/C subassemblages because axial compression force exists in a PRC and PC beam due to prestressing to PC tendons.

#### **【Jiro TAKAGI】**

#### **Reinforcement Design and Performance Assessment of New Wall Openings in Existing WPC Apartment Buildings**

Jiro Takagi, Kazuhiro Kitayama, Susumu Minami, and Masao Koizumi

In this study, reinforcement design options are developed and the performance is experimentally assessed for walls with new openings in existing wall-type precast reinforced concrete (WPC) apartment buildings. Renovation plans of the existing WPC apartments are developed by our project team and layout change with new openings in the walls is included in these plans to meet recent demands with diverse family and life styles. In WPC structures, pre-cast (PCa) concrete panels are connected with embedded steel plated and welded at the construction site. These connections are called “Setting Bases (SB)”. Normally, two SBs are set on the upper and lower sides of the PCa wall panels. Under earthquakes, the SBs transfer shear force of the walls and carry vertical tension/compression resisting the over-turning moment (OTM) of the walls. With the new openings, remained parts of walls at the side of the opening are considered as independent walls; however, these walls cannot carry OTM, because there is only one SB left on the upper and lower side. In addition, the part of the wall above the new openings is expected to work as a beam; however, reinforcement of this part of the wall is not enough as a beam. In order to improve the performance of the walls with the openings, two types of reinforcement design are developed: (1) placing new connections between the walls and (2) strengthening the

wall (beam) above the openings. The reinforcement design options are prepared for two cases depending on the opening locations (i.e. new openings are at the same place in each floor or not), using two alternative materials (concrete and steel). Half-scale experimental study is scheduled for seven cases (one without opening, two with openings, and four with reinforcing). The specimens are designed and created in 2008 fiscal year, and tested in 2009 fiscal year.

**【Kazushige YAMAMURA】**

**Strong Motion Observation of A High-rise RC Building**

Kazushige YAMAMURA

Strong motion observation started of a high-rise RC building in Tokyo. This building was analyzed the last year by the method of microtremere. The earthquake recorders are placed at the first floor and the roof floor. So the transfer function can be estimated by the strong motion records. This year 4 earthquake data were obtained. Results of analyses are similar to that estimated by microtremere.

**Explanation Method of Live Loads**

Kazushige YAMAMURA

It is difficult to explain design live loads because they are defined as equivalent uniformly distributed loads. And 1) expression of images as seen, 2) correspondence between cost and performance, 3) CASBEE index, are also difficult problems. This year the investigation of relationship between characteristic and images are carried out. And the feasibility of real-time stress explanation system by computer graphics are investigated.

**【Susumu MINAMI】**

**Brittle Fracture of Structural Steels**

Susumu Minami

In beam-to-column welded connection of steel structure, brittle fracture may occur from two or more fracture initiation points, e.g. scallop, end-tab, weld metal and HAZ. As a basic study on the local fracture criteria, the fracture of a steel member that is composed of more than one element, such as a welded joint, is investigated. Fracture experiments on steel elements with notches are carried out, by using two materials that have different fracture toughness. The effects of the notches on the brittle fracture and the fracture characteristics of the combination of two different steel materials are investigated in this study.

**Influence of Weld Defects on Tensile Strength of Weld Joints of Thinner Structural Steel Plates**

Susumu Minami

The inspection of welded joints in building structures in Japan has been examined by using "Standard for the ultrasonic inspection of weld defects in steel structures, Architectural Institute of Japan". However, this standard is applicable only to steel plates with a thickness greater than 6 mm. The objective of this study is to develop the ultrasonic testing method that is applicable to welded joints in steel thin plates. Test specimens that have weld defects were made by arc welding. Ultrasonic test, radiographic test and tensile test of the specimens are carried out. The relation between the strength and the welded defect rate was obtained.

### **Environmental Engineering**

**【Noriyoshi ICHIKAWA】**

#### Development of Optimal Water Supply System in Buildings

Noriyoshi ICHIKAWA

Receiving Tank Water Supply system has been adopted in the building which was higher than middle scale. However, Direct Booster Water Supply (DBWS) system method was developed about 15 years ago. Thereafter ten story of DBWS methods became adopt a lot in a building of a class. Recently, Direct Water Supply system is adopted for a building to four story, too. Both water supply method has many advantages, but there are many the problems that you must examine in future. This year, I examined about the construction of the model of the design quantity of water consumption by the estimated maximum value and so on.

#### Study on Countermeasure to Legionella in the Public Bath Facilities

Noriyoshi ICHIKAWA

In Japan, Legionellosis infectious disease has been a serious problem in big bathtubs with water circulation system installed in hotels, spa, public bath, training facilities etc.. Legionella occurs in the bathtub by various causes. It can be supposed that a bathtub has such infectious risk when water is stagnant in it. This year, the experiment which removed DOC of the circulation bathtub water was carried out.

#### Study on utilization of water resources

Noriyoshi ICHIKAWA, Satoshi NAKAYAMA

Japan is located in the east end of an Asian monsoon. Therefore, annual average precipitation is about 1,700mm, and the quantity is considerably ranked as a high rank in the world. However, in our country, there are many areas that experienced a shortage of water and shortage of water till now. A cut in water intake and restriction on water supply have been done each time. The level has a considerable difference by an area. A purpose of this study is construction of an effective use model of the aquatic resources which let you reflect a local characteristic. This year examined precipitation according to an area in Japan by use of Expanded AMeDAS Weather Data

**【Nobuyuki SUNAGA and Tamaki FUKAZAWA】**

Research on Comfortable Bioclimatic Architecture

For the benefit of preserving global environment, the effective use of energy consumed in architecture and the utilization of natural energy are indispensable factors for architectural design. Furthermore to popularize Passive and Low-Energy Architectures which are buildings designed by considering energy conservation and natural energy utilization, it is necessary to clarify the actual performance of them and to establish evaluation methods for them which are simple and widely acceptable for the public. We have been engaged in the research of these themes.

In this academic year, we carried out following studies.

1. Promoting Sustainable Improvement of residential buildings in China

[International Agreement with Northwestern Polytechnical University (NPU), China]

Based on the international agreement with NPU in 2007 and the special research budget of Tokyo Metropolitan Government in 2008 titled 'Promoting Sustainable Improvement of residential buildings in China', we carried out field measurements and a simulation study. We decided to study about the actual conditions and improvement methods for the typical residences in the three regions in Shaanxi province. The three regions are the north part (very cold region), the middle part (cold region) and the south part (cold and hot region). We measured some typical residences in the north and middle part in summer and winter, and also we examined the thermal performance of a typical residence, which has brick construction and flat roof, in the middle part by simulation.

2. Environmentally Friendly School (Eco-School)

a) Questionnaire Survey; We presented the results of analyzing the questionnaire survey for 150 Eco-Schools at the annual meeting of AIJ. Also we printed some of the results in the professional journal of school building.

b) Actual Performance of Eco-School; We measured and examined the actual thermal performance of Meguro-chuou Junior High School, which was designed with out-side thermal insulation, horizontal louvers, solar floor heating and so on, and was opened April in 2008.

c) Effect of Measures for Heat in Classroom; We carried out the experimental monitoring about the effect of the additional eaves, bamboo blinds and night-purge (cross-ventilation in nighttime to cool the building) using ventilating fans, 'Kanki breath' and opening the windows at two primary schools in Tokyo and Yokohama city. From results of them, it is clarified that the influence of thermal mass of school building is huge and the effect of night-purge by opening windows is the biggest among the three ventilation methods.

d) Standard and Guideline for School Building; In order to improve the performance of school buildings, we investigated about the laws, standards and subsidy for school

building, and also collected the standard plan of school in Suginami Ward and Yokohama city.

e) Investigation of Eco-School in Germany and England; Prof. Sunaga carried out the on-site investigation of Eco-Schools in Germany and England. In Germany he interviewed with Prof. Peter Hübner about his concept of Eco-School, who is an architect and a professor of University of Stuttgart.

### 3. Development of Insulated Door at Inside of Window (IDiW)

It is clarified in last year that high thermal performance is obtained by the installation of insulated doors at the inside of windows. In this year we made some trial pieces of IDiW for office building and we had significant knowledge about the surface finish, support members and the awareness of users.

### 4. Effect of Thermal Capacity on Thermal Performance of Detached House

Monitoring and simulation study were carried out to clarify the effect of thermal capacity on the thermal performance of detached house, using an actual-size experimental house which has a wooden room, an AAC room and a RC room. A part of the first results of this study was presented at the annual meeting of JSES in 2008.

### 5. Evaluation Method for the Bioclimatic Houses

Concerning the evaluation method that can evaluate the thermal performance of building with no air-conditioning system, a series of experiment with subjects was carried out to obtain the data under the non-uniform thermal conditions. The experimental house, the above-mentioned, was used for this experiment and the 338 persons' data was gained.

### 6. Improvement of Indoor Environment by Buffer Zone

We argued that it is required to examine the thermal condition in the buffer zone when buffer zone is designed in a building. And we discussed the influence of the placement of buffer zone, the window area and the thermal insulation of buffer zone upon the thermal performance both of living space and of the buffer zone with simulation results.

### 7. Life-cycle Evaluation about Apartment House Considering the Life-stage of Residents

We studied about the effect of adjustment actions for the indoor environment by residents on the heating/cooling load by simulation considering the life stage of residents. As a result, it is shown that the adjustment actions lead to 40 % off the heating/cooling load in the whole life of residents.

**【Akihiro NAGATA】**

Evaluation of Thermal Performance of Building Envelope Components

Akihiro NAGATA

Today, further efforts are required to reduce energy use for global warming prevention and the improvement of thermal performance is one of the issues for residential



buildings. In such situation, the in-situ measurement of the thermal performance of a building envelope component is increasingly important. This study is a development of in-situ measurement methods of thermal performance of walls in conventional timber construction. Last year, we developed the insulating material identification sensor (appl. No. (2008)235075) and the needle scope for visual observation of wall inside. This year, measuring methods using these apparatuses applied to various fibrous insulating materials and following results were obtained: 1) Both methods are effective to measure the position and the thickness of the insulating material, 2) It is necessary to improve the insulating material identification sensor because it may be difficult to identify materials, 3) Three types of fibrous insulating materials(glass wool, rock wool and cellulose fiber) can be roughly distinguished by needle scope images.

#### Exterior Design and Environment of Low-Rise Residential District Akihiro NAGATA

Walls, fences and plants, which are located on boundaries between building constructions and roads, have a considerable impacts on interior and exterior environments, such as delighting, cross-ventilation, wind trail and so on. However, quantifications of these impacts are not comprehended well. This study aims to clarify these impacts in low-rise residential districts. This year, existence rates, positions and heights of walls and fences in several districts are investigated to collect basic data on exterior designs.

#### 【Satoshi NAKAYAMA】

#### Research of the Urban Climate and the Weather Data Satoshi NAKAYAMA and Shin AIBA

The urban climate consists on several factors such as urban conformation, covered materials of earth surface, industrial activities, and so on. In actual urban district, we conducted a field survey such as air temperature distribution. In this year, the Kokubunji district was intended for survey at early morning and mid daylight hours in summer, and winter mid daylight hours.

#### Research of Framework for Thermal Environmental Control by Clothes Satoshi NAKAYAMA

The amount of clothing is generally evaluated by Clo value, but the value is changed by how to wear it, or variable around conditions. In this research, it was made clear by experiment that the shift of thermal performance by the fibers transform of clothes under the around air flow.

#### **Strategic Research Center** 【Shigeru AOKI】

The reproduction technique of the public building is analyzed and it examines it referring to the existing stock use case with the public building (citizens hall etc. planned to Kiyose City, Tokyo).

It proposes a new technique for a large-scale repair of the public house that the municipality etc. own.

A school eco-repair of the Ministry of the Environment and practicing research in the environmental education business are done.

### **Urban space, system and planning**

**【Itsuki NAKABAYASHI】**

**【Hidenori TAMAGAWA】**

Studies of concept and method for creating compact city

Hidenori TAMAGAWA, Fumiko ITO, Taro ICHIKO, Takashi OGUCHI, Tohru YOSHIKAWA, Tsutomu SUZUKI and Satoru SADOHARA

The various studies are conducted to create the compact city ; rearranging its basic concepts, measuring the objective compactness in real city area, the compactness of land use related to energy consumption, finding the compact urban administration unit, the relation between the compactness and urban disaster mitigation planning and so on. Summing-up book “Re-considering the Compact City” was published in November, 2008.

A Fundamental Study on the Characteristics of Urban Model

Hidenori TAMAGAWA

The new implications of a spatial interaction model have been investigated. The gravity type model is adopted to fix the territory of two facilities on two dimensional plane. The theoretical consideration and computer simulation are conducted whether the result in the case of linear city, “while the ordinary phenomenon ‘the smaller the distance-resistance parameter is, the more frequently the monopolization occurs’ is observed, the model’s reversal behaviors can occur by some cases of the two facilities positioning”, also comes true of the case on two dimensional plane.

**【Fumiko ITO】**

Real Estate Related Information

Information of real estate should be provided widely to the customers. We made some analyses of the technical terms and phrases used in housing or real estate. The present situation of real estate related information was surveyed and the strategy of enhancing the information was suggested.

Cost-Benefit Analysis of Public Projects

Several public projects were analyzed by cost-benefit analysis.

1: Cost benefit analysis of the location of wards and ward offices in Niigata city.

2: Cost benefit analysis of reducing the emission of nitrogen oxides in Asia.

#### **【Taro ICHIKO】**

Planning theory for disaster-proof community development

Taro ICHIKO

The building loss of the Tokyo capital earthquake directly above the focus was estimated five times bigger than the Hanshin-Awaji earthquake according to cabinet office government of Japan. It is inevitable to make and do mitigation strategy for not only directly loss like death and injured but also indirectly loss like housing damage. In this study, I supposed to make planning technology for disaster-proof community development.

In fiscal year 2008, I engaged in 10th municipal staff training by TMG. Target area was in Senjyu Adachi word. Recovery urban planning guideline was verified and training program was inquired.

Development of the neighborhood community-training program for post-disaster recovery

Taro ICHIKO and Itsuki NAKABAYASHI

The objective of this study is developing inhabitants, administration, training technique to make the indirect damage reduction from a viewpoint of "pre-disaster planning" ahead of a serious damage assumption by a capital earthquake directly above the focus.

In this year, we developed some training methods in Horikiri, Katsushika word. In addition, we proposed earthquake disaster recovery manual for a municipality.

Multi hazard risk communication program for TAMA region

Taro ICHIKO

In the TAMA region where contains Hachioji, Hino, Tama and so on, not only single hazard like earthquakes but multi hazard risk communication is needed. My thesis is developing social learning methods and analyzing behavior change for residents exposed to multi hazard.

In this year, I've investigated activities about citizen secure society program. And I've interviewed with some experts.

#### **Urban society, residents and institution**

##### **【Tanji HOSHI】**

Health status in urban area of Tokyo and making clear the factors which contribute the healthy life for the people living in urban city.

The purpose of our study is to make clear the yearly trend of the health status in urban city and determine which have the validity for the survival rate of the dwelling elderly for several years followed up in urban city..

**【Masami HAGAI】**

Study on Inter-Governmental Relations and Local Governance in Japan

The objective of this study is to re-examine of the reforming of IGR and to clarify the meaning and the conditions of local governance of Japanese cities.

Study on Municipal Cooperation and Social Functions

The objective of this study is to re-examine the co-operation system of small municipalities and to reconsider the social functions of municipalities.

**【Kenji TAKEMIYA】**

Study on Support System and Care Environment for the Patients with Mental Disease

Kenji TAKEMIYA

This study aims at re-arrangement of the mental hospital and support facilities in Japan from users point of view. This year two surveys were conducted,

- 1) Analysis of the characteristics of utilization, inpatient treatment and discharge in a mental hospital
- 2) Analysis of the characteristics of utilization of day-night care unit where discharged patients come and stay during the day.
- 3) Analysis of the utilization of the space and patients' behavior in the wards and day-night care unit.

Architectural Planning of Health Care Facilities for Patients with Cancer

Kenji TAKEMIYA

This study aims at making clear the characteristics of health care facilities for patients with cancer. This year we had two research projects.

- 1) To show the current conditions and issues of the health care facilities for patients with cancer in Japan, field survey and correcting data of the core medical centers were carried out in a local district.
- 2) To show the current conditions and issues of the palliative care team in the core medical center for cooperative treatment for patients with cancer, inside observation, correcting questionnaire, and interview survey were carried out.

Residential Care System and Milieu for Elderly People and Disabilities

Kenji TAKEMIYA

For the progressive aging society, it is important to improve the quality of living environment for the elderly and disabilities in Japan. This year, some remarkable

results were got as follows:

- 1) The current situation and characteristics of rental housings for the elderly in Japan.
- 2) The current situation and utilization of the group home and care home for people with intellectual disabilities.

#### **【Shin AIBA】**

Decentralization of City Planning

Shin AIBA

I studied three points of current condition of decentralization 1) Cases of community based city planning, 2) National situation of city assembly reformation and 3) Cases of city planning regulation proposed by city assembly.

City planning methods for sustainable urban architecture stocks

Shin AIBA

Japanese city planning method must be changed to “Urban architecture activation style” instead of “Scrap and build style”. I studied a basic accumulation situation of urban architecture stocks using a tax roll of Hachioji city.

Comparative history of Community Development in East Asian countries

Shin AIBA

I studied comparison of community development history in three countries- Taiwan, Korea and Japan. I held an international workshops in Korea(Oct.) with participants from three countries.

Urban Design Method on Shrinking City

Shin AIBA

The population decreasing society begun in 2006, and it is said that the expanded city is going to shrink. I studied an actual condition of shrinking cities in suburb area of Tokyo Megalopolis, and studied the method of designing shrinking city.

#### **【Kahoruko YAMAMOTO】**

Urban Sociological Study on Social Structural Changes and Reconstruction of Urban Inner Area

My Study has been focused on social structural changes in urban inner areas, taking cases of Kotobuki, Yokohama and Hiro, Kure, Hiroshima. These two areas have three points in common; 1) change in industrial structures, 2) Globalization and increasing numbers of foreign residents and migrant workers, 3) town development plan engaged by public administration and NPOs. My academic aim is to clarify 1) how these three points affect over changes and reconstructing of local communities, and 2) how social lives of residents have changed. As the study outcome, “Kotobuki, Yokohama and

Migrants” (Japanese) was published in March, 2008.

### 3. List of Research Activities in 2008

#### Architectural Planning/ City Planning

【Jun UENO · Masumi MATSUMOTO】

##### 1. Refereed Articles

Ryoko KURAKAZU, Jun MUNAKATA, Kuniko HASHIMOTO, Jun UENO, 2007, A STUDY OF APPROPRIATE CLASS SIZE FROM THE TEACHERS'VIEWPOINT EVALUATION OF JAPANESE SCHOOL CLASSROOMS, Journal of Architecture, Planning and Environmental Engineering (Transactions of AIJ) : No.614, pp73-79

Asuka YAMADA, Jun UENO, 2007, A FOLLOW-UP RESEARCH ON REFURBISHMENT OF A PLAYROOM IN THE CHILDREN'S WARD BASED ON AVAILMENT ASPECTS, AIJ Journal of Technology and Design : No25 : pp.219-224.

Soyi CHONG, Jun UENO, 2007, CONDITIONS OF THE SOCIAL SUPPORT SYSTEM AND COMMUNITY ENVIRONMENT FOR THE INDEPENDENT ELDERLY PEOPLE, Journal of Architecture, Planning and Environmental Engineering (Transactions of AIJ) : No.616, pp55-62

Taka KATO, Jun UENO, 2007, LIVING ASPESTS AND LIFE STYLE OF ELDERLY IN HOUSING ESTATES OF TAMA NEWTOWN –About the life style and housing environment of the elderly in housing estate of Tama Newtown –, Journal of Architecture, Planning and Environmental Engineering (Transactions of AIJ) : No.617, pp9-16 :

Masayuki SATO, Jun MUNAKATA, Ryoko KURAKAZU, Jun UENO, 2007, A STUDY ON STUDENTS' ACCEPTANCE OF ENVIRONMENTAL TRANSFORMATION AND THEIR BEHAVIOR TOWARD IT IN THE CLASSROOM –Influence of age and adaptation on the students' response toward the ceiling height of classroom Part 2–, Journal of Architecture, Planning and Environmental Engineering (Transactions of AIJ) : No.617, pp25-30.

Kuniko HASHIMOTO, Ryoko KURAKAZU, Jun UENO, 2007, CONSIDERATIONS IN SPATIAL DESIGN AND PSYCHOLOGICAL EVALUATION OF CLASSROOMS – Analysis on classrooms' evaluation by questioners surveys to students, Journal of Architecture, Planning and Environmental Engineering (Transactions of AIJ) : No.620, pp57-64.

Noriyuki SHINODA, Masumi MTSUMOTO, Jun UENO, 2007, STUDY ON THE

ELDERLY' , DAILY LIFE ACTIVITIES IN THE DOWNTOWN DWELLING AREA OF TOKYO –A Casa study in Kanda area of Chiyoda ward –, AIJ Journal of Technology and Design : No.26 : pp673-678.

## **2. Proceedings of Oral Presentations**

Kuniko Hashimoto, Jun Munakata, Ryoko Kurakazu, Jun UENO, 2007, CONSIDERTION OF CLASSROOM ENVIRONMENT BY FREE DESCRIPTION IN QUESTIONARY SURVEY TO THE STUDETS, Summaries of Technical Papers of Annual Meeting Architectural Institute of Japan D-1 : p.69- :

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**【Tamaki FUKAZAWA】**

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【Shigeru AOKI】

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Shigeru AOKI,

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Shigeru AOKI,

Extension Lecture for Graduate Students of Aichi Sangyo University and Public (Aichi Sangyo University)

Shigeru AOKI,

The University of Tokyo in Komaba – Special Lecture for School Eco Renovation and management (Kankyo Sanshiro)

Shigeru AOKI,

Group for New Construction Development (Group for New Construction Development)

Shigeru AOKI,

Miyasaka Construction Corporation (Miyasaka Construction Corporation)

Shigeru AOKI,  
Zenjyu Fair 2008 in Tokyo (Zenjyu Association)

Shigeru AOKI,  
“Overcome Official recession!” Symposium (Data Max)

Shigeru AOKI,  
Kumamoto, Kumamoto Association of Real Estate Appraisers Training Workshop  
(Kumamoto Association of Real Estate Appraisers)

Shigeru AOKI,  
Kanagawa, Zenbanren · Nicnibankyo Seinenbu Asunaro in Kanagawa (Zenbanren ·  
Nicnibankyo Seinenbu)

Shigeru AOKI,  
Fukuoka, Group for Residence-making with Composure in Fukuoka (Group for  
Residence-making with Composure in Fukuoka)

Shigeru AOKI,  
Uwajima Design Cram School (Uwajima regional brand making promotion business  
executive committee secretariat)

Shigeru AOKI,  
Osaka Association of Architects & Building Engineers (Osaka Association of Architects  
& Building Engineers)

Shigeru AOKI,  
“Challenge to environmental problems II” (Nagoya University graduate school)

Shigeru AOKI,  
Shikoku Regional Development Bureau (Shikoku Regional Development Bureau)

Shigeru AOKI,  
Joint Workshop of Asset Management Division of Japan Agricultural Cooperatives in  
Fukuoka (Japan Agricultural Cooperatives in Fukuoka)

Shigeru AOKI,  
Ministry of Land Conservation Cram School (Ministry of Land)

Shigeru AOKI,  
Oita Prefecture Building and Repairing Government Business Studies (Oita Prefecture  
Civil Engineering and Construction Department)

Shigeru AOKI,  
Japan PFI Seminar (Japan PFI Association)

Shigeru AOKI,  
Prefectural University of Kumamoto (School of Symbiosis)

Shigeru AOKI,  
Study Session of The Association for a Study of the Electrical Apartment in Next  
Generation (Kyushu Electric Power Co., Inc.)

Shigeru AOKI,  
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### **3. Others**

#### **3-4. Works / Products, etc.**

Shigeru AOKI,  
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**【Fumiko Ito】**

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【Kahoruko YAMAMOTO】

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