

Training Report

on

Cultural Heritage Protection

**Training Course for Researchers in Charge of Cultural Heritage Protection
in Asia and the Pacific 2011 - Indonesia -
5 July - 4 August, 2011, Nara, Japan**



Cultural Heritage Protection Cooperation Office,
Asia-Pacific Cultural Centre for UNESCO (ACCU)

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Practical training of taking rubbing



Practical training of drawing



Practical training of photography



The closing ceremony at the ACCU office

Preface

The Cultural Heritage Protection Cooperation Office, Asia-Pacific Cultural Centre for UNESCO (ACCU Nara) was established in August 1999 with the purpose of serving as a domestic centre for promoting cooperation in cultural heritage protection in the Asia-Pacific region. Subsequent to its establishment, our office has been implementing a variety of programmes to help promote cultural heritage protection activities, in close cooperation with the Agency for Cultural Affairs, Japan (*Bunkacho*); National Institutes for Cultural Heritage, National Research Institute for Cultural Properties, Tokyo and Nara; the Nara Prefectural Government; the Nara Municipal Government; universities; and museums.

The ACCU Nara's activities encompass training programmes for the human resources development; international conferences and seminars; the website for the dissemination of information relating to cultural heritage protection; and the world heritage lectures in local high schools. In addition to those, ACCU Nara offers "Local Training Workshop" which dispatches a group of lecturers from Japan to one of Asia-Pacific countries and implements the practical training on cultural heritage protection on sites. Besides, we annually appoint "International Correspondent" from each country for the purpose of establishing closer ties with the countries in the Asia-Pacific region, who will periodically send latest reports on cultural heritage protection in their country.

Our office has been conducting two types of the training course in Nara: for the group and for the individuals. The group training course offers the opportunity to sixteen experts from Asia-Pacific region for about one month with two themes in alternate years: "Preservation and Restoration of Wooden Structures" and "Research, Analysis, and Preservation of Archaeological Sites and Remains." Meanwhile, the individual training course is organized for a few researchers from one country on the specific theme according to their requests.

ACCU Nara has learned that one of the most urgent issues currently facing Indonesia is a shortage of trained conservation architects who can conserve groups of traditional wooden buildings as historic landscapes for better utilization of them, and therefore we have invited three researchers into the Individual Training Course 2011 for providing them with basic and practical techniques on recording/documentation of wooden structures and for preservation of townscape and historic villages. They belong to Ministry of Culture and Tourism, being engaged in cultural heritage protection in Indonesia. This programme was also organised so as to provide them with opportunities to be exposed to as many preservation districts for groups of traditional buildings, townscapes and agricultural communities in Nara, Kobe and Shiga as possible. They saw with their own eyes how heritage architecture or vernacular houses were preserved and managed in Japan. It is hoped that their acquired knowledge and experience will contribute to heritage protection activities back in Indonesia.

Finally, we would like to express our sincere appreciation to Agency for Cultural Affairs, Japan (*Bunkacho*); Nara National Research Institute for Cultural Properties; Nara Prefectural Board of Education; Nara Municipal Board of Education; Kyoto City Board of Education; Kashihara City Board of Education; Hyogo Prefectural Board of Education; Kobe City Board of Education; Nara Women's University; and the University of Shiga Prefecture for their cooperation and support.

NISHIMURA Yasushi

Director

Cultural Heritage Protection Cooperation Office,

Asia-Pacific Cultural Centre for UNESCO (ACCU)

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I. Introduction



Training Course on Cultural Heritage Protection in Asia and the Pacific 2011 - Indonesia - (5 July - 4 August 2011, Nara)

1. Organisers

The course is jointly organised by Agency for Cultural Affairs, Japan (*Bunkacho*); Asia-Pacific Cultural Centre for UNESCO (ACCU); and the National Institutes for Cultural Heritage, Nara National Research Institute for Cultural Properties.

2. Background

The Republic of Indonesia comprises numerous islands with more than 300 ethnic groups and has developed diverse cultural properties rooted in unique cultures in each island. There exist not only many stone structures including Borobudur Temple, but also abundant wooden architecture such as old mosques and vernacular houses, which need research study for preservation.

In 1998, Agency for Cultural Affairs of Japan conducted “Workshop on Conservation of Wooden Architectural Heritage” in the central regions of Java in cooperation with Indonesian government and confirmed that this kind of exchange programme between two countries should be continued, while Ministry of Culture and Tourism recently realized that it would be the matters of urgency to conserve groups of traditional wooden buildings as historic landscapes for better utilization of them. For that purpose, the capacity building of conservation architects becomes the urgent issues, because there are not sufficient numbers of experts in Indonesia to conserve wooden heritage except in the specific area of Java.

Based on this current situation in Indonesia and in response to a request from Directorate General of History and Archaeology, ACCU Nara has decided to invite young officials who are to engage in conservation work of wooden heritage in Indonesia into the individual training course.

3. Date and Venues

Date: 5 July (Tue.) 4 August to (Thur.) 2011. [31 days]

Venues: Cultural Heritage Protection Cooperation Office, Asia-Pacific Cultural Centre for UNESCO (ACCU Nara); Facilities and museums of cooperating organisations.

4. Objectives

A sequence of the individual training course aims at mainly providing participants with the basic knowledge and practical technique in Japan concerning to measures for survey and preservation of the historic buildings which make up significant parts of the townscape and villages, and methods for conservation management and utilization of the townscape and villages as a whole, which will accordingly contribute to the protection of cultural heritage in Indonesia.

5. Training Curriculum

- Introduction to Recording/ Documentation of Wooden Structures
- Practical Works of Recording/Documentation of Wooden Structures
- Restoration Plan for Wooden Structures
- Introduction to Restoration Techniques of Historic Building
- Practical Works of Restoration of Historic Building
- Introduction to Preservation of Townscape and Historic Villages
- Practical Works on Preservation of Townscape and Historic Villages

6. Participants

Anton Wibisono (Mr)

Staff, Restoration Division, Directorate of Archaeological Property, Ministry of Culture and Tourism

Date of Birth: 19 October 1981 (Age 29)

Albertus Nikko Suko Dwiyanto (Mr)

Staff, the Office for Preservation of Sangiran Early Man Site, Ministry of Culture and Tourism

Date of Birth: 15 November 1982 (Age 28)

Prima Ardiani (Ms)

Staff, Registration and Determination Division, Directorate of Archaeological Property, Ministry of Culture and Tourism

Date of Birth: 9 September 1986 (Age 24)

7. Process of Invitation

Ms Aurora Tambunan, Director General of History and Archaeology, Ministry of Culture and Tourism, recommended three applicants suitable for the above mentioned invitation programme as participants. Then ACCU Nara Office has determined to invite three applicants as participants through close examination.

8. Others (Past achievement to accept participants)

Since 2000 when the above-mentioned invitation programme started, forty-one participants from fourteen countries have been accepted.

9. Certificate

Each participant will be awarded a certificate upon the completion of the course.

10. Language

Indonesian is the main working language of the course.

11. Expenses

Expenses for the training course will be borne by ACCU and comprise the following:

(1) Travel expenses:

Each participant will be provided an economy-class return air ticket between the international airport nearest to their residence and Kansai International Airport, and domestic transportation costs to and from the airports and between the training venues in Japan.

(2) Living expenses:

Participants will be provided daily subsistence allowances during the training course, beginning from 5 July (Tue.) to 4 August (Thur.) 2011. Arrangements for accommodations will be made by ACCU Nara.

12. Secretariat

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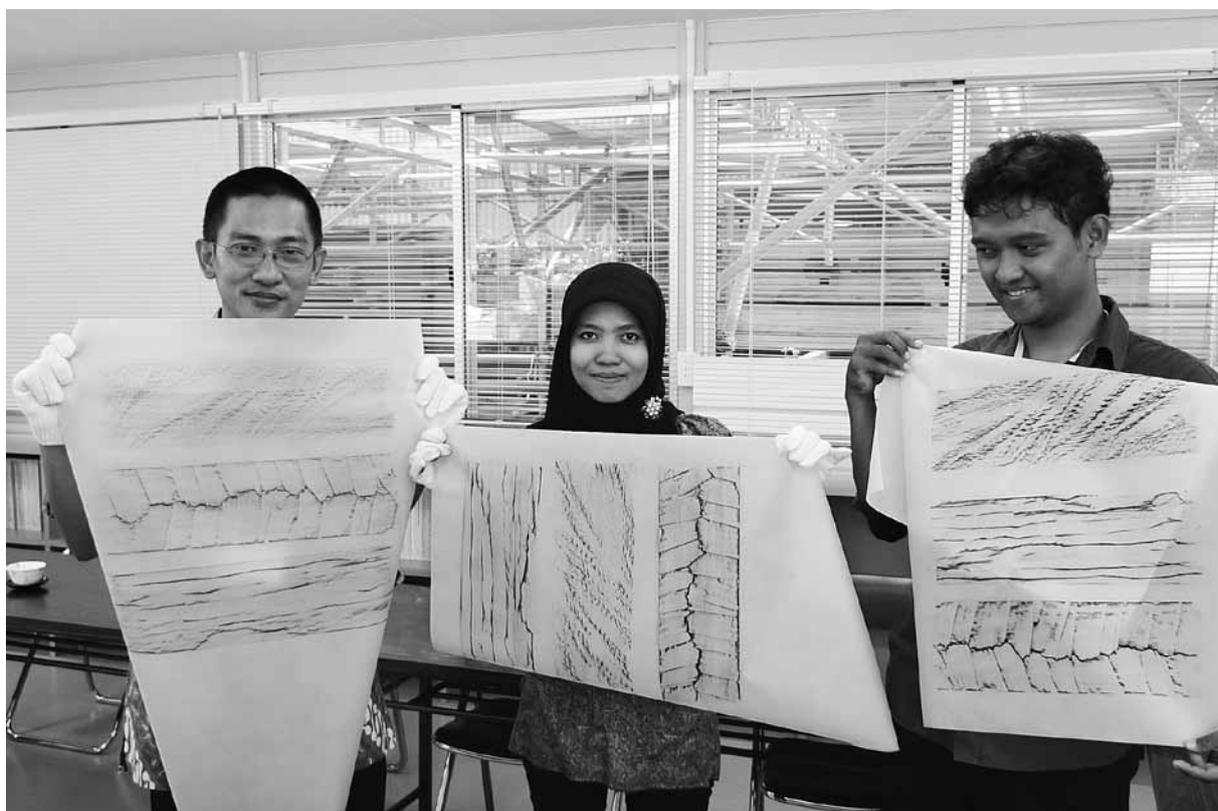
Programme Schedule

Date		Schedule		Venue		
July	5	Tue.	Opening Ceremony	Orientation to the Programme	ACCU Nara	
	6	Wed.	On-site Lecture: Historic Monuments of Ancient Nara, World Heritage Site		Nara City	
	7	Thur.	Introduction to Japanese Architecture / Introduction to Conservation Policy of Architectural Heritage		NNRICP	
	8	Fri.	Documentation and Restoration Plan of Wooden Structures		ACCU Nara	
	9	Sat.				
	10	Sun.				
	11	Mon.	On-site Lecture: Practical Works on Restoration of Historic Buildings I		Yakushiji Site and Tanzan Jinja Shrine	
	12	Tue.	Practical Training: Recording of Wooden Structures		Tanaka Family Residence, Nara City	
	13	Wed.	Practical Training: Recording of Wooden Structures			
	14	Thur.	Practical Training: Material Survey for Sustainable Conservation and a Management Policy			
	15	Fri.	Practical Training: Damage Survey and Planning for Restoration			
	16	Sat.				
	17	Sun.				
	18	Mon.				
	19	Tue.	Introduction to Preservation of Townscape and Rural Settlement		NNRICP	
	20	Wed.	On-site Lecture: Historic Monuments of Ancient Kyoto, World Heritage Site		Kiyomizu-dera Temple and To-ji Temple	
	21	Thur.	On-site Lecture: Practical Works on Townscape Preservation I (Agricultural Community)		Yamatokoriyama City	
	22	Fri.	On-site Lecture: Practical Works on Townscape Preservation II (Merchant's Houses)		Imai-cho Town	
	23	Sat.				
	24	Sun.				
	25	Mon.	Introduction to Dendrochronology	Introduction to Recording of Wooden Structures (Photography)		NNRICP
	26	Tue.	Practical Training: Recording of Wooden Structures (Photography)		Imai-cho Town	
	27	Wed.	Practical Training: Recording of Wooden Structures (Photography)		Imai-cho Town	
	28	Thur.	On-site Lecture: Practical Works on Restoration of Historic Buildings II		Himeji-jo Castle	
	29	Fri.	On-site Lecture: Risk Management of Cultural Heritage / Practical Works on Townscape Preservation III		Kobe City	
	30	Sat.				
	31	Sun.				
	August	1	Mon.	On-site Lecture: Practical Works on Townscape Preservation IV		Shiga Pref.
		2	Tue.	Identification of Unearthed Architectural Members	On-site Lecture: Buddhist Monuments in the Horyu-ji Area	Asuka Historical Museum/ Horyu-ji Temple
		3	Wed.	Writing Final Reports		ACCU Nara
		4	Thur.	Submission of Final Reports / Closing Ceremony		ACCU Nara

ACCU Nara: Cultural Heritage Protection Cooperation Office, Asia-Pacific Cultural Centre for UNESCO

NNRICP: Nara National Research Institute for Cultural Properties

II. Summary of Lectures



Summary of Lectures

5 July (Tue.)

■ Opening Ceremony / Guidance to the Programme

The opening ceremony began with a welcome message by Mr Nishimura, Director of ACCU Nara. He hoped that participants would study well the methods of recording buildings and conducting repairs and they would adapt these to work for the conditions in Indonesia after their return. He also wished that over the coming month they would approach their experience here with interest and come to like Japan and finally concluded to take care of their health as this was a very hot season. After the self-introduction by participants, they expressed determination to study hard and pleasure in having an opportunity to come to Japan.

At the orientation of the programme, Ms Kato explained as follows:

- Explanations of the curriculum, the texts, and submission of final reports.
- Making scale drawings is highly effective for conservation.
- Rules regarding the preservation of cultural heritage.



Mr NISHIMURA,
Director of ACCU Nara



Opening Ceremony



Orientation

6 July (Wed.)

■ On-site Lecture: Historic Monuments of Ancient Nara, World Heritage Site

<NAKAI Isao / Nara city>

Prior learning at ACCU Nara

- Explanation outlining the Historic Monuments of Ancient Nara, World Heritage Site.
- The types of cultural heritage and their values.
- Buildings from the time of the founding of the Nara capital survive; when rebuilding is done the traditional style is recreated.
- Explanation with a chronological chart of the periods from which buildings survive.
- Explanation that the Nara capital was a city of bureaucrats.
- Questions from the participants about the former class system and differences in rank.

At Tōdaiji

- *Nandaimon*. Explanation of the architectural style and record of rebuilding, and the composite wooden construction of the guardian statues. From the Song dynasty style of the guardian beasts (*koma inu*) it is possible that craftsmen from China participated in the construction.

- *Daibutsuden*. Detailed explanation of the history of rebuilding the structure. It is the third such Great Buddha Hall. It is slightly smaller than the original, etc. Also, the participants eagerly asked questions about the structure of the hall and about the roof tiles.
- *Hokkedō*. A fusion of eighth and thirteenth century structures. Currently under repair. Questions from the participants about countermeasures for termites.
- *Sutra repository*. Explanation about the structure of the *azekurazukuri* (log construction). Participants were surprised by the log framework of the storehouse portion functioning as pillars.

At Kasuga Taisha shrine

- *Kasugayama Primeval Forest*. Explanation of cultural landscapes.
- *Carriage house*. Even the aristocrats dismounted from their ox carts here and walked for their shrine worship.
- *Cypress bark roof*. Detailed explanation of the method of repair. Inspection made of the remains of the Kasuga pagoda and cloister.

At Kōfukuji temple

- *Five-storied pagoda, eastern main hall*. It was explained that the purpose here was to reconstruct faithfully the Nara period buildings of the temple. The Buddha images were removed on the occasion of fire, and a detailed lecture was also heard on the images that survived the flames.
- *National treasure museum*. Inspection made of Buddha images.
- *Northern octagonal hall*. Inspection made of the excavation of the cloister.



Lecture at Todaiji Temple



Lecture at Kasuga Taisha shrine



7 July (Thur.)

■ Introduction to Japanese Architecture / Introduction to Conservation Policy of Architectural Heritage <HAYASHI Yoshihiko / NNRICP>

At first, explanation of Japan's cultural heritage system and categories, with outlines given especially in relation to buildings for: Important Cultural Properties; National Treasures; Preservation Districts (and Important Preservation Districts) for Groups of Traditional Buildings; arrangements for support, duties, and regulations. At present there are 91 Important Preservation Districts for Groups of Traditional Buildings, and in many cases these are selected as central attractions for tourism.

Explanations concerning the history of cultural heritage legislation and protection.

- At the start of the modern era (Meiji period), temples and shrines that had been closely involved in politics saw devastation. In order to prevent this the 1897 Ancient Temples and Shrines Preservation



Lectured by Mr Hayashi

Law was adopted, followed by the 1919 Historical Sites, Places of Scenic Beauty, and Natural Monuments Preservation Law, and then the 1929 National Treasures Preservation Law, and preservation was carried out under this complement of legal measures for buildings, historic sites and places of scenic beauty, art objects, and so forth.

- After the Second World War, these measures were finally integrated and became the 1950 Law for the Protection of Cultural Properties.
- With the period of high economic growth as background, the system of Preservation Districts for Groups of Traditional Buildings was newly established as a significant improvement in 1975 to protect townscapes from development, with the establishment in 1996 of a registration system for cultural properties, and the addition in 2004 of cultural landscapes, as significant developments.
- The registration system for cultural properties differs in nature from other cultural heritage measures, in that no subsidies are provided for repair. Its purpose is to increase awareness on the part of the owners, with structures that have been standing for 50 years as a standard. It can be called a system that is well suited to the situation, with registrations at the rate of 400-500 annually.
- More than 90% of Important Cultural Properties (including National Treasures) in Japan are made of wood.

Regarding repairs

- Explanations about reports (e.g. the 1955 report on the five-storied pagoda at Hōryūji, the three-volume report [photos, drawings, text] on the Daibutsuden, and as the most recent item, the one for Hōzanji Shishikaku). Compilation of reports is required for any repair project of a certain scale, and over 2,000 have been published thus far.
- For extremely ancient buildings such as those at Hōryūji, the recent (1955) repair was not the first occasion, with numerous prior repairs having been experienced. Among those, from the second time on, there was concern to maintain the policies followed in previous repairs. But due to technological innovation, there are instances of new techniques being adopted.

Accumulation of expertise

For wooden structures, during the dismantling (or partial dismantling) that accompanies repair, the original technology and skills nearly always come to light, and from the repairs done to the present the history of wooden construction technology from the ancient period on has been made clear. Using this knowledge, the Former Imperial Audience Hall and Suzaku Gate were reconstructed.

Problems and issues in repair

When investigation is made in conjunction with repair, there are aspects of the structure's history and original form that become clear and aspects that do not. But the parts that are not understood cannot be left as they are, since the building has to be completed structurally, so some solution has to be found.

An outline of Japanese buildings

Using concrete examples (from ancient to modern, buddhist temples, *sinto* shrines, domestic architecture, private houses etc.), an outline was given of historical change in Japanese architecture.

8 July (Fri.)

■ Documentation and Restoration Plan of Wooden Structures

<IMANISHI Yoshio / ACCU Nara>

Explanation of Japanese cultural heritage, dates of construction and criteria for protection. Changes over time in thinking about repair, since repair programmes began from the time of the 1897 Ancient Temples and Shrines Preservation Law, were illustrated by introducing the recent large-scale repair programme at Tōshōdaiji temple (1998-2009).



Lectured by Mr Imanishi

11 July (Mon.)

■ On-site Lecture: Practical Works on Restoration of Historic Buildings I

<IMANISHI Yoshio / Tōshōdaiji and Tanzan shrine>

At Tōshōdaiji

The subject of Friday's (8 July) lecture on repairs was explained at the actual site. Explanations were also given about fire fighting equipment (water cannons and automatic fire alarms, water cisterns, etc.), monitoring of deformation for components such as axle portions, and methods of managing upkeep.

At Yakushiji

Inspection was made of the site of dismantling and repair prior to the start of work. The contents of the project, and various investigations accompanying the dismantling and repair, such as seeking out the causes of damage, investigating the paintings on the ceiling and the coloration and so forth, were explained. Also, at the work site, explanations were heard and demonstrations observed regarding the carpentry tools used at the time of construction. Further, the types and characteristics of wood used in wooden construction were explained, along with where they were utilized. Additionally, at the on-site office, practical training was done in taking rubbings of surfaces that had been cut with a saw, an adze, and a planing tool (*yariganna*).

Explanation about Tanzan shrine at the Tanzan *sinto* shrine repair project office.

Until the nineteenth century, this was a temple named Myōrakuji dedicated to Fujiwara no Kamatari, but with the Meiji period persecution of Buddhism this was converted into a Shinto shrine. The thirteen-storied pagoda stands atop Kamatari's grave. Kamatari's spirit is enshrined in the main hall. The period of repair work is from November 2005 to October 2012. In the current repair project, the thirteen-storied pagoda, Gonden, Sessha Tōden, east and west treasure halls, main hall, east and west open corridors, are to be repaired. The cost of the project is 860,000,000 Yen. The high cost is due to the cypress bark roofs, lacquer painting, and the many decorative patterns. This will not be a dismantling and repair. The east and west treasure halls will be partially dismantled for repair.

The Sōja Haiden (worship hall of a shrine consolidating many deities), the Hie shrine (where carpenter's graffiti can be seen on the back side of the stairs), Gonden (where the main icon is enshrined during repairs), and the thirteen-storied pagoda etc. were visited. Also, the west treasure hall, Sakura gate, and on to the main hall. Climbing the scaffolding, a close-up explanation was given of the cypress bark roofing. At the corner of the roof, fan-shaped pieces of bark are used. One reason *sinto* shrines do not have tile roofs may be due to the intent of a ceremonial cycle of transfer every 20 to 30 years. Where the sun hits it directly, the cypress bark quickly weakens, but where it receives no sun moss will grow. The main hall, east and west open corridors, east treasure hall, and Tōden were visited. In the work area, explanations were heard of planing tools (*yariganna*, a point plane; *daiganna*, box plane).



Lecture at Toshōdaiji



Lecture at Yakushiji



Lectured by Mr Yoshida at Tanzan shrine

12 July (Tue.)

■ **Practical Training: Recording of Wooden Structures**

<YAMAGUCHI Isamu, NAKAMURA Nobuo and TAKAMIYA Kunihiro / Tanaka Family Residence, Nara City>

On the *tatami* mats of the Tanaka residence, there were explanations from Mr Yamaguchi about the outline of Japanese traditional private houses, the former Tanaka family residence, and the *hōrenzukuri*

style. When the Tanaka residence was rebuilt, the city received the building and moved it to the present location. It was reconstructed in its original form at that time. New material was used for a portion of the members, and the wood was painted in antique colours. Currently the building is open to the public, and as part of its educational use a fire is made in the traditional cooking stove, *kamado* which is used for activities such as cooking rice. Combining aspects of town houses and farm houses is a characteristic of *hōrenzukuri* architecture. As it was built in direct contact with adjacent houses, it was not possible to exhaust the smoke from the gable end of the building. On the living room side from the stove a low hanging wall was placed to prevent the smoke from the stove filling the living room. Afterwards, there was an explanation of the aims and methods for documenting and investigating buildings, and after making a sketch of the floor plan, scale measurements were taken. During this practical session, there was instruction from each of the lecturers.

Floor plan sketch:

The order is to draw the pillars, and from there the components in the spans (walls, openings, etc.). Are the pillars square or round in cross-section, what is the relation of the pillars to other architectural members (door sills, walls, etc.), what is the position of center of the pillar and so forth, these are recorded after careful observation.

Demonstration of scale drawing:

As far as possible, measurements are taken on members thought to be from the original structure, with little deformation (ex. *sashigamoi*, a heavy lintel etc.).

Mr Yamaguchi showed a field notebook for drawing kept by a Nara municipal worker. He explained its use for noting the scale and other information about drawings as they differ according to purpose, plus points noted while making a drawing, and so forth.



Lecture at Tanaka Family Residence



Practical training of a floor plan sketch



13 July (Wed.)

■ Practical Training: Recording of Wooden Structures

<YAMAGUCHI, NAKAMURA and TAKAMIYA / Tanaka Family Residence, Nara City>

Continuation of yesterday's work of making scale drawings:

There was an explanation of how to draw round shapes such as stoves. Advice was given that when taking measurements of floor board widths or the grooves in door sills, or other materials, places that are less worn are to be selected. After the measuring was finished, the making of a drawing was

begun in the community center. Explanations were given by the lecturers of how to draw the plans. As a summary at the end, the participants gave as their impressions that by doing the drawing they understood the importance of making scale drawings, the essential points, and the need to observe carefully as mistakes are made in the measuring, and so forth.

The lecturer advised as follows:

It is extremely important to observe carefully the building you are to draw and sketch it accurately in your field notebooks. Sketches made from observations at the site are so important. Also, the basic drawings (floor plan, cross section, etc.) are used afterward for such things as recording the content of inspections for marks and traces, they are extremely vital, and must be done so that anyone looking at them will understand. When making sketches and taking measurements, it is important to keep in mind the kind of drawing you will produce. This is something that you need to gain experience in to do properly.



Taking measurements



Practical training of drawing the plans

14 July (Thur.)

■ **Practical Training: Material Survey for Sustainable Conservation and a Management Policy <YAMAGUCHI, NAKAMURA and TAKAMIYA / Tanaka Family Residence, Nara City>**

At the former Tanaka family residence the lecturers explained how to make a sketch for a cross-sectional plan. Work commenced. (In this training the task was to make a cross section through the *doma*, packed earth floor area, viewed facing the living area).

- Basically, it is a section cut in traverse direction through the *doma*. Also, at other portions where the structure differs, sections are taken at times in the traverse direction and along the ridge axis through the living area.
- Proceed from ground level, to the pillars, to the beams.
- Care is needed with the beam ends, which may differ in thickness from the trunk versus root portions.
- After assessing the approximate height, care must be taken to the layout of the drawing.
- At points where members are joined (such as where the rafters rest on the beams), measurements are taken not only of the dimensions of the members, but also so the relation of their positions will be clear.
- The projection of the eaves is important. (The distance from the surface of the pillar to the rafter end is measured.)



Lectured by Mr Yamaguchi



Taking measurements



Advised by Mr Nakamura

15 July (Fri.)

■ **Practical Training: Damage Survey and Planning for Restoration**

<YAMAGUCHI, NAKAMURA, TAKAMIYA and Higashi / Tanaka Family Residence, Nara City>

Explanations were given of the equipment used for taking measurements of elevation (the training uses an optic automatic level and a simple water level consisting of clear tubing fed with water from a metal can), and the disparity in level and the inclinations of the pillars was measured. Mr Higashi (of Nara prefecture) explained the use of the water level.

Next the inclinations of the pillars were measured. (Use of a plumb bob was explained.) In conjunction with the investigation of wooden materials by Mr Nakamura, after receiving an explanation of the outline of wooden materials used in architecture, an inspection to classify the cross-sectional shapes (into five types) of the pillars was conducted, and each participant plotted these onto their floor plans.

Subsequently, after receiving an explanation of tree species, the pillars were inspected to divide them into the four classes of cedar, cypress, pine, and other, performing the task of checking the items while listening to the commentary on them. The characteristics of cedar are the wood is soft, and the surface is not very fine and thus feels rough to the touch; it is used for pillars, doors and other fittings. By contrast cypress is fine-grained and smooth to the touch. It is often used for boards as the finish of flooring. Pine can be distinguished by its resin, and as an additional characteristic its grain is not straight but wavy, and it is often used for beams and so forth. The purpose of the wooden material inspection is that when it is necessary during repair to renew or mend a damaged or rotten portion of wood, the same variety of wood, and for the beams and such the same shape, of new replacement material must be procured. The same is true for wood grafted into a member to mend it.



Practical training of damage inspection



Demonstration by Mr Higashi



Practical training of rubung

Next, there was an explanation of the outline of damage inspection for the purpose of making a plan for repair work, and practical work in conducting a damage inspection and making repair plans for damaged portions of the former Tanaka family residence was carried out. Each participant presented a draft repair plan and an explanation. Mr Yamaguchi gave an explanation of the repair work scheduled for the current fiscal year. (Roof [ridge, southwest corner], *hōren* style lattice, struts under the door sills of the rear portion of the living area, adjustment of the doors and fittings, tile portion of the stove, electric wiring; period of work to be perhaps one or two months.)

Afterwards, the lecturer gave explanations of and conducted discussions on the damaged portions, and the content of repair work planned to be carried out this fiscal year by the city of Nara. Finally, rubbings were taken in conjunction with repair as part of the inspection to determine the tools used originally. This was followed by an overall summation of the four days of training starting on the twelfth, with questions and answers, and discussion.

19 July (Tue.)

■ **Introduction to Preservation of Townscape and Rural Settlement**

<HAYASHI Yoshihiko/ NNRICP>

Lecture on the system of Preservation Districts for Groups of Traditional Buildings as a method of Japanese cultural heritage management for conservation streets of towns and villages. Explanation was given on differences with Important Cultural Properties (including National Treasures) and the significance of the system, the definitions of groups of traditional buildings and types of districts (post-station towns, castle towns, port towns, merchant towns, etc.). Under this system the local communities designate the district, and those deemed particularly valuable are selected as Important Preservation Districts for Groups of Traditional Buildings. Also, with regard to the method followed for protection, the procedures for designation and criteria for selection as Important Preservation Districts, and the measures for support were explained. The inspections in conjunction with designation that have been carried out by the Nara National Research Institute for Cultural Properties were covered. A similar inspection, conducted for Duong Lam village in Vietnam by the Institute, and the report were introduced. Also, explanation was made of façade enhancement and repair work, citing actual examples, and it was noted that currently there are 91 Important Districts, which contribute not only as cultural heritage but to tourism and reviving local economies, so the system is noteworthy as one which is functioning well. Questions came from the participants about subsidies and the process of gaining consent from residents and building owners.



Lectured by Mr Hayashi

20 July (Wed.)

■ **On-site Lecture: Historic Monuments of Ancient Kyoto, World Heritage Site**

<NARA Hiromi, YAMAGUCHI Yasuhiro and FUKUSHIMA Takumi / Kiyomizu-dera Temple and Tō-ji Temple>

At the office for repairs at Kiyomizudera temple, there was an explanation of how the work was being done. There are long-term projects at five different places in Kyoto prefecture. At Kiyomizudera, in addition to the restoration architects (supervising the design), six out of the eleven temple carpenters work exclusively here. Ordinarily only two would be involved at a particular site, but as there are multiple work locations at Kiyomizu-dera, a greater number of carpenters are in place there. In the current repair, 9 out of a total of 16 National Treasures and Important Cultural Properties are to be worked on under a plan lasting from 2008 to 2018. At present repair work has been completed at two, with another two now underway, and from this summer to autumn protective structures are to be erected around two more and repairs are planned to start. The work must progress while allowing visitors to be received and maintaining a safe working design. The aim is to conduct the work without compromise in quality while giving consideration to the 5,000,000 annual visitors.

Photographs are used to record the condition prior to repair, and the manner in which members are put together. For the report, as much data as possible are taken, with the important aspects then selected and used. The traces of previous alterations are also recorded, using chalk for marking them.

At the Koyasu(easy childbirth)-no-to pagoda repair site

Known to have been brought from another temple, but the details are unclear. As a result of the current repair, the date of construction, which had been inferred as around 1630, was shown to be the year 1500. With this clarification of its age, it is the oldest structure at Kiyomizu-dera. What is learned in the process of dismantling and repair may thus enhance the value of heritage.

It is being reassembled starting with the pillar base stones, and at present the first story is near completion. Mr Yamaguchi, a temple carpenter who has previously been invited to Indonesia as a training instructor, gave an explanation of the present and future states of Indonesian wooden architecture. Fine examples of Daibutsuyō architecture also survive in Indonesia, and he would very much like to see them designated as cultural properties.

Explanation of structures on the precincts

Remains of the Koyasu pagoda, Umadome (horse stable), Deva gate, three-storied pagoda, Asakuradō



Lectured by Ms Nara and Mr Yamaguchi at Kiyomizu-dera Temple

(under repair), main hall (National Treasure), Amida hall and Oku-no-in (these two are to be covered by summer or autumn to begin repairs), and so forth, were inspected. The colours of the Amida hall were renewed 10 years ago. The colours of the Oku-no-in are as yet unrepaired.

At Higashi-daimon Gate of Tō-ji Temple repair site

A visit was made to Toji temple repair worksite. After the outline of the wooden structures in the precincts such as *kondo* (a main hall) and the five-storied pagoda was given, there was an explanation of the repair policy and traditional techniques used in the restoration work at *higashidaimon* (an eastern gate) being dismantled under repair.



Lectured by Mr Fukushima at To-ji Temple

21 July (Thur.)

■ On-site Lecture: Practical Works on Townscape Preservation I (Agricultural Community) <MASUI Masaya / Yamato Kōriyama City>

After inspection of the Memorial Hall (former main building) of Nara Women's University, there was a lecture by Prof. Masui on the preservation of agricultural villages in Japan. Of the 91 Important Preservation Districts for Groups of Traditional Buildings, agricultural communities are only about 10 and thus not many. As examples of rural communities preserved under the system, there was an explanation of the process and the problems that accompanied Kita village in Miyama, Nantan city in Kyoto prefecture, and the mountain village of Ochiai in Higashi Iyayama, Miyoshi city in Tokushima prefecture. Next, regarding farming settlements in the Nara basin, the lecture covered the *jōri* field system established in the ancient period, and the villages that resulted from it.

Afterwards, visits were made to three moated villages in the Nara basin, Banjō, Hieda, and Wakatsuki in the city of Yamato Kōriyama. At Banjō, inspection was made of the interior of the Suzuki family residence, which survives as an example of the *yamatomune* style, and they were able to hear the current household head talk about conditions of preserving the settlement and securing traditional materials (thatched roofing materials).



Lectured by Prof. Masui

Lectured by Prof. Masui at Banjō

22 July (Fri.)

■ **On-site Lecture: Practical Works on Townscape Preservation II (Merchant's Houses)**
<MATSUNAGA Nobuo / Imai-cho Town>

After hearing an explanation of the outline of the preservation district at the office for preservation work for Imai-cho town, inspections were made of Important Cultural Properties within the district including Shōnenji temple, where repair work is to be done, and the Imanishi, Toyota, Kawai, and former Kometani family residences etc. A visit was made as well to a site of repair and façade enhancement work under the preservation district system while hearing an explanation from Mr Matsunaga, as part of training on the task of preserving urban districts under the system.

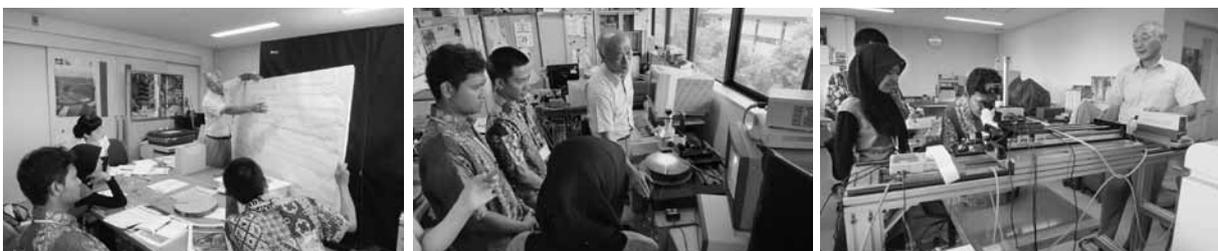


Lectured by Mr Matsunaga at Imai-cho

25 July (Mon.)

■ **Introduction to Dendrochronology** <MITSUTANI Takumi / NNRICP>

After receiving an explanation of the beginnings of dendrochronology (U.S.A., first half of the twentieth century), and of its spread, and as indication of its current state the species and time spans which it can cover in various regions (Europe and U.S.A.), there was an inspection of the microscope actually used for measuring tree rings, and a lecture on their makeup, on the beginnings of dendrochronology in Japan (1970s), species utilized and their geographic areas and time spans, various other equipment (digital cameras used in surveys), and examples clarified through this work (Hōryūji, Tōshōdaiji). There were also questions about future prospects, and differences with radiocarbon dating.



Lectured by Mr Mitsutani

■ **Introduction to Recording of Wooden Structures (Photography)**

<SUGIMOTO Kazuki / NNRICP>

At first, Mr Sugimoto questioned the participants about photography in Indonesia.

- In Indonesia, they take photos of the entire object before and after restoration work.
- Anton and Nikko themselves sometimes take photos, but Prima does not, just sorts them.
- They use film photography at times, but most of the photos are digital.

Because it is easy to handle data with digital photographs, in Japan film photography is declining, but for records of cultural properties for which clear images are needed and for preparations of reports and so forth, it is common to use film photos. And large-format cameras are suited to architecture, because they use bellows, this allows more flexibility in adjusting the focus. It is possible to bring a greater area into focus.

Images are formed in the camera with light gathered by the lens. The lens is like the pupil of the eye in that it has an aperture, which becomes small in bright light, but is opened when dark. The more the aperture is closed, the greater the depth of field. Closing the aperture too much is not good for the image quality.

Explanation of colour scale

The standard is known as “18% grey.” It is the seventh level in a 19-grade scale of reflectivity, and also referred to as M. It is the average value of black and white shades existing on earth. Putting an 18% grey card in view and photographing something makes it possible to reconstruct the coloration. On bright sunny days, the contrast is too high for good photographs. Streets will be too light, and latticework will be too dark. Cloudy days are best. As the latitude in contrast comes down, the area which can be photographed widens.

Practical training in photographing with large-format Polaroid film

- Determining the lens angle
- Use of a light meter
- Use of a reflector board to reduce shadow

Participants took turns in photographing, with the lecturer giving critical comments on the results.



Lectured by Mr Sugimoto



Practical training in photography



26 July (Tue.)

■ Practical Training: Recording of Wooden Structures (Photography)

<SUGIMOTO / Imai-cho Town>

After review of the previous day’s content and continuation of practical training in photography, photographs of the streets of Imai town were taken using a large-format camera, while receiving explanations of how to adjust the exposure and decide the angle of view.

27 July (Wed.)

■ **Practical Training: Recording of Wooden Structures (Photography)**

<SUGIMOTO / Imai-cho Town>

Continuation of practical training in photography. In training up to this point Polaroid film was used, and the photograph was checked on the spot, but today's training was to take several pictures actually using large-format film. Practice with using supplementary light to produce correct exposure, by bringing some lighting to the dark parts of the lattice and fittings when photographing the exterior of a structure. Advice was given that fittings such as doors should be closed when photographing buildings. Afterwards, practice was done in photographing the urban scenes with digital cameras.



Practical training at Imai-cho

28 July (Thur.)

■ **On-site Lecture: Practical Works on Restoration of Historic Buildings II**

<KOBAYASHI Masaharu / Himeji-jo Castle>

After hearing about the repair plan at the Himeji castle administrative office from Mr Kobayashi, participants were guided by him on an inspection while receiving explanations of the public facility for the repair project, Tenkū no Shirasagi, and the actual repair site.

Route:

Office → Diamond Gate→ Three Country Moat→ Uzumi (buried) gate→ Nu gate→ Chi connecting gallery→ Okiku's well→ Ri gate→ (temporary route for hauling)→ Bizen gate→ main (Bizen) bailey→ Tenkū no Shirasagi(the main keep restoration site)→ Mizu no Ni gate→ Mizu no Ichi gate→ Ro connecting gallery (LED explanation)→ Ni gate→ Ha gate→ (Hyakken Rōka)→ west bailey



Lectured by Mr Kobayashi

Roof tiles of the main keep

29 July (Fri.)

■ **On-site Lecture: Risk Management of Cultural Heritage / Practical Works on Townscape Preservation III** <MURAKAMI Yasumichi / Kobe City>

At the Rokkōsō nearby the city of Kobe's Kitano-chō Yamamoto-dōri Important Preservation District for Groups of Traditional Buildings (hereafter, Kitano Preservation District), there was explanation from Mr Murakami, using the Great Hanshin earthquake as a case study, of the damage at the time of a catastrophe, the response, the approach to repair and so forth, and the method of promoting the work, etc. Afterwards, inspections were made of buildings in the district that had been damaged by the earthquake, while receiving explanations from Messrs. Murakami, Maeda, and Higashi. In the afternoon, a visit was made with explanation from the lecturer of the Sawanotsuru Museum, a Hyōgo prefectural Important Tangible Folk Cultural Property which had been completely destroyed in the disaster, and had been repaired with a seismic isolation system installed, which was inspected in the building's foundation.

In Indonesia as well, methods for dealing with catastrophes are being considered and devised with cooperation from Japan and elsewhere. At the time of a disaster, as communication with the private sector, and rapid and expedient responses are demanded, it is vital for the government to be aware of the laws and administrative systems on a day-to-day basis, to fully ascertain what measures from the government (public institutions, etc.) are possible and what are not, and be prepared to act. Also, how to follow up for cultural heritage other than designated cultural properties (meaning heritage of value) is key to protecting the culture and identity of the nation and the local region.

At the Sawanotsuru Museum, participants heard about how the examination was made for introducing new seismic isolation technology. In order to utilize the surviving members as much as possible, it was explained how they came to use structural reinforcement and seismic isolation devices. Afterwards, the devices were inspected in the basement.



Lectured by Mr Murakami

1 August (Mon.)

■ **On-site Lecture: Practical Works on Townscape Preservation IV**
<HAMAZAKI Kazushi / Shiga Pref.>

After explanations at the Kondō Machinami Hozon Kōryūkan hall in the city of Higashiōmi, Shiga prefecture, of an outline of the Gokashō Kondō preservation district, the town preservation and the repair of the hall, a tour of the structure (interior, garden) was made while receiving detailed guidance. Afterwards, inspection was made of the preservation district, while listening to explanations of characteristics of this town, such as the metal fittings for exterior boards that can be removed all at

once to prevent the spread of flames when there is a fire, the use of boards from boats on the exterior walls, they manner of attaching doors to the service (kitchen) entrance, and the *kawato* (work area fronting on a waterway).

At Ōmi Hachiman city, the Tanida family residence was visited, and the residents asked about summer preparations and repairs for preservation. Moving through the streets to inspect them, a traditional building reutilized as an office, another made accessible for public use (as a rental hall), and a building reused as a day care center were observed. In addition, examples of the reuse of buildings as galleries and workshops, of a sake storehouse as a rental hall and so forth, were inspected while hearing explanations from the lecturer and building owners.



Lectured by Mr Hamazaki

2 August (Tue.)

■ **Identification of Unearthed Architectural Members**

<NARITA Satoshi / Asuka Historical Museum>

Asuka Historical Museum

Explanations were given of artifacts from the Asuka period to accompany the displays. It was noted that many stone objects have survived in Asuka, and their discoveries and inferred uses explained. The location of the Fujiwara capital, and its relation to the positions of tombs were covered. The history of the Kitora murals and the method of preservation were given. An explanation was made of the items recovered from Yamadadera temple, noting that the structural members of the eastern cloister were found intact, and relating their preservation. (Waterlogged condition aided preservation.)

■ **On-site Lecture: Buddhist Monuments in the Horyu-ji Area < Horyu-ji Temple>**

Visit to Hōryūji

- Inspection of Nandaimon gate of the Kamakura period, the main hall, the five-storied pagoda of the Nara period, the treasure hall, the lecture hall, and the eastern cloister.
- Compared with Kōfukuji and other temples the precincts are remarkably large.
- The lecture hall was added later, and the cloister cut and reshaped to join with it.
- The supports for the eaves of pagoda and main hall are later additions. These are the portions with the carved dragons.



Lectured by Mr Narita

At Horyu-ji

3 August (Wed.)

■ **Writing Final Report**

The participants prepared their reports of the training programme.

4 August (Thur.)

■ **Closing Ceremony**

The participants submitted their reports and a closing ceremony was held. Mr Nishimura, Director of ACCU Nara awarded a certificate of completion with a word of appreciation for their hard work and wished they would impart their knowledge and experience to their colleagues and friends in Indonesia. Then each participant addressed a short speech and expressed their gratitude toward lecturers and ACCU Nara and missed memorable days in Japan.

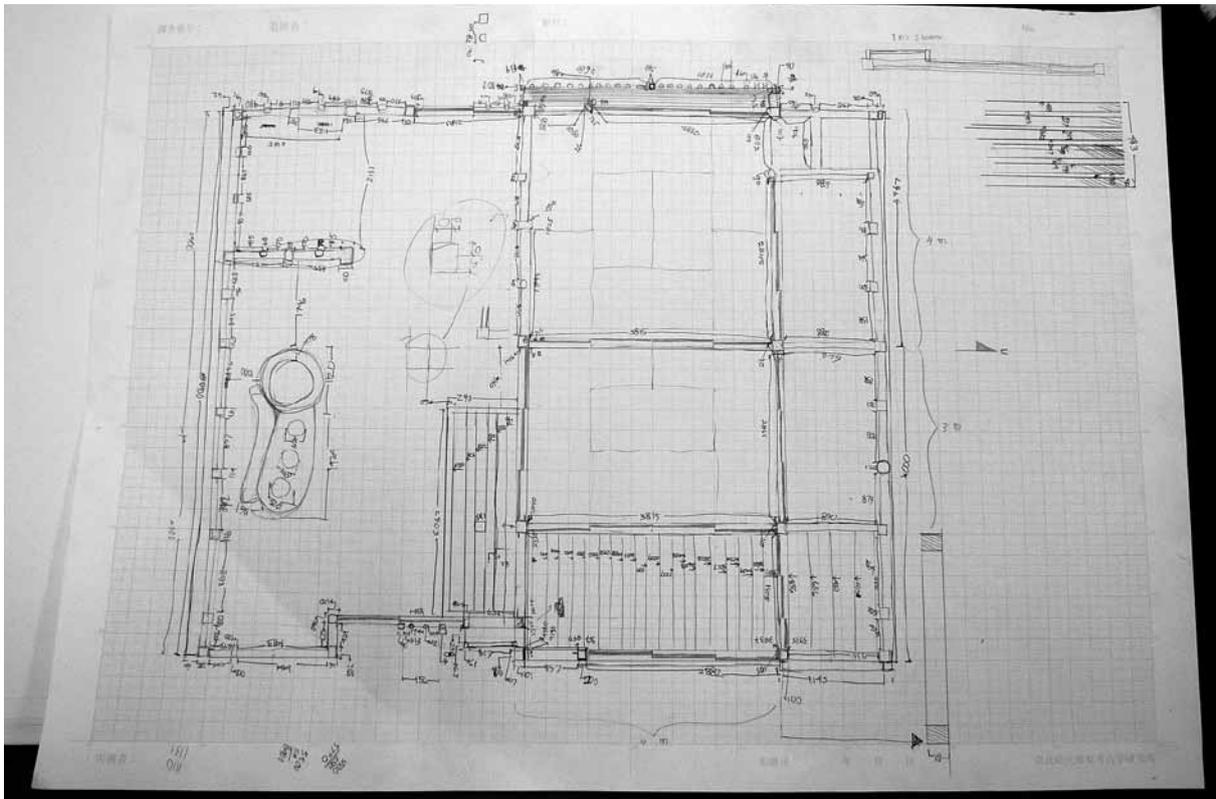


Address of appreciation



Awarding a certificate of completion

III. Country Reports by Participants



Anton Wibsono

Staff

Directorate of Archaeological Property

Ministry of Culture and Tourism

Procedures and Methods in the Rehabilitation of Wooden Structural Heritage in Indonesia: Pendopo Ageng, Pura Mangkunegaran

Background

Cultural heritage is a nation's cultural treasure which holds important value for understanding and developing national history, science, and culture, so it needs to be protected and preserved for increasing awareness of and interest in national identity. The definition of cultural heritage according to the Law of the Republic of Indonesia Number 11, 2010, is cultural patrimonial which has material characteristic in the form of cultural heritage properties, cultural heritage sites, and cultural heritage regions in land and/or water, which needs to be preserved through the process of decree because it has important values for history, science, education, religion and/or culture.

A common item of cultural heritage is a cultural heritage building, namely a structural composition made of natural or man-made objects to meet the needs of space, with or without walls and/or a roof. Cultural heritage buildings can be temples of volcanic stone or brick, traditional wooden architecture, or old masonry buildings with adhesive mixtures of cement, lime, and sand.

In general, cultural heritage buildings as these have been greatly damaged by natural processes or human activities, leaving part of the building tilted, sunk, cracked, or broken. In addition, the original building components have often been altered, replaced, lost, or damaged, so they cannot be sustained.

One cultural heritage building made of wood and which had suffered damage is the Pendopo Ageng at the Pura Mangkunegaran palace.



Pura Mangkunegaran was the residence of Sri Paduka Mangkunegara, and is located in Solo, Central Java Province. It was established in 1757 after the Treaty of Salatiga, by which the Kingdom of Surakarta separated into two small kingdoms, Kasunanan and Mangkunegaran. Raden Mas Said was the first king and ruled as Mangkunegara I. He built his palace on the west bank of the Pepe river (Kali Pepe). Like other palaces in Java, Pura Mangkunegaran consists of several major components known as *pamedan*, *pendopo*, *pringgitan*, *dalem*, and *kaputran*. European influence can be seen clearly in the decorative ornaments of the Pendopo Ageng, such as the chandelier, pillars, and roof.



European influence in decorative ornaments: (1) decoration on the roof, (2) front decoration of Pendopo Ageng, (3) statue of a lion in the pavilion, (4) chandelier, (5) details of the chandelier, (6) details of one of the pillars of Pendopo Ageng

Over the years, Pendopo Ageng at Pura Mangkunegaran suffered damage to some of its parts from the forces of nature and animals. According to the regulations in Indonesia, every person who owns and controls cultural heritage is required to conduct protection and maintenance in keeping with its historical value and authenticity of form, and its security (Article 13, paragraph (1) and (2), The Indonesian Government Regulation Number 10 of 1993). Restoration work on a damaged cultural heritage building is done to restore its physical condition by repairing, strengthening, and/or preserving, through reconstruction, consolidation, rehabilitation, and restoration (Article 77, paragraph (1), Law of Republic of Indonesia Number 11 of 2010, concerning Cultural Heritage).

Pre-Restoration

For a cultural heritage building which is going to be restored, studies are conducted in the form of a

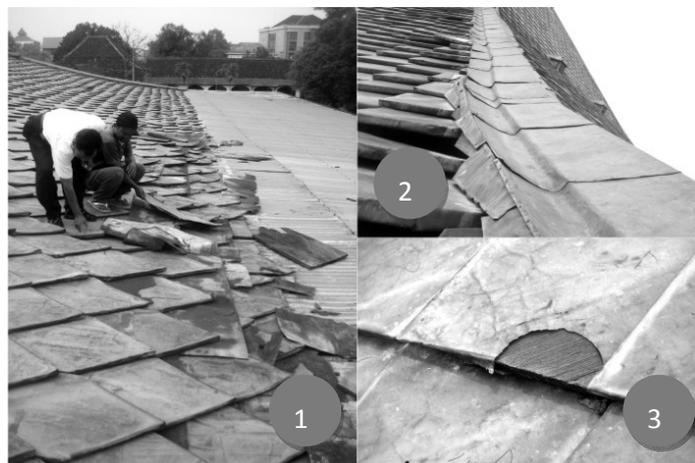
feasibility study and a technical study. Based on these studies, restoration work on a cultural heritage building can be implemented.

1. RESTORATION FEASIBILITY STUDY

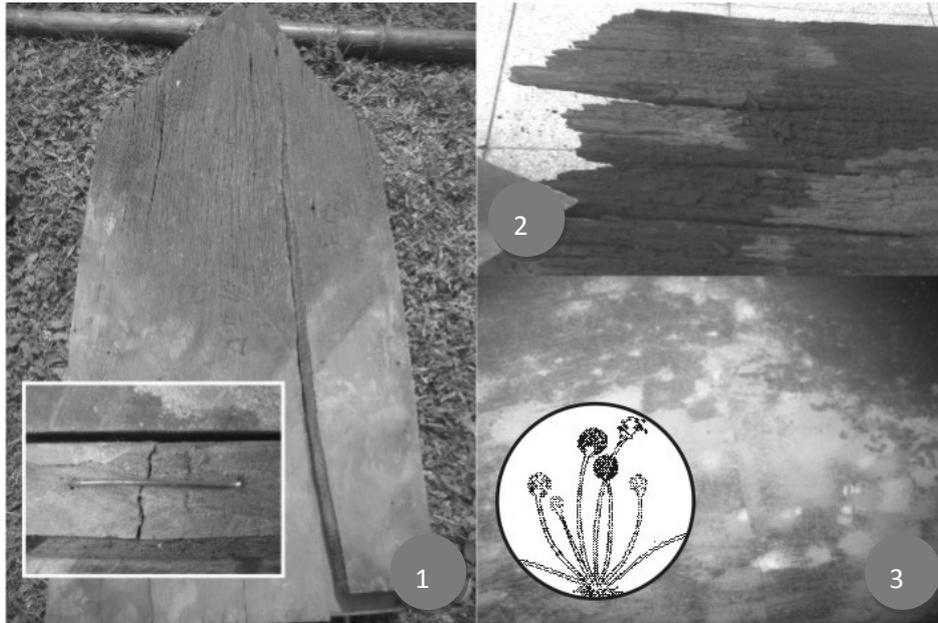
The restoration feasibility study is conducted to determine the feasibility of restoration, based on an assessment of historical and archaeological value contained in the cultural heritage building, and its treatment measures according to its condition of maintenance. Data collection is carried out in the field through direct observation of the heritage building, and in libraries through a search of relevant documents. Data collected in the restoration feasibility study include archaeological data (the archaeological value of the building in terms of originality of form, materials, workmanship, and contextual layout), historical data (the building's historical background and its role in historical events), and technical data (condition of the building, including its maintenance problems).

Here is some of the damage at Pendopo Ageng, Pura Mangkunegaran, found in the study.

Roof. Pendopo Ageng has a roof of shingles, made of *ulin* wood (*Eusideroxylon zwageri*) and coated with copper plating. *Ulin* trees are numerous in Kalimantan, and its timber can last for a very long time. The damage to the roof is mainly due to weather, rust, and the growth of microorganisms on the copper plating, as well as broken shingles.

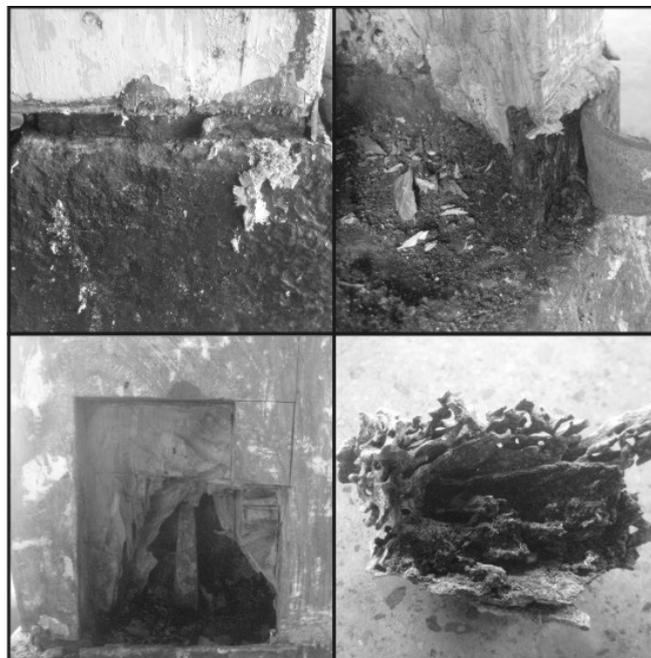


Damage to the roof of Pendopo Ageng: (1) and (2) copper plating on the shingle roof that has rusted and broken, (3) details of a shingle roof with its broken copper plating



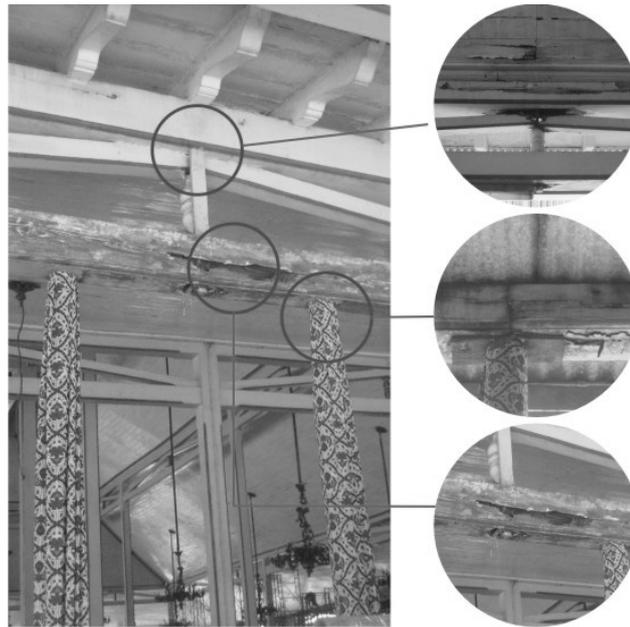
Shingle conditions: (1) broken shingle (*insert*: use of a cramp iron to unite two parts of a broken shingle), (2) weathered shingle, (3) microorganisms that grow on copper plating

Pillars. Supporting pillars of the roof on Pendopo Ageng also suffered damage, from water through capillary action and termites. Damage was also found at the bottom of the pillars. To overcome the termites, chemical treatment was required.



Details of damage on wooden pillars supporting the roof as a result of capillarity and termites

Roof trestlework. Damage on this part is caused by weathering, due to water that drips from the roof when it rains, and by termites.



Decorative ornaments, floor. Damage to decorative ornaments and the floor was caused by patination and sparrows (*Passer Montanus*). These birds made nests in the crevices of the chandelier, and their droppings littered the floor surface of Pendopo Ageng.



Nests of the tree sparrow (*Passer Montanus*) in the chandelier. Droppings litter the floor, damaging the surface.

After obtaining the results of the restoration feasibility study, a restoration technical study is conducted.

2. RESTORATION TECHNICAL STUDY

The technical study establishes the procedures and implementation techniques for restoration, based on an assessment of any change or damage that may be caused to the heritage building. Just as in the restoration feasibility study, the technical study is also conducted through data collection by observing,

measuring, and recording field data, and by researching the relevant literature. The data collected include the following.

- architectural data, describing the condition of the heritage building's architectural elements in terms of completeness, or whether the components are original, replaced, altered, or lost
- structural data, describing the condition of the heritage building in terms of damage such as sloping, dented, cracked, or broken portions
- maintenance data, describing the condition of components in terms of damage caused by weathering, such as peeling, worn-out, and brittle portions, with a focus on the causes and mechanisms of the weathering process
- environmental data, describing the land around the heritage building in terms of topography, flora, fauna, land use, ownership status, and the general development plan of region

Restoration

1. PREPARATION

Tools. These include everything needed to support the work of restoration, including equipment and materials that will be used for dismantling, conserving, retrofitting, and reassembling. Tools to support research and documentation also include equipment for excavating, mapping, drawing, and photographing.



Some of the tools used in the restoration of Pendopo Ageng

Infrastructure. This includes the work areas, workshops, and temporary shelters for original components of the heritage building that has been dismantled, and the scaffolding.



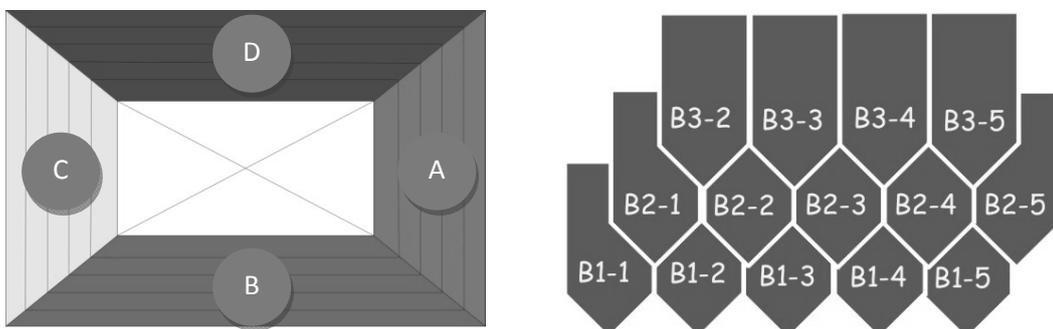
Infrastructure for restoration used at Pendopo Ageng

2. STRUCTURAL REPAIR

Structural repair is the phase of activity taken to overcome or prevent further damage to a heritage building. Its main focus is repairing damage to parts of the building that are tilted, sunk, cracked, or broken, and it includes treatments of components that are weathered. The restoration process and techniques of repair at Pendopo Ageng of Pura Mangkunegaran can be specified as follows.

Dismantling. This part of the restoration process is conducted with the aim of subsequently rebuilding a damaged heritage building in a strong and stable state. The dismantling process is done with careful consideration for the condition of the original components, which are prone to damage.

One principle which must be followed, when dismantling any part of a heritage building, is that each dismantled element needs to be numbered and systematically registered, so that the reassembly process will not encounter any difficulties. The registration system includes the marking or coding of each element before dismantling, and the recording of its original position in the building. In dismantling the shingle roof of Pendopo Ageng, the following registration system was used.



Letters of the alphabet (A, B, C, D) are used to indicate groups of shingles in accordance with the sides of the building. The first number following a letter (e.g., B1) indicates the row, and the final

number is the shingle's position in that row. Accordingly, B1-1 means the first shingle from the left on the first row of southern side.



Numbering the shingles prior to dismantling

After registration is completed, dismantling of the shingle roof can proceed. This is done carefully, passing each shingle from one person to another until it arrives at the storage room. There, shingles are stacked according to group.



Dismantling the shingle roof after registration is completed



Condition of the roof after the shingles are removed

Restoration was also carried out on the interior of Pendopo Ageng. After flaking loose paint off the wooden pillars, the remaining paint was removed with chemicals and putty knives.



Removing paint from the wooden pillars

Strengthening. Structural strengthening or consolidation aims to reinforce and strengthen the building. Strengthening can be done on the building if, according to the restoration technical study, it is needed for the preservation of the building. Structural strengthening for the part above the ground can be in the form of additional strength or permanent construction, and additional reinforcement for the underground part can be in the form of strengthening the building's foundation as needed.

At Pendopo Ageng, structural strengthening was also carried out on the roof trestlework. This part was damaged by water droplets from a leaky roof and termite attacks. The work was done by removing the damaged wood and replacing it with new wood of the same quality.



Replacing roof trestlework: (*top left*) identifying damaged parts, (*top right*) measuring to remove the damaged wood, (*bottom*) removing the damaged wood



The original wood is glued together with new wood using epoxy, then the connection is camouflaged with wood putty.

Treating materials. This integral part of building preservation efforts is aimed especially at preventing the occurrence of weathering which will indirectly affect the stability of the building. The main activities include the cleaning and conservation of material elements which have undergone weathering, and also the installation of a protective or waterproof layer suited to the building's structural condition. Chemical treatment to prevent termite attacks uses a mixture of kerosene, creosote, and Lentrek in the ratio of 1:1:0.05.



Chemicals used to prevent termites in Pendopo Ageng's restoration, as a mixture of kerosene, creosote, and Lentrek in the ratio 1:1:0.05



Conservation work on the roof of Pendopo Ageng

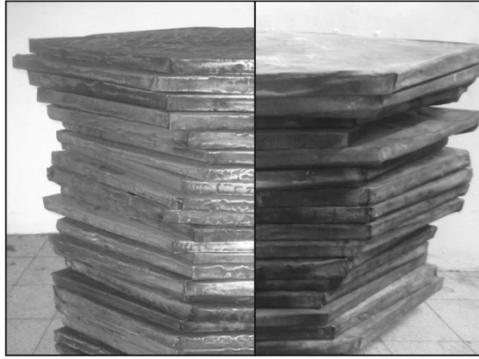


Application of chemicals to both sides of the original shingles, to prevent damage from termites

Conservation of the copper plating of the original shingles was also done by applying benzotriazole to the surface, to remove microorganisms and restore the copper's original color.

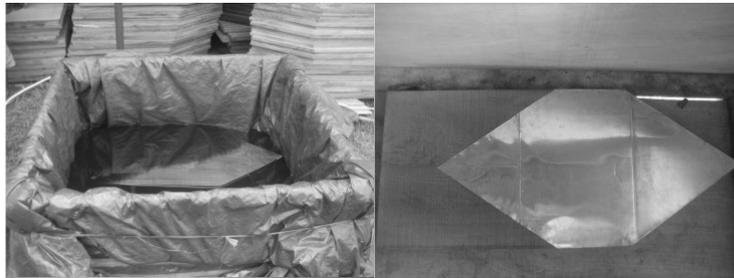


Using benzotriazole for conserving the copper plating on the original shingles



Copper plating, after (*right*) and before (*left*) conservation

Conservation for new shingles is done with the same mixture of kerosene, creosote, and Lentrek used for original shingles, soaking them thoroughly in the substance for 24 hours.



Left: soaking new shingles in kerosene, creosote, and Lentrek; *right*: copper plating applied to new shingles after soaking

Conservation is also done for decorative ornaments such as chandeliers, using nitric acid (HNO_3) and sulfuric acid (H_2SO_4) to remove patination. Chandeliers are taken apart and the pieces dipped first in sulfuric and next in nitric acid, then removed and left to dry so dirt and patination exfoliate. After removing loose dirt and patination with a dry brush, the parts are wiped to restore the original color.



Conservation of a chandelier: (1) before conservation, (2) nitric acid (*top*) and sulfuric acid (*bottom*) used for conservation, (3) dipping parts in sulfuric acid, (4) dipping parts in nitric acid



Conservation of a chandelier (continued): (1) a chandelier part before conservation, (2) after dipping in nitric acid then sulfuric acid, (3) after brushing, (4) chandelier after conservation

Further restoration work at Pendopo Ageng was done on the wood. Wood from which the paint had been peeled was then sanded and coated with putty so the fresh paint can easily adhere, then sanded again. Putty is applied not only to wooden pillars but also the ceiling, to prevent leakage.



The use of putty on the woodwork in restoration at Pendopo Ageng

Work on the floor was done by injecting grout filling into the lower layers of tiles. This begins with drilling at the corners of the tiles and then injecting the grout into the holes. This is done to keep the tiles attached and eliminate cavities.



Injection of grout ceramic filler

Replacing original components. In the restoration of a heritage building, the replacement of original components is often unavoidable because the materials have been severely damaged or even lost. Technical principles that must be considered in replacing the original components are as follows.

- replacing is only done when the original component is damaged and its continued use is not technically feasible, and structurally it is necessary to maintain the existence of the building
- replacing lost components can be done if there is clear information about shape, size, type, and age
- new components must be of the same type and quality as the originals, and must be marked to distinguish them from original components

In restoration work at Pendopo Ageng, replacement of wooden components was necessary for several sections that had been severely damaged and could not be maintained. The original components were made of teak wood (*Tectona grandis L. f.*). The new components had to be the same type and quality as the original, meaning teak at least 80 years old in age. The new teak components had to be top quality, with a moisture content of less than 14 percent. The same requirements also applied to the new shingles.



New teak wood for use to replace damaged components. The new teak wood must have the same quality as the original components and be at least 80 years old, with a moisture content of less than 14 percent. *Insert:* Protimeter, a tool for measuring the moisture content in wood.



Replacement of wood components in the roof's trestlework

3. ARCHITECTURAL RESTORATION

Architectural restoration is the stage of activity to restore the original form of a heritage building based on existing data. The main activities are reassembling the original components of the heritage building that were dismantled, and installing new components.

The technical work of architectural restoration begins by cataloging the completeness of original components that are still in place, and those that have been replaced, changed, damaged, lost, or found.

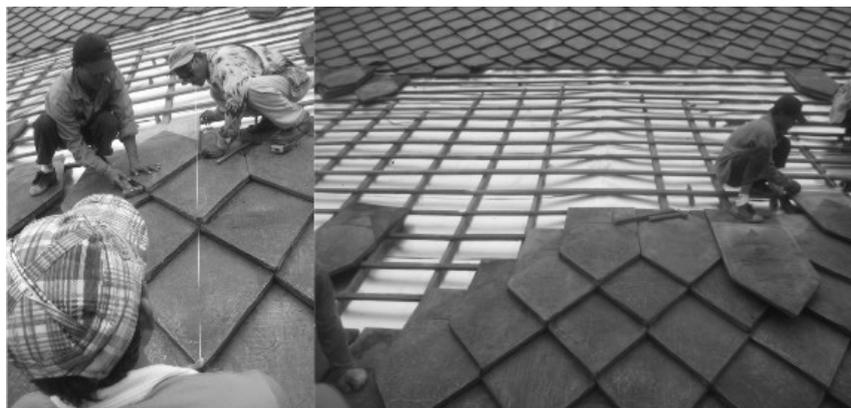
Reassembling the original components. Reassembling the original components is an effort undertaken, based on the registration system, to install the components in their original positions. This kind of work is referred to as restoration because it aims to restore the authenticity of a heritage building without using new materials.



Installation of galvalume as a roof coating. Galvalume is used as a thermal barrier (insulator) and to prevent leakage. After the roof coating is laid, wooden ribs for the shingles are reinstalled.



Fiberglass coating to cover cracks in the galvalume and to prevent further leakage



After work with galvalume and fiberglass is completed, the original shingles that are still usable are returned to their original positions by referring to the registration system.

The roof work is completed by installing galvalume as a thermal barrier (insulator) and to prevent leakage. Fiberglass was then used to cover the cracks in the galvalume. Once this was finished, the original shingles were installed in their proper positions using the registration system as reference.

Installing new components. Installation of new building components is done to replace the original components that are damaged or lost, and is based on the results of comparative studies with other components that are similar in terms of age, shape, material, size, and layout. This kind of work is referred as reconstruction as it aims to reestablish the authenticity of a heritage building with the addition of new materials.



Installation of new shingles to replace damaged items

Post-Restoration

Activities post-restoration are to conduct land arrangement plans to protect and preserve the heritage building and its utilization. After all restoration work on Pendopo Ageng was completed, cleaning was done to remove trash and debris from the work. The floor was mopped to restore the shine to the ceramic tiles.



Finishing work on the floor, by mopping and wiping the floor and the pillar bases

Once the restoration had finished, Pendopo Ageng was ready for use. Not long after completion of the restoration work, Pendopo Ageng served as the stage for holding Malam 1 Suro (The Night of First Suro), a celebration commonly performed by the Javanese to welcome the Islamic New Year. It falls on first day of Muharram, the initial month of the Islamic calendar.



The celebration of Malam 1 Suro at Pendopo Ageng, Pura Mangkunegaran

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Documenting Wooden Buildings (Heritage Properties)

Introduction

Documenting is the process of depicting an object at a particular point in time, including all relevant information concerning such object. It is important to have a documentation process in both written and pictorial forms to support the restoration of heritage properties. The written form of documentation is done by recording the condition of the restored heritage property and relevant information at every stage of the restoration activity. The pictorial form depicts the heritage property and its surroundings. For a building, this can be in the form of pictures and maps as pictorial data supporting the written documentation. The documenting process is an effort to conserve data and values of heritage properties which can be used to support restoration, and also as a source of information for developing and utilize the heritage. Written and pictorial documenting is done before, during, and after the restoration process of heritage properties. An outline of the components of the documentation process is as follows.

1. Recording. This part of the documentation process is the taking of written data on the technical condition and architectural structure of the heritage property.
2. Mapping. This is aimed at obtaining data on the position of the heritage property and its surroundings. The result is a map of the heritage property with a scale that may vary between 1:500 and 1:1,000, or as required.
3. Drawing. This part of the documentation process is the taking of data in the form of technical drawings of the architectural and structural condition of the heritage property. The results are in the form of plans, elevations, cross-sections, and drawings of detail, with the scale varying between 1:10 and 1:20, or as necessary.
4. Photographing. This is the recording of visual data on the form and technical condition of a heritage property. It provides images of the situation and details using black and white, color, or slide film in accordance with the purpose of the photograph.

Photographing a smaller object will be useful in identifying the object should it become broken or lost. Having the image will also lessen the necessity of directly holding the fragile or broken object, which will help reduce further damage.

Some matters that should be carefully noted in the photographing process are as follows.

- a. The size and color. It is recommended to include a scale in the photo to display the size of the object or building. If possible, a color chart is also desirable to help make clear the colors of

the object.

- b. **Lighting.** Lighting is an important aspect of picture taking, and is a basic element in making an image. Proper lighting will make the resulting image better and show more clearly the actual condition.
- c. **Background.** Better images will be obtained for objects if taken against a light background, which will show the proper color balance. A darker background may be necessary to get better contrast.
- d. **Curved objects and relief pictures.** It is always best to have pictures taken from the front, but those taken from other angles will help show the depth of the object.
- e. **Taking pictures of damage and recognizably distinctive features of the object.** As for written descriptions, taking pictures of damage and recognizably distinctive features will be useful in the object's identification.

Documenting a Building Restoration: Palace, Mosque, or Burial Site

In documenting the activities of wooden building restoration, such as for a palace, mosque, or burial site, there are three phases: pre-restoration, restoration, and post-restoration.

PRE-RESTORATION

Documenting the pre-restoration phase covers technical and archaeological data. The scope of those activities includes the recording of verbal and pictorial data.

Verbal data recording. The verbal data recording activities include the identification or description in the form of written records of the palace, mosque, or burial site before being restored. This description is undertaken to explain with greater detail and accuracy information which can not be conveyed adequately by pictorial data (maps, drawings, and photographs)

Pictorial data recording. This includes the recording of data in the form of maps, drawings, and photographs which describe the physical condition and environment of the building (palace, mosque, or burial site) being restored. An outline of the types of pictorial data is as follows.

1. Maps

- a. **Topographic map.** This map illustrates the situation and layout of the palace, mosque, or burial site in its environment. Such a map is obtained from direct measurement in the field using surveying instruments, using a large scale with a range from 1:1,000 to 1:5,000.
- b. **Location map.** This map shows the location of the palace, mosque, or burial site in an administrative area. Location maps are usually obtained as secondary data from existing maps (map of province, regency, district, or village) with a small scale of perhaps 1:100,000.

2. Drawings and plans. These document the various phases of reconstruction, and include a variety of different types of images.

- a. Phases of reconstruction work documented:
 - *Pre-reconstruction images*. These drawings and plans depict in detail the architectural and structural conditions of a building and its materials, and for the damaged parts of the building in particular. The damage will include conditions such as a sloping building, or collapsed, broken, sinking, or porous parts, etc.
 - *Reconstruction images*. These drawings and plans depict the architectural recoveries, which are designed based on the concept for the authenticity of the building. There are also images of reinforcements or replacement structures, which have been designed based on the condition of damage, for structural reinforcement.
 - *Excavation images*. These drawings and plans depict the positioning of an excavation grid, usually in a north-south orientation, and also include images of the finds, for both structural features and artifacts.
- b. Types of images used for this documentation:
 - *Plans*. These are drawings of the spatial layouts of buildings in the form of horizontal projections. The scale is typically from 1:50 to 1:100.
 - *Elevations*. These are vertical projections of buildings, as observed from the outside from all directions (front, back, left and right). The scale is typically from 1:50 to 1:100.
 - *Sections*. These are depictions of building as if sliced by a vertical plane, to display the height, structure, and aspects of construction. The scale is typically from 1:50 to 1:100.
 - *Details*. These are depictions focusing closely on particular aspects such as: (1) construction, showing details of the construction techniques or the connections between components; (2) profile, showing the details of outlines and sections, for both visible and hidden parts; (3) ornamentation, showing the details of patterns or appearance in three dimensions. The scale is typically from 1:1 to 1:20.
 - *Other*. To further clarify the shape of the building, it may be necessary to provide of supporting images, such as axonometric and perspective drawings. An axonometric drawing, a representation of a three-dimensional object placed at an angle to the plane of projection, helps indicate parallel lines on the object. A perspective drawing displays the object or building as the human eye sees it.
3. Photographs. These include panoramic views, detailed views of each part, and details of specific building elements.
 - a. Panoramic images depict the entirety of the building and its recent condition.
 - b. The detailed images of each part depict conditions of the wood or stone blocks, or of other building construction materials, showing aspects of damage or the building's weathering.
 - c. The details of specific building elements are photographed to display the construction details, decoration, ornamental details, and other aspects.

RESTORATION

Documenting activities at the phase of restoration of the palace, mosque, or burial site includes verbal and pictorial data.

Verbal data recording. This is in the form of daily records on the restoration activities, and the notes of excavation findings during the restoration.

Pictorial data recording. This is done through mapping activities, drawing, and photographing while the restoration is undertaken. An outline of types of pictorial data at this stage is as follows.

1. Mapping, to measure the position of the building for reassembly
2. Drawing, to making the following depictions
 - a. Depictions of each part to be disassembled
 - b. Depictions of each reinstalled part
 - c. Depictions of the building's reinforcement
 - d. Depictions of the implemented restoration
3. Photographing, to record visual information on the following
 - a. The selection of substitute materials. Photographing the types of wood that will be used as substitute materials in the damaged building, so that the selected types of wood are suitably matched to the originals.
 - b. Disassembly process. Photographing the ongoing activities shows the types of work activities and equipment used for each building element.
 - c. Results of disassembly. Photographs are taken as each part removed from the building is disassembled and classified, to make the reassembly easier.
 - d. Details of specific components. During the disassembly process, details of the condition of individual components, such as scratch marks on the wood, are photographed to record the position and condition of each element for the reassembly process.
 - e. Situation of the building. Photographs are taken from all directions as a depiction of a certain phase, such as after disassembly.
 - f. Cleaning, grafting, or replacing wood. Photographing these activities is intended to document the process of cleaning wood that has become soiled from plant growth, scratches, or other causes. It also intended to show the method of replacement for lost or damaged wooden parts, and the coating with waterproofing or anti-termite materials, after grafting or replacement, so that the wood will be better preserved.
 - g. Reassembly process. Photographing records the methods and instruments used for reinstalling disassembled components.
 - h. Reinstalled components. Each of the conserved elements is photographed, to compare its position in the conserved structure before disassembly and after reinstallation.

POST-RESTORATION

Post-restoration documentation consists of the recording of technical and archaeological data, both verbal and pictorial.

Verbal data recording. This is in the form of descriptions and daily notes explaining the completion of the installment process of wooden building elements, and describing the integrated environment, the land arrangement, and the results of research that was undertaken.

Pictorial data recording. This consists of drawings and photographs taken of the reinstalled wooden elements, the integrated environment, and also the results of site preparation. Pictures are taken from various directions, and can be used for comparison in the evaluation of restoration activities.

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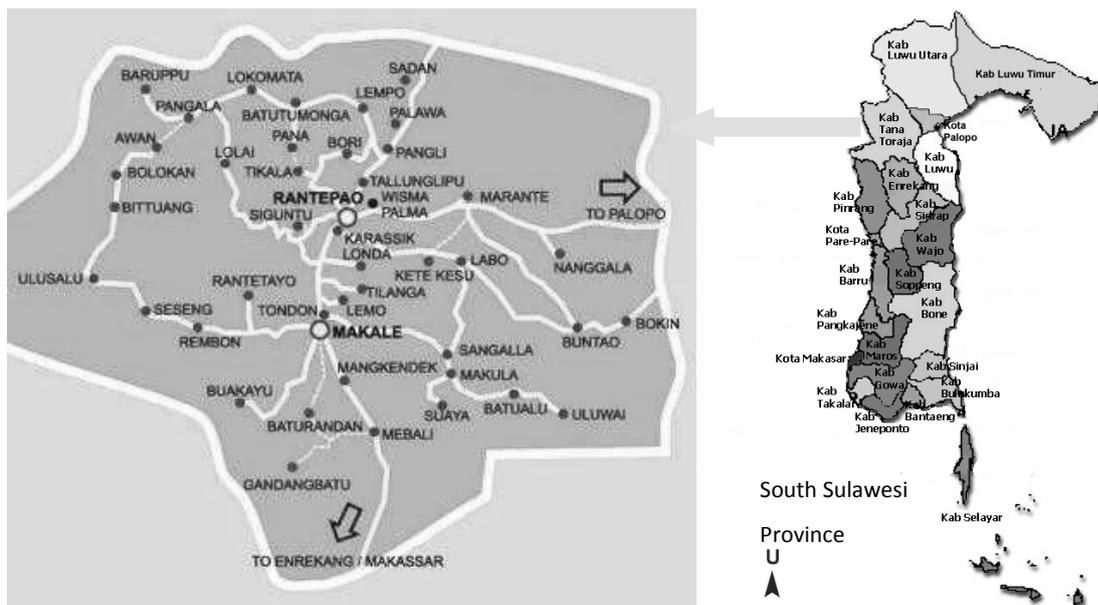
Ministry of Culture and Tourism

***Tongkonan* Toraja: The Quintessential Features of Indonesian Vernacular Architecture**

INTRODUCTION

THE LAND OF TORAJA

Tana Toraja is located in the northern part of South Sulawesi province, between the Latimojong mountain range and Mount Reute Kambola. The arable portion of Tana Toraja divides into Eastern Toraja around Lake Poso, Western Toraja around the Palu river, and Kalawi in Central Sulawesi.



DEMOGRAPHY

Toraja is a name of Bugis origin given to the different peoples of the mountainous regions of the northern part of the southern peninsula, who have remained isolated until quite recently. Their native religion is megalithic and animistic, and is characterized by animal sacrifices, ostentatious funeral rites and huge communal feasts. The Toraja only began to lose faith in their religion after 1909, when Protestant missionaries arrived in the wake of Dutch colonizers. Nowadays roughly 60 percent of the Toraja are Christian, and 10 percent are Muslim; the rest hold in some measure to their original religion. Whatever their religious belief, their cultural focus is their ancestral home, their “house of origin,” the great *banua* Toraja with its saddleback roof and dramatically upswept roof ridge ends.

This house of origin is also known as *tongkonan*, a name derived from the Toraja word for “to sit”; it literally means the place where family members meet – to discuss important affairs, to take part in ceremonies, and to make arrangements for the refurbishment of the house.

The Toraja are divided up geographically into different groups, the most important of which are the Mamasa, who are centered on the isolated Kalumpang valley, and the Sa’dan of the southern Toraja lands.

VILLAGE PATTERN

In former times, Toraja villages were sited strategically on hilltops and fortified to such an extent that sometimes access was only possible by tunnels bored through the rock. The Dutch pacified the Toraja and forced them to leave the hills and build their villages in the valleys, and they also introduced wet rice cultivation. The Toraja abandoned their traditional slash and burn agricultural practice, and now live by rice farming, and raising pigs and buffalo.



An avenue of houses in a Toraja village

The Toraja are a proto-Malay people whose origins lie in mainland Southeast Asia (possibly Cambodia). Toraja legends claim that they arrived from the north by sea. Caught in a violent storm, their boats were so damaged as to be unseaworthy, so instead they used them as roofs for their new homes. The *tongkonan*, with their boat-shaped roofs, always face towards the north.

TORAJA TRADITIONAL ARCHITECTURE

Most of the Indonesia’s traditional dwellings are wooden. The traditional house developed in response to natural environmental conditions, particularly Indonesia’s hot and wet monsoon climate. As is common throughout Southeast Asia and the Southern Pacific, most *rumah adat* are built on stilts, with the exception of Java and Bali. Building houses off the ground on stilts serves a number of purposes: it allows breezes to moderate the hot tropical temperatures; it elevates the dwelling above storm water runoff and mud; it allows houses to be built on rivers and wetland margins; it keeps people, goods and food from dampness and moisture; it lifts living quarters above malaria-carrying mosquitos; it reduces the risk of dry rot and termites. The sharply inclined roof allows the heavy tropical rain to quickly run off, and large overhanging eaves keep water out of the house and provide shade in the heat. In hot and humid low-lying coastal regions, homes can have many windows providing good cross-ventilation, whereas in cooler mountainous interior areas, homes often have a vast roof and few windows.



The quintessential features of Indonesian vernacular architecture are exemplified by the Torajan *tongkonan* of south Sulawesi. The

specific architecture of the Torajan house has its own structural form.

Toraja houses are shaped like an inverted boat with the two ends bending upward in a bow. The *tongkonan* is a wooden house on stilts, with space under the house usually used for domestic animals. *Tongkonan* have boat-shaped roofs and face north, which symbolizes the origin of Toraja's people, who arrived in Sulawesi by boat from China. This house is rectangular in shape with a width to length ratio of 1:2. The width of the building is between 2 and 4 m.

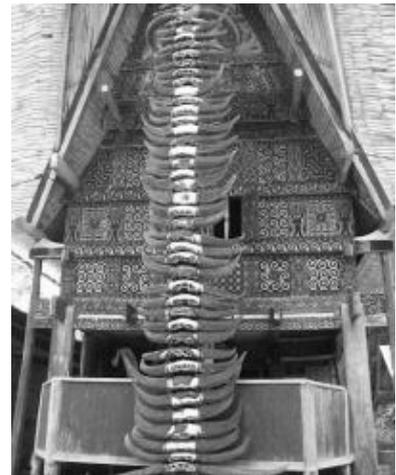
Traditional Toraja architecture is divided into five functional categories: the house (*banua*) which is known as *tongkonan*, the rice storage building/barn called *alang*, rice guard-houses, livestock stalls, and funerary architecture.

CARVING AND ORNAMENTATION OF *TONGKONAN*

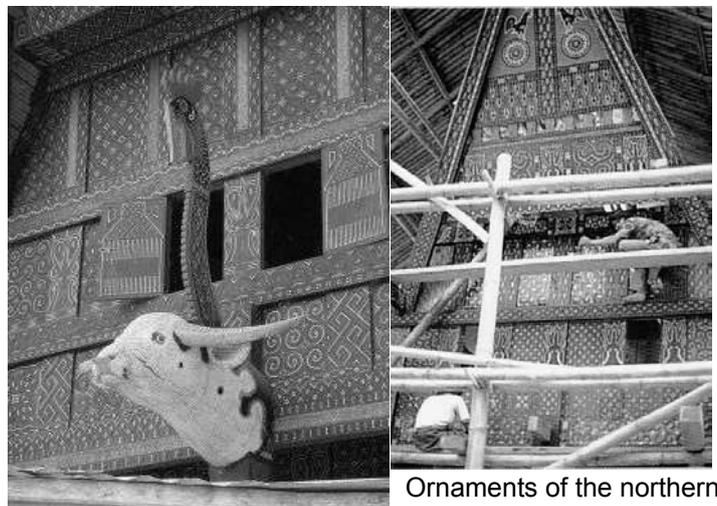
Tongkonan are sculpted with ornaments of various shapes. The ornaments are painted with traditional colors, dominated by red and black. These ornaments create the aesthetic value of the buildings of Torajan architecture.

In the front of the house, beneath the towering roof, are mounted buffalo horns which indicate the number of funerals conducted by the families owning the *tongkonan*, as water buffaloes are sacrificed at funeral ceremonies. On the left side of the house (facing west), there are usually the jaws of buffaloes that have been slaughtered, while on the right side (facing east) there are pig jaws.

Among Torajan arts, one of the most famous and distinctive is carving, which is as old as the ancestors of Tana Toraja itself. It takes the form of engraving, used as decoration on both the exterior and interior of the *tongkonan*, and also on the granary (*alang sura*).



Numerous water buffalo horns mounted in front of the house



Dragon figure (*top*) and water buffalo head replica

Ornaments of the northern gable, the most sacred part of the house



Motif of a chicken and the sun

All of the carvings symbolize the meaning of Toraja people's lives. Generally, the meaning of carvings are a relationship between Torajan people and the Creator, a relationship with fellow humans (*lolo tau*), cattle (*lolo patuon*), and plants (*lolo tananan*).

In front of *tongkonan* there is the rice granary, or *alang*. The granary's poles are made from trunks of the palm tree (*bangah*) that are slippery, so mice can not climb up into the barn. At the front of the barn there are a variety of carvings, including a motif of a chicken and the sun, a symbol that Toraja believe can resolve any problem.

LAYOUT OF THE *TONGKONAN*

The orientation of the *tongkonan* is always to the north, the direction Toraja people believe symbolizes life. This is why in Torajan villages the houses stand in a row side by side from east to west. The rice granaries stand facing the *tongkonan* with their front gables facing south. *Parampa* is

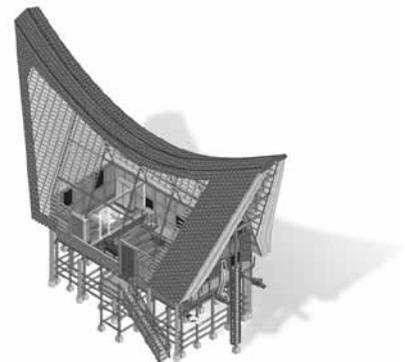


the yard that lies between the *tongkonan* and *alang*. Here the crop is left to dry; it is also a place for children to play, women to work, and men to arrange cock fights.

Alang (right) and tongkonan (left)

There are at least three rooms inside the *tongkonan*, as follows.

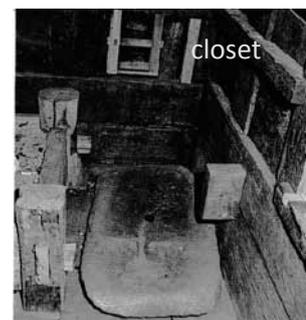
1. *Tangdo*. This room is located on the north. In this first room, there is ladder that provides access to the center room. The *tangdo* is the bedroom for unmarried girls. There are two windows facing north. The pile floor of the *tangdo* is same as for the *sumbung* (below) and there are no ornaments.



2. *Sali*. This is the family's main living area. There is a fireplace located on the eastern side. It consists of a large rectangular wooden box (called *dapo*) with a hearth used for cooking, which can also function to provide warmth because the land of Toraja has cold weather. The fireplace is located on the east side because food and rice are firmly associated with the life and rituals of the east. The

walls of the *sali* are black with soot from cooking and the smoke coming from the fireplace. The soot is useful as a wood preservative

Also to the east, right beside the hearth, is a toilet made of an oval-shaped stone with a slight concavity that has been given a hole. The toilet serves for mothers and children to urinate at night. The *sali* is also the bedroom for unmarried young men of the family and for the servants. In addition, the *sali* also functioned as room for laying a corpse until funeral services have finished.

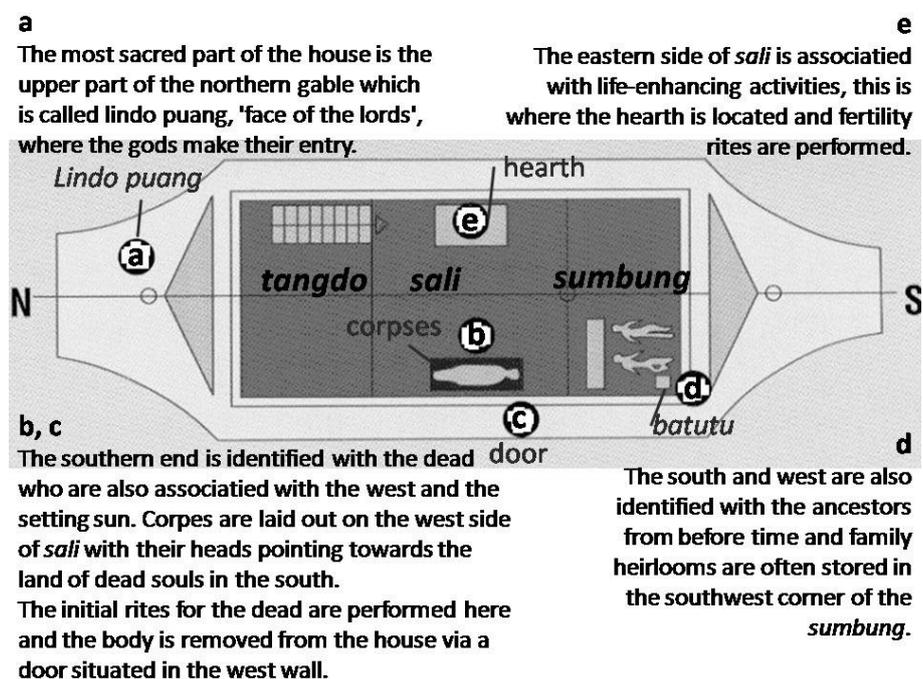


3. Sumbung. This third room is located to the south. It is the bedroom of the master and his wife. In this room, valuable things in large baskets or trunks called *batutu* are stored. The space below the *longa* (the overhanging section of the roof always present in a *tongkonan*) is used for tasks such as spinning or weaving. Also, the space below the house, called *bala-bala*, is used to stable animals such as chickens, cows, pigs, and buffaloes.



As the plan of the house is rectangular, it has the flexibility to be divided by partitions. The room division above is only based on practical reason, and can be changed according to need.

Diagrammed here are the rooms inside the *tongkonan* and their philosophic meanings.



STYLE AND CONSTRUCTION OF THE *TONGKONAN*

Tongkonan are built on wooden piles. They have saddleback roofs with ridge ends extending upward and so far beyond the walls they require an external free-standing post (*tulak somba*) for support. Traditionally, the roof was constructed with layered bamboo, and the wooden structure of the house assembled in tongue-and-groove fashion without nails. Nowadays, of course, zinc roofs and nails are increasingly used.



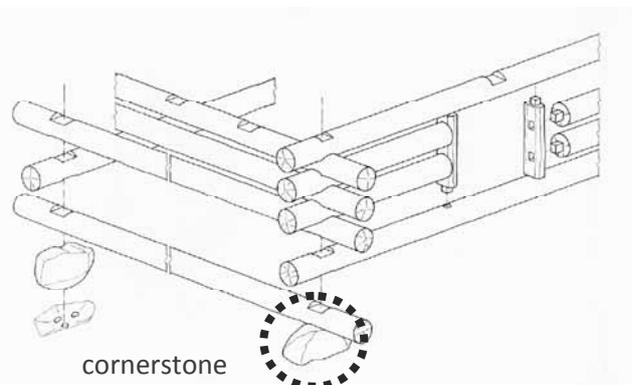
The construction of a traditional house is time-consuming and complex, and requires the employment of skilled craftsmen. First of all, seasoned timber is collected. Then, a shed of bamboo scaffolding with a bamboo shingle roof is erected. Here, components of the house are prefabricated, with the final assembly to take place at the actual site. Almost invariably now, a *tongkonan* is raised on vertical piles rather than a log cabin type substructure, so all wooden piles are shaped and mortises cut in them to take the horizontal tie beams. The piles are notched at the top to accommodate the longitudinal and transverse beams of the upper structure. The substructure is then assembled at the site. Next, the transverse beams are fitted onto the piles, then notched and the longitudinal beams set onto them, and the grooved uprights that will form the frame for the side walls are pegged in place.

Toraja people usually divide the structure of a *tongkonan* into three parts. They are: the lower structure which symbolizes the underworld, the world of cattle; the middle structure which symbolizes the middle world, the world of human beings; the upper structure which symbolizes the upper world, the world of the gods.

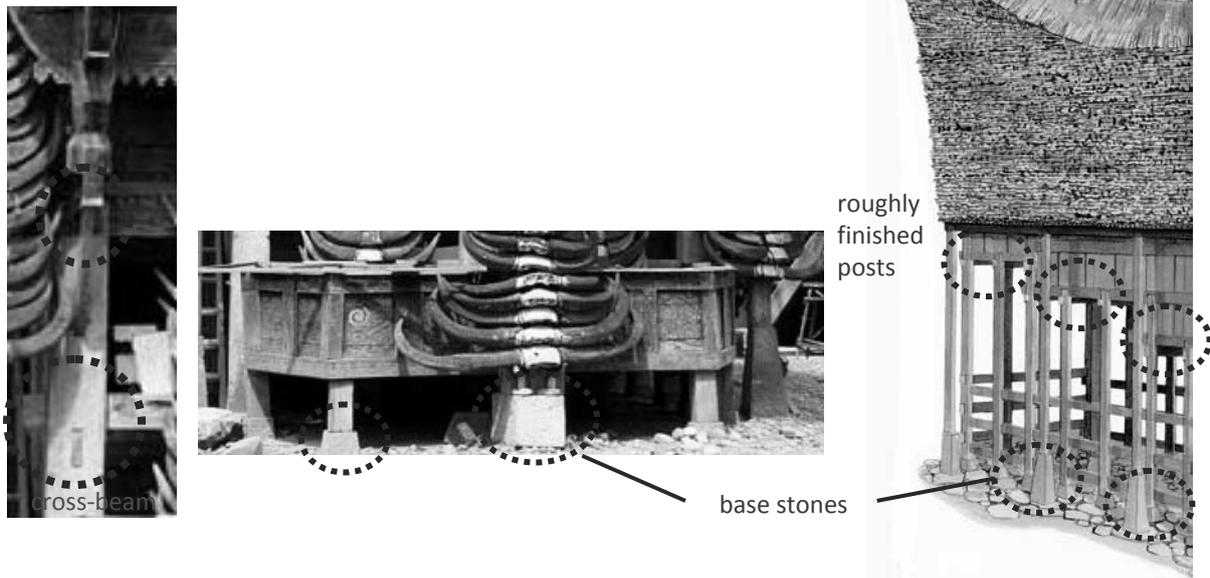
1. The substructure. The space under the house is used for stabling animals at night. Its height is about 2.35 meters, to make it high enough to accommodate buffaloes. The substructure can be either of the following two types.

Log cabin construction. The log cabin stands on a foundation of four cornerstones. In this construction round beams are placed on top of one another, their ends interlocked at right angles by means of slots cut on both the upper and lower sides of each log. The cornerstone is a mountain stone which is used as the foundation to avoid damage from termites and decay by ground water.

This is the older way of building, and according to one view the house originally had only one level, and its modification into the foundation for an upper living area did not take place until the 17th century.



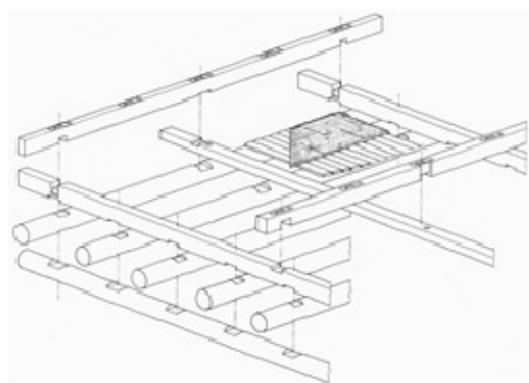
Wooden pile construction. The other type of construction uses a foundation of roughly finished piles, which are four- or many-sided posts, set onto base stones, and connected by cross-beams which pass through holes chiseled in the posts. There are three cross-beams in the longitudinal and transverse directions that link the posts securely to create vertical and lateral stability. This technique is more economical because it uses less wood.



Atop the end of each post, a transverse beam and a longitudinal beam are set at right angles. These beams, called *tangdan*, transfer the load from the upper structure to the substructure. Below each partition of the ground floor stand posts running transverse to the main axis. One of these posts, called *ariri posi'* (navel post), is located in the center of the house, and is the main post in terms of philosophical meaning.

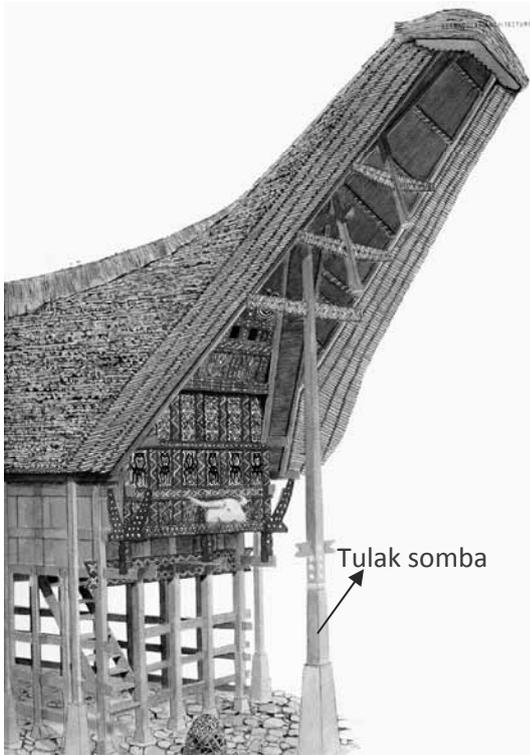
2. The Middle Structure

The height of this part is about two meters. The floors consist of thick transverse boards and are frequently at different levels. Different levels of floor are supported by horizontal beams at different heights. The walls consist of a framework of flat, rectangular uprights which pass through the horizontal beams. The upper ends of the uprights support the top beams (called *samborinding*) of the longitudinal walls, which serve as purlins. The construction of partition walls, which stand on the central joists of the floors, is the same as the side walls. Thin boards, usually over 40 centimeters wide, fill the rectangular openings in the framework, inserted into grooves cut in the uprights.

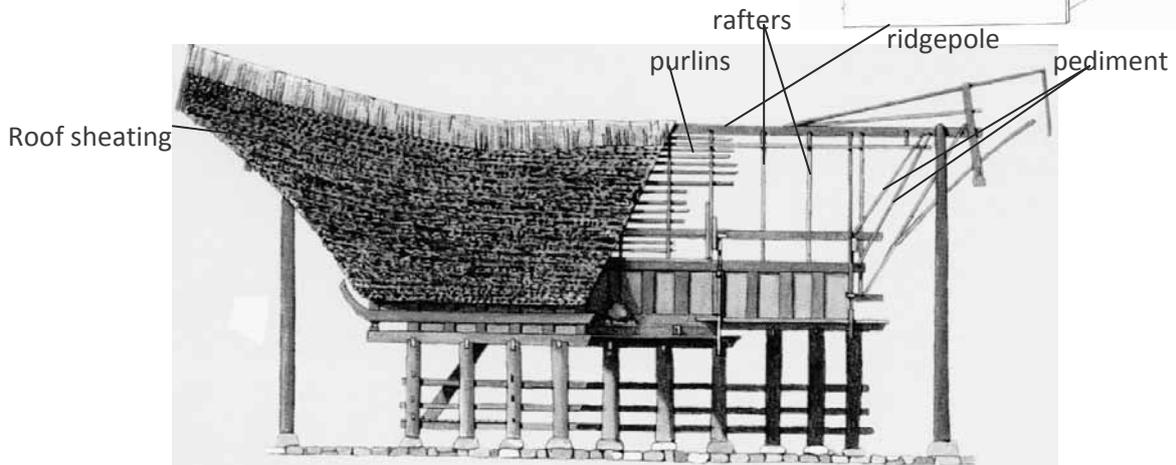
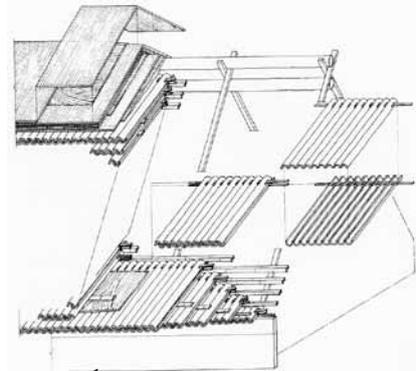


3. The Upper Structure

The distinctive feature of the *tongkonan* house is the curved roof. The concave curvature is achieved by pinning one or two upward angling beams to the front and rear ends of the straight, jutting ridgepole. The ridgepole lies atop cross rafters supporting the ridge purlins. The outer ends of the ridge purlins are attached to the pediment of the gable, and within the house they rest on the grooved ends of the posts standing in each transverse wall. The pediment supports the outer end of the topmost ridge beam. In the case of a highly curved roof, the section of the ridge projecting beyond the walls at the front and back of the house are afforded additional support by a free standing pole rising from the ground (called *tulak somba*).



The ends of the ridgepole run through the center of short, vertical hanging spars grooved in their upper ends to carry the upward angling beams at the front and rear of the house. Transverse ties pass through both the free-standing poles and the lower ends of these hanging spars. Each vertical hanging spar has two functions: at its top it supports the upward angling members of the ridge; at its lower end, through the transverse ties, it carries the rafters of the projecting roof as they branch outward from the ridge, thus preventing the roof from collapsing. The rafters lie on the ridge purlins, the *samborinding*, and longitudinal beams atop the transverse partition walls. The bottom ends of the rafters are also supported by additional longitudinal beams, supported by additional lateral posts.



MATERIALS OF THE *TONGKONAN*

The traditional *tongkonan* was built with natural materials such as bamboo, timber, and rattan. The frames, posts, and beams were usually made of timber or bamboo poles. The floor consisted of wooden boards laid over thin hardwood joists, and between the floorboard and the hardwood joists a layer of split bamboo was laid to give the floor extra rigidity. Its walls and partitions were built from wooden boards, wooden uprights, or plaited bamboo. All of these components were prefabricated before in a shed called *pondok*, and were assembled with fitted joints, without the use of nails.

The roof of the *tongkonan* was traditionally covered with layers of bamboo and thatch. The bamboo layers were constructed in panels, prefabricated beforehand and tied to the roof structure with rattan string. The framework, ridgepole, and the cross rafters were made of bamboo or timber.

The Toraja people usually obtained these materials from the forest and their natural surroundings. They also used simple and traditional carpentry tools and wood carvers to build the house, though even under traditional conditions they were already using bamboo scaffolding to finishing their jobs.

There is no specified characteristic for the materials. The natural materials were used only because of practical and economical reasons. They tended to use materials that were easy to obtain as long as they were sufficiently strong and the size was suitable. Under conditions of development there are no prohibitions on using other materials, as long as the philosophical values of the *tongkonan* are maintained.

A new *tongkonan* at Pa'tengko, just outside Makale, took three months for eight men to build, and another month for six men to carve and paint the outside wall panels. There is no carving inside recently built Toraja houses, but on occasion timbers from old houses are reused in the construction of new ones.



Tongkonan used bamboo and thatch for the roof covering



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IV. Final Reports by Participants



Anton Wibsono

A Summary Report on the Training Course on Cultural Heritage Protection 2011

Japan and Indonesia are two archipelagoes in Asia which consist of thousands of islands and various cultures. Both countries were involved in World War II, which left a tragic history for them. Despite this history, their relationship has now changed. Japan often helps Indonesia, not only in economic matters but also in cultural heritage preservation. The Training Course on Cultural Heritage Protection in Asia and the Pacific Region is a program which aims to improve the quality of human resources in the Asia/Pacific region as agents of cultural heritage preservation. The participants are given basic knowledge about how the Japanese government preserves cultural heritage, and this year, Indonesia is honored to be a part of this program.

The history of the making of cultural heritage preservation and management laws in Japan goes back to the Meiji era, when measures were enacted in 1871. Over subsequent years, legislation has been continually revised until 2004. The laws that exist today cover various aspects related to cultural heritage, both intangible and tangible. This shows the Japanese government's concern to protect the nation's history. They realize that history is not something achieved but something inherited from previous generations. It has to be protected and preserved, so it can be passed on to future generations. After implementing laws on cultural heritage, the government has the duty to inform the public about these measures' content and meaning. This is not an easy thing to do, for educating society to the point where it becomes aware and protects cultural heritage is a long and exhaustive process. There is a good example about the difficulties in educating society, regarding the application of cultural heritage laws in 1975 to Imai-cho, Kashihara city. At first, the Imai-cho residents refused to apply the laws to their district for they thought that if they accepted the laws, they would face difficulties in renovating their buildings. However, thanks to the hard work and cooperation of the central and local governments, the residents finally accepted the laws in 1993. This case is an important lesson for the Indonesian government, which has just revised Law No. 5 of 1992 to become Law No. 10 of 2011 concerning cultural heritage.

After society has attained awareness about protecting and preserving cultural heritage, the government has a responsibility to promote the enforcement of protective measures. The Japanese government approaches this problem by giving exemptions on real estate taxes (even making the property tax free), giving rights to the owners of cultural heritage to charge tourists who visit, and giving assistance in the form of funds and experts for those who want to restore their buildings. However, not all cultural heritage building owners can get such benefits for their facilities, for it is only for those buildings certified as Important Cultural Properties by the central government. Even this support requires large amounts of money, and Japan as a developed country is capable of providing it. Nevertheless, the situation would be different if applied to governments of developing countries such as Indonesia. The Indonesian government does not have the ability to donate funds for every restoration plan undertaken by owners of cultural heritage buildings. This is because we are still focusing on education and economic development, which makes funds for cultural heritage very limited. However, it is not impossible for Indonesia to do the same kinds of things Japan does. Sooner

or later Indonesia will follow the Japanese government's footsteps.

The restoration of large-scale wooden buildings such as those found at the temples of Todaiji, Kofukuji, and Kiyomizudera, and at castles such Himeji, is quite a challenge for the Japanese government. Not only do the buildings have to be restored gradually, but also the wooden materials are already hard to obtain. Therefore, the Japanese have to import some materials, as in the Kofukuji restoration which used wood from Cameroon, and the Yakushiji restoration for which wood was imported from Taiwan. These activities require large amounts of funds, so the central and local governments must cooperate to allocate funding for the restoration. An interesting thing about large-scale cultural heritage buildings is the use of scaffolding, such as for Himeji castle which requires extensive scaffolding to cover the entire building, and uses half of the 2.8 billion yen budget for the reconstruction just to build the scaffolding. This kind of scaffolding allows the work to be done in every kind of weather, and filth produced by the restoration activity will not contaminate the environment.

Before restoration, the first thing to do is record data through technical drawings and photographs. The documentation process for cultural heritage buildings, through such drawings or photographs, has a very important role in preservation activities. The principle to follow in drawing is "think like a carpenter," so the layout will be drawn from the pillars first, then the walls and other details. These steps are followed not only for large-scale buildings but also for traditional houses. The drawing activity starts with sketching, measuring, and redrawing using scales. The picture made must be detailed and easy to understand by a non-expert. Documentation in the form of photographs is usually done using an analog or digital camera. Each camera has its own techniques of use. The details of a room or building have to be recorded to the maximum capacity in the photograph. This process requires knowledge of photographic techniques for combining adjustments of the aperture and shutter speed of the camera, in keeping with the ISO speed. The use of extra lighting such as a strobe is acceptable to get a clearer and more detailed photograph. Every angle of the cultural heritage building should be recorded in order to be used as reference for the restoration.

Technical studies of must be done for every planned restoration. Through such study, the damage and ways to handle it should be identified. Some of the cultural heritage buildings in Japan lack data about their date of construction. If this kind of problem occurs, dendrochronology can be used. Dendrochronology is a method for identifying the age of a wooden building by determining the date when a tree was felled and used as building material, with an assumption that the time of both cutting down and processing of a tree is roughly the same year. Dendrochronology is based on measuring the patterns of tree rings, which are produced by varying rates of growth over the annual cycle of seasons. The denser part of the ring is produced as growth slows toward winter, and the lighter or less dense part as it goes into the summer. The method was developed by Dr. Douglas from the United States in the early twentieth century. One of the aims in restoring cultural heritage buildings in Japan is to detect damage and prevent it from happening in the future. The restoration principles followed in Japan and Indonesia are somewhat similar, to keep the authenticity of form, materials, location, and techniques. One of the techniques used by the Japanese to keep the authenticity of materials is the making of rubbings of wooden members. This is done by putting drawing paper on the wood, then rubbing carbon onto the paper's upper surface. The result will show the traces of the wood's surface and the marks left by the woodworking. By applying this

technique, the type of wood and its technique of working can be found. Dendrochronology and rubbing can be applied to the restoration of wood-based cultural heritage buildings in Indonesia.

The restoration activity for cultural heritage buildings in Japan needs around five to ten years to finish. This is because of the rarity of the materials and the complexity of the architecture of the building. Once the restoration has finished, the next step is protecting the building from the same damage in the future. Steps are often taken to strengthen the construction of cultural heritage buildings to lengthen their age. One example is the Kondo or main hall of Toshodaiji temple, for which the roof was strengthened to prevent damage. The materials added to the original are distinguished by applying a different color of paint. The biggest enemy of wood-based cultural heritage buildings is fire. The Japanese government has done many things to overcome this, from providing hydrants to conducting training. Hydrants can be found in every corner of cultural heritage buildings. They are put there to prevent fires from spreading from one building to another. Doors on hydrant compartments are unlocked to make the rescuing process easier and quicker. The hydrants are often hidden or disguised so tourists will still feel comfortable. Another preventive measure provided by the Japanese government is training in firefighting for people who own cultural heritage buildings and/or live nearby. This training is given so that they can have a quick response in the handling of fires. The training is held annually for every cultural heritage building in Japan, so that they can also check the condition of fire extinguishing equipment and promote awareness in society. The Indonesian government should also follow the same methods to prevent fires at their wood-based cultural heritage buildings.

Another threat is from earthquakes. Both Indonesia and Japan are countries which lie on fault lines, and thus this threat to the endurance of cultural heritage buildings needs to be noted. There is one significant policy for cultural heritage buildings in Japan that emerged after the Kobe earthquake in 1995. The Japanese government started to form rapid assessment teams for cultural heritage buildings. Such a team consists of several members from various areas of expertise. When the disaster happens, not all the members visit the location. They will just send one person who will tell his partners about his evaluation result. There are several things to do when a disaster happens: (1) get an understanding of the damage gradation, from the center to the margin, (2) determine the border line of the damage, (3) call friends in the disaster area, listen to the situation, (4) make a rough estimation, (5) book accommodations, (6) make preparations for a support team of up to one week, (7) secure a forward base, which can change depending on the situation. With regard to preserving cultural heritage buildings, we have to be concerned not only with authenticity, but also the factor of safety while still keeping intervention to a minimum. There should be a balance between working for authenticity and safety, particularly on cultural heritage buildings that are still utilized. One good example in preserving cultural heritage buildings is the installation of anti-earthquake systems in one of the traditional cultural heritage buildings which is now used as a sake-making museum in Kobe.

Thanks to ACCU Nara who have given us the honor to be able to participate in this program. All the things that have been studied of course not can be applied directly in Indonesia without going through the process of modification and adjustment in accordance with local conditions. However, we hope that Indonesian participation will not end at this point because we still require a lot of training and input for the realization of cultural heritage preservation in Indonesia.

Reconstruction and Maintenance of Heritage



This training aims to introduce measures to preserve heritage buildings in Japan, and is expected to be used in the preservation of cultural heritage in Indonesia with adjustments for the conditions of existing cultural heritage there. The training course was conducted by the Cultural Heritage Protection Cooperation Office, Asia-Pacific Cultural Centre for UNESCO (ACCU Nara). Training was conducted in the city of Nara, Japan, which is one of the oldest towns in that country with many historic sites and heritage buildings, mostly made from wood; the city of Nara was also once the capital of Japan. The training was conducted for one month, from July 5 through August 4, 2011. In this training the topics taught are as follows:

- Introduction to the Recording/Documentation of Wooden Structures
- Practical Work in the Recording/Documentation of Wooden Structures
- Restoration Planning for Wooden Structures
- Introduction to Restoration Techniques for Historic Buildings
- Practical Work in Historic Building Restoration
- Introduction to the Preservation of Townscapes and Historic Villages
- Practical Work in the Preservation of Townscapes and Historic Villages

The content of these training activities is described in the following paragraphs, organized according to the separate lectures.

In the introductory lecture by Mr. Isao Nakai, we obtained knowledge about heritage in the city of Nara that is inscribed on the World Heritage List, including ancient buildings made from wood, and also learned the reasons for these buildings being listed as World Heritage, which of course means the conditions for being inscribed on the list. After that, Mr. Nakai showed us the locations in on-site lectures at the places that have been entered into the World Heritage located in the city of Nara: Todaiji temple, Kasuga Taisha shrine, and Kofukuji temple. In this field excursion, one of the explanations given by Mr. Nakai was a description of the preparation techniques of a timber building used as a warehouse. After that, we also observed excavation activity in the Kofukuji temple compound and learned about the purpose of the excavation.



Todaiji temple, Kasuga Taisha shrine, and Kofukuji temple (*photo: Nikko Suko*)



Explanation by Mr. Nakai, warehouse building techniques, excavation (*photo: Nikko Suko*)

The second lecture was by Mr. Yoshihiko Hayashi of the Nara National Research Institute for Cultural Properties (NNRICP). This lecture, on the history of the city of Nara, included the background for the initial construction of the city. This explained why the city of Nara has been inscribed as the World Heritage. This lecture also described the process for cultural heritage to attain the status of National Treasure, explaining about registering heritage buildings and also covering the rights acquired by heritage buildings that have been registered for financial assistance and management. One example of this is when a cultural heritage building receives damage caused by natural disasters, the government will provide funds to repair the building.

The third lecture was by Mr. Yoshio Imanishi of the ACCU Nara office, on the theme of Documentation and Restoration Plan of Wooden Structures. This described various ways of renovating wooden buildings. Prior to the renovation of a building, of course, there are stages that

must be done, including the feasibility study. The lecture explained that cultural heritage buildings are very important and have high historic value, and therefore documentation is now required in maintenance so that details about the initial state are recorded before working on the heritage building. In renovating a building one must be very careful, because if there are errors in the planning all of the activities until the end could be wrong, so in renovating a building we need to know its previous history and original state. Next, we had field studies at Toshodaiji and Yakushiji temples and at Tanzan shrine. We learned about the history of Toshodaiji temple, with its distinctive roof construction and pillars, and also about evidence for construction activities in both the Kamakura and the Nara periods. The lecture conducted at Yakushiji temple was about the history of the restoration of existing buildings, and damage to the buildings that required them to be renovated. Techniques were also demonstrated for the use of woodworking tools, and also the types of wood used in the renovation of the building at Yakushiji. At Tanzan shrine they were conducting the roof repairs on a newly renovated building, so we could directly see the new roof and the repair work. The lecture also described the history of the shrine, which is known to have originally been a Buddhist temple but is now used for Shinto.

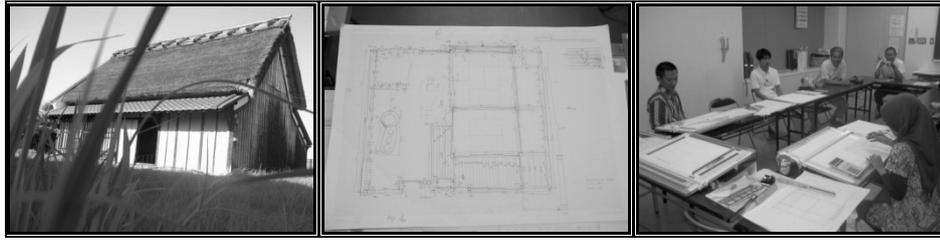


Toshodaiji and Yakushiji temples, and Tanzan shrine (*photo: Nikko Suko*)



Mr. Imanishi explaining the reconstruction of pillars at Toshodaiji, and carpentry and conservation work on the roof at Tanzan shrine (*photo: Nikko Suko*)

The fourth lecture was practical training by Mr. Isamu Yamaguchi, Mr. Nobuo Nakamura and Mr. Kunihiro Takamiya, held at the Tanaka Family Residence in Nara City. In this activity we learned about the recording of data by drawing, and had direct practice in drawing with the help of the lecturers. We were taught how to draw the structure of a wooden building and fill in the details. We were also instructed in how to measure the wooden building after sketching an image.



Tanaka Family House, the resulting drawing, explanations during lectures (*photo: Nikko Suko*)

The fifth set of lectures was at the Nara National Research Institute for Cultural Properties by Mr. Yoshihiko Hayashi. These lectures explained the preservation of buildings that form a region or group. They also described the efforts to establish an area that could be a group of cultural heritage properties. An area can gain this status if it has buildings of historical or cultural value as traditional architecture. The lecture not only described the requirements for becoming a cultural region, but also the rights acquired by the region in designating the historic buildings. Groups of buildings that have become cultural heritage in Japan are generally buildings made from wood, so the lecture also described the efforts of fire prevention. As fire is the main enemy of wooden buildings, it was explained how fire extinguishers are installed at almost every building, and that they should be functioning properly, amounting to a significant cost in the effort to preserve existing traditional buildings in Japan. The lecture also explained that cultural heritage regions include not only buildings but also elements such as protected forests, landscapes, or rice fields.



Field lectures with Mr. Hayashi and Mr. Kobayashi (*photo: Nikko Suko*)

The sixth lecture was at the Kiyomizudera temple complex in Kyoto. Aspects were explained of what is obtained in an effort to preserve heritage buildings. Also, the renovation of a heritage building or of a complex must have the necessary technical people and experienced carpenters. In renovation activities at Kiyomizudera one of the obstacles is the presence of so many visitors that it blocks the activities of renovation. The lecture also explained that conservation is increasing the resilience of buildings and also enhancing their cultural value.



Field study at Kiyomizudera temple (*photo: Nikko Suko*)

Next was an on-site lecture in Imai-cho, a town which is a complex of cultural heritage consisting of the former homes of merchants, with the lecture given by Mr. Nobuo Matsunaga. In addition to the complex history described for the merchant's houses, there was also an explanation about the rights obtained for buildings that have been designated as cultural heritage, which include tax-free status and subsidies of 50-80% of the cost of building renovations. The lecture also described the problems that exist for a community which has registered heritage buildings, since they should not change the shape of the buildings to increase the size for living or storage, and also many people do not approve of the Imai-cho area being made the object of tours.



Imai-cho cultural heritage complex; Mr. Masui Masaya giving an explanation (*photo: Nikko Suko*)

The eighth lecture was about dendrochronology, given by Mr. Takumi Mitsutani. He described the origin and development of dendrochronology, and its application to materials in Japan. He explained how it has been applied to figure out the age of wood used in the construction of temples, as a way of indirectly finding out the age of the building using that wood.

In the next lecture, by Mr. Kazuki Sugimoto, we learned about photographic techniques for both cameras that use film and digital cameras. In the lecture, there was an explanation about the regulation of light so that the images obtained can be maximized, and it was also explained how to take pictures of buildings that require detailed images, which can be used in the report on a building for renovation activities. In addition to the techniques just described for shooting outdoors, there was also an explanation of indoor shooting techniques and ways to use auxiliary lights for photos.



Practice in taking photographs of buildings with Mr. Sugimoto and photographs of heritage buildings in Imai-cho (*photo: Nikko Suko*)

The tenth lecture was held on-site at Himeji castle in the Hyogo prefecture. Apart from describing the history of the castle, it also explained the activities that were given priority in the current renovation, such as the renovations and plastering of the walls. There were explanations of the plastering techniques and materials used, and also about how many years they would hold up.



Renovation of roofs and walls at Himeji castle and explanations on building renovations in Kobe (*photo: Nikko Suko*)

Next was a lecture about the threat of earthquakes to cultural heritage buildings, by Mr. Yasumichi Murakami. He gave an explanation of the large earthquake in Kobe and earthquake mitigation efforts. The lecture also described the institutions in charge of rebuilding the heritage damaged by that natural disaster, and also renovations being done in anticipation of similar occurrences of earthquakes.



Installation of an earthquake resistant foundation at a traditional Kobe sake maker (*photo: Nikko Suko*)

The next lecture was in Shiga by Mr. Kazushi Hamazaki. It explained the utilization of heritage buildings owned by the government which can be used by the public or social institutions for the benefit of society. We were shown heritage buildings that have been renovated and then used as a nursing home and a community meeting place.



Lectures at traditional homes in Shiga, and photos of cultural heritage buildings used as a nursing home and a restaurant/café (photo: Nikko Suko)

What can be taken from this training

From the training activities organized by ACCU Nara, we learned a lot of new things and obtained new skills we did not have before. We learned about the history of Japan and more particularly about the heritage that exists in Japan. We also obtained knowledge about the ways of renovating heritage buildings, about the techniques, procedures, equipment, and also the parties in charge of building maintenance activities for traditional heritage that go into both the local and the world heritage. The skills that we get from this training can we apply in Indonesia in the maintenance of heritage buildings, with adjustments to conditions in Indonesia. One of the techniques we can directly apply is from the lesson on documenting cultural heritage buildings, using either analog or digital cameras. We can also teach what we learned from these training activities to friends in Indonesia who have jobs in the conservation of traditional buildings, especially buildings made of wood.

We are very grateful to the ACCU for inviting us to attend this training. We are really pleased with the new knowledge that we got, and we will use the skills we have learned in this training for the benefit of society and especially to preserve cultural heritage in Indonesia.

Suggestions for future training activities

Training conducted by the ACCU is excellent and well-organized from the preparation until the end of all scheduled activities, and the material provided can be conveyed to all, and we as students could receive good lessons as well. Just one suggestion that we can make, having found that several different lecturers covered the same material or offered the same information, which resulted in the repetition of lessons that had already been delivered, so our advice is that for the material to be taught, agreement should be held so the lectures are not repetitions, which the participants find tedious. With this advice, we basically salute the ACCU positively for its frequent training in conversation science for the benefit of participants like ourselves from other countries, because the science is very useful for us. Thank you.

Prima Ardiani

Learning from Nara about Cultural Heritage Preservation

A month of training is an invaluable experience for me, a new staff member at the Directorate for Archaeological Properties, to have the opportunity to attend this course organized by ACCU. Accordingly, I would like to say thanks to the leaders and members of ACCU Nara for the invitation and the opportunity given to me, to the interpreters, and to the experts with the following organizations, who helped us so much during our stay in Nara: the Nara National Research Institute for Cultural Properties, the Cultural Properties Division of the Nara Prefectural Board of Education, Nara Women's University, Imai-cho town, Kobe city.

Before starting this training course, I read the schedule and found that we would get both theoretical and on-site lectures, which made me excited. We would have the chance to actually visit a number of cultural heritage sites in several areas in Japan and see how they have been preserved. Most of them are ancient wooden buildings.

Now I have undergone the training course, in which day by day I was able to get new experience and new knowledge. There were many amazing places we visited: ancient temples and shrines, townscapes and rural settlements, and restoration sites. There was much practical training for us. We did practical work at restoration sites, recording wooden structures (through drawing and photography), making damage surveys and plans for restoration, and material surveys for sustainable conservation, etc.

Besides the invaluable experiences from on-site lectures and practical training, we also got a number of material books for our guidance. The pile of books that we got every day in training is evidence of the knowledge we gained. And the knowledge in those books can be taken to our country for guidance and reference when we do work related to this training. With these references and experiences, I hope we can do our job in preservation of cultural heritage better than before.

I. Japanese Architecture

It is always interesting to learn about Japanese architecture. Starting from my first day of training here, I realized that my knowledge of Japanese architecture is very limited. I just know about the housing in Japan, light and clean with a simple style, and modern buildings with sophisticated technology.

Now, I have learned much more than that. From the course I know that *Nihon kenchiku* originated in prehistoric times with simple pit houses and storehouses. The Kofun period is the latest during prehistoric times. Subsequently the influence of Buddhism also affected the style of architecture, as Japan entered the Asuka and Nara periods. By that time, there were many large-scale temple buildings using complicated techniques in wood. That was so amazing for me to see, one by one, as the Ancient Monuments of Ancient Nara. I was amazed by the wooden structures and the ancient wooden architecture. And most important is their existence in this modern era. Entering those building complexes made it seem like entering the past. I felt as if I was enjoying movies set in past scenarios. That made me curious about how they have all been preserved, about the methods and

techniques that helped them survive through time, from one century to the next.

Temples and shrines with their wooden structures continued to be built in the Heian, Kamakura, and Muromachi periods. In the Kamakura and Muromachi periods, techniques of making wooden structures were more advanced. This period saw the birth of a unique type of architecture, the Daibutsuyō and Zenshūyō styles.

In the Azuchi-Momoyama period, another style of building emerged. Castles were built in this period by warlords as symbols of their power, such as Nobunaga's Azuchi castle and Hideyoshi's castle in Momoyama. They were amazing structures, which seem like castles from fairy tales. It made me curious to know how they were made. From the Edo Period, there are many types of residential architecture about which we can learn. From this era, we can easily find structures still preserved as Groups of Traditional Buildings. After the Edo Period came the Meiji, Taisho, and Showa, and now is the Heisei period.

II. Restoration of Historic Buildings

Most of the historic buildings in Japan are wooden structures. Wood is a material susceptible to weathering and changes in climatic conditions. In Japan, once every 100 years, wooden buildings are checked to determine damage in need of reconstruction and repair. For total restoration, the time schedule is about ten years. Because it is such a long time, they must plan so that restoration does not impact too much the convenience of visitors. We visited several restoration sites, and learned that every place has its own method. Engineers and carpenters at each restoration site play an important role in determining the method used.

By visiting restoration sites, we learned about materials for roofing, and about the structures and styles of buildings. The ancient wooden structures are shrines and temples. Most of the shrines we visited use thatched roofs of cypress bark (*hiwatabuki*), while most of the temples have tile roofs. Most of the shrines also used red to color the structure and had colorful ornamentation, while in temples the structure was in natural colors with less ornamentation. But at Kiyomizudera, some buildings were in natural colors with less ornamentation, while others were full of ornamentation and had red colored columns, beams, etc. This complex also consisted of two types of roofing, roof tiles and cypress bark. All of ancient buildings used *hinoki* (cypress), while the newer ones mixed this with others woods such as oak, *matsu* (pine), and *sakura* (cherry).

One thing that has not changed from restoration in ancient times is the construction of a temporary roof to cover the building, so the construction process is not disturbed by weather and other external factors.

At restoration sites, we also tried to recognize styles of the buildings. Almost all of the storehouses (*kura*) were in the *azekura-zukuri* style. At Toji temple, we found there are two styles. The Kondo has a different, more modern technique because it was built 100 years later. It used the Daibutsuyō style that is stronger in structure, so it needed bigger and longer wooden members. Besides temples and shrines, we also had a chance to visit the restoration site of Himeji castle. It was amazing to see, for example, that the process of restoration is presented to visitors, so we could observe how they were plastering the walls and roof tile joints. The castle was born in Azuchi-Momoyama

period, so it had a very different structure, building method, and style from the temples and shrines.

The time between each restoration is long, so the report for each restoration is important to provide continuity and serve as a guide for the next restoration. Modification of the structure and shape is usually seen in restoration in order to make the structure better, more resistant to the climate, and thereby give the building longer life. But it is important to minimize the replacement of old with new materials, choose traditional materials, and reuse old material which are still in good condition.

III. Recording Wooden Structures, Making a Damage Survey and Planning for Restoration, Conducting a Material Survey for Sustainable Conservation: Tanaka Family Residence

At the Tanaka Family Residence we learned about the recording done for wooden traditional structures. Actually, the building is simple and symmetrical in plan, but the recording technique is not as simple. We have to take detailed and meticulous measurements, so there is no difficulty when we make a technical drawing. Recording and drawing an object that already exists is more complicated than drawing the new object that we are to create.

When we make a sketch of a building, we must be concerned with every detail of the joints and other aspects. Accuracy and precision are very important in doing this work.

At this site we also learned about making a damage survey and planning for restoration. Before doing restoration, we must know the materials of the building, what kind of wood was used and the shape of the wood. The Tanaka Family Residence uses *sugi* (Japanese cedar), *matsu*, and *hinoki*. We learned to recognize the kinds of wood that are used in components one by one.

Often, because the wood is so old, it is very difficult to determine its type. Therefore the rubbing technique is used to show the surface texture of the wood and how it was shaped in the past. If there is to be replacement, the rubbing is used to find the same type of wood, in terms of texture and shape.

It is important to survey the damage, to see which parts of the building need to be restored and to know the causes of the damage, so we can anticipate those conditions in making the restoration, in order to reduce the same type of damage.

My job field is related with recording. I have often recorded and drawn colonial buildings. Accordingly, it is very important for me to learn more about recording. I have never recorded wooden traditional houses before. I think it is more complicated than recording colonial buildings. Drawing this house was also more difficult than drawing a Javanese type of house called *joglo*. There are many traditional wooden houses in Indonesia. Therefore this training was good practice for me in recording traditional wooden buildings.

IV. Fire Prevention

Wood is a combustible material, so concern is given to fire hydrant systems for wooden buildings, groups of traditional building, and ancient buildings. Hydrants are placed around the building so they are not visibly intrusive. However, hydrants are planted in soil with easy opening gates which are deliberately not locked, so that anyone can access a fire hydrant as soon as possible in case of fire in the building. The hydrants are kept out of view because it is a heritage building, so new equipment

surrounding it should not distract visually.

V. Dendrochronology

Dendrochronology is a new topic for me. Dendrochronology is an analysis based on tree ring width. This analysis is useful for telling when a building was built, and when other ancient wooden cultural properties were made. But, we need to consider that the possibilities for analysis differ according to the type of wood. In Japan, dendrochronology is possible with *hinoki* (cypress), but this would be different for other types of wood, or in a country with a different climate. For tropical climates, there is special dendrochronology for tropical timber.

With regard to the method of dendrochronology, there are three different types of wood: bark (A), sapwood (B), and heartwood (C). If either type A or B is in the sample, we can determine the date when the tree was felled. However, in buildings these types of wood are not often found. With only heartwood, we can find the age when the wood in the sample was formed, but we cannot tell when the timber was felled. In recent years, methods in dendrochronology have become more advanced. Initially, it was considered necessary to take a sample, but now it can be done more simply by taking photos using a camera, entering the data into a computer for automatic analysis. From the results of dendrochronology, the origin of the wood, where it came from, can now be determined.

For application in Indonesia, of course, we cannot use the basic data of dendrochronology developed in Japan because of differences in climate and the types of wood used. In Indonesia, most buildings are made of teak wood, and Thailand has developed the application of dendrochronology for teak. It is important to use dendrochronology for analyzing the age of buildings because determination from architecture style alone is not enough.

VI. Recording Wooden Structures (Photography)

In this course, we studied techniques of photography starting with the basics of how to set the lens and shutter speed in relation to the ISO, etc. Besides theoretical study, we had a chance to do practical work, recording traditional settlements in Imai-cho. We learned how to determine a good angle, adjust the light, and how to take pictures for documentation correctly.

Learning about photography for recording wooden structures is exiting. In my job, when we do documentation work, there is another person who handles the photography. Starting from now, I want to learn more about architectural photography, and I hope someday I can do the photography in a documentation.

VII. Risk Management of Cultural Heritage

Earthquake resistant maintenance is essential for zones that are prone to earthquakes. There are so many world heritage sites in these zones. When an earthquake happens, the priority is to help the victims. Usually no one goes to the cultural heritage site. So it is important to manage the relevant personnel. We must think about: (1) how to distribute personnel/human resources from the central government, regional government and district/local government; (2) how to renovate/restore the devastated area of a city; (3) how to help people to rebuild their residences; (4) how to renovate the

cultural properties.

The system of regulations for renovation of cultural properties affected by earthquakes is revised time and again, because previous regulation did not give adequate coverage to cultural properties.

Teams consisting of personnel from the central government, regional government and district/local government are divided according to the status of cultural properties (local, region, national).

The authenticity of the cultural properties should be checked from time to time. As cultural properties become older, more treatment is needed. We must be more concerned about safety in the buildings. Society is changing, and the techniques of construction are also developing. We must think about balancing between safety and authenticity. So discussion and communication between researcher and engineer are very important before the implementation of renovation, to find the right balance of safety and authenticity. We must also consider local earthquake resistant techniques.

Almost all of Indonesia is an earthquake-prone zone. Accordingly, Indonesia has similar problems. Policy making for anticipating disasters, handling the situation right after a disaster happens, and post-disaster work is in progress now. Disasters in Indonesia are not only earthquakes, tsunamis and fires, but also volcanic eruptions. Regarding earthquake resistant construction, I think Japan's innovations are the best in the world, so we must learn much more from Japan. I agree that we should not ignore local techniques. Almost all traditional wooden buildings in Indonesia also have their own earthquake resistant construction. Different types of building have different techniques.

V. Appendix

1. List of Participants
2. List of Lecturers and Interpreters
3. Staff Members, ACCU Nara



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