

REPORT ON THE CONSERVATION AND RESTORATION PROJECT OF
LION AND NAGA BALUSTRADES

AT THE CAUSEWAY AND OUTER GALLERY OF BAYON
ANGKOR, UNESCO WORLD HERITAGE SITE,

世界遺産アンコール遺跡群 バイヨン寺院外回廊

ナーガ・シンハ彫像および欄干修復プロジェクト

事業報告書

គម្រោងជួសជុលរូបចម្លាក់ នាគ និង តោ នៅប្រាសាទបាយ័ន

2012-2020



A Cooperative project of

Japan-APSARA Safeguarding Angkor (JASA),

National Federation of UNESCO Association in JAPAN (NFUAJ),

Joint Support Team for Angkor Preservation and Community Development (JST)

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November 2024

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Edited by: Joint Support Team for Angkor Community Developmet, National Federation of Associations for UNESCO in Japan

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This project has been made possible by the support of many companies and individuals who have supported it through the National Federation of Associations for UNESCO in Japan. I would like to express my deepest gratitude here. A memorial plaque listing the names of those who have supported this project is installed next to Bayon Hut.

本事業は日本ユネスコ協会連盟を通じて支援して下さった多くの企業、個人の方々のご支援により進められてまいりました。ここに深い御礼を申し上げます。本プロジェクトを支援して下さった方々を記した銘板台はバイヨン・ハット脇に設置されています。



Site Members of this Project

Supporters listed on the nameplate stand 2013

2013 年度 銘板台掲載 支援者

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HAYASHI MIKIKO	KUMAGAYA KATSUE	NAGAI YOSHIKIYO	UCHIDA SHINRO
HIRAI HANA	KUMAGAYA SAKI	NAKAHARA MITSUNORU	USUKURA SANAE
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FUSHIMI MASAHIKO	KATOU GAKU	SAITO YUTAKA	TANIGAWA KEIKO
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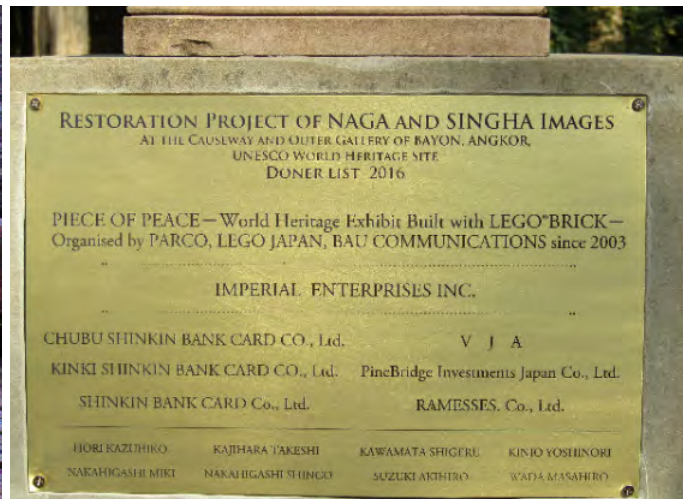
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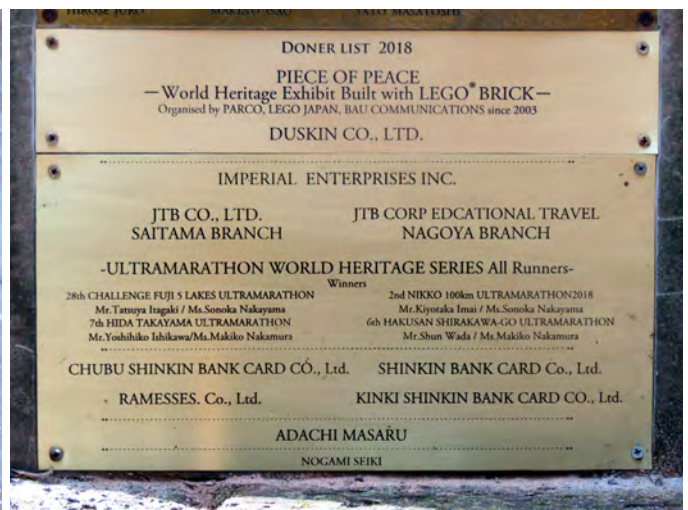
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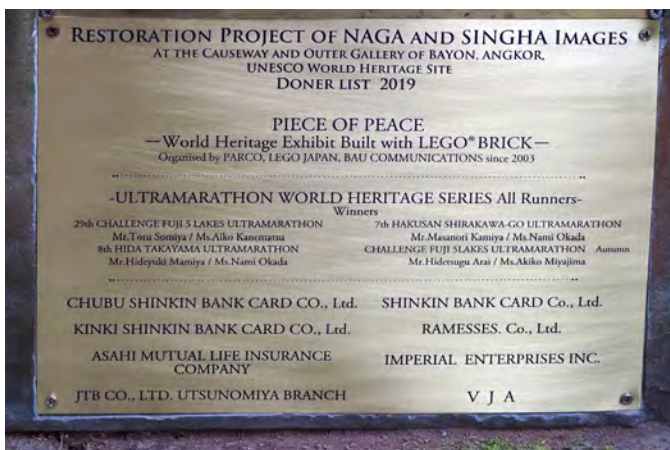
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Nameplate stand next to the Bayon Hat

バイヨンハット脇に立つ銘板台



PHOTOS 1&2 C71.4.1, Before and After Restoration



PHOTOS 3&4 G64.1, Before and After Restoration



PHOTOS 5 & 6 G65.4, Before and After Restoration



PHOTOS 7 & 8 T71.1.1, Before and After Restoration



PHOTOS 9, 10 During Restoration Work



PHOTOS 11 JASA staffs and this project staffs at T58



PHOTO 12 Project Staffs

I. Greetings

ご挨拶

Suzuki Yuji

(Director general of National Federation of Associations for UNESCO in Japan(NFUAJ))

鈴木 佑司 (公益社団法人日本ユネスコ協会連盟 理事長)

“That since wars begin in the minds of men, it is in the minds of men that the defences of peace must be constructed.” The National Federation of Associations for UNESCO in Japan (NFUAJ) was established as a grassroots movement for UNESCO membership that resonated with the principles of the UNESCO Constitution, which begins with this preamble. We have been promoting based on the belief that history, culture, nature, and education that nurtures the hearts and minds of the future will be the foundation of peace.

Understanding diverse cultures and nature of the world is the first step towards a peaceful society. It is also our mission to pass on irreplaceable cultural and natural heritage inherited from our ancestors to the next generation. As one of pillars of our activities, we have been implementing to preserve endangered World Heritage sites, mainly in developing countries where funds and human resources are insufficient. To date, we have implemented safeguarding projects in World Heritage sites of Afghanistan, Cambodia, the Philippines, Nepal, Vietnam, and other countries where the situation was in danger, as well as in need of human resource development assistance and awareness-raising activities.

In 2012, NFUAJ launched this project in Cambodia cooperating with a Cambodian NGO (Joint Support Team for Angkor Community Development: JST) under the technical advice of JASA (Japan-APSARA safeguarding Angkor). This project implemented restoration of Sinha (lion) and Naga (snake) statues adorning the outer corridor (first corridor) of Bayon temple, part of the World Heritage Sites of Angkor, as well as training of technicians to protect and preserve the Angkor for future generations. The restoration works greatly improved the landscape of the temple, which had been

「戦争は人の心の中で生まれるものであるから、人の心の中に平和のとりでを築かなければならない」。公益社団法人日本ユネスコ協会連盟は、この前文から始まる UNESCO 憲章の理念に共鳴した草の根の UNESCO 加盟運動から始まりました。歴史、文化、自然、そしてそこで育まれた心を未来につなぐ教育が、平和の礎となるとの信念のもと活動してまいりました。

世界の多様な文化や自然を理解することは、平和な社会への第一歩です。そして、祖先から引き継がれた大切な文化や自然遺産を次世代へ届けることは、いまを生きる私たちの使命です。私たちは世界遺産活動を柱の一つに据え、主に資金や人材の不足する途上国において、危機に瀕する世界遺産を守る活動を行ってきました。これまでに、アフガニスタン、カンボジア、フィリピン、ネパール、ベトナムなどの国々において危機的な状況にあった世界遺産の保護・保全活動と、そのための人材育成、普及啓発活動に取り組んできました。

カンボジアにおいて展開した本プロジェクトは JASA の技術協力のもと、JST との共同事業として 2012 年に始まりました。世界遺産アンコール遺跡群のひとつである、バイヨン寺院外回廊（第一回廊）とその欄干を飾るシンハ（獅子）とナーガ（蛇）の彫像修復と、それを将来にわたって守り伝えていくため、修復技能員の育成とを並行して行いました。修復により、崩落や劣化の激しかった寺院の外観が大幅に改善されたという成果に加え、育成された技能員たちも立派に育ち、プロジェクト終了後に日本国政府アン

severely damaged and deteriorated. The technicians who were trained and skilled up well, to my great pleasure, were hired as staff of JASA after the project was completed. In fact many are still active today.

We also implemented the “Angkor Coloring Book Project”, a World Heritage learning program for those children living in Siem Reap province. We hope that the children who learned about the history and outstanding value of Angkor will become future leaders in heritage conservation in Cambodia and beyond.

Finally, taking this opportunity we would like to express our sincere gratitude to JASA for their professional and technical assistance, JST for their cooperation as a partner organization, and all others who provided invaluable support in implementing the project successfully.

コール遺跡救済チーム（JASA）スタッフとして採用され、現在も活躍していることは、誠に喜ばしいことです。

また、シェムリアップ州に暮らす子どもたちを対象に、世界遺産学習プログラム「アンコール塗り絵プロジェクト」も実施しました。アンコール遺跡の歴史と素晴らしい価値を学んだ子どもたちの中から、将来の遺産保護の担い手が育っていくことを願ってやみません。

最後になりましたが、実施に際して技術協力をいただきました日本国政府アンコール遺跡群救済チーム（JASA）、パートナー団体としてご協力いただきましたアンコール人材養成支援機構（JST）の皆さまをはじめ、プロジェクト実施にあたり多大なるご支援を賜りました数多くの皆さまに、この紙面をお借りして心からの感謝を申し上げます。

II. Forward

はじめに

TAKESHI Nakagawa

(Co-Director of Japanese government team for Safeguarding Angkor(JSA/JASA))

中川 武 (日本国政府アンコール遺跡救済チーム 共同代表)

Introduction

From the third phase, we have been working on the issues necessary for the permanent stabilization of the Bayon temple, while seeking ways to obtain the budget of Grants-in-Aid for Scientific Researches from the Ministry of Education, Culture, Sports, Science and Technology of the Japanese government for the research and dispatch of experts for the conservation issues with the cooperation of the related parties. We have been working on the issues necessary for the permanent stabilization of Bayon.

However, since there were many issues that could not be fully addressed within the framework of the project, and since it was necessary to seek measures within a new framework from a long-term perspective, two technical cooperation projects by JSA/JASA have been implemented since the fourth phase in a different way from the framework centered on the Japanese Trust Fund for Conservation of UNESCO Cultural Heritage. One of the projects is the restoration of the Naga, Lion statues and balustrades in the outer galleries and eastern Causeway of the Bayon.

Restoration Project of the Naga, Lion statues and balustrades in the outer galleries and eastern Causeway of the Bayon

The Naga, Lion statues and balustrade of the outer gallery and the east causeway of Bayon had been restored by the French restoration team in the past, but they were in a damaged condition again. These are important elements in the landscape of Bayon, and although JASA has been promoting the landscape improvement of the east façade of Bayon since the fourth phase of the project, it was not possible to maintain all Naga, Lion statues

はじめに

本プロジェクトはこれまでユネスコ文化遺産保存日本信託基金を主な財源として進められてきたが、第3フェーズ以降、保存修復課題にともなう研究および専門家の現場派遣は関係者の協力を得て日本政府文部科学省科学研究費助成事業を獲得するといった対応を模索しながら、バイヨン寺院の恒久的安定化に必要な課題に取り組んできた。

しかしながら、その中では対応しきれない課題も多いこと、さらには長期的なスパンで考えた場合には新たな枠組みでの対策を模索する必要があったことから、第4フェーズ以降、ユネスコ文化遺産保存日本信託基金中心の枠組みとは異なる形で2つの主な技術協力事業を実施してきた。その一つがバイヨン外回廊および東参道のナーガ、ライオン彫像および欄干修復事業である。

バイヨン外回廊および東参道のナーガ、ライオン彫像および欄干修復事業

バイヨン寺院外回廊及び東参道のナーガ、ライオン彫像及び欄干は、過去にフランスの修復隊による修復処置が施されたものの、再び破損、散逸している状態にあった。これらはバイヨンの景観上重要な要素であり、JASAのプロジェクトとしても第4フェーズ以降、バイヨン東面景観整備を進めているものの、該当のナーガ、ライオン彫像及び欄干をすべて整備するには手が回らない状況にあった。その中で、日本ユネスコ協会連盟にご賛同いただくことができ、現地ローカルNGOであるJSTの協力を得て、JASAの技術協力事業として本プロジェクトを実施することとなった。日本ユネスコ協会連盟を主体としたJSA/JASAの技術協力事業として、その都度ICCにおいて事業計画と進捗状況を報告しており、それなりの議論を得てきたものと考えている。

本プロジェクトの大きな目的の一つとして、JSA/JASAによ

and balustrades. In this situation, we were able to get the support of the National Federation of Associations for UNESCO in Japan(NFUAJ), and with the cooperation of JST, a local NGO, it is decided to implement this project as a technical cooperation project of JASA. As a technical cooperation project of JSA/JASA led by the NFUAJ, we have reported the project plan and progress at the ICC on occasion, and we believe that we have received a fair amount of discussion.

One of the main objectives was to pass on the skills "from Cam- bodian to Cambodian" in order to connect the human resources trained by JSA/JASA to the next generation. The local staff of this project consisted of one Cambodian expert and site staff living in a neighboring village, who were basically all young members and grew up with direct technical guidance and advice from Mr. Suor Sothy, the JASA Siem Reap office director at that time, the expert, and the skilled staff. As a result, this project started in August 2012 and was successfully completed in August 2020. The members who were trained through this project are now active as JASA staff. We consider this in itself to be one of the major achievements of this project.

This project would not have been possible without the support of the National Federation of Associations for UNESCO in Japan, their efforts in securing a budget and publicity, JST, a local NGO, and the efforts of Ms. Shimoda Mariko, the project coordinator. This restoration project has greatly improved the overall landscape of Bayon. In addition, the publication of this report will contribute greatly to the preservation of Bayon and the Angkor monuments in the future. I would like to thank all of them again.

りこれまで養成された人材を次の世代へと繋げるために、カンボジア人からカンボジア人への技術継承があった。本プロジェクトの現地スタッフは1名のカンボジア人専門家ならびに近隣の村に在住している技能員によって構成されていたが、基本的にはいずれも若手メンバーであり、当時のJASA現地事務所長であったス・ソティならびにエキスパートそして熟練作業員から日々直接技術指導やアドバイスを受けて成長していった。その結果、本プロジェクトは2012年8月に開始し、2020年8月に無事完了を迎えることができた。そして現在このプロジェクトによって育成されたスタッフは現在JASAのスタッフとして活躍している。このこと自体が本プロジェクトの大きな成果の一つだと考えている。

本プロジェクトは日本ユネスコ協会連盟にご賛同いただき、予算確保および広報に尽力いただいたこと、そして現地NGOであるJST、そしてプロジェクトコーディネーターである下田麻里子氏の尽力がなければ、完遂に至らなかったであろう。この修復事業によってバイヨン全体の景観は大きく整備改善された。また本報告書の刊行によって本修復事業が将来ともバイヨンのひいてはアンコール遺跡の保存事業に貢献するところ大なるものがあると考えられる。改めて感謝を申し上げる。

III. Heritage Conservation and Restoration in Collaboration with Local Communities

地域の人々と共に歩む遺跡修復保存

Chea Nol

(Director of Joint Support Team for Angkor Development(JST))

チア・ノル (アンコール人材養成支援機構 代表)

I moved to Japan as a refugee in 1980, right after the end of the Pol Pot era. I received my education in Japan from the 5th grade of elementary school until I graduated from university. In 1994, I returned to my homeland, Cambodia, and joined the Japan Team for Safeguarding Angkor (JSA) organized by the Japanese government. As an interpreter and liaison, I have been involved in the restoration projects of several ruins, including the North and South Libraries of Bayon Temple, the North Library of Angkor Wat, and Prasat Suor Prat within Angkor Thom.

At the time, the infrastructure for daily life was gradually being built in the urban areas of Cambodia, but the people in the rural areas that made up the majority of the country were living a poor and primitive life, far from civilization. Angkor Krau, where the restoration workers of the Japanese Government's Angkor Site Assistance Team (JSA) live, was no exception. There were no roads, bridges, or schools, and in cases of sudden illness, it was impossible to transport patients to a hospital in the town. Children were also unable to receive an education. In response to this situation, I began collecting donations from acquaintances in Japan and, during my days off, worked together with the villagers to hand-build roads, bridges, and schools. This was in the late 1990s.

To expand our activities in such rural areas, in 2005, we established a local NGO in Cambodia, "Joint Support Team for Angkor Community Development (JST)".

1. Empowering Cambodians to build the future of Cambodia themselves,
2. Bringing the Angkor monuments closer to the local people,
3. Make the health of children and their ability to learn the driving force of the region

With these principles in mind, we have focused on expanding our activities, particularly in providing educational

私はポル・ポト時代終焉直後の1980年に難民として日本に渡り、小学5年生から大学卒業まで日本で教育を受けた後、1994年に祖国カンボジアに戻りました。そして、日本国政府アンコール遺跡救済チーム(JSA)に所属し、バイヨン寺院北経蔵/南経蔵、アンコール・ワット北経蔵、アンコール・トム内プラサート・スーブラ等の遺跡修復事業に、通訳・渉外として従事してきました。

当時、カンボジアの都市部は少しずつ生活インフラが整いつつありましたが、国土の大部分を占める農村地域の人々は、文明とは程遠い、貧しく原始的な生活を送っていました。日本国政府アンコール遺跡救済チーム(JSA)で働く修復作業員が住むアンコール・クラウ村も例外ではありませんでした。当時は道路や橋や学校がなく、急病人が出ても町の病院へ運ぶことができず、子供たちは教育を受けられない、といった状況にありました。そこで、私は日本の知人から寄付金を集め、休日になると村人と一緒に道路や橋、学校などを手作りで作る作業を細々と行っていました。1990年代後半のことです。

そうした農村部での活動を広げようと、2005年には、カンボジアのローカル NGO である「アンコール人材養成支援機構 (JST)」を立ち上げました。

そして、

- 1) カンボジア人自らがカンボジアの将来を築き上げる
 - 2) 地域の人に、アンコール遺跡をもっと身近に
 - 3) 子供たちの健康と学ぶ力を地域の原動力に
- を基本理念に掲げ、特に、カンボジアの次世代を担う農村部の子供たちへの教育支援を中心に活動の輪を広げていきました。

当時、地域の小学校を回る中で驚いたのは、遺跡までバイクで20分ほどの距離に住んでいても、一度もアンコール・ワットやバイヨン寺院を訪れたことがないという生徒がほ

support to children in rural areas who will lead Cambodia's next generation.

During my visits to local elementary schools at that time, I was surprised to find that most students had never visited Angkor Wat or Bayon Temple, even though they lived only about a 20-minute motorcycle ride away from the ruins. In Cambodia, there are no school events like field trips or study tours, and the reality for the residents living around the ruins was that they were very poor, struggling just to get by day-to-day. The idea of visiting the ruins with their families on their days off was completely beyond their reach.

On the other hand, some elementary school students living closest to the ruins could not attend school regularly because they were selling souvenirs to tourists inside the ruins.

From around the year 2000, the number of foreign tourists visiting Cambodia gradually began to increase. However, it was mostly foreign tourists walking around Angkor Wat and Angkor Thom, which are symbols of Cambodia. For the children living in the areas surrounding the ruins, the Angkor monuments had long been a "close yet distant" presence.

In response to this situation, we, together with Cambodian experts involved in the JSA's restoration projects, started organizing study tours to the Bayon Temple restoration site for elementary and junior high school students from the Angkor area. The tours were conducted in Khmer, of course. The explanations, which included not only historical information but also hands-on experiences with the restoration methods, seemed to have a strong impact on the Cambodian children.

One of the students wrote the following comment after the tour:

"I was excited by everything I saw and heard. I am very glad that I was able to participate. This is the first time for me to visit the ruins, and I am a little sad to think that it might be the last time in my life. But I am so moved that I want to cry that I had the chance to study this time.

No one, not my grandparents, parents, or teachers, ever told me about the Angkor period until now. I guess it can't be helped that I wasn't born there, but I wish I had known about it earlier. I want to know more and more things, so much so that I want to continue this study all day long.

I also felt very proud that I was born a Cambodian.

I also appreciate the Japanese people spending their wealth and time to fix things up for Cambodia."

とんどだったことです。カンボジアでは、遠足や社会見学会といった学校行事がないこともありますが、遺跡周辺の住民はとても貧しく、日々生きていくことに精いっぱい、休日に家族で遺跡を訪ねるといった発想はかけらもないというのが実情だったのです。

逆に、遺跡に最も近い地域の小学生の中には、観光客向けの土産物を遺跡内で販売するため、十分に学校へ通うことができない子供もいました。

2000年頃から、カンボジアを訪れる外国人観光客も少しずつ増えていましたが、カンボジアの象徴でもあるアンコール・ワットやアンコール・トムを歩いているのはほとんどが外国人観光客といった状況で、遺跡周辺地域の子供たちにとってアンコール遺跡は、長い間“近くて遠い”存在だったのです。

そこで、JSAの遺跡修復事業に携わるカンボジア人専門家とともに始めたのが、アンコール地域にある小中学校の生徒を招待してのバイヨン寺院修復現場の社会見学会でした。説明はもちろんクメール語です。歴史的説明だけでなく、修復の方法など実際に体験してもらいながらの説明は、カンボジアの子供たちには強いインパクトがあったようです。

見学会後に書いてもらう感想文の中には、こんな文章を書いてくれる生徒もいました。

「見るもの聞くものどれも興奮しました。参加できて本当によかったと思います。遺跡に行くのは今回が初めてで、ぼくの人生でもしかしたら最後になるかもしれないと思うと、ちょっと悲しい。でも、今回、勉強のチャンスがあったことに、泣きたいほど感動しています。

アンコール時代のことで、今まで祖父母も両親も先生も誰も教えてくれませんでした。生まれてなかったから仕方がないと思うけど、ぼくはもっと早くに知りたかった。もっともっといろいろなことが知りたいので、1日中でもこの勉強を続けていたいほどです。

それに自分がカンボジア人に生まれたことを、とても誇りに思いました。

カンボジアのために、日本人が自分の財産や時間を費やして修復してくれていることにも感謝します。」

Seeing these children expressing such straightforward joy, as a fellow Cambodian, I strongly felt that I wanted as many local children as possible to participate.

In this context, the project began in 2012. It was an exceptional opportunity to apply my experience in managing restoration projects with the Japan Team for Safeguarding Angkor (JSA). This was a unique opportunity to contribute to the three aspects: supporting heritage education for impoverished rural children in Cambodia, enhancing the restoration education through the Bayon Temple study tours organized by JST, and to develop new human resources involved in the restoration work.

For eight years, people of all ages, from children to adults, and from local residents who were previously unaware of the value of the ruins to restoration experts, worked together towards the common goal of preserving the great culture created by our ancestors. Those involved in the project will likely be reminded of their role in passing these heritage sites down to future generations every time they see the beautifully restored Naga and Lion statues.

I would like to express my heartfelt gratitude to the Japan UNESCO Association Federation and the supporting companies and donors who planned and executed this wonderful project, as well as to the Japan-APSARA Safeguarding Angkor (JASA) for their technical guidance.

こんなストレートな喜びをぶつけてくれる子供たちを見て、同じカンボジア人として、一人でも多くの地域の子供に参加してもらいたいと強く思いました。

そのような中、2012年、本プロジェクトが始まりました。私が日本国政府アンコール遺跡救済チーム（JSA）で担当していた遺跡事業管理業務での経験が生かせるのはもちろん、JSTで実施していたバイヨン寺院修復現場の社会見学会を通して、カンボジアの貧しい農村部の子供たちへの遺跡教育支援、さらに、遺跡修復作業に関わる新たな人材を育てるという3つの側面に貢献できるまたとない機会となりました。

子供から大人まで、また、遺跡の価値を全く知らなかった地域住民から遺跡修復専門家まで、私たちの祖先がつくった偉大な文化を地域で守るという同じ目標に向かって、皆が力を合わせ、一体となって取り組んだ8年間でした。本プロジェクトに関わったカンボジア人は、きれいに修復されたナーガ像及びシンハ像を見るたびに、自分もこれらの遺産を後世に伝える一員だということを思い起こすことでしょう。

このような素晴らしいプロジェクトを企画／実施してくださった日本ユネスコ協会連盟の皆様と協賛企業や支援者の皆様、そして、技術指導をしてくださった日本国政府・アプサラ共同チーム（JASA）に、心から感謝の意を表したいと思います。

IV. 30 Years of the Bayon Temple and the Japanese Government Team for Safeguarding Angkor

バイヨン寺院と日本国政府アンコール遺跡救済チームの 30 年

NAKAGAWA Takeshi, SHIMODA Mariko

中川武、 下田麻里子

In 1992, the Angkor ruins were listed as both a UNESCO World Heritage Site and a "Site in Danger," making their preservation and restoration an urgent task. In response to this situation, the Japanese government established the Japanese Government Team for Safeguarding Angkor (JASA: Japanese Government Team for Safeguarding Angkor) in 1994 as a project funded by the UNESCO/Japanese Funds-in-Trust for the Preservation of the World Cultural Heritage. Since 2005, this project has been a collaborative effort with the APSARA Authority, an organization responsible for the conservation of Cambodian ruins, and it is now known as JAPAN-APSARA Safeguarding Angkor (JASA). Over the past 25 years, JASA has been engaged in various restoration and research projects in Cambodia, focusing on the Bayon Temple, one of the most important yet deteriorating and collapsing sites within the Angkor complex.

Specifically, in Phase 1 (November 1994 - September 1999), the team conducted the preservation and restoration of the North Library of the Bayon Temple, which was in a critical state. In Phase 2 (September 1999 - April 2005), they worked on the North Library and Prasat Suor Prat within Angkor Wat. Phase 3 (December 2005 - August 2011) involved the preservation and restoration of the South Library of the Bayon Temple. During Phase 4 (November 2011 - June 2018), the team focused on the preservation and restoration of Towers 55 and 57 as part of the landscape improvement of the East Façade, the front of the Bayon Temple. In Phase 5 (November 2018 - March 2022 [planned]), the team continued the landscape improvement of the East Façade by working on Tower 69 and Corridor 70.

Along with these preservation and restoration projects, JASA has conducted various experiments and studies to ensure the permanent stabilization of the central tower of the Bayon Temple, which stands approximately 43 meters tall, and the preservation of the bas-reliefs on the inner gallery,

1992 年、アンコール遺跡はユネスコの世界遺産リストと同様に「危機にさらされている遺跡」としても登録され、その保存修復が急務となっていた。日本政府はこうした状況をふまえ、ユネスコ文化遺産保存日本信託基金によるプロジェクトとして、1994 年に日本国政府アンコール遺跡救済チーム (JASA: Japanese Government Team for Safeguarding Angkor,) を結成した。2005 年より、カンボジアの遺跡保全を行う APSARA (アプサラ) 機構との協同事業となり、現在は JAPAN-APSARA Safeguarding Angkor (JASA) という名称で活動している。カンボジアにとって最も重要な遺跡の一つであると同時に、アンコール遺跡群の中でも最も劣化、崩壊の危機に瀕した遺跡でもあるバイヨン寺院を中心に、現在まで 25 年以上にわたりカンボジアにおいて様々な遺跡修復調査事業に従事してきた。

具体的には、第 1 フェーズ (1994 年 11 月 ~ 1999 年 9 月) では、アンコール遺跡の中でも危機に瀕した状態であったバイヨン寺院の北経蔵の保存修復を実施した。続く第 2 フェーズ (1999 年 9 月 ~ 2005 年 4 月) では、アンコール・ワット内北経蔵とブラサート・スーブラの保存修復を実施し、第 3 フェーズ (2005 年 12 月 ~ 2011 年 8 月) では、バイヨン寺院の南経蔵の保存修復、第 4 フェーズ (2011 年 11 月 ~ 2018 年 6 月) では、バイヨン寺院の正面となる東面ファサードの景観整備の一環として塔 55 と塔 57 の保存修復工事を実施し、第 5 フェーズ (2018 年 11 月 ~ 2022 年 3 月) では第 4 フェーズから引き続き東面ファサードの景観整備の一環として塔 69、回廊 70 に取り組んできた。こうした保存修復工事とともに、同寺院中央に聳える高さ約 43m のバイヨン中央塔とそれを囲う - 内回廊に施された全長約 600m に及ぶ浅浮き彫りを保存するために、中央塔の恒久的な安定化のための補強方法の検討及びバイヨン内回廊浅浮き彫りの保存のための各種実験を継続して行ってきた (JASA 2021:15-16)。

which span about 600 meters in total length(JASA 2021:15-16).

Currently, JASA continues its restoration activities at the Bayon Temple, including: 1. landscape improvement of the outer gallery, 2. development and implementation of a permanent preservation plan for the central tower, 3. formulation of a preservation and restoration plan for the bas-reliefs in the inner gallery, and 4. archaeological excavations at the Bayon Temple.

Reflecting on the past 30 years, JASA's role in the history of Angkor's restoration is significant. Since Angkor was listed as a World Heritage Site in 1992, more than ten teams have consistently been involved in restoration and research activities at the site. However, there is still no standardized method or philosophy for restoration, and each team continues to explore restoration methods based on their respective countries' techniques and philosophies.

Amidst these circumstances, JASA has conducted extensive research and restoration activities, focusing not only on preserving the shapes and materials of the ruins but also on reviving and inheriting the ancient construction techniques and philosophies (adapted to Cambodia's natural environment) that were used when the ruins were originally built. The restoration approach based on these revealed ancient construction techniques is groundbreaking and unprecedented in the history of Angkor's restoration, gaining attention from other international teams, which are gradually adopting these techniques.

Another fundamental principle of JASA is "human resource development." JASA's pioneering efforts in this area have been well-regarded. By 2002, JASA had trained specialists in fields such as archaeology and architecture, targeting students from Cambodian art universities. These students, who have since become professionals, not only support JASA's current restoration projects but also play crucial roles in other restoration teams, demonstrating the success of JASA's human resource development initiatives. However, to ensure that Cambodians can independently preserve their cultural heritage in the future, it is essential to increase not only skilled technicians with significant experience but also true experts capable of solving problems independently and field restoration technicians who take pride in their work.

JASA continues its activities with precise and advanced restoration techniques and high ideals befitting the magnificent ruins.

バイヨン寺院では現在も継続的に JASA による修復活動が進められており、1. 外回廊の景観整備事業、2. バイヨン中央塔の恒久保存対策案の策定及び施工実験、3. バイヨン内回廊浅浮き彫りの保存・修復計画案の策定、4. バイヨン寺院における考古学的発掘調査などが実施されている。

これまでの 30 年間を振り返ると、JASA がアンコール遺跡修復史において果たしてきた役割は決して小さくない。

アンコール遺跡が世界遺産に登録されたのは 1992 年以降、常時 10 チーム以上がこの地での修復調査活動に携わっている。しかし、遺跡修復についてその方法や理念が未だ共通化されたとはいえず、それぞれのチームが各国の技術や理念のもと修復方法を模索し続けているというのが実状である。

こうした中、JASA では遺跡の形や材料だけを守るのではなく、遺跡がつくられた当初の工法や理念に目をむけた〈古代建造技術 (= カンボジアの自然風土に向き合った工法) の再生と継承〉を軸に修復やそれに先立つ膨大な遺跡研究を行ってきた。こうして明らかにされた古代建造技術に基づく修復のあり方は、それまでのアンコール遺跡修復にはみられない画期的なものであり、今では他国のチームからも注目され、その技術が導入されつつある。

JASA のもう一つの基本理念となっているのが、〈人材育成〉である。JASA が先駆的に行ってきた人材育成は一定の評価を受けてきた。2002 年までにカンボジアの芸大生を対象とした考古学、建築学といった分野の専門家の育成を行った。これに参加した学生が社会人研修生を経て、現在の JASA の修復事業を支えているだけでなく、他の修復チームの重要な役割を担う人物として育っていることが、人材育成の成果を物語っている。しかし、将来的にカンボジア人の手で自国の文化遺産保存ができるようになるためには、こうした一定程度の経験を積んだ技術者だけでなく、自ら課題を解決していく真の専門家と、誇りを持ち仕事に打ち込む現場修復技術者を増やしていく必要がある。JASA は素晴らしい遺跡にふさわしい、精確で高度な修復技術と高い理想を掲げ、現在も活動を続けている。

V. World Heritage Activities in Cambodia by the National Federation of Associations for UNESCO in Japan (NFUAJ)

日本ユネスコ協会連盟のカンボジアにおける世界遺産活動

AOYAMA Yuniko(NFUAJ)

青山由仁子 (NFUAJ)

NFUAJ's involvement with the Angkor monuments as part of our World Heritage activities dates back to the 1990s. After the end of the civil war, the then Director General of UNESCO, Mr. Mayor, called on the international community to help save the Angkor monuments, and the NFUAJ served as the domestic fund-raising window for this conservation campaign. As a result, many donations were made to help save Angkor.

Inscribed on the World Heritage List in 1992 at the same time as the List of World Heritage in Danger, the Angkor monument was removed from the list in danger in 2004 thanks to the cooperation of the international community, including Japan. Although the phase requiring urgent support for the collapse or damage of the monuments themselves and the establishment of a conservation and management system for the monuments, including the establishment of laws and regulations, has ended, the importance of supporting the monuments, such as research, excavation, and restoration, as well as training human resources in conservation and restoration techniques and promoting understanding among the residents living near the ruins, is also being pointed out.

In response to the problems with the theft of some of the Angkor monuments and their sale on the black market, although the number is decreasing year by year, the NFUAJ recognized the importance of opportunities to learn about the Angkor monuments in education and has been developing teaching materials and conducting teacher training since 2008 in collaboration with APSARA (Authority for the Protection of the Site and the Management of Angkor Region) and the Ministry of Education, Youth and sport. At the time, there were few teaching materials for learning about the culture and history of their own country, and colorful teaching materials were also scarce. Therefore, we published coloring book-style teaching materials with motifs related to the Angkor monuments so that children could learn while having fun.

当連盟の世界遺産活動として、アンコール遺跡との関わりは 1990 年代に遡る。内戦終了後、当時の UNESCO のマヨール事務局長は、アンコール遺跡の救済を国際社会へ呼びかけ、当連盟は、この救済キャンペーンの国内の募金窓口となり、写真展やシンポジウムなど普及啓発活動を展開した。その結果、多くの寄付が寄せられ、アンコール遺跡の救済へ貢献した。

1992 年に世界遺産と同時に危機遺産リストに登録されたアンコール遺跡群は、日本を含む国際社会の協力により、2004 年に危機遺産リストから削除された。遺跡自体の崩落や破損、法整備を含む遺跡の保存管理体制の確立といった緊急的な支援を要する段階は終了したものの、遺跡の調査や発掘、修復といったハード面の支援のほか、保存修復技術を有する人材の育成や、遺跡周辺に居住する住民の理解促進といったソフト面の重要性も指摘されるようになってきた。

年々減少傾向にはあるものの、アンコール遺跡の一部の盗掘、闇市への流出といった問題を受け、当連盟では、教育の中でアンコール遺跡を学ぶ機会の重要性を認識し、2008 年以降、教材の開発および教員研修を APSARA（アンコール地域遺跡保存整備機構）、教育青年スポーツ省の協力を得て実施した。当時は、自国の文化や歴史を学ぶ教材も少なく、またカラフルな教材も少なかったことから、子どもたちが楽しみながら学べるよう、アンコール遺跡に関するモチーフを題材にした塗り絵形式の教材を制作した。

小学校低学年から高学年向けの教材を、学年に合わせて 3 種類制作し、実際に小学校のカリキュラムとしても導入され、多くの子どもたちがアンコール遺跡について学習することができた。さらに、座学だけでなく、実際に遺跡を訪問する体験学習も合わせて実施し、学びを深めること

Three types of educational materials were published for lower to upper primary school students according to their grade level, and were actually integrated into the primary school curriculum, enabling many children to learn about the Angkor monuments. In addition to classroom lectures, the programme also included hands-on learning experiences by actually visiting the ruins, which deepened the children's learning. Many of the participants were visiting the site for the first time, and the programme contributed to their sense of identity by making them aware of the greatness and pride of their ancestors. In fact, this project has contributed to the production of students studying archaeology in Phnom Penh, and we hope that they will become leaders in the conservation and management of the Angkor monuments in the future.

In the course of providing such support for World Heritage education, it was necessary to raise awareness not only in the educational aspect but also among the residents living near the monuments and to train the next generation of human resources who will be responsible for the conservation and restoration of the monuments. In 2012, the "Restoration Project of NAGA and SINGHA images at the Causeway and outer Gallery at BAYON Temple" was launched with the technical cooperation of the Japan-APSARA Safeguarding Angkor (JASA) and Joint Support Team for Angkor Preservation and Community Development (JST).

This project was launched with the aim of researching and restoring the Naga and Sinha statues and platforms located in the outer gallery of Bayon temple, as well as transferring the techniques of Cambodian technicians trained by JASA for 20 years to the next generation, and spreading awareness among the residents living near the Angkor monuments.

The project employed eight people from Leang Dai village, Angkor Thom district, near the ruins, who were trained by the JASA's restoration team in drawings, crane operation stone carving and conservation and restoration skills. After the completion of the project, they have all been working as members of JASA restoration team. We hope that everyone on the team will continue to work with pride and pass on their skills to the next generation.

In addition, as an awareness raising activity for the residents living near the ruins, NFUAJ's educational support

ができた。参加者の中には初めて訪れる子も多く、祖先の偉大さや誇りを実感するなどアイデンティティの認識に寄与することができた。実際に、本事業がきっかけで、プノンペンで考古学を学ぶ学生も輩出されており、将来、アンコール遺跡の保存管理の担い手になってくれることを期待したい。

こうした世界遺産教育支援を実施していく中で、教育現場のみならず、遺跡周辺に居住する住民への普及啓発や、遺跡の保存修復を担う次世代の人材育成の必要性から、2012年に日本国政府アンコール遺跡救済チーム（JASA）の技術協力を得て、アンコール人材養成支援機構（JST）と共同で、「アンコール遺跡バイヨン寺院彫像修復プロジェクト」を開始した。

本事業では、バイヨン寺院の外回廊に位置するナーガ、シンハ彫像、基壇の調査研究、修復と同時に、JASAによって20年にわたり養成されたカンボジア人技術者から、次の世代へ技術移転すること、さらに、アンコール遺跡の周辺に居住する住民たちへの普及啓発を目的に開始した。

プロジェクトでは、遺跡近郊のアンコール・トム郡リエンダイ村などから8名の修復スタッフを雇用し、JASAの修復チームから、図面への記録、クレーンの操縦、石材の彫刻など、保存修復に関する技術伝承を行い、本事業終了後は、JASAの修復チームの一員として皆が活躍している。これからもチームの皆が誇りを持って従事し、さらに次の世代に繋いでいくことを願っている。

他方、遺跡周辺に居住する住民に対する普及啓発活動として、当連盟の教育支援である寺子屋（CLC）に通う復学支援クラスの子どもたちを中心に、上述の塗り絵教材を通じた学習並びに遺跡訪問に加え、遺跡の修復体験学習を実施し、理解の促進を行なった。（詳細は〇ページを参照）

世界遺産であるアンコール遺跡は、年間多くの観光客が訪れるが、観光の利益を享受できるのはごく一部の人であり、遺跡周辺の住民の多くは貧困状態にあるというのが現状だ。持続的な遺跡の保護と継承を実現するためには、保

programme, the “Terakoya” (Community Learning Centre), mainly for the children in the equivalency class to provide their learning opportunity, conducted a hands-on learning programme on the restoration of the ruins in addition to learning through the above-mentioned coloring books and visiting the ruins to promote their understanding. (For details, see page xxx)

Angkor, a World Heritage Site attracts many tourists every year, but only a small percentage of the population benefits from tourism, and many of the people living near the ruins live in poverty. To achieve sustainable conservation and legacy of the monuments, in addition to conservation techniques, understanding of the local people and return of benefits are important factors, and a comprehensive conservation system in cooperation with the local people is needed.

The UNESCO World Heritage is intended for tangible heritage, which is a priceless and irreplaceable asset for all humanity. In principle, a country's own heritage must be protected in that country, so it is necessary to consider not only the protection of the heritage itself but also the environment of the people who live there.

Although this project has come to an end, we would like to continue to contribute to the sustainable preservation of the Angkor monuments by continuing to educate children and local residents.

存技術以外にも、住民の理解や利益の還元も重要な要素であり、周辺住民と共同した総合的な保存システムが必要である。

UNESCO の世界遺産は、人類共通の貴重な遺産である有形の不動産が対象で、原則自国の遺産はその国で保護措置を講ずる必要があることから、遺産そのものの保護だけではなく、そこに生活する人びとの環境も考慮する必要がある。

本事業は終了を迎えたが、今後も子どもたちや住民への普及啓発活動を継続し、アンコール遺跡の持続的な保全に寄与していきたい。

VI. The relationship between the National Federation of Associations for UNESCO and Cambodia

日本ユネスコ協会連盟とカンボジアのあゆみ

SHISHIDO Ryoko(NFUAJ)

宍戸 亮子 (NFUAJ)

In 1989, one year before the International Literacy Year, the National Federation of Associations for UNESCO in Japan (NFUAJ) launched the "World TERA KOYA Movement (WTM)", an international cooperation program for non-formal education. The core objective of the WTM is to provide adult illiterates and out-of-school children with opportunities to learn literacy and learning spaces (TERA KOYA = CLC: Community Learning Center), in cooperation with governmental, non-governmental, local and international organizations in partner states. So far, 539 "Terakoya" have been established in 44 countries and 1 region, and approximately 1.35 million people have learned at these learning centers.

The first activities in Cambodia date back to 1992, after more than 20 years of civil war. The United Nations Volunteer Program, UNESCO Phnom Penh Office, and NFUAJ decided to launch the Community Temple Learning Center (CTLC) program in Battambang and Siem Reap Provinces, which have a high concentration of returned refugees, in three areas: literacy education, revival of traditional craft, and primary education. The CTLC program was launched in 1994.

In 2006, the NFUAJ established its local office in Siem Reap Province and launched the "Angkor Terakoya Project" from a long-term perspective, focusing on "the continuity of activities by local residents after Japanese assistance ends". Although it is the NFUAJ's own project as an NGO, it is authorized and officially supported by the central, provincial, and local administrations under MOU with the Ministry of Education, which is signed every three years. Collaboration with local government was effective in aligning the project with local educational policies and issues. The objectives of the project are to "disseminate basic education through community learning centers (CLCs) with resident participation," "foster local Ministry of Education staff and community leaders (Terakoya operators) who will be responsible for disseminating literacy education," and "promote mutual understanding through exchange between the people of Japan and Cambodia.

As of 2024, 22 CLCs have been constructed in Siem Reap Province, covering all 12 districts in the province. The specific activities of each CLC include educational programs such as "adult literacy class," "kindergarten class," "elementary school

日本ユネスコ協会連盟では、国際識字年(1990年)の前年である1989年に「ユネスコ世界寺子屋運動」と銘打った教育分野の国際協力を開始した。戦争や貧困などあらゆる要因で、教育の機会に恵まれず非識字者となった成人や、学校に通うことができない子どもたちが文字の読み書きから学べる場「寺子屋」をつくり、世界に広げることで、すべての人が暮らしやすい平和な社会づくりに貢献することを目指す。それぞれの対象国の政府、国際機関、非営利組織等と協力し、これまでに、44か国1地域で539軒の寺子屋ができ、約135万人の人々が学んでいる。

カンボジアにおける活動は、20年以上にわたる内戦を経た1992年にさかのぼる。国連ボランティア計画、UNESCO プノンペン事務所、日本ユネスコ協会連盟の3者による協働で、帰還難民が集中するバットアンバン州とシェムリアップ州で、識字教育、伝統工芸復興、初等教育の3分野で実施する「Community Temple Learning Center (CTLC) プログラム」を決定し、1994年から開始した。

2006年からは、日本ユネスコ協会連盟がシェムリアップ州に現地事務所を立ち上げ、「日本からの支援終了後の、地元住民による活動継続性」を重視し、長期的視野に立った「アンコール寺子屋プロジェクト」を開始した。NGOとしての連盟独自のプロジェクトではあるが、カンボジア政府教育省と3年ごとに覚書を締結し、現地の教育施策や課題を踏まえた事業計画のもと、適宜中央政府、州政府や寺子屋の地元行政と連携している。目的として「住民参加型のCLC(コミュニティ学習センター＝寺子屋)を通じた基礎教育の普及」「識字教育の普及を担う現地教育省スタッフや地域リーダー(寺子屋運営者)の育成」「日本とカンボジアの人たちの交流を通じた相互理解の促進」を掲げた。

2024年現在、シェムリアップ州内に22軒の寺子屋が完成し、州内全12郡を網羅している。各寺子屋の具体的な活動内容は、教育プログラム「成人識字クラス」「幼稚園クラス」「小学校クラス」「中学校クラス」「(中学校への)進学支援」のほか、貧困層が家計を安定させ、教育を受け

class,” “junior high school class,” and “support for higher education (to junior high school),” as well as “cattle raising,” “rice loan,” “traditional performing arts,” and “microcredit” as income enhancement programs to ensure that low-income families can stabilize their household finances and receive an environment conducive to education.

Although there are differences in the starting year for each program, education programs have so far helped approximately 8,400 adults learn to read, write, and do basic calculations in literacy classes. In elementary school classes, a total of 2,857 dropouts have completed the equivalency curricula of Cambodian elementary schools, and more than 3,000 students in kindergarten classes have graduated and been able to enter elementary schools. In recent years, as an effort to address the less than half of the secondary education completion rate (46%, 2019 UNESCO estimate), a “Middle School classes” have been started to help students obtain lower secondary school diploma and enter a vocational training school or upper secondary schools. To enable people of all ages to consider their future options according to their circumstances, each CLC class provides a bridge to public education and an opportunity to learn job skills.

Along with education and income generation, community human resource development also forms a pillar of the project. Each CLC has a “CLC Management Committee” made up of volunteers elected by residents. The committee decides on the content of each year's activities based on the current situation of illiteracy, children dropping out of school, poverty level, and other needs of the community in which they live, and is responsible for recruiting and explaining to students, managing the budget, and other administrative tasks. The committee members are provided with a variety of training programs to impart their know-how on the operation of the CLC and to strengthen their leadership. Once the committee is functioning properly and basic education support such as literacy classes are completed, the CLC graduates from Japanese financial support and transitions to self-supporting operations. Although there are differences among CLCs, self-supporting operation becomes possible after about 10 years of establishment, and currently 12 out of 22, or more than half, have achieved this goal.

The current state of education in Cambodia remains a severe challenge, as assessed by the SDG 4 Achievement Index (Rank 104th out of 166 countries). (Ranked 104th out of 166 countries in the SDG Index Rank.) On the other hand, there are signs that the long-term goals of the “Angkor CLC Project” are gradually being realized, thanks to long-term efforts.

NFUAJ is committed to supporting the local people to maximize their potential, not only in the field of culture, but also in the field of education, with an emphasis on sustainability and long-term effects.

られる環境を担保するための収入向上プログラムとして「養牛」「米の貸付」「伝統芸能」「マイクロクレジット」など、多岐にわたる。

プログラムごとの開始年度の差はあるが、教育プログラムでは、これまでに識字クラスにおいて約 8,400 人の成人が、クメール語の読み書きや基本的な計算を身に着けた。小学校クラスでは、のべ 2,857 人の中途退学児童がカンボジアの小学校課程を修了し、幼稚園クラスでは 3,000 人以上が卒業して小学校に入学することができた。近年は、半数に満たない中学校修了率（46%, 2019 年 UNESCO 推計）への取り組みとして、中学校卒業資格を獲得して職業訓練校ないし普通科高校への進学を目指す「中学校クラス」を開始した。幅広い年齢層の人びとが、それぞれの状況に応じて、自分の未来の選択肢を考えられるよう、寺子屋の各クラスは公教育への橋渡しや、仕事のスキルを学ぶ機会を提供している。

教育、収入向上と並行して、コミュニティの人材育成もプロジェクトの柱をなす。各寺子屋には、地域住民から選挙で選ばれたボランティアで構成する「寺子屋運営委員会」を置いている。委員会は、自分たちの暮らす地域の非識字状況、子どもの中途退学状況、貧困度その他住民ニーズなどの現状に鑑みて、毎年の活動内容を話し合いで決定し、学習者募集・説明や予算管理など運営を担う。運営委員にはさまざまな研修を提供し、寺子屋の運営ノウハウを伝え、リーダーシップ強化を図っている。運営委員会がきちんと機能し、識字や復学支援クラスなど基礎教育支援が終わる等の条件を満たした寺子屋は、日本からの資金的な支援を卒業し、自立運営に移行する。寺子屋により違いはあるが、設立からおおよそ 10 年以上経つと自立運営が可能になっており、現在では 22 軒中 12 軒と、半数超が達成している。

カンボジアの教育の現状は、SDG4 の達成度評価に鑑みても、依然厳しい課題が残る。(SDGs Index Rank166 か国中 104 位) しかし一方で、長い時間をかけた取り組みにより、「アンコール寺子屋プロジェクト」としての長期的目標が、徐々にではあるが実現する兆しも見えてくる。

日本ユネスコ協会連盟では、文化の分野のみならず教育支援においても、長い目で見た効果を重視し、現地の人びとの力が最大限発揮されるために寄り添う姿勢で臨んでいる。

1 Executive Summary

事業概要



1.1 Overview of the Project

事業の概要

a) Project Title:

“Restoration project of NAGA and SINGHA images at the Causeway and Outer Gallery of BAYON”

b) Main activity of the project:

Statues of NAGA and SINGHA(lion) and balustrade in the causeway and Outer Gallery of BAYON , southern part of east side, south side.

c)Objective:

1) The causeway and the outer gallery was restored by EFEO in the past. However, through tumultuous times in 1970s to 80s, now it is in the trouble again. Under these circumstances, restoration and re-installation works of Naga and Lion stone statues which are severely damaged and scattered around the original location would contribute to improving the archaeological landscape of Bayon. Also, it is urgent matter to improve the landscape and security issues for Bayon temple which is one of the most crowded tourism sites in the Angkor Archaeological Park.

2)Japanese Government Team for Safeguarding Angkor(hereinafter referred to as JASA) has been conducted restoration work, survey, and observation in Bayon. This project is focused on the human resources development from Cambodian staff for Cambodian staff, in order to pass the fruit of the human resources development over 20 years to the next generation.

d) Term and target of Project (Fig.1.1)

- 1st Phase September 2012 ~ March 2014 :
Southeast quarter of outer gallery (T57, T58, T56)
- 2nd Phase April 2014 ~ March 2016 :
Causeway and its surrounding(C71, T70.2)
- 3rd Phase April 2016 ~ March 2018 :
April.2016-March.2017, Causeway (C71),
April 2017-March 2018, North side of outer gallery
(T68.1, T67, T66, T65)
- 4th Phase April 2018 ~ March 2020 :
West and South side of outer gallery
(T64, T63, T62, T61, T60, T59)
- Extension phase June 2020 ~ August 2020:
Northwest quarter of outer gallery (T69, T68.2, T70.1)

a) 名称 :

アンコール遺跡群 石像修復プロジェクトーバイヨン寺院
ナーガ、シンハ彫像ー

b) 事業内容 :

カンボジアの世界遺産アンコール遺跡群内のバイヨン寺院にて、東参道及び外回廊東面南側、南面の獅子像、ナーガ像、及び欄干の保存・修復、および景観整備を実施する

c) 事業目的 :

1) バイヨン寺院の東参道、外回廊を飾るナーガ石彫像、シンハ石彫像、欄干は、過去にフランスの修復隊による修復処置が施されたものの、既に半世紀以上を経て、再び破損して、遺跡の周囲に散乱しているものも散見される。これらの石彫像や欄干を修復、再整備することは、バイヨン寺院の景観整備に欠かすことのできない最重要項目の一つであり、近年急激に増加しつつある観光客への安全性を確保することが急務となっている。当事業による成果が大きく期待されるところである。

2) バイヨン寺院では、1994年より実施されている日本国政府アンコール遺跡救済チーム（以下 JASA と呼称）の修復工事・調査・研究が行われてきたが、本事業では JASA によりこれまで約 20 年間に養成された人材を次の世代へと繋げる、“カンボジア人からカンボジア人”への技術継承を進める。

d) プロジェクト期間と対象範囲 (Fig.1.1)

- 第 1 フェーズ 2012 年 9 月 ~ 2014 年 3 月
外回廊南東区域 (T57, T58, T56)
- 第 2 フェーズ 2014 年 4 月 ~ 2016 年 3 月
東参道 (C71, T70.2)
- 第 3 フェーズ 2016 年 4 月 ~ 2018 年 3 月
東参道 (C71), 外回廊北側 (T68, T67, T66, T65)
- 第 4 フェーズ 2018 年 4 月 ~ 2020 年 3 月
外回廊西側、南側 (T64, T63, T62, T61, T60, T59)
- 延長期間 2020 年 6 月 ~ 2020 年 8 月
外回廊北東区域 (T69, T68.2, T70.1)

e) Budget

Financial resources : National Federation of Associations for UNESCO in Japan

1st Phase: 57, 600USD,
2nd Phase : 62,850 USD,
3rd Phase: 80,500 USD,
4th Phase: 89,980 USD
Extension term : 13,830 USD

e) 予算

財源：日本ユネスコ協会連盟
第1 フェーズ：57,600USD,
第2 フェーズ：62,850 USD,
第3 フェーズ：80,500 USD,
第4 フェーズ：89,980 USD
延長期間：13,830 USD

1.2 Project Organization

事業体制

1) Division of duties (Fig.1.2)

The Project will be operated in cooperation of three organizations, JASA, JST and National Federation of Associations for UNESCO in Japan. Each organization will perform following duties.

NFUAJ

- Arrangement of fund.
- Activity report for founders.

JST

- Employment and management of technical staff.
- Operation and management of restoration work.
- Report of restoration activity.

JASA

- Technical advice about restoration method and public relations.
- Loan restoration machinery except consumables.

2) Project Staff

■JST Staff

CHEA Nol: Representative of JST, Total Coordination

SHIMODA Mariko:

Project Coordinator, JST Expert(Architecture)

NOV Sopheak:

Site Manager, JST Expert(Archaeology)

Site Technical staff:

Sem Theng
Don Dorn
Kong Reaksmeay
Tem Tha
Lory Hak
Hean Peng Lieng
Soeurn Ly
Moy Moan

■NFUAJ Staff

AOYAMA Yuniko: Fundraising, Coordination in Japan
SHISHIDO Ryoko: Fundraising, Coordination in Japan

1) 運営体制 (Fig.1.2)

本ユネスコ協会連盟, JASA, JST の三者が協力して事業を推進する。以下に定める主な担当業務をそれぞれは遂行した (Fig.2)。

日本ユネスコ協会連盟；

事業広報, 予算確保, 支援者への活動報告

JST；

作業員の雇用・管理, 修復業務の実施・管理, 現場作業の報告

JASA；

修復方針や広報への技能支援, 消耗品以外の修復機材の貸与 (JASA 時間外使用に限る)

2) プロジェクトスタッフ

■ JST スタッフ

チア・ノル：JST 代表、全体管理

下田麻里子：

プロジェクトコーディネーター、日本人専門家 (建築学)

ノブ・ソピアック：

サイトマネージャー、カンボジア人専門家 (考古学)

技能員：

Sem Theng

Don Dorn

Kong Reaksmeay

Tem Tha

Lory Hak

Hean Peng Lieng

Soeurn Ly

Moy Moan

■日本ユネスコ協会連盟

青山由仁子：広報、日本側事業運営

穴戸亮子：広報、日本側事業運営

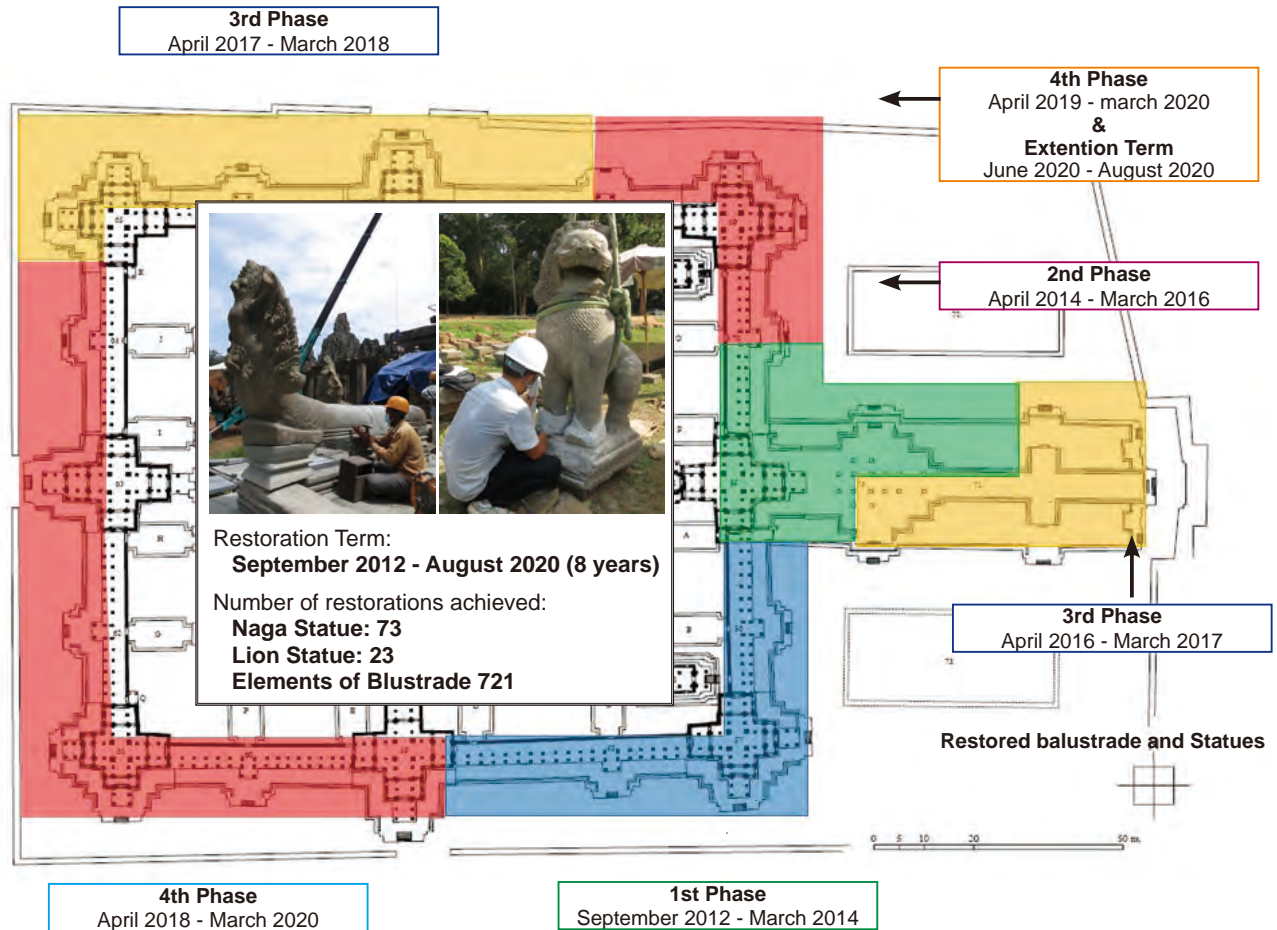


Fig.1.1 Restoration area by phase

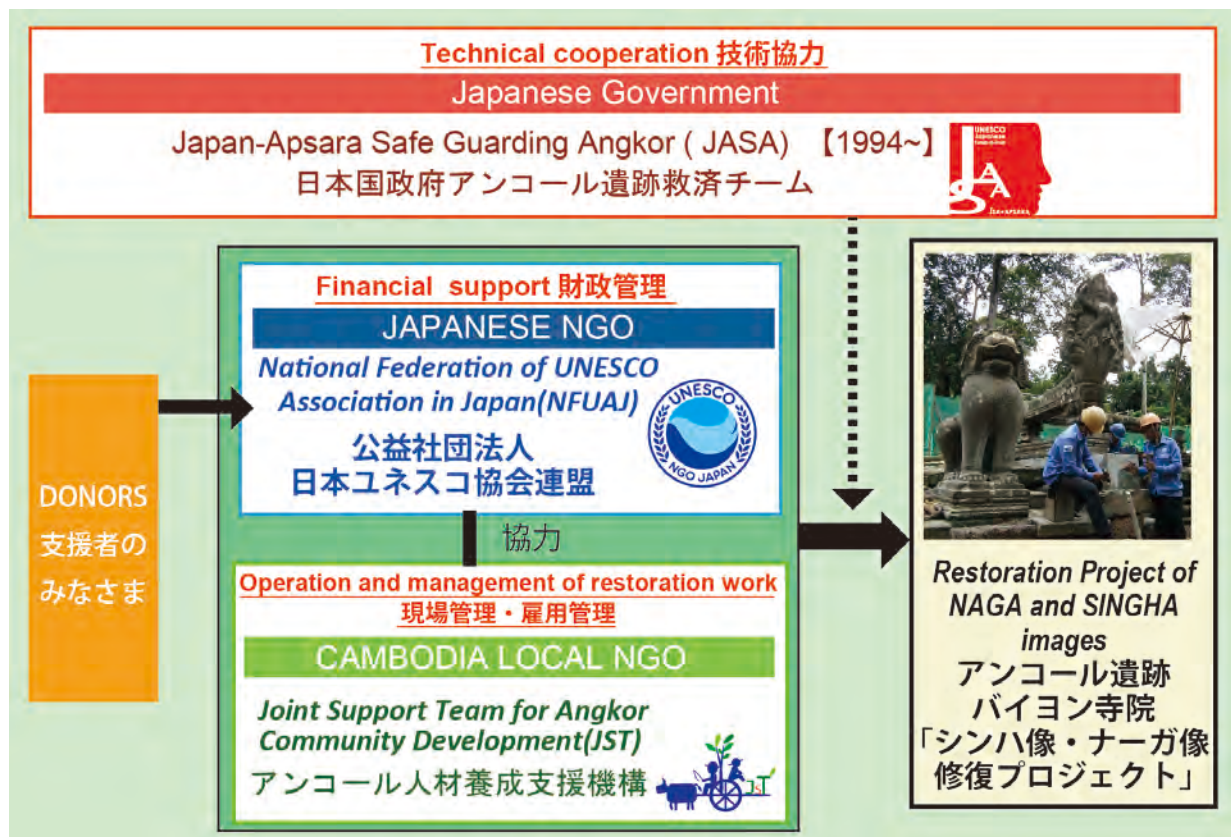


Fig.1.2 Project Organization Chart

2 Previous Restoration

既往修復



2.1 Restoration of the Outer Gallery and Balustrades in the Early 20th Century 20 世紀初頭の外回廊欄干の修復

Since the establishment of École française d'Extrême-Orient (EFEO) in Siem Reap at the beginning of the 20th century, EFEO initiated maintenance and restoration projects in the Angkor Historical park. Bayon Temple, along with Angkor Wat, was one of the first sites to undergo restoration and maintenance due to its importance as a focal point for Angkor site preservation and tourism, thus restoration continued until interrupted by the Pol Pot era. The maintenance and restoration activities carried out by EFEO at the Bayon Temple, including the clearing of vegetation, relocation of scattered stone materials, and construction of roads, were continuously implemented from the 1910s to around 1950. These activities were documented by the restoration officers of the time in their daily reports (the *Journaux des Fouilles* (JF)) and monthly reports (*Rapports des Activités de la Conservation d'Angkor* (RCA)), as well as through photographs (note 1). Descriptions of the sorting and repair work of scattered stone materials, including the balustrades and statues of the outer gallery and the eastern causeway, can mainly be found in records from around 1911 to 1932.

At the beginning of the 20th century, the Bayon Temple was overgrown with trees and grass, making it difficult to grasp its entirety. The surrounding area was littered with tens of thousands of stone materials, and the maintenance work started with the removal of these stones and the clearing of vegetation.

The first mention of the balustrades appeared in the RCA of March 1911, which noted that the identified balustrade components were left in place about 2 meters from the base of the outer gallery for future restoration. Regarding the eastern causeway, a record from November of the same year indicated that most of the balustrades, though nearly collapsed, were intact enough to be restored and reinstalled.

From July to December 1919, after the removal of stone materials around the outer gallery had progressed to some extent, partial dismantling and reinstallation of the outer gallery took place, followed by the installation of balustrades in a counterclockwise order: south face, east face, east causeway, and north face (RCA 7,8/1919). The eastern causeway's southern side was obstructed by a fallen tree and roots, which hindered proper floor paving, but the balustrades could still be installed.

In January 1920, the restoration of the platform and the installation of balustrades began in the northwest section of the outer gallery. Although several balustrade rails

20 世紀に入りフランス極東学院 (EFEO) がシエムリアップに設立されて以降、EFEO はアンコール遺跡歴史公園の整備を先駆的に行ってきた。バイヨン はアンコール遺跡整備および観光の重要拠点として、アンコール・ワットと並び最初期から整備、修復が行われた遺跡であり、その後内戦によって事業が中断するまで、同寺院では継続的に修復が行われてきた。EFEO によるバイヨンの伐採、散乱石材の移動、道路の建設といった整備活動および修復活動は 1910 年代から 1950 年頃まで継続的に実施された。これらの活動の様子は当時の修復担当官らにより日報 (the *Journaux des Fouilles* (JF))、月報 (*Rapports des Activités de la Conservation d'Angkor* (RCA)) そして写真に記録されている (註 1)。外回廊および東参道の欄干、彫像の散乱石材の整理、修理作業に関する記述は主に 1911 年から 1932 年頃までの記録にみられる。

20 世紀初頭の時点のバイヨンは、全体に樹木や草が繁茂し、その全容を把握することさえ難しい状況であった。周囲には数万個ともいわれる数の石材が散乱しており、こうした石材の移動や草木の伐採といったところから整備作業は開始された。

こうした初期段階の 1911 年 3 月の RCA には初めて欄干に関する記述がみられ、欄干部材として確認された部材は運搬せずに、のちの修復に備えてその場で外回廊基壇から 2 m 程度の位置におかれたことが記述される。東参道についても同年 11 月の記録にて、「ほとんど倒れているが壊れておらず」大部分が修復の上、設置可能であったことが書かれている。1919 年 7 月から 12 月にかけて、外回廊周辺の石材の除去がある程度終わり、外回廊の部分的な解体再設置などを行った上で、南面、東面、東参道、北面と反時計周りの順で欄干の設置作業が実施される (RCA 7,8/1919)。東参道の南面の東側階段には倒木が横たわり、床面にも根が張っていたことから床面舗装を十分に行えなかったようであるが、欄干については設置することが可能だったようである。

1920 年 1 月より外回廊北西での基壇修復および欄干設置作業が開始する。瓦礫の中から欄干架木がいくつか発見されたが、束を発見することができていない。南西隅建物から、西面北半分にかけては欄干、特に架木の多くが原位置とは異なる場所に設置されていることが事前調査で確認され、本プロジェクトにて原位置の同定作業に至った。バイヨン発見当初から欄干部材が散乱石材に混在していたの

were found among the rubble, no posts were discovered. Preliminary surveys for this project confirmed that many of the balustrades, particularly the rails, had been placed in locations different from their original positions, from the southwest corner building to the northern half of the west face. Whether the balustrade components were mixed with the scattered stones from the beginning or if EFEO's collection of scattered stones around the outer gallery caused this misplacement is unclear. Unlike the eastern causeway, where fallen balustrades were reinstalled on-site, it was difficult or time-consuming at this stage to identify the original positions of the balustrade components found among the rubble, leading to their incorrect placement.

From April 1922 to January 1923, focused maintenance was conducted on the west and north faces, exposing the outermost walls. During the maintenance of the northern part of the west face, nearly complete naga and rails were found among the rubble, allowing the installation of about 15 balustrade rails by reinforcing them with reinforced concrete and securing them with iron anchors, spikes, and dowels (old photos available).

In 1932, the naga balustrades around the eastern causeway and Tower 55 were restored (Fig.2.9). Since most had merely collapsed on the spot without mixing with other scattered stones, the eastern causeway was restored almost perfectly, except for a part on the southern side where stone materials could not be found. However, later the balustrades on the north side of Tower 55 collapsed again due to a fallen tree or some human factor, scattering the stone materials.

It is recorded that many balustrades on the south side of the east face were lost (1932.3). Due to their distinctive shape, balustrade rails could often be found among the rubble, but posts were frequently missing. In such cases, the coping stones were partially rebuilt, sandstone blocks were placed as substitute posts, cut to the required height, and fixed with mortar and pins before the rails were mounted (1932.11). Instances of adjusting the height and stability of adjacent balustrades using plates of sandstone or concrete were also confirmed.

The landscape-oriented restoration methods of the time are evident in the placement of reinstalled balustrades and statues. During preliminary surveys and restoration work of this project, it was found that about half of the currently installed balustrades are in their original positions, but only a few of the posts are in their original locations. Additionally, many well-preserved components (especially naga and lion statues) were placed in visually appealing positions, different from their original locations. Cases were also observed where clearly non-original components were joined and inconsistencies at the joints were forcibly compensated with concrete, likely for stability and aesthetic reasons.

The materials used in previous restorations include

か、EFEOによって一旦外回廊周辺の散乱石材を集めたことが原因であるのかは不明だが、東参道のようにその場で倒れた欄干を設置しなおす場合とは異なり、この時点では瓦礫から発見された欄干部材の原位置を特定することが困難、あるいは十分な時間をかけられず、欄干部材の位置が入違ってしまっている原因と考えられる。

1922年4月頃から1923年1月にかけて西面、北面の集中的な整備を行っており、最外周壁を露出させるためのクリアランスを実施している。西面北側での整備時には、瓦礫の中からナーガと架木ほぼ全体を探し出すことができ、これらを鉄筋コンクリートで補強、鉄のアンカーやスパイク、ダボなどを必要箇所に設置することで、約15体の欄干架木を設置することができたことが記されている。

1932年には東参道とT.55周囲のナーガ欄干が復原された(Fig.2.9)。多くがその場で倒壊していたのみであり、他の散乱石材と混ざることが無かったため、東参道は石材を発見することができなかった南側の一部を除き、ほぼ完ぺきな形でこの時復原された様子が写真からは伺える。しかしその後T.55北側の欄干は倒木あるいは何等かの人的要因により再び崩壊、石材が散乱している。

東面南側では多くの欄干が失われていることが記述されている(1932.3)。欄干の架木は特徴的な形態であるため瓦礫の中から発見することができても、束は見つからない場合も多かったようである。その場合、地覆を部分的に作り直し、その上に束の代用材として砂岩のブロックを置き、それを必要な高さに切断した上でモルタルやピンなどで固定し、そのあと架木を載せたという方法をとった(1932.11)。原位置が特定できず、隣り合う欄干の高さ位置を合わせたり、安定性を確保するためにプレート状に加工した砂岩やコンクリートなどで調整する事例も確認された。

当時の、景観を重視した景観修復的な方法は、欄干や彫像の再設置の配置にもみることができる。事前調査および本事業の修復作業を進める中で、現状設置されている欄干のうち、オリジナルの位置に設置された欄干は半数となっており、特に斗束に関して言えば、オリジナルの位置に置かれているものはごく少数であることが確認された。さらに、特に保存状態・残存状態の良い部材（特にナーガ・シンハ彫像）を、オリジナルの位置とは異なる、景観的に見栄えのよい位置に設置している事例も多く確認された。また、安定性とおそらく景観上の目的から、明らかに本来同一部材ではない部材同士を接合し、接合部の矛盾をコンクリートで無理矢理補っているケースも見られた。

既往修復で用いられている材料は、コンクリートモルタル、鉄製のピンやベルトである。鉄製のピンは、外れにくくするために鋸（かすがい）形に加工されていることもある。鉄製のベルトは、架木を安定させるために、地覆や基



Fig.2.1 Concrete support under Naga



Fig.2.2 Collapsed section due to deterioration of restoration material



Fig.2.3 Substitute Post



Fig.2.4 Iron pin connection



Fig.2.5 Iron belt support



Fig.2.6 iron materials used for repairing by EFEO

concrete mortar and iron pins and belts. Some iron pins were processed into staple shapes to ensure they stayed in place. Iron belts were used to stabilize the rails by securing them to the coping stones or platforms. Where rails or naga statues still exist without supporting coping stones or posts, substitute materials or concrete supports were used (Fig. 2.1-2.6). This project's restoration policy had to be considered based on these existing restoration conditions.

壇に固定させた鉄製ベルトで架木を固定している。また、欄干部分において、架木やナーガ彫像が現存するものの、それを支える地覆や斗束がない場合、あるいは、上部部材を載せる上で安定性が悪い場合には、代用材やコンクリートでのサポート材を用いている (Fig.2.1-2.6)。当プロジェクトではこうした既往修復の状況を踏まえて、修復方針を検討された

<Note>

1. The original versions of the *Journaux des Fouilles* (JF) and the *Rapports des Activités de la Conservation d'Angkor* (RCA) have recently been made available by the EFEO as open access materials on the BANYAN Bibliothèque numérique de l'EF. Similarly, old photographs can be viewed from the Photothèque Virtuelle (<https://collection.efeo.fr/ws/web/app/report/index.html>).

<註>

1. The *Journaux des Fouilles* (JF) および *Rapports des Activités de la Conservation d'Angkor* (RCA) のオリジナルは近年 EFEO によってオープンアクセス資料として BANYAN Bibliothèque numérique de l'EFEO (<https://banyan.efeo.fr/s/bibnum/page/welcome>) に公開されている。また、古写真についても同様に Photothèque Virtuelle (<https://collection.efeo.fr/ws/web/app/report/index.html>) から閲覧することができる。

2.2 Comparison of conditions before this project and after previous restoration work

既往修復後と本事業修復前との状況比較

Comparing old photos from the early 1900s stored by EFEO with current photos reveals that balustrades and statues that had been maintained during EFEO's restoration efforts collapsed again due to turmoil in the 1970s and 80s or natural disasters. Additionally, some components now lost were identified through these old photos (Figs. 2.7-2.12).

From the descriptions by EFEO, it is evident that the eastern causeway often had balustrades that had simply collapsed in place, allowing many rails to be reinstalled in their original positions. The RCA records show that efforts were made to locate balustrade components from the rubble and scattered stones on other sides as well. However, as noted later, there was a tendency to place well-preserved naga statue components in visually appealing positions. For those components whose original positions could not be determined during the massive sorting of scattered stones in the first half of the 20th century, it seems they were installed with an emphasis on aesthetics. Additionally, for reasons likely related to both stability and aesthetics, there are numerous instances where components that were not originally part of the same unit were joined together, with concrete used to forcibly compensate for inconsistencies at the joints.

Comparing old photographs from the early 1900s held by EFEO with current photographs reveals that balustrades and statues, which were maintained during EFEO's restoration efforts (though their original positions are uncertain), have since collapsed again due to the turmoil of the 1970s and 80s or natural disasters. Moreover, by verifying current components against these old photographs, it was found that some components are now missing.

20世紀初頭に撮影された古写真と、現状の写真を比べると、EFEOの保存修復事業の時点では（オリジナルの位置であるかは不明だが）整備されていた欄干や彫像群が、その後の1970年代、80年代の混乱期や自然災害により、再び欄干や彫像が崩落してしまっていることがわかる。また、これらの古写真をもとに現状の部材を確認すると、現在は失われてしまっている部材があることが判明した (Figs.2.7-2.12)。

また、EFEOの記述からは、東参道は元々欄干がその場で倒壊しているのみの場合が多く、原位置に設置することができた架木が多いことが記述されている。その他の面においても可能な限り瓦礫や散乱石材の中から欄干関連部材を探す努力が行われたことがRCAからうかがえる。しかしそれと同時に、後述するが、保存状態・残存状態の良いナーガ彫像部材を、景観的に見栄えのよい位置に設置している傾向がみられる。20世紀前半に大量の散乱石材の整理作業の中で行われた原位置特定が行えなかったものについては、景観を重視して設置したとみられる。また、安定性とおそらく景観上の目的から、明らかに本来同一部材ではない部材同士を接合し、接合部の矛盾をコンクリートで無理矢理補っているケースも随所で確認されている。

一方で、EFEO所蔵の1900年代初頭に撮影された古写真と、現状の写真を比べると、EFEOの保存修復事業の時点では（オリジナルの位置であるかは不明だが）整備されていた欄干や彫像群が、その後の1970年代、80年代の混乱期や自然災害により、再び欄干や彫像が崩落してしまっていることがわかる。また、これらの古写真をもとに現状の部材を確認すると、現在は失われてしまっている部材があることが判明した。



Fig. 2.7 Situation after previous intervention
East Causeway, Bayon
(EFEO photothèque, CAM06104)



Fig. 2.8 Situation before present restoration



Fig. 2.9 Situation after previous intervention
East Causeway, Bayon
(EFEO photothèque, CAM05865)



Fig. 2.10 Situation before present restoration



Fig. 2.11 Situation after previous intervention
East Causeway, Bayon
(EFEO photothèque, CAM06147)



Fig. 2.12 Situation before present restoration

3 Preliminary Survey Before Restoration

修復前の事前調査



3.1 Overview of the Bayon Temple

バイヨン寺院の概要

Angkor region was the capital of the Khmer Empire for nearly 600 years from the 9th to the early 15th century. Bayon is the central temple of Angkor Thom, a 3×3 kilometer fortified city that epitomizes the urban engineering and philosophical achievements of this empire. It is believed to have been constructed by Jayavarman VII (reigned 1181–1218), who built more temples than any other king of the Khmer Empire (Note 1). The temple is characterized by 49 towers adorned with large serene faces, which are situated on the central terrace, inner gallery, and outer gallery. The complex also includes the north and south libraries within the outer gallery, the eastern terrace, adjacent reservoirs, and surrounding walls.

The discussion of Bayon's construction phase, which began with Parmentier and Stern's discussion published in 1927 (Parmentier 1927; Stern 1927), has been addressed by a number of researchers. In addition to the results of the preceding excavations, Dumarçay provided a comprehensive report on construction procedures, additions and alterations, and the date of erection, based on the results of excavations conducted in 1965-1966 (Dumarçay and Groslier 1973). In this literature, the significance of the site, construction techniques, architectural composition of the site, molding style, and excavated artifacts, including the history of research and restoration at Bayon, are reported in detail.

Cunin and Uchida et al. roughly followed Dumarset's four-stage theory, but made modifications based on close examination of the masonry process and measurements of the magnetic susceptibility of the stones, and summarized the construction process in the building details (Cunin and Uchida 2002; Cunin 2007). Cunin's four-step transition theory, based on actual traces left on the building, is now commonly accepted as the accepted theory (Nakagawa 2005: 120). Yamamoto's archaeological verification of the results of JSA/JASA's excavations at Bayon is also important as it provides certainty regarding the context of the remains limited below the base of the building (Yamamoto 2011).

This four-phase hypothesis posits that during the first phase, the central terrace and the 'cross-shaped corridor' of the inner gallery were erected. In the second phase, the 'hook-shaped corridor' at the four corners of the inner gallery was appended. The third phase involved the establishment of the outer gallery, the creation and subsequent removal of a corridor linking the inner and outer galleries, and the construction of the southern and northern libraries, as well as the eastern terrace and its associated reservoirs. The fourth phase experienced limited construction activities within

現在のアンコール地域は、東南アジアにおいて隆盛を誇ったアンコール朝（9世紀～15世紀前半頃）がほぼ600年間にわたり王都を置いた地域である。バイヨンは、この王朝の都市工学技術や思想の集大成とも言える3×3キロメートル四方の城郭都市、アンコール・トムを中心寺院であり、アンコール朝を通じて最も多くの寺院を建造したジャヤヴァルマン7世（治世1181～1120年頃）による建立とされる（註1）。同寺院は四方に巨大な尊顔を冠する49基の塔が中央テラス、内回廊、外回廊の各所に配され、外回廊内の南北経蔵、東側のテラス、その両脇の溜池、そして周壁等で構成される。

バイヨンの複雑な増改築をめぐる議論は1927年に発表されたパルマンティエ、ステルンの論考に始まり（Parmentier 1927; Stern 1927）、多くの研究者によって取り組まれてきた。デュマルセは先行する発掘調査の成果に加えて、1965年から66年にかけて実施した発掘調査の結果をふまえて、建設手順、増改築、建立年代に関する包括的な報告を行った（Dumarçay 1973）。当文献において、バイヨンの調査研究・修復史を含め、遺跡の意味、建造技術、遺跡の建築構成、モールディングの様式、出土遺物などについて詳しく報告されている。

クニン、内田らはデュマルセの四段階説おおまかには踏襲しつつも、石積みの綿密な組積過程の精査、石材の帯磁率測定などに基づき修正を加え、建物細部における建造過程をまとめている（Cunin & Uchida 2002, Cunin 2007）。ジャックは刻文研究の立場から、デュマルセとは異なる説を展開しているが（Jaques 1998）、現在では建物に残された実際の痕跡を基に検討されたクニンの四段階変遷説が通説として受け入れられている（中川 2005:120）。

この4段階説の概要としては、第1期には中央テラスおよび、内回廊の「十字型回廊」部が建造され、続く第2期には、内回廊の四隅である「鉤型回廊」部が建造された。第3期には外回廊が建造され、内回廊と外回廊を結ぶ通廊の建造とその撤去、南北経蔵、外回廊東側の東テラスとその南北の貯水池が建造された。第4期にはバイヨン主要建築部での大規模な建造活動は行われず、シヴァ派による画像改変、その後の上座部仏教関連画像への改変、外回廊壁の入口の一部閉鎖に加え、バイヨン主要建築部を取り囲む周壁の建造が行われたと考えられている。第1期から第3期はジャヤヴァルマン7世時代の建設、第4期はその後の

the primary architectural components of Bayon. Instead, it witnessed modifications, including iconographic alterations influenced by the Shaiva tradition, subsequent adjustments to Buddhist-related imagery, partial closure of entrances in the outer gallery walls, and the erection of an enclosure wall enveloping the main architectural elements of Bayon. The first three phases are attributed to construction during the reign of Jayavarman VII, while the fourth phase is believed to represent subsequent modifications (Cunin 2007: 138-229).

The Naga balustrade and Lion statue in the Outer gallery, which are the targets of this project, were built in the last phase of the Jayavarman VII period. As the fringes of the temple and guardians of the entrance, they are thought to have played an important role both in terms of landscape and religious space. The next section deals with the characteristics and surviving condition of the balustrades and statues at Bayon.

<Note>

1. Bayon is famous as a structure built by Jayavarman VII, however, no inscriptions commemorating its construction or any inscriptions related to Jayavarman VII have been found. As a result, there has been much debate over the date of construction of Bayon. Until the early 1920s, through the study of early inscriptions, it was thought that Bayon was a Hindu temple built in the 9th century. The discovery of the Lokesvara pediment at Bayon in 1924 revealed that the temple was dedicated to Mahayana Buddhism (Finot 1925). In 1927, Stern proposed that Bayon was built in the 11th century, a later date than previously thought, based on an examination of the decorative details and artistic style (Stern 1927). At this point, it was still thought that Bayon was built before Angkor Wat. However, in the following year, 1928, Cœdès announced that it was a structure built by Jayavarman VII, based on the inscriptions and the fact that it clearly resembled the architectural style of Ta Prohm and Preah Khan, which had been identified as having been built during the reign of Jayavarman VII (Cœdès 1928). This brought the debate about the date of construction to a settlement.

改変と考えられている (Cunin 2007: 138-229)。

本事業で対象とする外回廊のナーガ欄干およびライオン彫像はジャヤヴァルマン 7 世時代の最後の段階で建造されたということになる。寺院を縁取り、入り口を守護する存在として、景観的にも宗教空間的にも重要な役割を担っていたと考えられる。次節ではバイヨンの欄干および彫像の特徴と残存状況などについて検討を行う。

<註>

1. バイヨンはジャヤヴァルマン VII 世の建造物として名高いが、創建を記念する碑文や、ジャヤヴァルマン VII 世に関連する刻文は一切見つかっていない。そのため、バイヨンの創建年代については多くの議論が重ねられてきた。1920 年代初頭までは、初期の刻文研究を通じて、バイヨンは 9 世紀に建立されたヒンドゥー教寺院であると考えられていた。1924 年にバイヨンでロケシュヴァラのペディメントが発見されたことで、同寺院が大乘仏教に捧げられた寺院であることが判明した (Finot 1925)。1927 年にはステルンは装飾の詳細な検討に基づく美術様式の観点から、バイヨンが従来よりも時代が下る 11 世紀に建立されたとする説を発表したが (Stern 1927)、この時点でもバイヨン建立はアンコール・ワットより前であると考えられていた。しかし、翌 1928 年にセデスが刻文に基づいてジャヤヴァルマン VII 世治世下の建造と判明しているタ・プロームやブレア・カーンの建築様式と明らかに類似していることから、ジャヤヴァルマン VII 世による建造物であると発表 (Cœdès 1928)。これにより創建年代に関する議論は収束した。

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3.2 Overview of Naga Balustrade and Lion Statues at Bayon

バイヨンのナーガ欄干およびライオン彫像の概要

3.2.1 Lion statues in Bayon temple

There are 26 entrances in outer gallery of Bayon, lion statue stands at the both side of the 18 entrances among them, excluding 8 entrances that lead to gallery directly. Although it is considered that originally there are 36 lion statues at beginning, now only 28 statues remaining. The lion is called SINGHA in Sanskrit (sometime written as Simha), it has been appeared as an iconographic image variously from ancient times, as represented by Lion Capital of Asoka in India.

Lion is often appears as a symbol of sovereignty in all ages and countries. Also in Khmer history, it has been taken into confidence as a symbol of sovereignty since Pre-Angkor period, and often appears in ornaments such as an entrance and a terrace of the temple related to Khmer kings. As the iconographic image of a lion is introduced into Southeast Asia where lion doesn't inhabit, it deforms. Also in Khmer, It comes to put on many accessories and implications, also bodily features become more decorative (such as mane) as a time goes down.

Although the decoration of all the lion statues of the Bayon temple can be said to be same fundamentally, there are two kinds of lion statues. First type is which the face turns straightly front (henceforth, front-type), second type is which the face inclined to inside to the entrance (henceforth, inclined-type) (Fig3.1, 3.2).

Look into the distributions of these two types, front-type statues are only stand at causeways and northeast tower of outer gallery (Fig.3.3, Area A and P), and all the lion statues placed on the rest entrances are inclined-types.

Moreover, also these lion statues can be categorized with the size. The presumed size of 28 lion statues which remaining are shown in Fig.3.7 (The measured size is from the lower side of a pedestal to the top part of the head. Although there could be 1~2 cm error, since the top part is missing in many cases and the overall height size is presumed in this case). It is categorized into the following four sizes.

- A) 189 - 195cm
- B) 178 - 186cm
- C) 155 - 160cm
- D) 140 - 145cm

As you can see from the distribution map, all the lion statues stand at the entrance of causeway are (A) size which is the largest size. The next largest (B) size lion statues are stand at the entrances in the middle of each side of the gallery (North, West, and South main entrance). The lion

3.2.1 バイヨン寺院 ライオン彫像について

バイヨン寺院外回廊には 26 箇所の入口が存在するが、このうち回廊部分に設けられた 8 箇所の入口を除く、18 の入口の両脇にライオン彫像がたつ。当初 36 体あったと考えられるライオン彫像であるが、現在確認できるものは 28 体のみである。ライオンは、サンスクリット語でシンハ (singha あるいは simha などとも表記される) と言われ、インドにおけるアショカ王の柱頭に代表されるように古代より様々に図像化されてきた。

ライオンは古今東西、王権の象徴としてしばしば登場する動物であるが、カンボジアでも同様に王権を象徴する動物としてプレ・アンコール時代より重用され、アンコールの歴代の王に関わる寺院の入口やテラスなど装飾として多く登場する。ライオンの生息しない東南アジアにライオンの図像が渡来すると、時代が下るにつれ、装飾品を多く身に着けるようになり、たてがみなどの身体的特徴も装飾的な意味合いが強くなるなど変形していく。

バイヨン寺院のライオン彫像は、装飾は基本的には同一とみなせるが、正面を向くタイプ（以下、正面タイプ）と、入口に顔を向けたタイプ（以下、斜めタイプ）の 2 種類が存在する (Fig.3.1, 3.2)。この 2 つのタイプの分布をみると、参道と、外回廊北東隅の建物 (Fig.3.3, エリア [A] と [P]) のみ正面タイプで、その他の外回廊入口に置かれているライオン彫像は全て斜めタイプであることがわかる。



Fig. 3.1, 3.2 Two Patter of Lion Statue at Outer Gallery

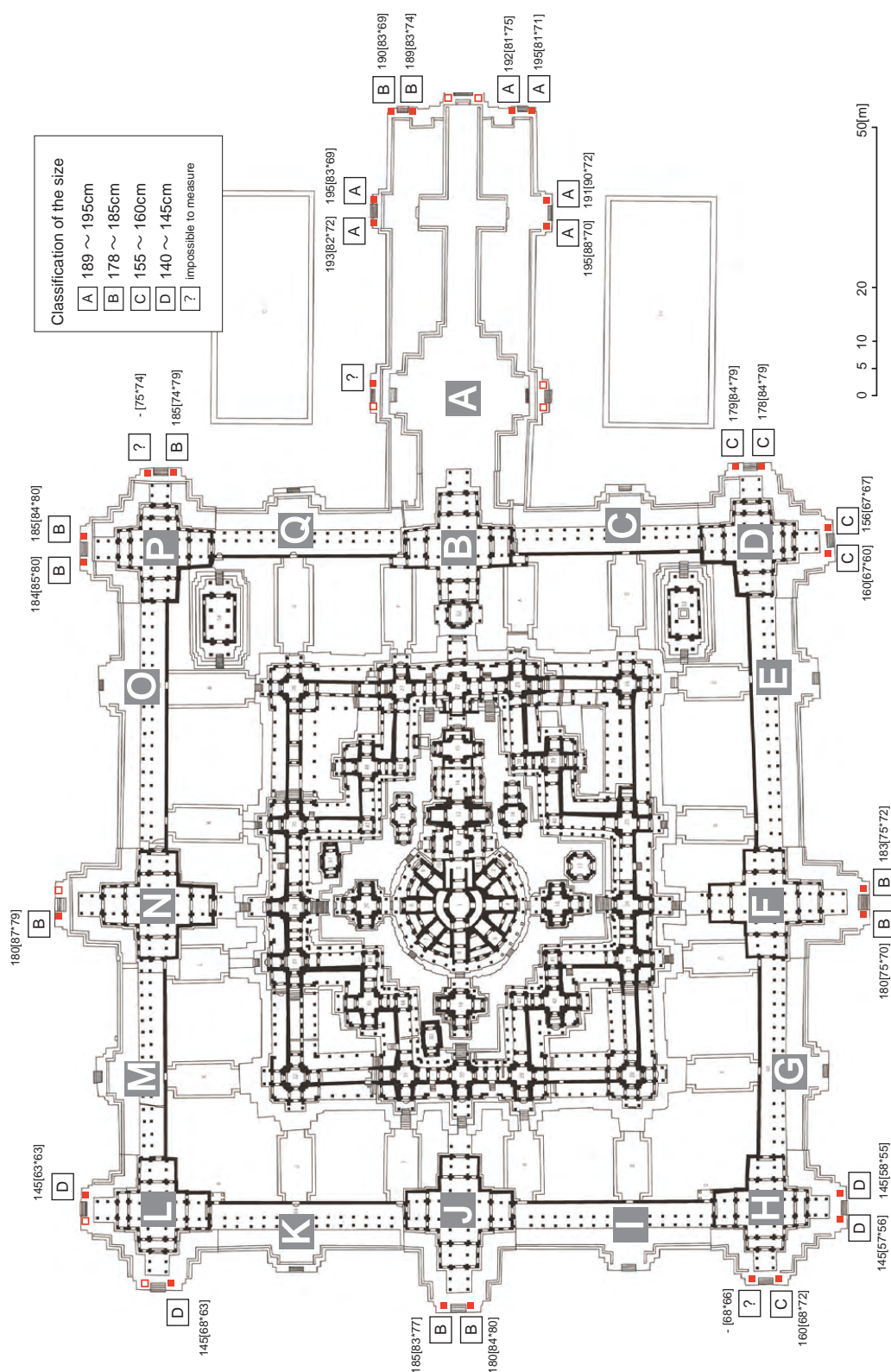


Fig. 3.3 Size Category of Lion Statue at Outer Gallery

statues stand at the each corner tower of the outer gallery are more smaller size (C) and (D) size. An exception is area [A]&[P] also, that unlike other three corner towers, the lion states stands in area [P] are (B) size lions. Also, at the T57, only eastern entrance put the (B) size statues.

The impressions given from the lion statues stand at the entrances should be different by the size or direction

また、大きさによってもライオン彫像をわけることができる。Fig.3.1 に、残存する 28 体のライオン彫像の推定寸法（台座の下辺から頭の頂部までであるが、頂部はかかっていることが多く、その場合は全高寸法を推定しているため、1~2cm の誤差あり）を示す。これより、以下の 4 つの大きさに分けられる。

for those who visit a temple. There can be a possibility that the direction of the face and the size of the statues shows the frequency in use of the entrance or a hierarchy of each entrance in Bayon. If so, it can be assumed that the eastern causeway whose entrance was guarded by the lion which is the most largest size and have dignity glaring at the front, can be the most important entrance as for the royal family or high class people. Assume from the size, the following important or frequently used entrance could be the entrance in the middle of each side of the outer gallery (North, West and South). The entrance of the corner tower on which the smaller lion statues are placed, can be considered that the hierarchy of these entrance were comparatively low, or were low frequency in use. Furthermore, especially the most smallest (D) size statues gather at entrance at two western corner tower, there could be a difference of hierarchy by east and west. The entrance with no lion statues might hardly be used in practice, or may have been the lowest importance. Finally in addition, the northeast corner tower which set a front-type and (B) size statue uniquely had a special meaning than other corner tower.

Since some of the lion statues might have changed their position from original position by the previous restoration, consideration above doesn't come out from assumption level, though, further survey can reveal the interesting notice in restoration process.

3.2.2 Garuda-on-NAGA statues and balustrade in Bayon temple

The outer gallery of Bayon temple was surrounded by the balustrade of Naga body. Also, at the entrance or each corner, totally 98 Garuda-on-Naga statues [hereafter Naga statue] are assumed to be placed in the original, though now only 85 statues from around the outer gallery and 1 statue from JASA 17th excavation can be confirmed at present.

Snake (NAGA) was worshipped through all the times in Asia, and it has been believed that he is the holder of the life energy in the spring, a well or a pond. They bring about prosperity and fertility, cure the illness. Moreover, Naga is indispensable agricultural God for economic prosperity of the



Fig.3.4 basic type of motif

- I) 189 ~ 195cm
- II) 178 ~ 186cm
- III) 155 ~ 160cm
- IV) 140 ~ 145cm

これらの分布を見てみると、参道におかれたライオン彫像はいずれも最も大きい (I) クラスのライオン彫像が設置されており、その次に、外回廊の各方向 (北面、西面、南面) の中心、入口脇には (II) クラスのライオン彫像が置かれている。それ以外の、外回廊の各隅の塔におかれているライオン彫像は、一気に小規模となり、一部を除いて (III),(IV) クラスのものとなる。例外はやはり [P] で、この建物の入口のみ外回廊隅建物としては他の3隅とは異なり、すべて (II) クラスのライオン彫像が置かれている。また、南東隅塔 (T57) では東側入口のみに (II) クラスが置かれていることから、寺院の東面を重視した可能性は高い。

寺院を訪れる者にとって、入口脇に置かれたライオン彫像は、大きさや向きにより受ける印象がかなり異なる。こうしたライオン彫像の顔の向きや大きさが設置の有無が、数多あるバイヨン寺院の入口の使用頻度、あるいはヒエラルキーを示している可能性もあるだろう。だとすれば、最も大きなサイズで、威厳をもち正面を睨むライオン彫像が置かれていた寺院正面となる東参道は、王族のエリアとして、王家あるいはそれに属する人々により使用された、重要性の高い入口であったと推察される。続いて、外回廊のうち、各辺 (北側、西側、南側) の中央の入口に次に大きな (II) クラスの彫像が置かれていることから、参道入口に続いて重要性が高かった可能性があるだろう。最も小さいタイプのライオン彫像が置かれた各隅の塔入口は、比較的ヒエラルキーの低い入口であったか、使用頻度の低い入口であったことが考えられる。特に、西側の2つの隅建物は最も小さな (D) クラスのライオン彫像が集中していることから、東西によってもヒエラルキーの差があったのかもしれない。ライオン彫像が置かれていない回廊沿いの入口は、実際は殆ど使用されることがなかったか、重要性としては最も低かった可能性がある。最後に参道以外に唯一正面タイプをおき、隅建物にも関わらず (II) クラスのライオン彫像をおく北東隅は、特別な意味を持っていたのかもしれない。

上述の推測は、ライオン彫像が原位置を留めているという仮定のもとに行なったものであるが、今後の修復工事の進行とともにさらなる検討を進めていきたい。

3.2.2 バイヨン寺院 欄干とナーガ彫像について

バイヨン寺院外回廊には、ナーガの欄干がめぐらされている。各入口や、角部分にはナーガ・ガルダの彫像が並び、その数は当初 98 体あったと考えられるが、現時点で確認できたものは周囲に散乱しているものを含め 85 体、これ

village, as a guardian of the fields (Kshetrapala).

The most unique feature of the balustrade in Bayon temple is the appearance with Garuda (sacred beast of half human and half bird creature in Hindu mythology, transfer Vishnu which is one of the 3 most powerful God in Hindu gods). This combination shows the fusion of the animism power (NAGA) and influence from outside world (Garuda) and embodies the peculiar religion view of this time.

The balustrade consist of three elements that are handrail, post, and basement. The size and construction method of these three elements are not standardized, thus, it is appropriate to consider that handrails, posts, and basements are made and curved at the construction site, adjust with the each situation of platform, rather than to think that these elements are uniform product made in one atelier workshop and bring to the site and set after all the platform was constructed.

According to research about process of construction of Bayon, outer gallery and east causeway was constructed at the 3rd term of whole 4 construction stage [Olivier 2007:203-216]. It can be considered to be the balustrade surrounding outer gallery was constructed at same term.

The decoration of Naga statues, handrails, basements, and posts are seemed to be fundamentally all the same. Although, pedestal part curved under the Naga statue and post under this pedestal that were curved with pedestal decoration have some variety in motif.

Look into the decoration of majority of the post which support handrail, the post divides into three layers. As for two lower layers are curved into Lotus motif, and upmost layer has a motif of Bird at the corner and three headed Naga in the central part of each side (Fig.3.4). On the other hand, the pedestal of Naga statue can be categorize in three types of motif, 1)Kala, 2) Image of deity, 3) arabesque design(Fig.3.5~3.7). In accordance with this three types of motif, at least in type (2), the central part of the top layer of post directly under this pedestal serves decoration following the image of deity of the pedestal right above.

Fig.3.8 shows distribution of three decoration types of the pedestal under the Naga statue. At present, it is difficult to see tendency by distribution of decoration. It is not clear whether these distribution is depends on the difference in a craftsman group, or on iconographical meanings, or on architectural meaning concerning to direction or hierarchy. Such motif distribution of balustrade will need further survey and consideration.

に JASA 第 17 次考古学調査で発掘された 1 体のみである。

蛇（ナーガ）はヒンドゥー教圏のアジアでは全時代を通じて礼拝され、泉や井戸や池に貯えられる生命エネルギーの保持者であると信じられてきた。彼らは繁栄と豊穡をもたらし、病を癒し、そして望みを叶えてくれるという。また、田畑の守護神（クシェトラパーラ）として、村の経済的な繁栄にとっても欠かせない大切な農業神でもある [ダジェンス]。

バイヨン寺院のナーガの最大の特徴は、ガルルダ（ヒンドゥ教三大神の一人・ヴィシュヌ神の乗る半人半鳥の聖獣）と共に登場することである。これは土着的信仰（ナーガ）と外来信仰（ガルルダ）を習合したもので、この時期の独特の宗教観を具現化したものである。

欄干は、ナーガ彫像と胴体部分からなる架木、それを支える斗束と、さらに基礎となる地覆の 3 材で構成されている。これらの 3 部材の大きさ、組合せ方などが統一的でないことから、地覆、斗束、架木ともに、どこか別の工房で画一的に生産された後に外回廊に設置されたというよりは、石材を設置しながら基壇に応じて現場合わせで最終彫刻を行なったと考える方が妥当であろう。外回廊と東参道は、オリビエによれば、全体として第 4 期までであるうちの、第 3 期に同時期に建造されたものと考えられており [Olivier 2007:203-216]、欄干の彫刻痕跡から、おそらく欄干もこの時期に同時に建造されたとみていいだろう。

ナーガ・ガルルダが彫られている彫像部分、地覆、そして架木の胴体部分の下に設置される斗束の装飾は、基本的には全て同一とみなせるが、架木の一環として彫られているナーガ彫像の台座と、その直下の斗束はセットでデザインされており、これについてはいくつかの装飾パターンをみることができる。

まず、基本的な斗束のデザインをみると、3 層にわかれ、下部 2 層は蓮弁模様、一番上の層のみ、4 隅に鳥のモチーフ、各辺の中央に 3 頭をもつナーガが描かれている (Fig.3.4)。一方、ナーガ・ガルルダ彫像の台座は、中央部が①カーラ、②祈祷をする神、③唐草模様の 3 種に分けられる (Fig.3.5~7)。これにあわせて、その直下の斗束もいくつかの種類に分けられ、少なくとも②の場合は台座直下の斗束の最上層の中央部分が直上の台座の神像につづく装飾となっている。

Fig.3.8 は、ナーガ彫像の台座部分の 3 つの装飾タイプの分布を示したものである。現時点では、これらの装飾タイプの分布に一定の傾向を読み取ることはできないが、こうした分布が職人集団の違いによるものなのか、図像学的あるいは、方位やヒエラルキーに関わる建築的な意味によるものであるのか、今後欄干のこうした装飾分布には引き続き興味をもたれるところである。



Three types of pedestal under Naga statue,
Kala(Fig.3.5, left), Deity(Fig.3.6, middle), Arabesque design(Fig.3.7, right)

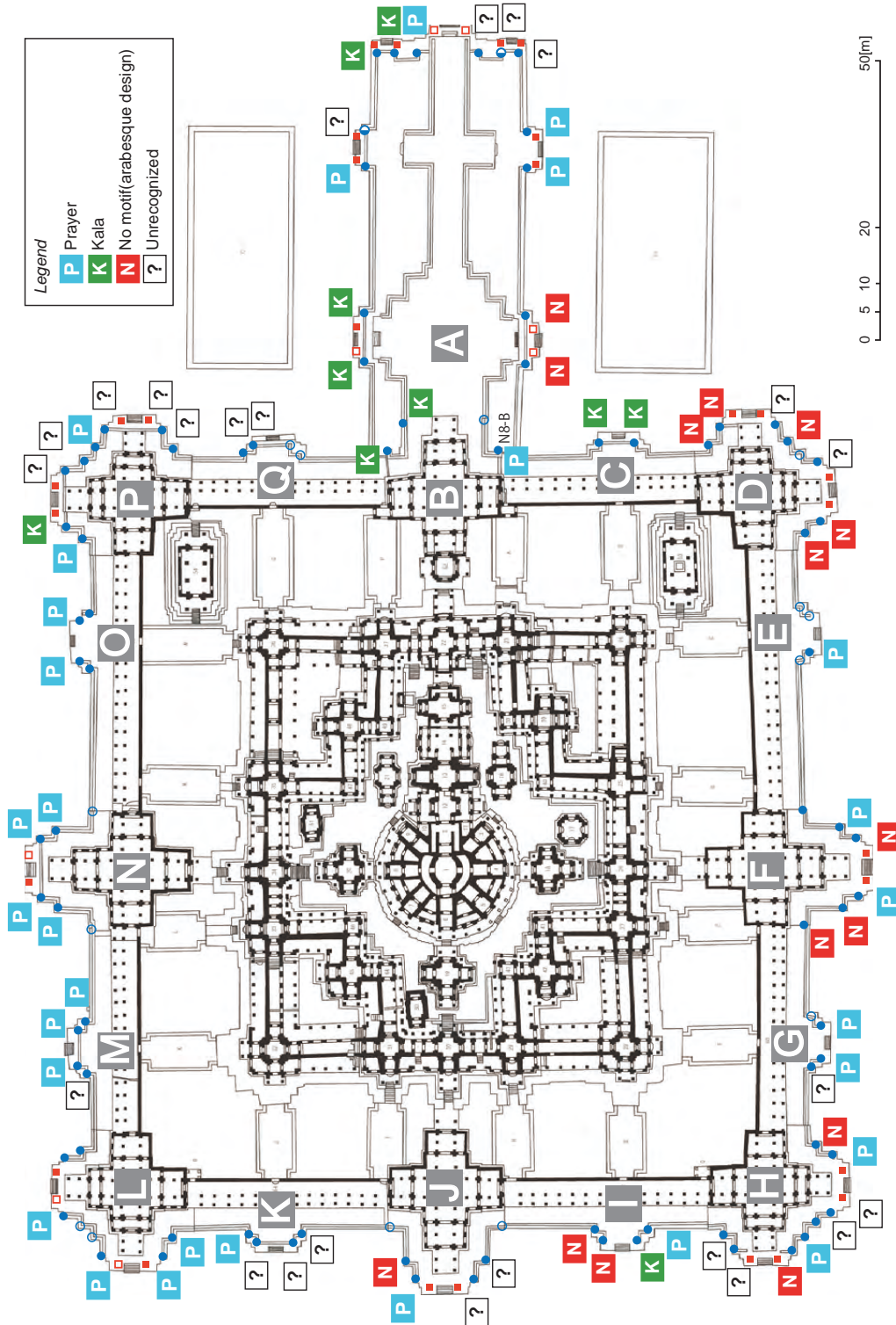


Fig. 3.8 Distribution of three decoration types of the pedestal under the Naga statue

3.3 Reuse of the balustrade elements

欄干部材の再利用について

As mentioned later, it was confirmed that the remaining condition of the railings on the southern and northern sides was particularly poor. This is believed to be because the materials of the railings in these positions were reused in later periods. The reuse of Naga components was revealed in JASA's excavation survey. During the 17th excavation conducted on the eastern side of the 57 towers of the outer corridor of Bayon Temple, numerous fragments of statues and railings, including Naga statues and lion statues that once stood in the outer corridor of the temple, were unearthed. Most of these were parts of statues and railings already installed in the temple. However, along with some carved components of the temple, a nearly complete Naga statue was newly discovered in the recent sediment layer (17SXO25) on the southern edge of the southern pond. This Naga statue showed traces of being used as an abrasive material on part of its surface, causing the intricate patterns of the Naga statue to be worn down. Stone materials believed to be part of Bayon Temple, found around this statue, also showed signs of abrasion. This indicates that stone cutting and polishing were conducted in this area, suggesting that there was a stone processing workshop in this vicinity in the past. Two reasons can be considered for the remaining abrasion marks. One reason is that significant damage such as cracks or fractures occurred at a near-completion stage, making the statue unusable and thus used as an abrasive material. The second reason, similar to the aforementioned reuse case, is the possibility that the importance of the Naga statue was lost, and it was simply reused as an abrasive material. This Naga statue, which had been broken into more than 50 fragments, was restored by the members of the Naga-Sinha Statue Restoration Project and JASA(Figs.3.9~3-11).

Additionally, the use of railing materials, such as Naga beams, in the paving of the outermost wall of the northern side is noted in RCA's description (RCA1922.12). Another instance is that the paving remains southeast of Bayon also used railing beams, which was confirmed through RCA's descriptions and on-site investigations (RCA1922.11). These two structures are considered to be from the period after the influx of Theravada Buddhism, built after the 14th century (Yamamoto et al.2014-2015:83), and it is believed that the reuse of railing materials in later periods is a factor contributing to the current poor remaining condition of the railing materials.

後述するが、南面、北面では特に欄干の残存状況が悪いことが確認されたが、その理由として、これらの位置の欄干部材が後世の時代に再利用されたためと考えられる。

ナーガ部材の再利用事例は、JASA の発掘調査で明らかとなっている。(以下考古発掘ナーガについて) バイヨン寺院外回廊 57 塔 の東側で実施された 17 次発掘調査では、寺院の建設部材のほか、寺院の外回廊にたつナーガ彫像や獅子彫像、欄干の断片が多数出土している。そのほとんどが、寺院にすでに設置されている彫像や欄干の一部であるが、彫刻が施された寺院のいくつかの部材とともに南池の南辺部の新期堆積層 (17SXO25) において、ほぼ完形を保つナーガ彫像が新たに確認された。このナーガ彫像は一部表面に研磨材として使用した痕跡が認められ、この部分は精緻なナーガ彫像の模様が磨滅してしまっている。この彫像の周囲から発見された、バイヨン寺院の一部と思われる石材も、同じく摩滅の痕跡が認められた。つまりこの地域で石材の切断や研磨はおこなわれていたことを示しており、石材加工の作業場が往時この周辺にあったことが推察される。擦痕が残された理由としては 2 つ考えられる。一点は完成に近づいた段階で何等かの石材の割れやひびなど重大な損傷がおこり、使用できなくなったため研磨材として使用した、2 つ目は前述の再利用の事例のように、ナーガ彫像の重要性が失われ、単なる研磨剤として再利用した可能性である。50 以上の破片に破断していたこのナーガ彫像は、ナーガ・シンハ彫像修復プロジェクトおよび JASA のメンバーらによって修復が施された (Figs.3.9~3-11)。

このほか、北面の最外周壁の砂材による舗装路にはナーガ架木などの欄干部材が一部利用されていることが RCA の記述にみられる (RCA1922.12)。また、バイヨン南東の舗装遺構 にも欄干の架木が使用されていることが、RCA の記述や現地調査で確認される (RCA1922.11)。これら 2 つは上座部仏教流入以降の時代に建設された 14 世紀以降の構造物と考えられており (山本 et al. 2014-2015:83)、後世の時代に欄干部材の再利用が行われてたことが、現状の欄干部材の残存状況の悪さの要因となっていると考えられる。



Fig.3.9(left),3.10(middle), 3.11(right) Unearthed Naga Statue at 17th excavation of JASA

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3.4 Preliminary Survey Before Restoration

修復前事前調査

3.4.1 Preliminary survey and the result

From April to May, 2012, we have conducted previous survey at the outer gallery and causeway of BAYON for restoration planning. NAGA and Lion statues on the causeway and the outer gallery of BAYON Estimated original number of each statue would be Lion 36 and NAGA would be 98, but now there remains only 28 and 83. Also,

The majority of the remains of the statues are left in situations of collapse, detachment or missing elements. These situations cause increased and rapid deterioration of the stone, and require treatment. The causeway and the outer gallery were restored in the 1930s by EFEO. However, through tumultuous times in the 1970s and 80s, these stone elements are in trouble again.

In the previous survey, present conditions of remaining statues and balustrade are investigated, and made inventory for each Naga and Lion statue (Reported in: "Restoration plan for 'Restoration project of NAGA and SIGNHA images at the Causeway and Outer Gallery of BAYON'"). Also, we made hazard map that show present conditions of statues and balustrades (Figs.3.12~3.14).

3.4.2 Selection of dismantling and Reconstruction area based on preliminary survey at Southern, Northern and Western side from 3rd Phase

The platform of the Bayon temple where the balustrade were to be installed at areas T56, 57, 58, C71, and T69 were already started maintenance and stabilization work by JASA

3.4.1 事前調査と結果

2012年4月から5月にかけて、事業計画策定にむけて、バイヨン寺院外回廊における事前調査を行なった。その結果、推定される当初のナーガ彫像、シンハ彫像の数はそれぞれ98体、36体と考えられるが、事前調査の時点では現存している数がそれぞれ83体、28体であることが判明した。また、既に多数の欄干部材が失われていたり、周囲に散乱しており、調査で確認できた欄干部材の数は[架木;255部材、斗束;189部材、地覆;380部材]であった。

現存するナーガ彫像、シンハ彫像、欄干部材の中には、基段から落下したまま放置されたり、基段上にあっても破断していたり、欠損しているものも多く見られた。こうした状況は彫像や欄干の劣化を促進すると考えられ、早急な対応が必要とされることが確認された。

調査では、これら現存する彫像及び部材の破損状況などを確認し、ナーガ彫像、シンハ彫像については現状の目録を作成した（この目録は"Restoration plan for 'Restoration project of NAGA and SIGNHA images at the Causeway and Outer Gallery of BAYON'"にて報告済み）。また、ナーガ彫像、シンハ彫像、及び欄干部材の現状を示したハザードマップを作成した（Figs.3.12~3.14）。

3.4.2 第3フェーズ以降の外回廊北・西・南面における事前調査および解体再構築を実施する欄干および彫像対象の選定

2012年から2016年までの対象エリア T56, 57, 58, C71,

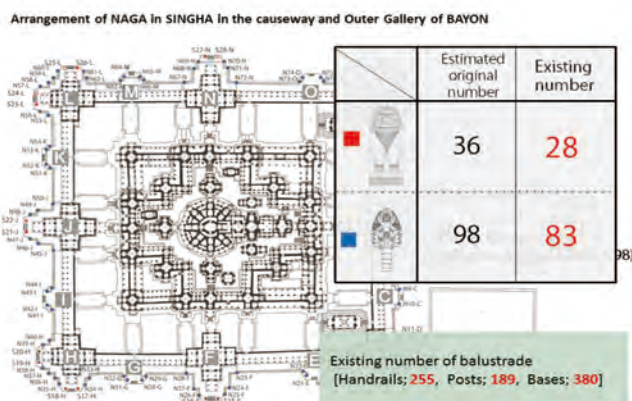


Fig. 3.12 Estimated original number and existing number

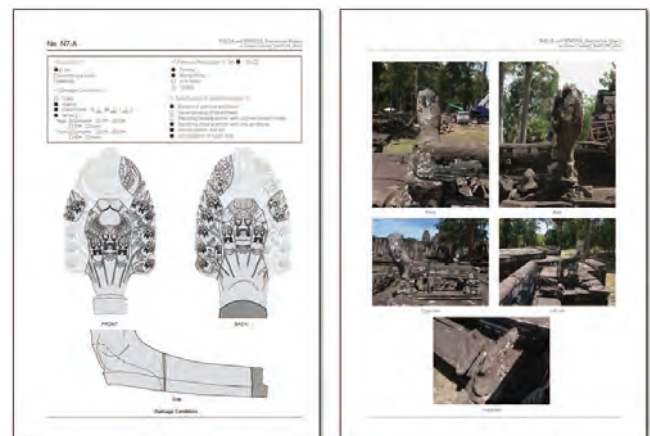
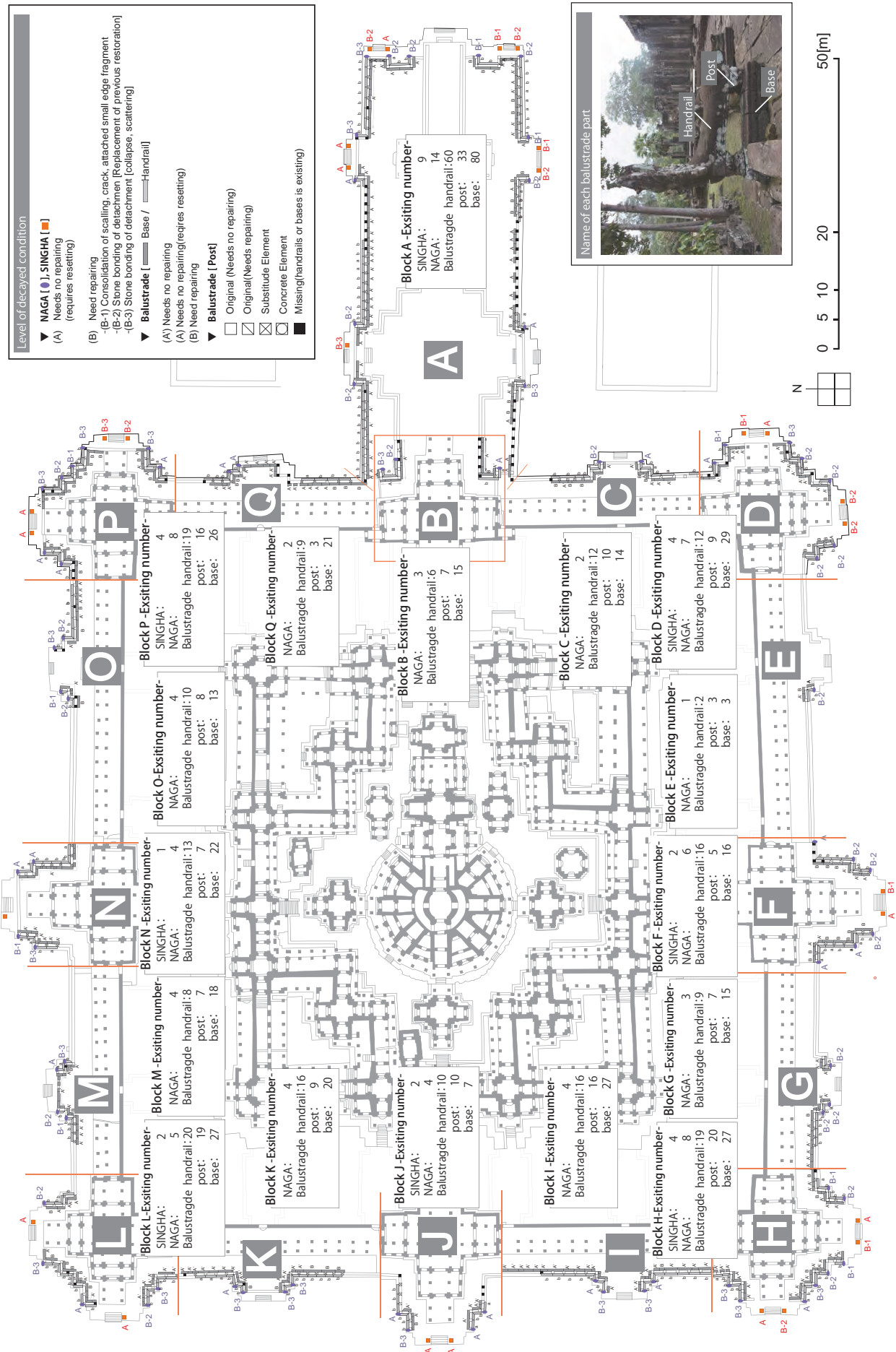


Fig. 3.13 Inventory of Naga statue before restoration



T69 は先行して欄干を設置する寺院本体の基壇の修復、整備、安定化作業が実施され (C71 の東半分は未実施)、この基壇整備作業に伴い欄干がすべて解体されたため、これらすべての欄干を修理及び再設置の対象とした。一方、2016 年以降に対象とした T59~68 はこうした JASA による整備対象ではないこと、そう遠くない将来に外回廊の整備作業が実施される可能性が高いこと、そしてプロジェクトの期間を予算を考慮し、すべての欄干を対象とせず、事前調査に基づいて、緊急性の高い箇所を解体再構築の対象とすることにした。

該当エリアの事前調査は、欄干の残存状況、安全性と安定性、既往の修復の耐久性、そして欄干や彫像に関連する散乱石材の状況などの観点から、緊急に処置が必要となる解体箇所を決定するために実施された。エリア T59~T68 のすべてのライオン彫像およびナーガ欄干は以下の分類項目に基づき分類、これに基づき部分解体修復を行う箇所を決定した (Fig.3.15)

<< ナーガ彫像および欄干の劣化度合による分類項目 >>

N-1：状態が比較的安定しており、緊急性が他の地域に比べて低いもの。

N-2:過去の処理（鉄ピン、鉄帯、コンクリートモルタル等）の耐久性が失われ、落下の危険性があるか、既に崩壊している箇所。

N-3: ナーガ彫像および欄干（特に架木）が破損し、落下の危険性がある箇所。あるいは既に倒壊して周囲に散乱している箇所。

<< ライオン彫像の劣化度合による分類項目 >>。

L-1：ライオン像が比較的安定した状態にあり、現時点では緊急に修復する必要はない。

L-2：大きな破損はないが、裂け目や亀裂が進行しており、近い将来に破損する恐れがある。

L-3: 獅子像の過去の処理（鉄ピン、コンクリートモルタルなど）の耐久性が失われており、落下の危険性がある。

L-4: すでに壊れて崩壊した部分があり、周囲にその破片が散乱している。

上記の項目のうち、本プロジェクトでは N-2, N-3 および L-2, L-3, L-4 を修復対象とした。また、N-1, L-1 についても、十分な安定性が確保できていない場合には、安全性を強化するために「予防的保存処置」として、必要に応じて鉛板や砂岩板を挿入して欄干と台の間を調整し、ナーガの欄干や獅子像の安定性を確保することとした。

team from 2012 (the eastern half of C71 has not yet been repaired), and all the balustrade at this area were dismantled as part of the platform work. Thus, all of these balustrades have been targeted for repair and reconstructing. On the other hand, considering that T59~68 are not subjected to this kind of maintenance by JASA, the possibility that the maintenance work of the outer gallery will be carried out in the near future, and the budget of the project period, we decided to dismantle and reconstruct the most urgent parts of the balustrade based on the preliminary survey, instead of targeting all the balustrade.

The survey was conducted to determine dismantling areas that require urgent treatment from the viewpoint of the remaining situation, safety and stability, durability of past treatment and also scattering stone relation to balustrade and Lion statues. For Lion statue and Naga balustrade, we classified deterioration state as below, and area of partial dismantling were determined (Fig.3.15).

<<Deterioration classification for NAGA balustrade>>

classification N-1: Naga balustrade is comparatively in stable condition and urgent necessity is less than other area.

classification N-2: Area of which durability of the past treatment for the Naga balustrade (iron pin, iron belt and concrete mortar etc.) are lost and in danger of falling or already collapsed.

classification N-3: Area of which Naga balustrade (especially handrail) are broken and in danger of falling. There are cases that already collapsed and scattered around the platform.

<<Deterioration classification for Lion statue>>

classification L-1: Lion statue that is comparatively in stable condition and there are no urgent necessity for repairing at this moment.

classification L-2: There are no serious breakage, but split and crack are in progressing and in danger of breakage in the near future.

classification L-3: Durability of the past treatment for the Lion statues (iron pin and concrete mortar etc.) are lost and in danger of falling.

classification L-4: Lion statue that already broken and collapsed part are scattered around platform.

Among the above items, N-2, N-3 and L-2, L-3, L-4 were selected for restoration in this project. In addition, for N-1 and L-1, if sufficient stability was not secured, it was decided to adjust the space between the balustrade and the platform by inserting lead plates or sandstone plates as necessary as a "preventive conservation treatment" to strengthen safety and ensure the stability of the Naga parapet and lion statues.

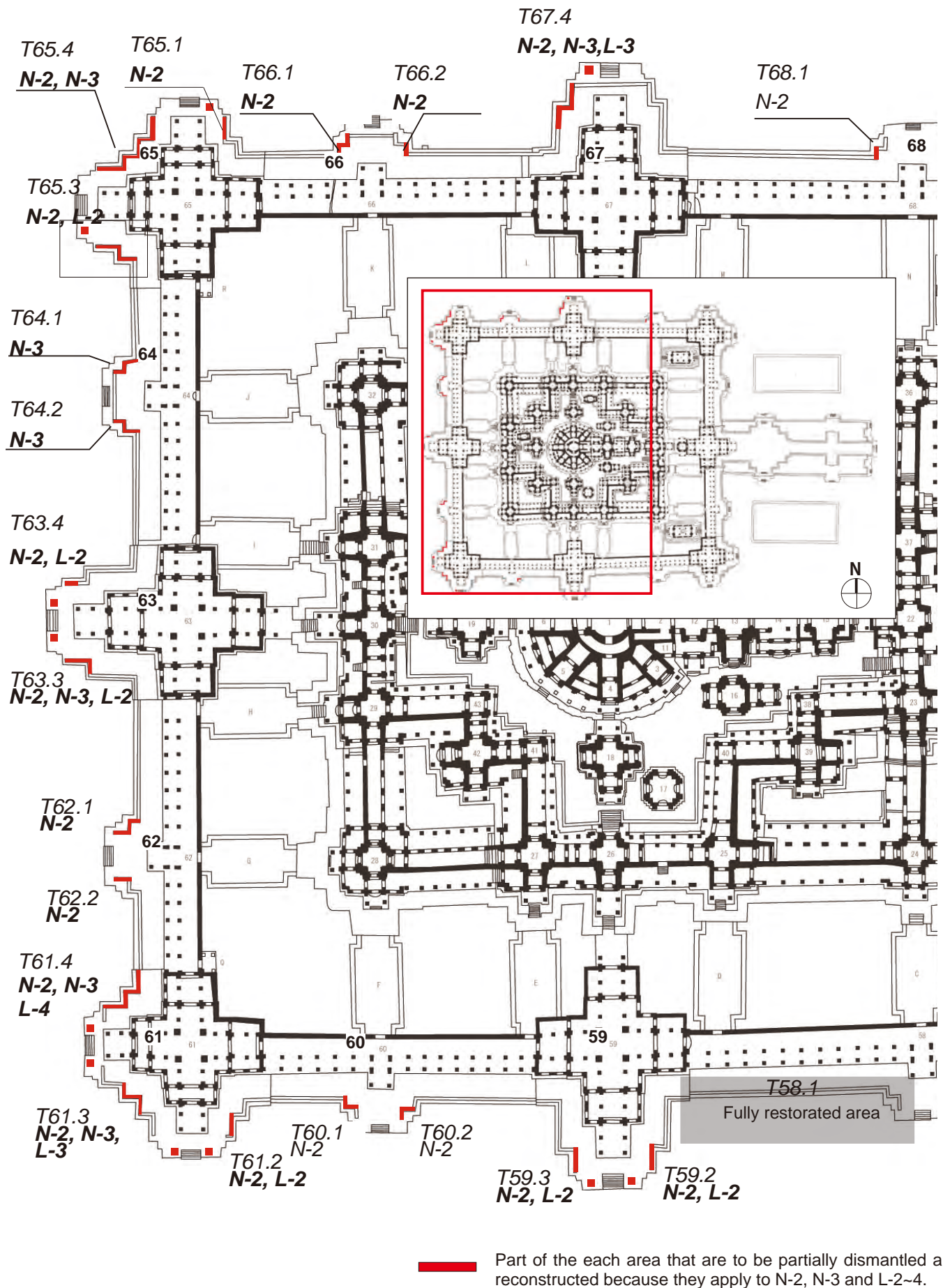


Fig.3.15 Partial dismantling and reconstruction area at Outer Gallery (G68-T59)



Fig.3.16 Example of N-2, N-3 (T64-2)



Fig.3.17 Example of N-2(T66-2)



Fig.3.18 Example of N-3(T65-2)



Fig.3.19 Example of N-3(T66-2)



Fig.3.20 Example of L-3(T61-2)



Fig.3.21 Example of L-4(T61-3)

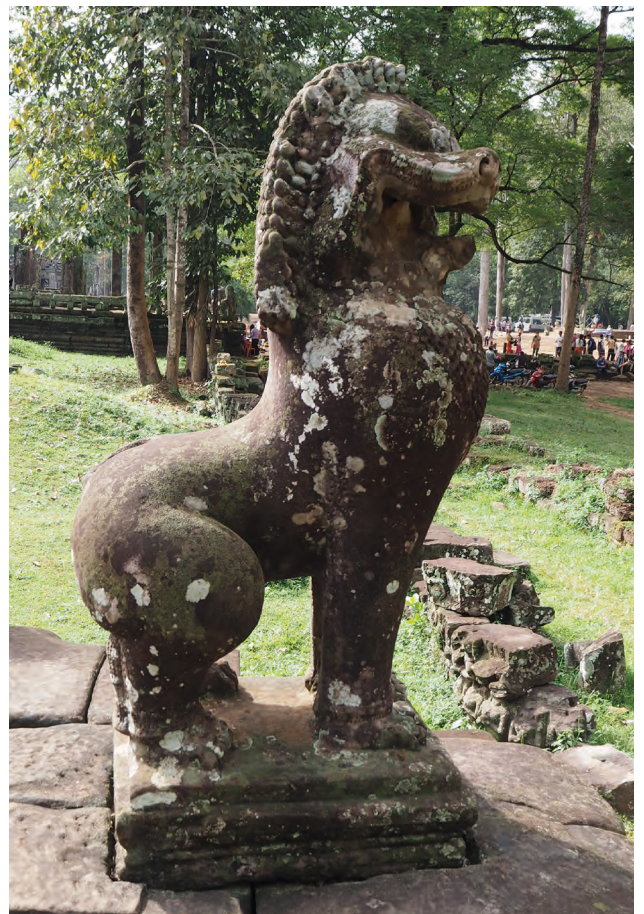


Fig.3.22 Example of L-2(T67-1)

3.4.3 修復事業前調査から見てきた課題

事前調査により確認された、バイヨン外回廊欄干の現状と問題点として主に以下の4点が挙げられる。

1. 特に南面、北面では多くの部材がすでに失われていること。このうちの一部は後世に別遺構に再利用されていること。
2. 既往修復によって原位置が同定されないまま、近傍の別の位置に設置、あるいは本来1つの部材でないものを一つの接合する事例が散見されること。過去に同定ができなかった際、景観上の見栄えを重視して残存状況のよい彫像を目立つ場所に置くなどの傾向がみられる。
3. バイヨン寺院周辺には未だに散乱している石材、土砂の中に埋伏している部材があること
4. 欄干の破損、倒壊は3つの要因があることが判明した。一つ目は倒木などによる自然・人的災害的要因、2つ目は既往修復の際に用いられた材料の劣化によって安定化力や接合力が失われたことによるもの、3つ目は基壇自体の不同沈下によって生じる床面の歪みである。

これらの課題に対して、本事業の修復基本方針が策定された。

3.4.3 Issues Revealed from the Preliminary Survey of the Restoration Project

The following four points can be listed as the current status and problems of the balustrade of the outer gallery of the Bayon, as confirmed by the preliminary survey.

1. Many of the members, especially on the south and north facades, have already been lost. Some of them have been reused in other structures in later periods.
2. There are some cases where the original location has not been identified due to previous restorations, and the site has been placed in a different location nearby, or where the site was originally not one component, but was joined together. In the past, when the original location could not be identified, there was a tendency to place the statues in a conspicuous location where they could be seen in the landscape, placing importance on the appearance of the landscape.
3. There are still scattered stones and materials buried in the earth and sand around the Bayon temple.
4. The damage and collapse of the balustrade were found to be caused by three factors. The first was natural and human-caused disasters due to fallen trees, the second was due to the loss of stabilizing and bonding forces caused by the deterioration of materials used in the previous restoration, and the third was the distortion of the floor surface caused by the uneven settlement of the platform itself.

To address these issues, a basic restoration policy for this project was formulated.

4. Restoration Policy and Methodology

修復基本方針と方法の策定



4.1 Fundamental Restoration Policy

修復の基本方針

In implementing the restoration work, discussions were held with JASA experts on the basic policy and methods for the restoration work. The basic policy shown below was made based on the results of the preliminary survey, based on the policies cultivated by JASA in the first to third phases.

1. Reinstatement of missing part will not normally be conducted. However, in some cases to provide structural stability, new stones will be supplied as required.
2. New elements must be distinguishable from the original elements.
3. The partial replacement with new stones will be considered only for severely decayed parts to provide structural stability.
4. Material used in the past restoration, such as elements supplemented by cement mortar, will be replaced with new stone or mortar especially in cases where the former material caused deterioration of original stone.
5. Substitute elements of past intervention will be replaced if the original elements are identified. (*)
6. Mortar spacers used by the past restoration will be removed, and replaced by lead plate or mortar. In some cases, fixing with a pin will be done to provide stability.
7. The new stone elements (posts and bases) will be installed only for supporting the upper original stone elements (Naga statues and handrails).
8. Substitute posts that are supporting handrails in their original position will be replaced with new sandstone posts to provide structural stability and improve landscape appearance.
9. Substitute posts that are supporting handrails not in their original position will not be replaced.
10. Collapsed elements that are scattered without orientation to their original place will be given the minimum necessary treatment and these elements will be gathered for safekeeping near the Bayon.

*Supplementary explanation

If post or handrail that was set in a different place by previous restoration can be identified on the basement as the original place, the identified post or handrail will be put back to that basement. In this case, post or handrail that was not the original element, but set on that basement by the previous restoration, will be sent to the another suitable place for landscape ascetics.

修復工事の実施にあたって、本修復工事の基本方針と方法について JASA 専門家を交えて議論を行なった。以下に示す基本方針は、JASA のこれまで第 1 ～第 3 フェーズにかけて培われてきた方針を基本として、事前調査をもとに作成されたものである。

- (ア) 遺失部の復元は行わない。ただし、構造的安定化のために必要な箇所への新材による部分的な補填は行う。
- (イ) 新材加工における仕上げは、オリジナルと区別可能なものとする。
- (ウ) 劣化・破損が著しく進んだ箇所で構造的安定化のために不可欠な箇所に限っては新材への置換をする。
- (エ) 既往修復の材料 (コンクリートによる補填部等) は石材劣化の原因となっていることが伺われる場合には新材または新たなモルタル材に交換する。
- (オ) 既往修復による代用材や転用材は、原部材が特定された場合はそれに置換する。(※補足)
- (カ) モルタルによる既往修復の嵩上げ調整材は除去し、鉛板、消石灰モルタルに交換する。又、安定性のためにピンタボ固定を行う場合もある。
- (キ) ナーガ彫像や架木の原位置が特定されているが、それらの支持材 (斗束・地覆) が発見されない場合には、支持材を新材で制作する。
- (ク) 代用材もしくは転用材が、当初の斗束の位置において架木を支持している場合には、構造的な安定や景観の改善のために、それらの部材は新材に交換する
- (ケ) 代用材もしくは転用材が架木を支持しているものの、それらが当初の斗束の位置にはない場合には、新材には交換しない。
- (コ) 現位置が特定されず、オリジナルと関連のない位置に散乱している部材は、最低限の修理を施して、バイヨン寺院近傍にまとめて保管する。

※補足：

原位置にある地覆の上に、過去の修復で斗束や架木が設置されているものの、別箇所の斗束や架木がその地覆上に当初はあったことが明らかになった場合には、本来の斗束や架木を原位置に戻す。その際、過去の修復で設置されていた部材の原位置が特定されない場合には、遺構の景観上望ましいと考えられる箇所に仮に設置する。

4.2 Restoration Work Process

修復工事の工程

One of the objectives of this project is to inherit the restoration techniques and methods cultivated through 20 years of JSA/JASA restoration activities. Therefore, while basing our work on the fundamentals of JSA/JASA, we proceed with the most optimal policies and methods based on the results of preliminary investigations conducted for this project. The procedures for the restoration work in this project are as follows (Fig.4.1).

a) Preparation of the Work Site

In this project, the restoration work progresses by dividing the outer corridor into sections to ensure it does not hinder tourist routes and safety. Prior to the restoration work in each section, necessary foundations for the mini-cranes lent by JASA, storage sheds for materials, and safety fences are installed.

b) Pre-Dismantling Records, Numbering, and Photographic Records (Supplementary Information in 4.3)

As a record before restoration, diagrams and photographic records of the pre-dismantling state are created. The diagrams document each layer (architrave, corbel, and stylobate) and the elevation is recorded from two directions.

c) Review of Restoration Methods for Each Area with JASA Experts

Prior to the restoration work in the designated areas, detailed discussions are held with JASA experts on the restoration methods and stabilization procedures for each component.

d) Investigation and Identification of Scattered Components

Since the collapsed components are often scattered not only on the foundation but also on the ground below the foundation, a thorough search is conducted around the temple to identify any parts related to the statues or balustrades of this project. If found, efforts are made to identify their original positions.

e) Partial Dismantling of Necessary Areas

The dismantling of the statues and balustrades is carried out. Concrete mortar, iron pins, and iron belts from previous restorations are carefully removed during this process.

本事業は、JSA/JASA の 20 年にわたる修復活動において培われてきた修復技術や方法を継承することが目的の 1 つであることから、これまでの JSA/JASA のもの基本としつつ、本事業のために行った事前調査結果に基づき最適な方針と方法で進められている。本事業における修復工事の工程は以下の通りである (Fig.4.1)。

a) 作業現場の準備

本事業では観光客のルートや安全性の妨げにならないよう、外回廊をエリアごとに区切り修復を進めている。各エリアでの修復工事に先駆け、JASA から必要に応じて貸与されるミニクレーンを設置するための基礎、資機材保管のための小屋、安全対策のための柵などの設置を行う。

b) 解体前記録、番付、写真記録 (4.3 にて補足あり)

修復前の記録として解体前の図面、写真による記録を行う。図面は、各層 (架木、斗束、地覆の 3 層) ごとに記録し、立面は 2 方向から記録する。

c) JASA 専門家を交えたエリアごとの修復方法の検討

該当エリアの修復工事に先立ち、JASA の専門家らと交えて各部材の修復方法や安定化の方法について詳細な検討を行う。

d) 散乱部材調査と同定作業

また、崩落した部材が基壇上だけでなく、基壇下の地面上に散逸していることも多いため、寺院周辺の散逸石材の中に本事業の彫像や欄干に関連する部材がないか入念に搜索を行い、発見した場合はその原位置の特定に努める。

e) 必要箇所の部分解体作業

彫像と欄干の解体作業を行う。既往修復によるコンクリートモルタルや鉄ピン、鉄ベルトなどもこの際に丁寧に除去される。

f) 破損石材の修理作業 (4.3 にて詳細)

結合、接着、注入、強化、新材への部分的な置換、補填といった JASA の過去の修復作業で確立された仕様を用いて修理作業を行う。

a) Set up of the site
作業現場の準備



b) Record of the state before restoration.
解体前記録、番付、写真記録



c) Detailed discussion with JASA expert.
JASA 専門家を交えたエリアごとの修復方法の検討



d) Identification work from Scattered stone
散乱部材調査と同定作業



e) Partial dismantling.
修復必要箇所の部分解体作業



f) Repairing of statues and balustrade
破損、劣化石材の修理作業



g) New sandstone processing.
新砂岩材による補てん



h) Maintenance of the platform.
基壇整備作業、欄干基礎の安定化



i, j) Trial assembling and reconstructing.
仮組み作業・再構築作業、かさ上げ調整



Fig.4.1 Restoration Process in this Restoration Project

f) Repair of Damaged Stone Materials (Supplementary Information in 4.3)

Repair work is conducted using established methods from past JASA restoration projects, such as joining, adhering, injecting, strengthening, and partial replacement with new materials.

g) Filling with New Sandstone (Supplementary Information in 4.3)

Following the same policy as JASA, this project does not restore missing parts. However, for locations with significant deterioration or damage where structural stabilization is essential, new materials may be introduced or partial filling may be performed. In such cases, the new material is processed to match the shape of the missing part and bonded to the original sandstone. The finish of the new material is made distinguishable from the original.

h) Platform Maintenance and Stabilization of Balustrade Bases (Supplementary Information in 4.3)

If necessary, minimal foundation maintenance work is carried out, such as dismantling only the surface stones of the foundation, removing unnecessary soil and vegetation, and refilling with improved soil to eliminate gaps before reinstalling the stones.

i) Temporary Assembly Work

After the repair of the stone materials and foundation maintenance is complete, a temporary assembly is conducted on the foundation or its surroundings to determine the optimal reconstruction method for the statues and balustrades. During this process, efforts are also made to identify the original positions of the balustrades placed in different locations during previous restorations.

j) Reconstruction Work and Height Adjustment

Based on the results of the temporary assembly, the balustrades and statues are reinstalled in the order of stylobate, corbel, and architrave. If partial height adjustments are necessary, lead plates or thin sandstone plates are used for the elevation to ensure structural stabilization.

k) Drawing Records After Reconstruction

The situation after reconstruction is recorded on a drawing.

g) 新砂岩材による補てん (4.3 にて詳細)

本事業では JASA の方針同様、遺失部の復元は行わないが、劣化・破損が著しく進んだ箇所では構造的安定化のために不可欠な箇所に限っては新材への置換や部分的な補填を行う。この場合は、遺失部分の形状に合わせて新材加工が行われ、オリジナル砂岩材と接着する。このとき、新材加工における仕上げは、オリジナルと区別可能なものとする。

h) 基壇整備作業、欄干基礎の安定化 (4.3 にて詳細)

必要に応じて基壇に対して、表層の石材のみを解体し、不要な土砂や植生を除去した上で、必要に応じて改良土を充填しながら隙間をなくすよう再設置するなど、最低限の基壇整備作業を行う。

i) 仮組み作業

石材の修理、基壇の整備が完了したところで、彫像および欄干の最適な再構築方法を検討するために基壇上、あるいはその周辺で仮組み作業が行われる。また、既往修復において原位置とは異なる場所に置かれた欄干についてもこの際に可能な限り原位置の特定を行う。

j) 再構築作業、かさ上げ調整 (4.3 にて詳細)

仮組み作業の結果に基づき、地覆、斗束、架木の順番で欄干や彫像の再設置を行う。この際、部分的な嵩上げが必要な場合は鉛板や砂岩材の薄いプレートを用いて嵩上げを行い、構造的安定化を図る。

k) 再構築後の図面記録

再構築後の状況を図面で記録する。

4.3 Supplementary Information about Each Restoration Process

各修復工程に関する詳細

b) Numbering System

Numerals on each stone element are necessary work for identifying its existing location, its condition and for counting amount of elements remaining in the structure before dismantling. A mount of dismantled sandstone elements will be moved from place to place for repairing, trail assembling and the re-assembling, therefore each sandstone elements must have an individual numeral that is easy to understand when we execute the restoration work. For this project, a method of using the numeral is following that of JASA to avoid confuse of restoration recording in Bayon.

- 1st numeral indicates the building number named by EFEO.
- 2nd numeral indicates the area in the building. Eg. T57 is divided into 4 areas. 1: Northeast area, 2: Southeast area, 3: Southwest area, 4: Northwest area.
- 3rd numeral indicates the part of the building. 1: Platform, 2: Pavement of the Platform, 3: Pavement and Basement of the upper structure, 4: Upper structure wall, 4: Upper structure roof, 6: Beam, 7: Column, 8: Naga balustrade, 9: Lion. 21: Door step, 71: Pilaster
- 4th numeral indicates a part of the balustrade(1: basement, 2: post, 3: handrail, Lion:1)
- 5th numeral indicates the individual number of each sandstone element. The individual number is given from clockwise way (right to left when you face to the building) and the numeral start from 1,2,3...
- 6th numeral indicates the broken part of each sandstone. The numeral start from 1, 2, 3, ... that marked the sandstone broken into two or three parts. If the sandstone elements is not broke, the 6th numeral will not used.

f) Process of sandstone repair

Base on the previous survey, a plan for restoration of decayed elements are studied. The process of the stone repairing is showed as below:

1. Record of the state before restoration (floor plan, elevation plan [outer side]).
2. Partial dismantling of statues and balustrade and transportation to the repairing center. During

b) 解体前記録、番付、写真記録

各石材への番付は、解体前の現状の部材の位置、状態、そして数を確認する上で不可欠である。解体された大量の石材は、場所を次々と移動し、修理をうけ、仮組みをへて、再構築という段階を踏むため、個々の番付はこうした修復工程を円滑に進めるために必要に重要となる。当プロジェクトにおいて用いる番付方法は、バイヨン寺院における修復記録における混乱を避けるため、JASAの番付方法を踏襲した。石材の番付方法は以下に示す。

- 1桁目の数字はEFEOによる建物番号を指示する。
- 2桁目の数字は建物における領域をしめす。57塔においては東西、南北の軸線で塔を4つの区画に区切り、北東区域:1、南東区域:2、南西区域:3、北西区域:4としている。
- 3桁目の数字は建物のを建築上の部位によって指示する。(1:基壇、2:基壇に属する床面、3:上部/構造に属する床面、4:壁体、5:屋根、6:梁、7:柱、8:ナーガ・欄干、9:ライオン像、21:扉の段、71:ピラスター)
- 4桁目の数字は各部位内における石材層を指示する(1:地覆、2:斗束、3:架木、ライオン彫像:1)
- 5桁目の数字は石材個別に与えられる。番付は基本的に時計回りに数える。
- 6桁目の数字はオリジナルは単一の部材であったが、現在は破断するなどして石材は別れてしまっている場合において、割れた石材個別に与えられる。

f) 破損石材の修理作業

2012年4月から6月にかけて行われた事前調査をもとに、劣化部材の修復方法の検討が進められた。砂岩材の修復工程は以下に示すとおりである:

1. 修復前の記録として、解体する前に図面(平面図2枚[ナーガ・欄干を含めた層、束と地覆を含めた層]、立面図2枚[建物を外側から見た際に見える2面])と、写真による記録をおこなう。
2. 彫像と欄干部分の解体を行う。解体中も図面と写真による劣化状況の記録を行う。
3. ミリメートル方眼紙上に1/10の縮尺で部材5面(上面1面、側面4面)の記録を行い、そのスキャンデータとして保存する。

dismantling, we also record the state of deterioration with drawing and digital photograph.

3. Drawing of five faces with scale 1/20 on millimeter paper and keep the scanning data.
4. Digital photograph record before, during and after repairs with three faces and two perspectives.
5. Cleaning stone with water and soft brush.
6. Repairing by application of specification standards including, bonding, connection, injection, consolidation, replacement and supplement (Case 1~6).
7. Stone arrangement for the trial assembly and re-constructing work.

In case of the state of platform situation and deterioration of elements, we will conduct the restoration without dismantling and make a re-treatment on the site.

■ Specification of dismantled sandstone repair

Through the past JSA restoration works at Northern Library of Bayon, Tower N1 of Prasat Suor Prat, and the Northern Library of Angkor Wat, JSA had developed sandstone restoration technique. Furthermore during the 3rd phase, the use of tools, proportion of material mixing and operational procedures had been improved in the restoration work of the South Library of Bayon. For the restoration of NAGA and SINGHA in Bayon, the repair method will basically follows from 3rd phase of JASA with a view to make further improvements in consideration of target of this project, we categorized deterioration of each statue into six classifications. Repairing specification for each classified deterioration condition (see below) are also established by the studies done from April to June 2012.

- Case 1) Remove of previous restoration materials
- Case 2) Attachment of small fragments
- Case 3) Stone bonding of uncomplicated detachments
- Case 4) Filling of missing sections
fill with cementation adhesive (Case 4a) or new stone (Case 4b).
- Case 5) Consolidation of fissile materials
- Case 6) Others

■ Materials

The material used to accomplish the restoration of breakage deteriorated elements are as Table 7-1 , Figs. 4.2-4.5.

4. 部材ごとに修復前後と修理中の状態をカメラにて記録する。
5. 水と柔らかいブラシを使用してクリーニングを行う。
6. 結合、接着、注入、強化、新材への部分的な置換、補填といった標準的な修復工法を適宜応用し、修理作業を行う。
7. 仮組み作業と、再構築作業として石材を順序通りに再設置する。

また、基段の安定性や石材の劣化の状況に応じて、解体を行わない範囲での基段の安定化処置を行うこともある。

■砂岩部材の修理仕様

バイヨン南経蔵の石材修理方法は、バイヨン北経蔵、プラサート・スープラ N1 塔、そしてアンコールワット北経蔵で実施されてきた JSA のこれまでの修復事業で培われた修理方法を、道具、材料配合の比率、そして作業手順のさらなる改善を重ねた上で用いている。バイヨン寺院ナーガ彫像、シンハ彫像、及び欄干の修復においては、修復方法は基本的に JASA 第 3 フェーズを基本として、当プロジェクトの目的に合わせた改良を加えた上で、以下の 6 つの標準的な修復方法を適時応用し、修理作業を行うこととした。対象部材を以下の 6 つの劣化状況に分類し、2012 年 4 月から 6 月に行われた事前調査と研究をもとに、各劣化状況に応じて修復方法を設定した。

Case 1: 既往修復の除去

Case 2: 小破片の接合

Case 3: 単純破断の接合

Case 4: 欠損箇所の充填 4a[セメント系充填剤による充填] 4b[新材による充填]

Case 5: 脆弱部の強化

Case 6: その他

■材料

上述の修復方法に用いられる材料は Table.1, Figs.4.2~4.5 に示す通りである。

g) 新砂岩材による補てん

基本方針にて示された新材導入の方針に基づき、新材の導入が必要と判断された箇所では以下の工程に沿った手法がとられている。

g-1) 砂岩材の粗加工

発注をうけ到着した石材は本来必要なサイズよりも 50mm 程度のマージンを取って切り出されているため、修

Tab.4.1 Materials and treatment methods

NO	ITEMS	USE	TREATMENT MEASURES	CODE	NAME	INGREDIENTS
RESIN MATERIALS						
1	Attachment	Stone attachment and Metal material attachment	Main chemical (B-7a)=2cc	B-7a	Main chemical	Bisphenol type A-epoxy resin+reacting diluted solution+thioxthopic argent
			Hardner (B-7b)=1cc	B-7b	Solidifying catalyst	Polyamid amin + thioxthopic argent
			Sandstone Powder=E3~4g(through 85sieve)	SP	New sandstone of Angkor	Green-gray color
CEMENTTICIOUS MATERIALS						
2	Treatment mortar	For sealing gap impregnation mortar	Cement C-1=100g(through 0.85 sieve) Sand S-1=350g(through 0.425 sieve) Pulmer P-1c=20g Water W=80g MC=0.3%=1.35g	C-1	Blue diamond portland cement	Blue diamond portland cement type I, ASTM.C-150
				S-1	River sand	
				P-1c	Polymar(green)	Acetic acid vinyl ethylene emulsion+inorganic
				W	Clear water	
				MC	Methyl cellulose	
3	Impregnation	Filling of cracks exfoliation and hollow	Impregnation polymar solution: 1-Polymer P-1a=100g+water W=200g 2-Cement C-2=100g+P-2e=60~80g	P-1a	Normal grain size polymer	Acetic acid vinyl ethylene emulsion
				P-2e	Economic, code of product	Micro grain size polymer, Acylic emulsion
				C-2	Blue diamond portland cement	blue diamond portland cement type I, ASTM.C-150
4	Impregnation	Filling of cracks exfoliation of bas-relifs and statues	Impregnation polymer solution: C-3=100g+black=4.5g+green=4g+yellow=3g(weight%) 1-Cement C-3=100g+P-3=80g+water W=180g(weight%) 2-Cement C-3=100g+P-3=80g	C-3	Micro-grain cement 600P	Regular portland cement + water retaining agent +shell mold silica + water repellent
				P-3	Normal grain size polymer	SBR (sthylene butadien rubber) latex
				W	Clear water	
5	Repair of missing parts	Sealing of missing section	Cement C-2=1000g parts Sand S=3000g (through 2mm sieve) Polymer P-1a or P-1c=290g water W=338g	C-2	Blue diamond portland cement	Blue diamond portland cement type I, ASTM.C-150
				S	River sand	Big grand size
				P-1a	Normal grain size polymer	Acetic acide vinyl ethylene emulsion
				P-1c	Green polymer	Acetic acid vinyl ethylene emulsion plus inorganic
6	Sealing joints	For sealing surrounding area during impregnation	Cement C-2=100g Sandstone Powder=300g (through 0.425 sieve) Water 20~30g	C-2	Blue diamond portland cement	Blue diamond portland cement type I, ASTM.C-150
				SP	New sandstone of Angkor	Green-gray color
				W	Clear water	



Fig.4.2 Epoxy resin for stone repair(JASA)



Fig.4.3 Cementitious materials for stone repair(JASA)



Fig.4.4 Pigment for adjustment the mortar color(JASA)



Fig.4.5 Manual tools for stone repair(JASA)

Diagnosis of Material Determination of bonding category

Case 1: Remove of previous restoration

- Material used in the past restoration, such as elements supplemented by cement mortar or iron pin/belt will be removed.
- Especially in cases where the former material caused deterioration of original stone.

Case 2: Attachment of small fragments

- For reattachment of small fragments fallen from large material under low load bearing condition.
- Reusable materials.
- Operation of Case 1 is to be repeated for multiple fractions

Case 3: Stone bonding of uncomplicated detachments

- Material stone itself retains its constructional strength but broken in large segments with uncomplicated detachment.
- To bear its own weight and certain compressive strength, additional reinforcement with metal rod is required.

Case 4: Filling of missing sections

- When a part of stones are missing, fill with cementitious adhesive (Case 4a) or new stone(Case 4b).
- Operation to reattach new stone fragments will follow case 3.

Case 5: Consolidation of fissile materials

- Occurrence of fissility along with bedding layers is severely evident.
- Inject polymer emulsion cement mortar by pump or syringe.

Case 6: Others

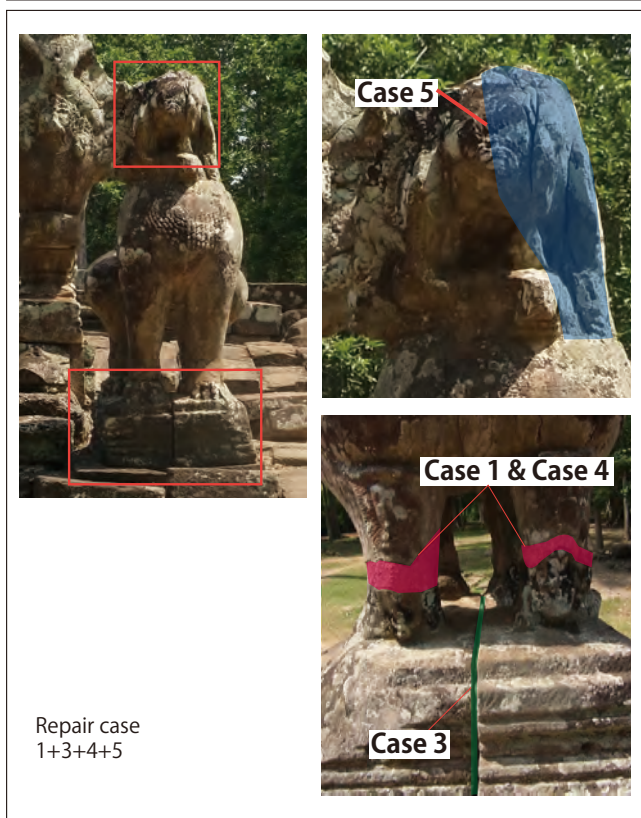


Fig. 4.6 Repair case example of Determination (71.2.1.9.1.4)



Fig. 4.7 Repair case example of Determination (71.3.1.8.1.1)

g) New Sandstone Processing

For install of the new stone elements, fundamentally based on following principles.

The new stone elements (posts and bases) will be installed only for supporting the upper original stone elements (Nagas and balustrades).

g-1) Trimming of new stones on the ground

The new sandstones are normally ordered in a reasonably large size, thus before use at the restoration site, re-processing on the ground that margin will be 10~20mm than the final size was needed. If it is too thick it will broken down by hammer or cut along a crease with stone-cutter, then trimmed and the surface grooved. When cutting the bug size stone in pieces, we rent JASA's large cutting machine which is set north of Bayon temple.

g-2) Processing of attachment side and attach with original elements

The stone cut into approximate trimmed sized was moved to restoration site for further processing work to adjust filling part. Sandstone for filling missing part will be manually trimmed to form of attachment surface with a chisel, pneumatic or power tool.

New sandstone that finish trimming of the attachment surface will be attached with the original elements, then other surface will be trimmed to fit surrounding from in same way.

As for the new post, it will be processed after the approximate height will be determined at the trial assembling work.

g-3) Finishing of the surface

New filled element need appropriate finishing process not only to harmonize with surrounding but also need to be distinguished by eyes. For the finishing will be determined after with JASA expert at the process of assembling and reconstructing work.

>>Replacement with new stone posts

At the previous restoration of balustrade of the outer gallery and causeway, in cases where restorers could not find the original post, they use the substitute blocks or concrete blocks. Also, to support the detached balustrade, the restorers put the support in a place where originally the post was not positioned.

These previous restoration are causing structural unstableness and might cause additional deterioration.

復サイトで加工を行う前に、最終的に必要となる石材のサイズよりも 10~20mm のマージンとなるように粗加工を行う。石材カッターを用いて必要に応じて 10mm ~ 20mm の深さで溝を入れ、それらをハンマーでたたき落として石材を加工し、さらに表面を粗く仕上げる。サイズの大きな石材を切断する場合は、JASA の大型石材カッターを借りて加工する。この工程は、多くの端材と粉塵がでるため、王宮広場脇に設置されている JASA の新材加工現場を借りて行われる。

g-2) 接合面の加工とオリジナル部材との接合

適切なサイズに切り出された石材は修復サイトに運ばれ、導入箇所形状に合わせて加工されていく。補填のために加工される砂岩材は、接合する面をオリジナルの石材の破損形状に合わせて鑿、エアツール、パワーツールを利用して手作業で細かく寸法を調整して削られていく。加工を終えた新砂岩材をオリジナルのものと接合し、その後周囲の形状に合わせて接合面以外の面の加工を同様にして進めていく。

置換を行う斗束に関しては、仮組みの段階で各部の高さが決定した後に上面と下面の接面を加工することになる。

g-3) 表面の仕上げ加工

挿入した新材について、周囲との調和を図りつつ、目視にて分別ができるよう、彫刻の段階について JASA の専門家との議論を重ねた上で仕上げ加工を決定し、仕上げを行う。各部材の石材加工と仕上げにおける留意点は以下の通りである。

≫ 斗束の制作

バイヨン寺院の外回廊欄干には、既往修復にて、発見することのできなかった斗束の変わりに転用の石材を用いたり、コンクリートによって代用材とした。また、破断した欄干を支えるために、建造当初には斗束が置かれていなかった場所にも支持材を設置した。

こうした転用材・代用材によってさらなる劣化や、不安定な彫像も少なくない。従って、一部のについては新材を用いて新たに斗束を製作することにした。

新砂岩材による斗束は、目視にて分別できる必要性があるが、同時にあまりにもその違いが明らかになりすぎてしまわないようにすることも大切である。仕上げ加工を検討する上で、バイヨン寺院には現存している斗束の調査を行った結果、バイヨン寺院の外回廊の斗束には少なくとも装飾において 2 つのタイプが確認された。しかし、残存しているものの劣化が著しく、オリジナルの斗束のデザイン

Therefore, we replaced the substitute posts with new sandstone posts to provide structural in original position of the support. We can confirm that there has been the original post by an indent trace. Additionally, we will continue to use substitute elements for support of the balustrade that are not in the original place.

To consider the finishing decoration level of new sandstone posts, we have conducted a survey of the post in the Outer Gallery and Causeway of Bayon. As a result, we confirmed that at least two types of design can be seen in the Bayon post. But unfortunately only less than half are remaining and even the remaining post are considerably deteriorated and difficult to recognize the original design.

Based on the survey and discussions with JASA experts, we carved only outline figure that cannot be distinguished by design type. Final decision of finishing method will be determined after the reconstruction, to harmonize with the surroundings.

>>Finishing method of the lion statue

When it comes to the introduction of new materials, sufficient discussion is always necessary to ensure that the value of the original is not lost.

There are 28 Lion statues exist in the Bayon, and a comparison of the decorations on these statues shows that the basic design is the same. Therefore, it was decided that the areas that were replaced with new wood should be processed to harmonize with their surroundings if the shape of the sculpture and its continuity was obvious, based on a comparison with other lion statues and the shape of the sculpture surrounding the area where the new wood was used.

As for the extent of detail decoration, the final finish of the statues will be determined after reinstallation to T57, in harmony with the final finish of the new wood in the restored areas of JASA.

h) Improvement of platform and stabilization of balustrade basement

Preliminary survey revealed that the surface of the platform faced the problem of horizontal opening gaps, inclination by displacement of floor elements. In particular, the most outer line of the surface layer were moved to the outside and causing the big gap with inner line where balustrade should be set on. Also, certain inclination could be seen that was too unstable to reconstruct without any treatment (Fig.4.8).

Thus, we dismantled basically only surface layer, remove

を特定することが難しい。こうした現状の劣化程度を考慮して仕上げの彫刻度合を決める必要がある。

以上のことから、JASA の専門家や技能員との議論の結果、確認された装飾のタイプを判別できない程度の概型まで成形を行い、それ以上の細部彫刻は行わないという方針をとることにした。最終的な置換用の新材斗束のデザインについては、基段上への仮組み作業の段階で、周囲の石材との調和を最優先した上で決定していく。

≫ライオン彫像の仕上げについて

新材の導入に関しては常にオリジナルの価値を失わないために、十分な議論が必要とされる。

バイヨン寺院にはライオン彫像が 28 体現存しているが、これらの彫像の装飾を比較したところ、基本的なデザインは同じであった。このことから、新材による補填を行なった箇所には、補填した箇所の周囲の彫刻の形状や他のライオン彫像との比較をもとに、彫刻の形状やその連続性が明らかな場合には、周囲に調和するように加工を施すことにした。

細部装飾をどこまで行うかという点については、T57 への再設置後、JASA の修復箇所の新材の最終仕上げとの調和を考えた上で、彫像の最終仕上げを決定していく。

h) 基壇整備作業、欄干基礎の安定化

事前調査より、欄干が設置される基壇床面では、床面の部材の変位により水平方向に大きな隙間や傾斜が生じてしまっていることが明らかになった。特に床面の最も端の石材が外側に変位してしまうことにより、その内側列との間に大きな隙間や傾斜が生じてしまい、基壇床面への何等かの処置を行わなければ、部材修理を完了した欄干石材を安定して設置することが難しい状況になっている箇所がこれまで修復したほとんどのエリアで確認された(Fig.4.8)。

したがって、当プロジェクトではこうした箇所に対し、問題となっている箇所について最低限の安定化処置を行ってきた。処置としては、基本的には欄干を設置する箇所の床面の層を一旦取り外し、石材同士の隙間に入り込んだ土や植生などを取り除く (Fig.4.9)。また、必要であれば取り外した床面の石材に適切な処置をおこない、再びこれらの床面の石材を隙間や傾斜をできる限り減らすよう設置しなおす (Fig.4.10)。それでもなお水平方向の隙間が大きい場合は、隙間に改良土 4 やラテライトチップを充填する場合もある。

一方エリア 71.1-1 では、基壇内部の版築盛土の沈下により基壇床面が大きく歪み、前述のような基壇床面の整備のみでは基壇床面と地覆の間に垂直方向の大きな隙間が生

the soils between the gaps and beneath the surface stones. (Fig.4.9) Also deteriorated platform elements received appropriate treatment and put back these elements. By these works, we could eliminate big gaps by pushing back the stones (Fig.4.10), though even there were still certain size of horizontal gaps remained were filled by laterite chip and soil 4.

Though, area 71.1-1 has more serious deformation of the platform by the subsidence occurred to the compacted soil inside the platform. And it seems to remain vertical direction gap between basement of balustrade and surface of the platform only by the improvement treatment as mentioned before. Therefore we insert the adjustment material (such as sandstone material and lead plate) under basement partially to the place where took the load of the balustrade when reconstruct balustrade. In addition, at gallery 56 restored in 1st phase, whole horizontal gap between basement and surface of the platform were filled by soil 4. Though this method caused phenomenon which rainwater remains for short time after heavy rain on the surface of the platform. Thus, we will changed method that not fill whole these horizontal gap at area 71.1-1. Also, we confirmed several stones of the surface of platform are lost in area 71.1-1 and impossible to install balustrade. In such case, supplementation by new sandstone was done.

■ Preventive conservation treatment

Among Naga balustrade and Lion statues which are not included in dismantling and reconstructing area above, there are some places that not so much to dismantle but are likely to become dangerous in the near future. For this kind of places, "preventive conservation treatment" will be

じてしまう可能性が判明した。そのため、欄干の再設置にあたっては、前述の基壇整備に加えて、地覆の下部に欄干の水平を保つための嵩上げ材（砂岩材、鉛プレート）を、欄干の荷重がかかる箇所に部分的に挿入した。なお、第1フェーズで修復を行った G56 では、同様に基壇整備後も垂直方向の隙間が大きかったため、欄干の安定化のため地覆と基壇床面の間全体を改良土等で埋めた。しかしその後、大雨の直後、基壇上に雨水等が短時間溜まってしまう現象がその後確認されたため、本エリアでは地覆下に挿入する嵩上げ材の間を埋めることはしない方針をとった。また、71.1-1 では欄干を設置すべき箇所の床面の石材が多く失われてしまっていたため、必要に応じてこうした箇所に新砂岩材による補てんを行った。

■ 予防保全処置

上記の解体・再構築対象に含まれないナーガ欄干や獅子像の中には、解体するほどではないが、近い将来危険な状態になる可能性がある場所もある。このような場所については、安定性を高めるために「予防的保存処置」が有効となる。そこで、上記の解体・再建工事と並行して、これら

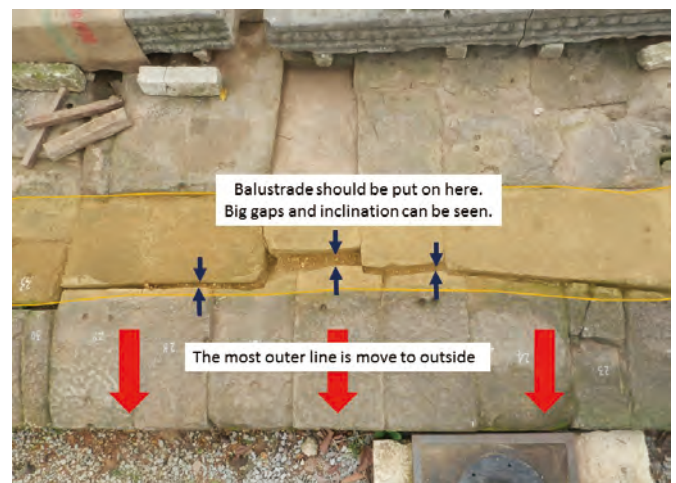


Fig. 4.8 Gap of the floor under the Balustrade



Fig. 4.9 Improvement of platform



Fig. 4.10 Improvement of platform

の場所の安定性を確認するための詳細な調査を行い、必要に応じて、欄干や彫像の安定性を確保するために、欄干と基壇との間に鉛板や砂岩板を挿入して調整する方針とした

g) 再構築の際の嵩上げ方法

再構築の際、欄干の高さを調整するための嵩上げは以下の方法で行われた。

- ・ 1 ～ 15mm の隙間：鉛板 + 消石灰混入モルタル + ポリマーセメントモルタル

- ・ 15mm ～の隙間：(砂岩材の薄板) + 鉛板 + 消石灰混入モルタル

※ 1：ポリマーセメントモルタルは、鉛板を固定させる程度。基壇での嵩上げのように内部の版築土などが流出するなどの危険性がないため、隙間を完全に詰める必要がないので、南経蔵のようにポリマーセメントを充填用には使用しない。

※ 2：将来的な修復にむけ、なるべく石材に負担が掛からないように取り外しが出来たほうがよいという点から、充填が必要な場合は消石灰混入モルタルを使用する（必要であればポリマーセメントモルタルでシーリングを行う）

valid to strengthen stability. Thus, beside dismantling and reconstruction work above, we plan to have detailed survey for check the stability for these places, and if necessary, lead plate or sandstone plate will be inserted for adjustment between balustrade and platform to ensure the stability of Naga balustrade or Lion Statue.

g) Raising method for adjustment

When reconstructing balustrade, raising for adjusting the height of the balustrade are done in the following way.

- 1-15mm: Lead plate+ calcium hydroxide soil mortar
- 15mm~: Sandstone spacer +Lead plate+ calcium

hydroxide soil mortar

*1: Polymer cement mortar is only used to hold the lead plate in place. Since there is no need to completely fill in the gaps because there is no risk of spillage of the interior slab soil, etc., as in the case of raising the building with a platform, polymer cement is not used for filling, as in the case of the Southern Library.

*2: Because when we reconstruct the platform, there are possibility that the inner soil would come out from the gap, but this time there is no such kind of danger, so in case we need to fill the gap, we use Calcium hydroxide soil mortar (it is good for remove in the future)

5. Restoration of Balustrade and Statue of Outer Gallery, BAYON

バイヨン外回廊の欄干と彫像の修復工事



5.1 Overview and Achievements of the Restoration work

バイヨン外回廊欄干と彫像の修復概要

This project was carried out in parallel with the landscape improvement project on the east side of the Outer Galleries from the 4th phase of the JASA project onward. On the east side of the Outer Galleries, where JASA had conducted the maintenance of the platform, the entire balustrade was targeted for dismantling and restoration. In other areas, such as the eastern causeway and the north, west, and south sides of the Outer Galleries, based on the aforementioned hazard map, partial dismantling, repair, and reconstruction were carried out for areas that had already collapsed, been damaged, or were at high risk of such damage. In areas aside from the east side, where uneven settlement of the platform was identified as the cause of collapse and damage, the surface stones of the platform were removed and the inner foundation soil of the platform was reformed to minimize distortion and gaps in the floor surface. Even in areas not targeted for partial dismantling, "preventive conservation methods" were taken to improve stability in areas where there was a risk of collapse in the future due to unstable conditions, and lead or sandstone slabs were inserted between the balustrade, statues, and platform as necessary.

The restoration treatment of the stones and the new material filling were done following JASA's policy, treatment methods, and materials. Since many balustrades and statues elements were found during the removal of mound soil next to the northwest platform in this project and during the sorting of scattered stones and removal of mound soil around the Bayon by JASA, the identification of these scattered elements was carefully carried out during the restoration of each area. When the original locations of balustrades and statues were identified, which were installed in different places during the previous restoration, they were moved to their original locations or replaced. In the end, 73 Naga statues, 721 balustrade elements, and 23 Lion statues were partially dismantled and repaired as a result of this project, completing the treatment of balustrades and statues in all areas of the Outer Galleries, including the eastern causeway, in eight years (Fig. 5.1).

本事業は JASA の第 4 フェーズ以降の外回廊東面景観整備事業と並行して進められた。JASA により基壇の整備が行われた外回廊東面においては、欄干全体を解体修復対象とした。それ以外の東参道、外回廊北・西・南面では、前述のハザードマップに基づき、すでに崩落、破損、あるいはその危険性の高い箇所を対象とし、部分的解体、修復、再構築を行った。東面以外のエリアでも基壇の不同沈下が崩落、破損の原因であると確認された箇所については、基壇の表層石材を外し、基壇内部の版築土を再構築することで、床面の歪みや隙間を最小限にする処置も行われた。また、部分解体の対象とならない箇所でも、不安定な状況から将来的に崩落の危険性がある箇所については、安定性を高める「予防的保存処置」がとられ、必要に応じて、欄干、彫像と基壇との間に鉛板や砂岩板を挿入し調整を行った。

石材の修復処置や新材補填は JASA の方針、処置方法、材料を踏襲して行われた。そのほか、バイヨン北西基壇脇での土砂の除去作業や、JASA によるバイヨン周辺での散乱石材整理や土砂の除去作業でも多くの欄干石材や彫像部材が発見されたことから、各エリアの修復時にはこれら散乱部材の同定作業が注意深く行われた。また、既往修復において原位置とは異なる場所に設置されていた欄干、彫像の原位置が特定された際は、原位置への移動や入れ替えを行った。最終的に当事業により部分解体、修理が施された部材は、ナーガ彫像 73 体、欄干部材 721 部材、ライオン彫像 23 体となり、8 年間で東参道を含む外回廊全エリアでの欄干、彫像に対する処置を完了した (Fig. 5.1)。

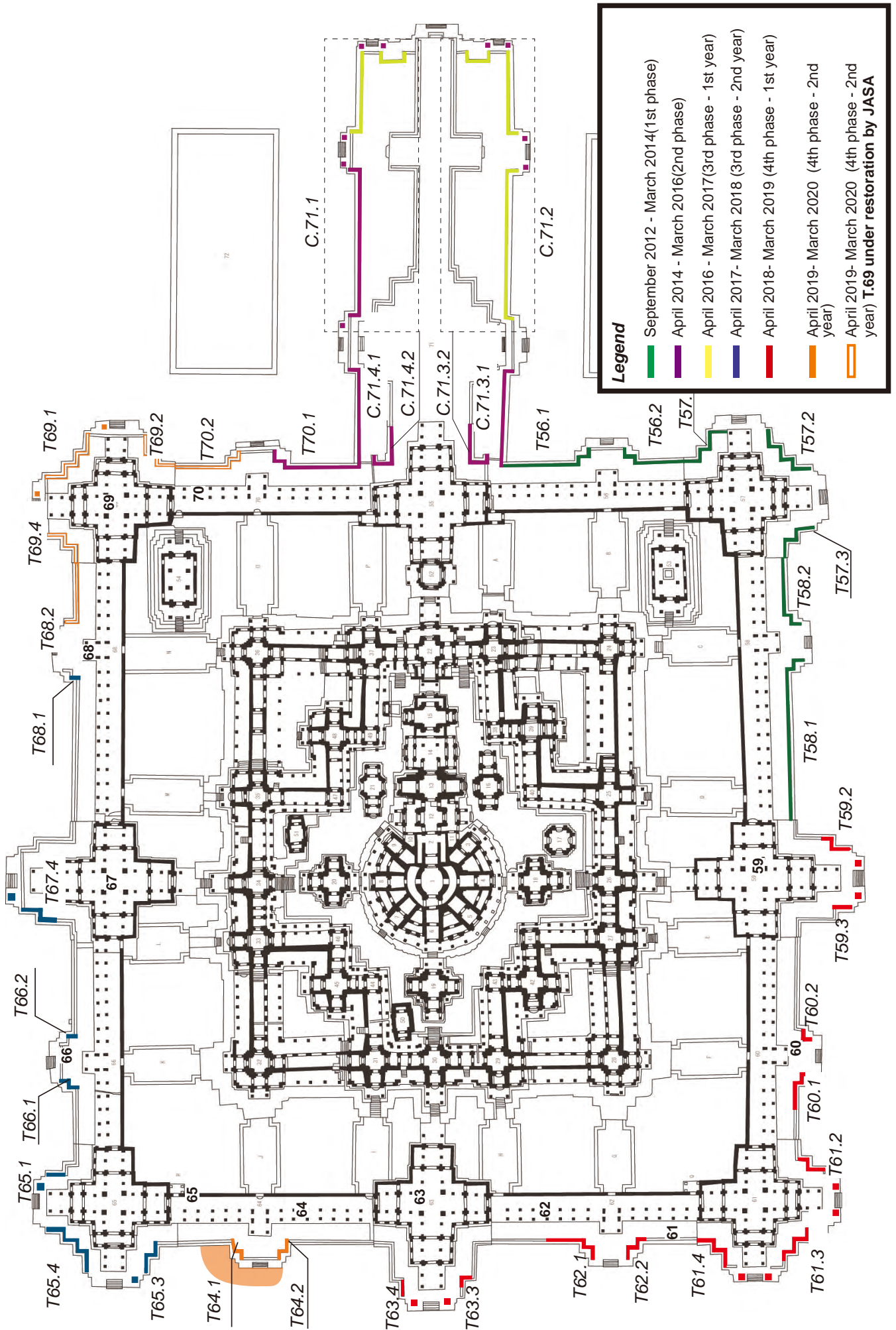


Fig.5.1 Restoration area in each phase

Tab.5.1 Schedule of restoration site from 9.2012-3.2014 [Phase 1]

Area	Work Items	2012				2013												2014		
		9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
T57	Site Preparing																			
	T57.3 Training for Drawing stones																			
	Repairing of each stone of balustrade																			
	Repairing of Naga Statue																			
	New Sandstone processing for filling base																			
	Assembling work of Balustrade and SinghaT.57																			
	Lion Repairing(New sandstone processing) of Lion Statue [S-gate of T57]																			
	Record and dismantling																			
	T57.2 Drawing stones before repairing																			
	Repairing of each stone of balustrade																			
	New Sandstone processing																			
	T57.1 Onsite training od record(post/base) before dismantling																			
	Dismantling northeast part of T57																			
	Repairing of balustrad																			
Assembling work of Balustrade and SinghaT.57																				
New sandstone processing of T57																				
Reconstruction of T57 after JASA paltform restoratio completed																				
G58	Repairing of scattering and newly found stones																			
	T58.2 Repairing of elements of east half of East wing of southern gallery																			
	※Balustrade of this part was already dismantled by JSA Phase 3																			
	Reconstruction of basements																			
	Drawing after restoration																			
	T58.1 Drawing record before dismantling[West part of Eblock]																			
	reparing of Basement, Handril, Post[West part of E block]																			
	trial assembling after JASA finished restoration of the platform																			
	New stone processing for basements																			
	Reignforcement and reconstructing of basement with soil 4																			
G56	Reconstruction of posts and handrail																			
	New stone processing for posts and handrails																			
	G56 Making grid line for drawing																			
	reparing of Basement, Handril, Post																			
	Assembling an Reconstruction work if balustrade [T56.2]																			
Assembling an Reconstruction work if balustrade [T56.1]																				
Identification of scattering and newlv found stones																				

Tab.5.2 Schedule of restoration site from 4.2014-3.2016 [Phase 2]

Area	Working	2014												2015												2016		
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
T56.1	Reinforcement and reconstructing of basement																											
	Drawing After restoration																											
	Preparation for 2nd Phase																											
71.3-1	Dismantling,record of each stone, and repairing of each stone																											
	Improvement of platform																											
71.3-2	Trial assembling																											
	Reconstruction and new sandstone processing																											
	Drawing before dismantling																											
	Dismantling,record of each stone, and repairing of each stone																											
71.4.2	Trial assembling																											
	Improvement of platform																											
	Reconstruction and new sandstone processing																											
	Drawing After restoration																											
71.4.1	Drawing before dismantling																											
	Dismantling,record of each stone, and repairing of each stone																											
	Record of each stone of scattering stone																											
	Trial assembling																											
	Improvement of platform																											
	Reconstruction and new sandstone processing																											
T70.2	Drawing After restoration																											
	Drawing before dismantling																											
	Dismantling and record of each stone																											
71.1-1	Trial assembling																											
	Drawing before dismantling																											
	Improvement of platform																											
	Repairing of Singha and Naga statue																											
	Dismantling,record of each stone, and repairing of each stone																											
	Trial assembling																											
	Reconstruction and new sandstone processing																											
NE Part	Drawing After restoration																											
	Dismantling, repairing of 4 Singha statues (No.71.1.9.1.2, 3, 4, 5)																											
	Maintenance of platform																											
71.2.1	Record by drawing before restoration																											
	Dismantling and repairing of each element at northern half																											
	Maintenance of platform																											
71.2.1	Trial assembling and new sandstone processing																											
	Dismantling, cleaning, repairing of 4 Singha statues No.71.2.1.9.1.1, 2, 3, 4																											
71.2.1	Finish repairing and new sandstones processing of statue No.71.2.1.9.1.2																											

Suspend work until JASA finish maintenance of platform (restart on 1.2016)

Tab.5.3 Schedule of restoration site from 4.2016-3.2018 [Phase 3]

Working			2016												2017		
			4	5	6	7	8	9	10	11	12	1	2	3			
71.1-1	Northeast	Maintenance of platform															
		Trial assemblign and new sandstone processing															
		Dismantling and repairing of each element at eastern half															
		Reconstruction work and new sanstone processing															
		Record by drawing after restoration															
71.2.1	Southeast	Record by drawing before restoration															
		Dismantling and record by photos of each element															
		Repair each elements and new sandstone processing															
		Trial assembling															
		Maintenance of platform															
		Reconstruction work and new sanstone processing															
		Record by drawing after restoration															
G.70-2		Reconstruction work after JASA finish maintenance of platform															
		Record by drawing after restoration															
71.2.1	West	Record by drawing before restoration															
		Dismantling and record by photos of each element															
		Repair each elements and new sandstone processing															
		Maintenance of platform															
		Reconstruction work and new sanstone processing															
G.56		Record by drawing after second reconstruction by JASA team															
T.69-3		Record by drawing before restoration															
T.69-2		Record by drawing before restoration															
T.69-1		Record by drawing before restoration															

Area	Working	2017												2018			
		4	5	6	7	8	9	10	11	12	1	2	3				
T68.1		On site training of survey instrument by JST to JST member															
		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
		Reconstruction work and new sandstone processing															
		Record by drawing after restoration															
T67.4		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
		Trial assembling															
		Reconstruction work and new sandstone processing															
T66.2		Record by drawing after restoration															
		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
		Reconstruction work															
T66.1		Record by drawing after restoration															
		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
		Reconstruction work															
T65.4		Record by drawing after restoration															
		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
		Maintenance of platform															
		Trial assembling															
T65.3		Reconstruction work and new sandstone processing															
		Record by drawing after restoration															
		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
T65.1		Trial assembling															
		Reconstruction work and new sandstone processing															
		Record by drawing after restoration															
		Record by drawing before dismantling															
T64.1		Set new restoration site															
		Dismantling and repairing of each elements															
		Reconstruction work and new sandstone processing															
		Record by drawing before dismantling															
T63.4		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
		Reconstruction work															
		Record by drawing before dismantling															
T61.3		Record by drawing before dismantling															
		Record by drawing before dismantling															
		Dismantling and repairing of each elements															
		Reconstruction work															

Tab.5.4 Schedule of restoration site from 4.2018-8.2020 [Phase 4 and Extension term]

Working		2018												2018		
		4	5	6	7	8	9	10	11	12	1	2	3			
T63.3	Dismantling and repairing of each elements															
	Reconstruction work and new sandstone processing															
T61.3	Record by drawing before dismantling															
	Dismantling and repairing of each elements															
T61.3	Reconstruction work and new sandstone processing															
	Reconstruction work that stones found form T60.1 and T61.3 to the original place															
T61.4	Record by drawing before dismantling															
	Dismantling and repairing of each elements															
T62.2	Reconstruction work															
	Record by drawing before dismantling															
T62.1	Dismantling and repairing of each elements															
	Reconstruction work and new sandstone processing															
T61.2	Record by drawing before dismantling															
	Dismantling and repairing of each elements															
T60.1	Maintenance of Platform															
	Reconstruction work and new sandstone processing															
T60.2	Record by drawing before dismantling															
	Dismantling and repairing of each elements															
T59.3	Reconstruction work and new sandstone processing															
	Record by drawing before dismantling															
T59.2	Dismantling and repairing of each elements															
	Reconstruction work															
T69.1	Record by drawing before dismantling															
	Dismantling and repairing of each elements															
T69.2	Reconstruction work and new sandstone processing															
	Record by drawing before dismantling															
T69.4	Dismantling and repairing of each elements															
	Reconstruction work and new sandstone processing															

Working		2019												2020							
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8			
T70.1	Record by drawing before dismantling																				
	Dismantling and repairing of each elements																				
T69.4	Trial assembling																				
	Joined to begin reconstruction in collaboration with JASA																				
T69.1	Dismantling and repairing of each elements																				
	Trial assembling on the ground(final reconstruction will be done by JASA)																				
T69.2	Record by drawing before dismantling																				
	Trial assembling on the ground(final reconstruction will be done by JASA)																				
T64 clearance	Record by drawing before excavation and restoration																				
	Set up site, make grid on the ground																				
T64.1	Clearance of the mound																				
	Record of the artifact and elements found from mound																				
T64.2	Stone repairing of excavated elements and dismantled elements																				
	Trial Assembling																				
T65.1	Finishing new sandstone processing and reconstructing																				
	Finish recording by drawing after reconstructing																				
T63.4	Record by drawing before excavation and restoration																				
	Dismantling and repairing of each elements																				
T60.18	Trial Assembling																				
	Maintenance of Platform																				
T62.18	Reconstruction work and new sandstone processing																				
	Finish recording by drawing after reconstructing																				
T61.18	Record by drawing after reconstructing																				
	Partially trial assembling and starting reconstructing																				
T60.18	Partially reconstruction work and new sandstone processing																				
	Finish recording by drawing after reconstructing																				
T60.18	Finish recording by drawing after reconstructing																				
	Finish recording by drawing after reconstructing																				

5.2 Contents of restoration work for each phase

各フェーズの修復作業内容

Since the restoration details for each area are described in detail in the Area Report, this section outlines the overall restoration workflow.

5.2.1 Phase 1: 9.2012-3.2014.3

The first restoration target was the Naga balustrade and the Sinha statues in the southeast corner of the outer gallery, T57, where the restoration work for the fourth phase of JASA was being conducted. The new technical staff employed by the project had no experience in restoration activities and needed to acquire skills and experience through on-site job training by JASA experts and technical staff, so T57 was selected as the first target. A work hut was set up within the limits of JASA's restoration site for drying and repairing the stones after cleaning. For the processing of new stone, which requires a large stone cutting machine, equipment was lent at JASA's work site, located on the south side of the Royal Palace plaza.

The first part of the training for the new technical staff was the drawing of the drawings of the stones before restoration. They were instructed on how to draw and plot the balustrade elements in the southwest area of T57, which had already been recorded and dismantled by JASA. Then, based on the repair specifications for the sandstone stones, the team received training on repair methods and how to handle the stones. In November, training began for the processing of new sandstone material for supplementation with new sandstone material, and supplementation to the basement, handrail, post, and Lion statue.

In December, the partial dismantling of the balustrade of T57.2 was started, and after recording the drawings of each stone before restoration, the repair work was begun. After completing the repair of the balustrade elements and the Lion statue at T57.2, the work was shifted to T58 on the south side of the outer gallery in February. The work was not covered by JASA's restoration target. The generator and air compressor, which had been partially loaned to the project, were prepared from the project budget and installed at the restoration site. Unlike T57, T58 did not have the grid required for recording drawings prior to dismantling, so the process began with the use of a level, transit, and other equipment to draw the grid to the site. In addition, to allow work to proceed without

各エリアごとの修復内容については、エリアレポートに詳細を記述しているため、ここでは、修復工事全体の流れについて概要を述べる。

5.2.1 第1フェーズ: 2012.9-2014.3

最初の修復対象としたのは、外回廊、南東隅建物 T57 のナーガ欄干およびシンハ彫像であり、当エリアは JASA の第4フェーズの修復工事が行われている箇所であった。当事業で雇用した新技能員は修復活動における経験がなく、JASA 専門家や技能員によるオンサイト・ジョブ・トレーニングを通じて、技術や経験を身につける必要があるため、T57 を最初の対象とした。JASA の修復現場範囲内に、石材の洗浄後の石材の乾燥、修理作業を行うための作業小屋を設置した。大型の石材の裁断機が必要となる新材の加工については、王宮前広場南側に位置する、JASA の作業現場にて機材の貸与を受けた。

新技能員へのトレーニングとして最初に行なったのが、修理前石材の図面を描く作業である。すでに JASA により解体前記録、解体が行われた T57.3 の欄干部材を対象として、図面の書き方、図り方の指導を受けた。その後、砂岩石材の修理仕様に基つき、修理方法や石材の扱い方についてトレーニングを受け、石材の修理を進めた。11 月に入り、新砂岩材による補填のための新材加工のトレーニングを開始、地覆、架木、斗束およびライオン彫像への補填を行った。

12 月に入り T57.2 の欄干部分の解体を開始、各石材の修復前図面記録の後、修理を開始した。1 月の T57 北東区域の開始は、解体前の図面記録に関するトレーニングを JASA 技能員から受け、修復を進めた。その後、T57 の欄干部材、ライオン彫像の石材修理をすべて完了したため、2 月より、外回廊南側 T58 に対象をうつした。JASA の修復対象外での作業となり、これまで一部貸与をうけていたジェネレーター、エアコンプレッサーなどを当事業予算で準備し、修復現場に設置した。T58 では、T57 とは異なり、解体前図面の記録に必要なグリッドが用意されていなかったため、レベル、トランジットなどを使用してグリッドを遺跡にひく作業から行った。また、クレーンなどの大型の機材なしでも作業が進められるように、三又を導入し、基段上での修復作業ができるように、工程を改良した。

3 月からは、新たに外回廊東側、南側 (T56) での修復を



Fig.5.2 Onsite job training for stone processing



Fig.5.3 Onsite job training for stone repairing



Fig.5.4 T.57.2: Re-install of Lion Statue



Fig.5.5 T58.1: Improvement of Platform



Fig.5.6 T.58.1: New sandstone supply for basement



Fig.5.7 T.58.1: Finished of installation of balustrade



Fig.5.8 T.56.2: Improvement of Platform around Stair



Fig.5.9 T.56.2: Reconstructing work

large equipment such as a crane, a tripod was introduced and the process was improved to allow restoration work to be performed on the platform.

In March, restoration work was newly started on the east and south sides of the outer gallery (T56). Since June 2013, when the platform maintenance work at T57 by JASA was completed, the balustrade and statues at T57 were reinstalled with the help of JASA technical staff, who were trained on the process of temporary assembly and reinstallation. At this time, it was also necessary to consider the method of raising the balustrade and statues to stabilize them, both in terms of construction method and materials, and a method was developed with experts from JASA (see Chap. 4 for details). Work on T57, 58, and 56 was almost completed by March 2014.

5.2.2 2nd Phase: 2014.4-2016.3

The second phase of the project began in April 2014. The second phase mainly focused on the Eastern Causeway and the T70 outer gallery adjacent to the Eastern Causeway. This site was adjacent to JASA's work on the east central tower of the outer Causeway (T55), and also partially overlapped with the excavation area of the archaeological survey of the Eastern Causeway conducted during FY2014.

From May to July 2014, work proceeded on dismantling and repairing balustrade elements in areas 71.3-1, 71.3-2, 71.4-2, and 71.4-1. The excavation by the JASA archaeological team then started from the area around T55 to the Eastern Causeway, and areas 71.3-1, 71.3-2, and 71.4-2 overlapped with the scope of the excavation. Work continued only on the platform and temporary assembly at 71.4-1, an area outside the excavation area. The restoration work in the western half of Area 71.4-1 was completed in October, and the restoration work in Area G70-2 began in November. In December, the restoration of the platform in the west half (northwest) of Area 71.1-1, and the dismantling and restoration of the Sinha and Naga statues and balustrade elements were started. Temporary assembly, reconstruction, and processing of new sandstone material as needed began in March, and all work in this area was completed in June 2015.

The JASA archaeological team's excavation of the area near T55 and the Eastern Causeway was almost entirely completed in April 2015, making it possible again to restore the balustrade in the area near the T55 tower, where work had been suspended when the member repairs were completed in July 2014. Therefore, in June 2015, work began

開始した。2013年6月より、JASAによるT57での基壇整備作業が終了したため、JASA技能員の協力を得て、仮組みと再設置の工程について、トレーニングを受け、T57における欄干および彫像の再設置を行った。この際、欄干や彫像の安定化のための嵩上げ方法についても同時に工法、材料ともに検討を進める必要があり、JASAの専門家を交えて方法を策定した(Chap.4に策定内容あり)。T57, 58, 56での作業は2014年3月までにほぼ完了した。

5.2.2 第2フェーズ: 2014.4-2016.3

2014年4月より第2フェーズを開始した。第2フェーズで対象としたのは主に東参道とそこに隣接する外回廊T70である。この場所は外回廊東中央塔(以下T55)で整備事業を進めるJASAの作業現場と隣接しており、また2014年度中に行われた東参道における考古学的調査の発掘調査範囲とも一部重複していた、JASAの修復工程やスケジュールを考慮し、協力しながら工事を進めた。

2014年5月～7月にかけて、エリア71.3-1、71.3-2、71.4-2、71.4-1での欄干の解体・部材修理作業が進められた。その後、JASA考古学班による発掘調査がT55周辺から東参道にかけて開始され、エリア71.3-1、71.3-2、71.4-2がその調査範囲と重なったため、これらT55塔付近のエリアでは部材修理作業が完了した段階で一旦作業を中断し、発掘調査範囲から外れたエリア71.4-1での基壇整備および仮組み作業のみ継続した。このエリアでは、欄干を再設置するにあたり、その直下の基壇の石材が大きく変位していたため、基壇整備作業には多くの時間を要した。10月にエリア71.4-1西半分での修復を完了したため、11月よりG70-2での修復工事を開始した。G70-2はJASAによって同範囲の整備事業を行うことが決定したため、解体と部材修理が終わった時点で一旦中断し、その後の作業はJASAの整備作業が完了してから再開する予定である。12月からエリア71.1-1西半分(北西)での基壇整備、およびシンハ彫像、ナーガ彫像、欄干部材の解体・部材修復を開始した。3月より仮組み作業、再構築作業および必要に応じて新砂岩材の加工作業を行い、2015年6月にこのエリアでのすべての作業を終了した。

JASA考古学班によるT55付近・東参道の発掘調査が2015年4月にはほぼすべて完了し、2014年7月に部材修理が完了した段階で作業が中断されていたT55塔付近のエリアでの欄干修復作業が再び可能となった。そのため、2015年6月からは、エリア71.3-2および71.3-1での仮組み、再構築作業を開始した。7月にはエリア71.3-2での修復作業がほぼすべて完了したため(ナーガ彫像一体をのぞき)、

on temporary assembly and reconstruction in areas 71.3-2 and 71.3-1. In July, almost all restoration work in area 71.3-2 was completed (except for one Naga statue), and in August, in parallel with 71.3-1, temporary assembly, platform The restoration work in both areas was completed in October. After that, from November onward, the restoration of 71.1.1 and 71.2.1, i.e., the Lion statues near the main entrance of the Eastern Causeway, proceeded. The distortion of the Eastern Causeway platform was so large that when the Lion statues were reinstalled, they were placed after placing soil improvements directly under the statues and building up the slabs. These works were completed in February 2015, and in preparation for the third phase, we began recording pre-restoration drawings of the eastern half of 71.1.1 (northeast) in March.

8月からは71.3-1と並行してエリア71.4-2での仮組み、基壇整備、再構築作業を開始、10月には両エリアでの修復工事を終えた。その後、11月以降は71.1.1、71.2.1、すなわち東参道の正面入り口付近のライオン彫像の修復を進めた。東参道は基壇の歪みが大きく、ライオン彫像を再設置する際には、彫像直下に改良土をいれ、版築を行った上で設置した。これらの作業は2015年2月に終え、第3フェーズの準備として3月からは71.1.1 東半分（北東）の修復前図面記録を開始した。



Fig.5.10 C71.4.1:Improvement of Platform



Fig.5.11 C71.4.1:Reconstructing work



Fig.5.12 C71.3.2: New Sandstone Supply for Naga



Fig.5.13 C71.2.1: Repairing of Lion Statue



Fig.5.14 C71.4.2: Reconstructing and New sandstone processingWork

5.2.3 Phase 3: April 2016 - March 2018

From Phase 3, two new staff members were hired from the neighboring village of Leang Dai as technical staff to improve the efficiency of work at the site, resulting in a total of 1 specialist and 8 technical staff members.

In April 2016, the restoration of the Naga balustrade in the northeast half of Area C71.1-1 (the west half of this area was completed in Phase 2), where drawing records, dismantling of balustrade elements, and restoration had begun in February 2016, proceeded. Since the collapse of the balustrades and statues in this area was caused mostly by the uneven settlement of the platform, the platform was leveled to the extent possible in this project, and sandstone slabs were inserted as bulking materials in areas where the stability was still insufficient. However, the locations of these substitute bundles were changed as necessary to accommodate the newly developed platform and the original location of the balustrade. Special attention was paid to the Naga statue in the northeast corner. For this Naga statue, two parts that were not originally identical in the previous restoration were joined together as a single Naga statue part. To ensure that the Naga statue could be installed in a stable condition, these two parts were not connected again, and the body part of the Naga head was newly fabricated. The length of the Naga's body was determined by referring to the traces of the funnel bundle left on the ground cover (Fig.5.18).

At the end of June 2016, all restoration work in the northeast area of C71.1.1 mentioned above was completed, followed by a pre-demolition survey and drawing documentation in the southeast area of C71.2-1 starting in June. The maintenance and reconstruction of the platform began in late July, after which the balustrade elements were dismantled and the repair of each partial dismantling and the processing of new sandstone compensations for the missing parts were proceeded. Compared to other areas of the approach, the unequal settlement of the platform was wider, especially near the stairway, and it was difficult to perform maintenance only directly under the balustrade, so maintenance was performed up to 2 m inside the balustrade (Fig.5.16). The unequal settlement of the platform structure was most pronounced at the west end of the balustrade at the southeast stairway of the causeway. Here, settlement of more than 60 cm was observed. This made the balustrades, including the Naga statues, very unstable and required extensive adjustments to keep all the balustrades at the same height. Therefore, laterite blocks and improved soil⁴ were used to fill the vertical and horizontal gaps in the surface layer, and four new sandstone blocks were inserted in the

5.2.3 第3フェーズ: 2016.4-2018.3

第3フェーズより、現場での作業効率を考え、新たに2名のスタッフを近隣村 Leang Dai 村から技能員として雇用し、専門家1名、技能員8名の体制で作業を開始した。

2016年4月からは、2016年2月から図面記録、欄干部材の解体、修復が開始されていたエリア C71.1-1 北東半分（このエリアの西半分は第2フェーズで完了）のナーガ欄干の修復が進められた。当エリアの作欄干や彫像の崩落の要因の多くが基壇の不同沈下にあったことから、当プロジェクトで可能な範囲で基壇の水平化を行い、それでも安定性が十分でない箇所には嵩上げ材としての砂岩板を挿入するなどした。本プロジェクトの方針として、オリジナルの斗束が見つからない限りは、既往修復にて挿入された代用斗束を再利用することとしているが、新たに整備された基壇状況や、欄干の原位置特定に伴い、これらの代用斗束の位置は適宜変更された。北東の角にあるナーガ像については特に注意が必要であった。このナーガ像については、既往修復で本来同一部材でない2つの部材同士が1つのナーガ像パーツとして連結されていた。ナーガ像が安定した状態で設置できるように、この2つのパーツは再び接続しないことにし、ナーガ頭部の胴体部分を新たに製作した。ナーガの胴体の長さは、地覆にのこされた斗束の痕跡を参考にして決定された (Fig.5.18)。

2016年6月末に前述の C71.1.1 北東エリアでの全ての修復作業が完了したため、続いて C71.2-1 の南東部での6月から解体前の調査と図面による記録を開始した。その後、欄干の解体、各部材修理と、欠損部分の新しい砂岩補填加工を進めた7月下旬から基壇の整備と再構築を開始した。参道の他のエリアと比較して、特に階段付近で基壇の不同沈下の範囲が広く、欄干直下のみのメンテナンスを実施することが困難であったため、欄干の2m内側までメンテナンスを行った (写真 5.16)。基壇構造物の不同沈下は、土手道南東階段の欄干西端で最も顕著であった。ここでは60cm以上の沈下が見られた。このため、ナーガ像を含む欄干が非常に不安定な状態になり、すべての欄干を同じ高さに保つために大規模な調整が必要となった。そのため、ラテライトブロックや改良土⁴で表層の縦横の隙間を埋め、また、ナーガ欄干の高さを他の箇所と合わせるために基壇に新たに砂岩ブロックを4個挿入した (Figs.5.23-5.28)。最終的に、9月末に C71.2-1 の南東部全体の復元作業が完了し、10月に復元後の図面による記録を行った。

2016年10月、南東部の復元工事が終了した直後、一部の図面作成メンバーを除くほとんどのメンバーが C71.2-1 西側エリアに移動し、解体前の図面作成を開始、欄干の



Fig.5.15 Before restoration at Northeast part of C71.1-1 .Platform was heavily distorted.



Fig.5.16 Maintenance were performed 2 m inside the balustrade/71.2.1.



Fig.5.17 Insert new sandstone plate for support under the basement /71.1.1



Fig.5.18 Reconstruction work/ 71.1.1 west part



Fig.5.19 Before restoration at East gateway of causeway/ C71.2-1



Fig.5.20 Reconstruction work, adjusting post height/ C71.2-1 east part



Fig.5.21, 5.22 Before and After restoration, Newsandstone bansement was inserted instead of substitute element/ 71.2.1



Fig.5.23, 5.24 More than 60cm subsidence at southeast gate of causeway(71.2-1). Naga and Lion statues are at danger of collapse.



Fig.5.25, 5.26 Large scale platform improvement was implemented. Laterite and Sandstone were inserted under the Balustrade.



Fig.5.27, 5.28 After improvement of platform, Naga Balustrade were reconstructed. New sandstone was added for Post and Basement in need.



Fig.5.29, 5.30 Due to the deterioration of the concrete material from the previous restoration and the danger of collapse, the lion's four legs were replaced with new sandstone.C71.1-1(71.1.1.9.1.4)

platform to match the height of the Naga balustrade with the other sections (Figs.5.23-5.28). Finally, the restoration of the entire southeastern portion of C71.2-1 was completed at the end of September, and the restoration was documented with drawings in October.

In October 2016, immediately after the restoration of the southeast section was completed, most members of the team, with the exception of some drawing members, moved to the west side area of C71.2-1 to begin drawing before dismantling and dismantling the balustrades. After repairing the balustrade elements, a method of reinstalling the balustrade was explored by the temporary team, and it was confirmed that it would be difficult to reuse the substitute bundles that had been inserted in some of the previous repairs, so bundles were made from new wood and inserted.

The partially missing ground cover was also made of new sandstone. In parallel, the platform was reassembled, and the reconstruction work was completed in mid-January 2017.

In between these operations, the reconstruction work at T70.2, where JASA had already completed the platform construction (temporary assembly had been completed by the second phase of the project), and the post-restoration drawings were recorded. The balustrade at G56 was reassembled and reconstructed by JASA after its re-installation in the first phase of the project.

After the restoration of the Eastern Causeway was completed, the restoration area was moved to the north, west, and south sides of the outer gallery, which were not included in the scope of JASA's "Outer Gallery East Facade Improvement Project. As mentioned in Section 3.4.2, the restoration work on the north, west, and south facades of the outer gallery, where no major maintenance of the outer gallery platform has been done, will not cover all balustrades due to project time and budget considerations, but will instead focus on the most urgent areas based on a preliminary survey. Based on a preliminary survey, it was decided to target areas of high urgency for demolition and reconstruction. In addition, as the project staff was leaving the JASA work site, they were no longer able to use the large cranes and other equipment that had been loaned to them from time to time, so they received training from JASA staff to enable them to use and manage the mini-cranes. The work began at T68.1 and basically proceeded counterclockwise around the outer gallery. With the change in the work site, the work site and equipment storage shed with scaffolding (loaned by JASA) and sheeting were moved and set up as the restoration work moved, in consideration of safety and flow lines for tourists.

From April to June 2017, pre-restoration drawing

解体を開始した。欄干部材修復後、仮組にて欄干の再設置方法が模索され、一部の既往修復にて挿入された代用斗束の再利用が困難であることが確認されたため、新材にて斗束を製作し、挿入した。また、一部欠落していた地覆も新しい砂岩にて作成した。平行して基壇整備がおこなわれ、2017年1月中旬に再構築作業が完了した。

こうした作業の合間に、JASAによる基壇整備工事が完了したT70.2での再構築作業(仮組作業までを第2フェーズまでに完了していた)、修復後図面記録を行った。G56では当プロジェクト第1フェーズで再設置を行った後、JASAによる大規模な基壇整備を行うことが決定したため、いったん欄干が再解体され、JASAによって再再構築されたため、2016年1月～3月にはその再再構築後の図面記録を実施、T69での修復前図面記録を行った。

東参道での修復が完了したのは、JASAによる“外回廊東面整備事業”の対象範囲ではない、外回廊北・西・南面へ修復対象エリアを移すこととなり、2017年4月から2018年3月にかけてはT68.1、T67.4、T66.1、T66.2、T65.1、T65.3、T65.4の修復作業を実施することとなった。3.4.2にて前述したとおり、外回廊基壇の大規模な基壇整備が行われていない外回廊北・西・南面では、プロジェクトの期間を予算を考慮し、すべての欄干を対象とせず、事前調査に基づいて、緊急性の高い箇所を解体再構築の対象とすることにした。また、JASAの作業現場と離れるにあたり、これまで時折貸与を受けていた大型クレーンなどの使用ができなくなったため、ミニクレーンの使用・管理を当プロジェクトスタッフも行えるよう、JASAスタッフから研修を受けた。また、作業はT68.1から始まり、その後基本的には外回廊を反時計周りに進んで修復が行われることとなった。また、作業現場の変更に伴い、観光客への安全性と動線に配慮し、足場(JASAより貸与)とシートによる作業現場と機材の保管小屋を修復工事の移動に伴い移動・設置した。

2017年4月～6月までは、該当エリアの修復、解体範囲に関する協議が続いていたため、現場では修復前図面記録が進められた。7月にAPARAの許可が下り、本格的な修復作業に入った。2班に分かれて作業を進め、3名で構成されるグループAは主に図面記録を担当し、修復前、修復後の図面記録を反時計周りに進めていくこととなった。もう一方の5名のグループBが、欄干・彫像の修復を主に担当した。当然、必要に応じて全員で作業に当たることもあった。

2017年7月よりT68.1で手すりの各要素の解体と修復を開始し、8月中旬に、T68.1の復元と復元後の図面によ

recording proceeded at the site as discussions regarding the scope of restoration and demolition of the area in question continued; in July, APARA's permission was granted and full-scale restoration work began; work proceeded in two groups, with Group A, consisting of three members, being primarily responsible for drawing recording, pre-restoration, Group A, consisting of three members, was mainly in charge of recording the drawings before and after restoration, working counterclockwise. The other group, Group B, consisting of five members, was primarily responsible for restoring the balustrade and statues. Naturally, all members of the group sometimes worked together as needed.

Dismantling and restoration of each element of the balustrade began at T68.1 in July 2017, and by mid-August, the restoration of T68.1 and documentation with drawings of the restoration were completed. A new site was then set up to begin demolition of T67.4. This area was difficult to dismantle the elements and determine the extent and method of restoration, and JASA experts advised on a detailed restoration plan for the balustrade elements and the Lion statue(Fig.5.31), after which the dismantling, repair of elements, temporary assembly, and reconstruction work began. In parallel with this work, on-site training on mini-crane operation was started by JASA for JST technical staff. In T64.1, the documentation work with drawings prior to dismantling was completed; in October, Group B started dismantling work on T66.1 and T66.2, and all the reconstruction work was completed in 3 weeks because of the limited number of components that needed to be dismantled or repaired in this area.

The restoration of T65.4 and T65.3 took place from November 2017 to February 2018. restoration work proceeded at two sites (T65.1 and T63.4) starting in March. one group continued work at T65.1 from last month and completed the reconstruction work in the third week. The other group began demolition work at T63.4 and completed reconstruction in the fourth week. Subsequently, the original schedule was to finish T63 before starting T62, but due to concerns that the area around T61 would be flooded if the rainy season began in May or June, it was decided to start T61 first, followed by T62.

る記録を完了した。その後、T67.4の解体作業を開始するため、新たな現場を設営した。このエリアは、部材の解体、修復範囲や方法の決定が難しく、JASAの専門家から、欄干とライオン彫像の詳細な復元計画についてアドバイスを受け (Fig.5.31)、その後、解体、部材修理、仮組、再構築作業が開始された。この作業と並行して、JASAからJST技術職員へのミニクレーン操作の現場研修が開始された。9月末に、T67.4の再構築作業は終了した。また、T64.1では、解体前の図面による記録作業が終了した。10月よりグループBがT66.1とT66.2で解体作業を開始し、当エリアでは、解体や修理が必要な部材が限られていたため、すべての再構築作業を3週間で完了した。

2017年11月から2018年2月にかけてT65.4, T65.3の修復が行われた。3月より2箇所 (T65.1、T63.4) で修復工事が進められた。1つのグループはT65.1で先月から引き続き作業を行い、3週目に再構築作業を完了した。もう1つのグループはT63.4で解体作業を開始し、4週目に再構築を完了した。その後、当初スケジュールでは、T63を終えてからT62を開始する予定だったが、5月か6月に雨季が始まった場合、T61周辺が浸水することが懸念されたため、T61を先に開始し、その後にT62を開始することにした。



Fig.5.31 Repairing of Lion statues at T67.4. It was broken in twoparts without previous treatment.



Fig.5.32, 5.33 Discussion with JASA experts on restoration methods(left). The concrete pillars of the previous restoration were to be removed and new sandstone material was to be inserted into the platform(right)/T67.2.



Fig.5.34 Reconstruction of balustade/T67.2.



Fig.5.35 Remove of deteriorated mortal of Naga



Fig.5.36, 37 Before restoration, the Naga statue at T65.3 had no trunk and couldn't stand without many iron pin inserted in previous restoration. However, we could found piece of trunk from scatter stone near this area, so that this statue could stand without support oafter restoration.



Fig.5.38, 5.39 [T65.4]Before(left) and after(right) resotration

5.2.4 Fourth phase: 2018.4-2020.3**Extension period: 2020.6-2020.8**

The fourth phase of the project began in April 2018. The work continued with basically two teams, divided into drawing versions and restoration work; from April (as a continuation of the March work), the reconstruction of T63.3 proceeded, and during April, the reconstruction of the balustrade was completed and the work moved to T61.3. In this area, there were concerns that the ground conditions would deteriorate as the rainy season progressed, and since the preliminary survey confirmed that there was no need to move the components, we dismantled the area in order, repaired and reconstructed it, and finished the work in this area by the end of June.

The work was then shifted to T62.2, and after recording the dismantling, dismantling, repair, and reconstruction work proceeded, with all restoration work being completed by the end of August. The site was then moved to T62.1 and all work was completed in mid-October; T61 was moved to T61.2 after the completion of work on T62.1 and restoration was completed during November, since the restoration of T61.3 and T61.4 had been completed before the 2018 rainy season and only T61.2 was left; in December, T60.1 restoration work was started. In January, T60.1 reconstruction work was completed in the third week, and T60.2 dismantling and repair work was started and completed in February. In March, T59.2 restoration work was started and completed, including platform maintenance and reconstruction. In collaboration with JASA, the dismantling of three sections of T69 (T69.1, T69.2, and T69.4) and their respective photographic documentation were completed prior to the restoration of the northeast section of Bayon temple.

With the start of JASA's restoration at T70 and T69 in April 2019, the project members also moved to document the pre-restoration drawings of the balustrade prior to the demolition by JASA, and this process continued until July. T64 on the north side of the west facade of the Bayon outer gallery had a mound that covered the platform right next to the platform, and many of the balustrade elements around the mound had collapsed or been lost, posing a major problem from a landscape perspective. It was decided that this mound would be removed under this project, and earth clearance work on the mound was conducted from August to September 2019. As described in detail in Section 5.3 below, many balustrade elements were unearthed as a result of this earth clearance work, and a large-scale restoration of the T.64 balustrade was conducted from October to January 2020 to incorporate these unearthed elements. In addition, a balustrade with a

5.2.4 第4フェーズ: 2018.4-2020.3**延長期間: 2020.6-2020.8**

2018年4月より第4フェーズを開始した。引き続き、基本的には2班体制をとり、図面版と修復作業に分かれて作業が進められた。4月からは(3月の継続作業として) T63.3の再構築作業が進められ、4月中に欄干の再構築を終え、T61.3へ移動した。このエリアは、雨季が進むにつれて、周辺の地盤の状態が悪化することが懸念され、事前調査から部材移動の必要性がないことが確認されたため、修復前記録を終えた箇所から順次解体し、修理、再構築を行い、6月中に当エリアでの作業を終了した。6月末より7月末にかけてT61.4を対象とした。

続いてT62.2へと対象を移し、解体前記録後、解体、修理作業、再構築作業が進められ8月中に全ての修復作業を完了。続いてT62.1へと現場を移し、10月中旬にすべての作業を完了した。T61は、2018年の雨季前にT61.3とT61.4の修復が完了しており、T61.2のみが残されていたため、T62.1の作業完了後にT61.2に移動し、11月中に修復を完了した。12月に入り、T60.1の修復工事に着手、1月にT60.1の再構築作業が3週目に終了し、T60.2の解体・修理作業を開始、2月に工事を完了した。3月はT59.2の修復作業を開始、基壇整備、再構築などの作業を完了した。また、JASAとの共同作業により、バイヨン寺院北東部の修復に先立ち、T69の3箇所(T69.1、T69.2、T69.4)の解体と各写真による記録を終了。

2019年4月より、JASAのT70、T69での修復開始に伴い、本プロジェクトメンバーも移動し、JASAによる解体工事前、欄干の修復前図面記録を行い、7月までこの作業が行われた。バイヨン外回廊西面北側のT64は基壇すぐ脇に基壇を覆い隠すほどのマウンドがあり、その周辺の欄干部材は多くが崩落、あるいは失われており、景観的にも大きな問題を抱えていた。本マウンドを当プロジェクトにて除去することが決定したため、2019年8月から9月にかけて、マウンドの土砂クリアランス作業が行われた。次節5.3にて詳述するように、本土砂クリアランス作業によって多くの欄干部材が出土したため、10月から2020年1月にかけてこれら出土部材を合わせてT.64の大規模な欄干修復工事が実施された。また、すでに修復を終えていたT.63に設置することが可能な、原位置が特定された欄干もT.64に見つかったため、これらの入れ替え作業なども行われた。

2020年2月からはT70がJASAによる基壇整備工事が開始されたため、当プロジェクトメンバーもT70のJASA現場に加わり、共同で欄干の解体作業を行うこととなった。これらの作業の合間に、図面版はT.62, 61, 60での修復後

specific original location that could be installed in T.63, which had already been restored, was also found in T64, so these balustrades were also replaced.

In February 2020, JASA began work on the platform of T70, and the project members joined JASA at the T70 site to jointly dismantle the balustrade. In between these works, the drawing version was used to record the post-restoration drawings at T.62, 61, and 60.

The restoration of the balustrade elements at T70 and T69 remained to be completed, and with the understanding of the NFUAJ, an additional three-month extension period (June-August 2020) was granted. The balustrade was temporarily placed on the ground near T69 because the restoration of T69 by JASA was not yet expected to be completed, and JASA would be responsible for reinstalling the balustrade once the restoration of the T69 platform by JASA was completed.

In August 2020, the restoration of all Naga balustrades and statues covered by this project was completed, bringing the project to a successful conclusion.

図面記録作業を行った。

T70, T69 での欄干修復作業が残されていたため、NFUAJ の理解の元、追加で 2020 年 6 月—8 月の 3 か月間延長期間が設けられることとなり、この 3 か月間、JASA と協力しながら同エリアでの部材修復作業を行い、完了した。JASA による T69 の修復作業がまだ終わられる見込みがないため、欄干は T69 近傍の地面上に仮組の状態でおかれ、JASA による T69 基壇の修復が完了したところで、欄干の再設置は JASA が行う事となった。

2020 年 8 月、本プロジェクトが対象とした全てのナーガ欄干、彫像の修復作業が完了し、無事事業は終了を迎えた。



Fig.5.40 [T61.3] Trial Connecting of Lion Statue(61.3.9.1.1)



Fig.5.41 [T61.3] Dismantling of Naga Statue



Fig.5.42 [T62.1] Before restoration, Support by concrete pillar was deteriorating.



Fig.5.43 [T62.1] Maintenance and improvement of platform floor before install the bulastrades



Fig.5.44, 45 [T62.1] Insert new sandstone block in order to make a level and stable floor surface



Fig.5.47 [T60.2] Reconstruction of balustrades



Fig.5.46 [T62.1] Connecting Naga statue



Fig.5.47 [T60.2] Reconstruction of balustrades



Fig.5.48, 49 [T62.1] Before(left) and after(right) resotration



Fig.5.50 [T69.2] Repairing of Basement of Bulastrade



Fig.5.51 [T69.2] Trial Assembling of Balustrade on the ground

5.3 Mound clearance work at T.64

T.64 でのマウンドクリアランス作業

5.3.1 Working progress and Summary

At T64, a large amount of earth and sand had accumulated next to the stairway porch, and the sides of the base were almost completely buried. Some naga statues and balustrade elements were found partially buried in the mound (Figs. 5.53-5.55). In order to improve the landscape and environment of this area, and to recover the lintel materials that are thought to be related to T64, clearance work to remove the earth and sand from this mound was carried out from August 15, 2019 to September 30, 2019. The work was carried out mainly in the following processes.

1. Record situation before clearance at T64 by drawing of plan and section.
2. Open 2m × 4m test trench at the middle of stair port for the purpose of confirming the situation of the mound (amount of contains of artifact and stone pieces) and platform.

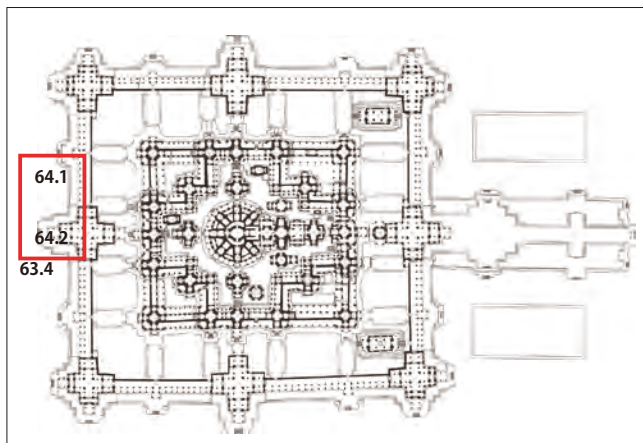


Fig. 5.52 Area of clearance work

5.3.1 T64 マウンド除去作業の概要

T64 は、階段ポーチ脇に大量の土砂が積まれ基壇の側面がほとんど埋まっており、そのマウンドに一部埋まるようにいくつかのナーガ彫像や欄干部材が確認されていた (Fig.5.53-5.55)。このエリアの景観、および環境の改善、そして T64 に関連すると思われる欄干部材を回収することを目的として、このマウンドの土砂を撤去するクリアランス作業を、2019 年 8 月 15 日～2019 年 9 月 30 日にかけてクリアランス作業が進められた。作業は主に以下の工程ですすめられた。

1. クリアランス作業開始前に、クリアランス予定エリアの基壇およびその周辺のマウンドの図面記録
2. 2 × 4 m の幅でテストトレンチを空ける。堆積土と堆積土に隠されていた基壇の様子を確認するためにテストトレンチを設定。基壇が著しく崩壊していることが確認された場合は、修復方法の検討を行う。



Fig. 5.53 Situation before work at T64



Figs. 5.54 Situation before work at T64

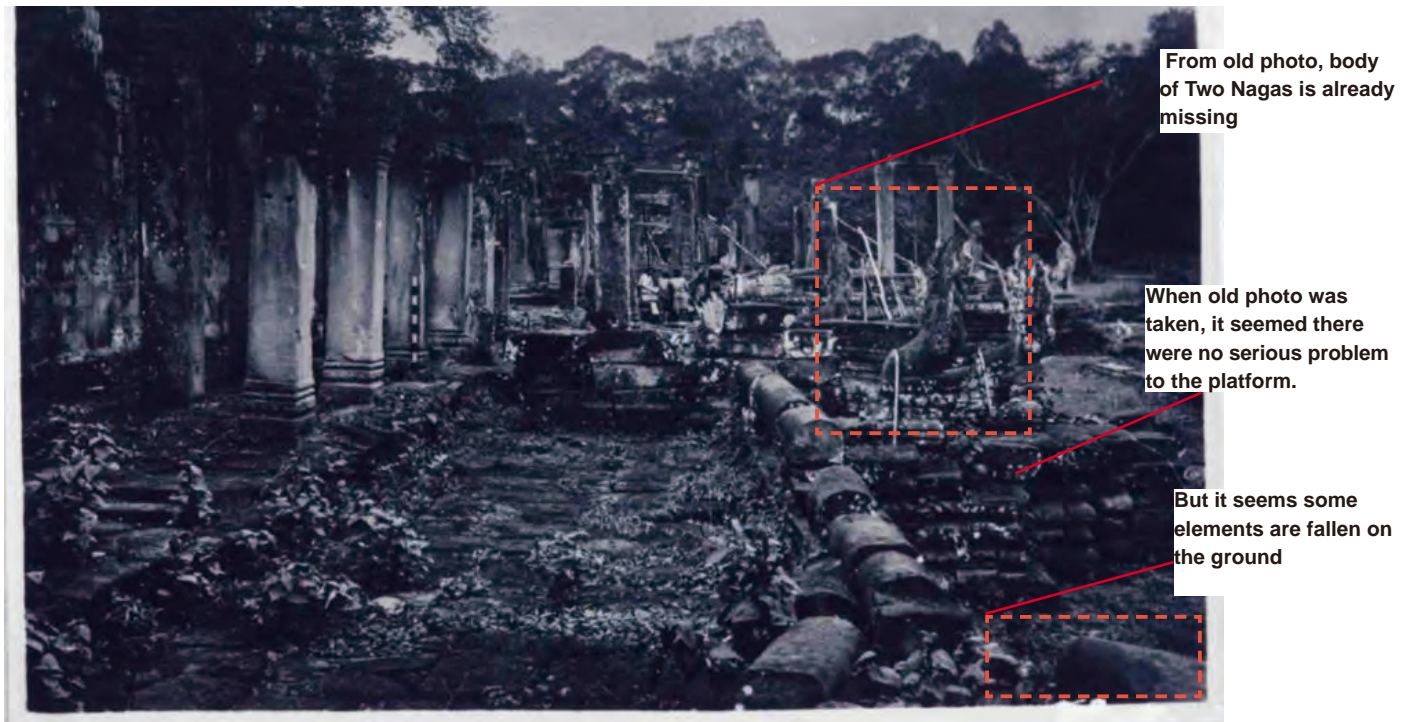


Fig. 5.55 During Improvement and Restoration work in 1930s by EFEO
(EFEO photothèque, CAM06130)



Fig. 5.56(left), 5.57(middle), 58(right) Situation Before Mound Clearance

3. If any component fragments or other important artifacts are found, they should be excavated to the extent that the whole object can be seen, and the level of excavation and photographs should be recorded.
4. Start clearance to the north first grid by grid, then move to south. Clearance will stop at the bottom level of platform

5.3.2. Past situation of this area

Around T64, an old photo taken just after previous restoration by EFEO in the beginning of 20 century have exist. Before starting clearance work, we have compared this old photo and present situation and confirmed some fact as below(Fig.5.55).

- When EFEO implemented improvement and restoration work at this area, once soil T64 was cleared, thus platform of outer gallery and stair porch were exposed. Present soil covoering T64 was accumulate

3. 遺跡の部材破片や、その他重要な遺物がでてきた場合は、全体が見える程度まで掘り出し、出土したレベルおよび写真にて記録。
4. その後、同じ要領で南北にクリアランス範囲を広げ、全域のクリアランスを実施。

5.3.2. このエリアの過去の状況

T64 付近では、20 世紀初頭に EFEO が前回の修復を行った直後に撮影された古い写真が残っている。今回の清掃作業に先立ち、この古い写真と現在の状況を比較したところ、以下の事実が確認された (Fig.5.55)。

- EFEO がこのエリアの修復・改修工事を実施した際、土層 T64 が一度取り払われ、外回廊の基壇と階段ポーチが露出した。現在の土層 T64 は、前回の修復後に堆積したものである。
- このエリアの 2 体のナガ像は、前回の修復後に修復され、そのうちの 1 体の頭部は一部が破損した。また、EFEO がこのエリアを修復した際には、2 体の

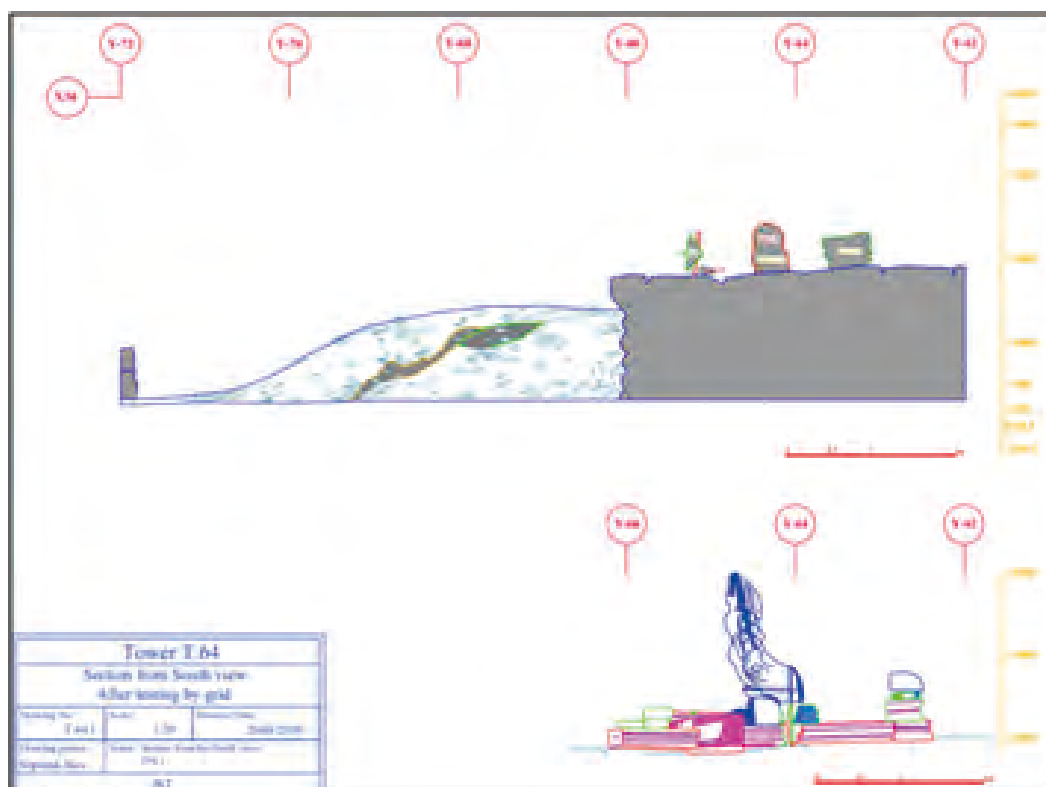


Fig. 5.59 Soil stratigraphy of north wall of test trench



Fig. 5.60 Test trench



Fig. 5.61 Photo of north wall of test trench

after the previous restoration.

- Two Nagas at this area was once restored and part of these head were broken after the previous restoration. Also, the bodies of two Nagas were already missing when EFEO restored this area.
- It seems that some elements of bluastrade were fallen on the ground.

We started clearance work with these facts in mind.

5.3.3 Mound Clearance Work

Clearance was started with small trench with 2m width(Grid, C, J, Q) to confirm the situation of the mound and platform.

ナガ像の本体はすでに失われていた。

- 特に T64.1 の基壇下付近の地面には多くの架木部材が散乱し、地中に埋まっている可能性がある。

これらの事実を念頭に置き、私たちは撤去作業を開始した。

5.3.3 土砂の除去作業について

まずマウンド土砂がいつの時期に形成されたものかを確認するために、中央部分に幅 2m のテストトレンチ (グリッド C, J, Q) を設定した。

試掘トレンチの調査は、プラットフォーム基部に到達した段階で完了し、複数の遺物および石材片が確認され

The excavation of the test trench was completed upon reaching the base of the platform, where several artifacts and stone fragments were identified. The stone materials at the platform were found to be in relatively good condition, exhibiting no significant displacement and requiring no major restoration. Analysis of the artifacts and their depositional contexts confirmed that the mound was constructed during the maintenance activities conducted by the EFEO in the 1930s. In the first trench, a variety of artifacts were recovered, including:

- Fragments of the platform and small sandstone pieces.
- Earthenware, as well as Khmer and Chinese ceramics.
- Materials likely associated with the 1930s restoration work, including iron pins, iron clamps, and a carving tool (chisel).

■ Description about section X34 (Soil stratigraphy) see North wall

After completed excavation, we can see this mound has 4 layers of soil. About section X34 (Soil stratigraphy) see North wall used "Standard Soil Color Charts" was described below:

- Layer I: 10 YR, 3/4 (dark brown), clay, many big and small sandstone chips are mixed.
- Layer II: 7.5 YR, 5/8 (bright brown), sand clay, sandy clay, small amount of scattered stone chip is mixed
- Layer III: 10 YR, 3/4 (dark brown), clay, clay, similar to layer I and IV but mixed new sandstone is less than these layers.
- Layer IV: 10 YR, 3/6 (dark brown), clay, similar to Layer I but small laterite chips are mixed.
- * Except for layer II, soil of tree layer is similar to foundation soil under stone structure. Therefore, it seems that this soil might be thrown away here from some excavation work in temple complex.

After confirming the soil layer and base conditions as described above, the trench was then extended in a north-south direction.

The removal of sediment revealed some stone fragments and artifacts on the T62.2 side, but not as many as in the test trench. The balustrade elements that were half buried at the surface of the ground were taken out and the combination of these in situ and original elements were confirmed. However, there were fewer parapet elements in the soil than expected, indicating that most of the parapet elements in this area, T62.2, had already been lost when the soil was formed. Next, we extended north of the test trench to the T62.1 side, where, as initially estimated, a large number of parapet

was found. The stone materials of the base were in a relatively good condition and preserved, and there was no need for large-scale movement or restoration. In addition, analysis of the excavated artifacts and the state of accumulation confirmed that the mound was formed during the restoration work of the outer gallery in the 1930s by EFEO (Ecole Française d'Extrême-Orient). The first trench found the following artifacts:

- Platform fragments or small sandstone pieces
- Pottery, Khmer and Chinese ceramics
- Materials related to the restoration work in the 1930s (iron pins, iron clamps, carving tools (chisels) etc.)

■ X34(グリッド D,K,R) 北側壁面の土層状況について：

- I層：10YR、3/4（暗褐色）、粘土質、大小の砂岩片が多数混じる。
- II層：7.5YR、5/8（明るい褐色）、砂質粘土、砂質粘土、少量の散在した石片が混じる。
- III層：10YR、3/4（暗褐色）、粘土、粘土、I層とIV層に似ているが、新しい砂岩の混合はこれらの層より少ない
- IV層：10YR、3/6（暗褐色）、粘土、第I層と類似しているが、小さなラテライトチップが混在している。
- * II層を除き、樹木層の土は石造物の下基礎土と類似している。したがって、この土は寺院伽藍の掘削工事で捨てられた可能性がある。

以上のように土層、基壇状況が確認できたため、その後は南北にむかってこのトレンチを広げた。まずはじめにテストトレンチより南側へ拡張することとし、このエリアの土砂の除去を行った。

土砂の除去の結果、T62.2側は、いくつかの石材破片や遺物は確認されたものの、テストトレンチほど多くはなかった。地表面で半分埋まっていた欄干の部材はとりだし、これらの原位置とオリジナルの部材同士の組み合わせを確認した。しかし、土中からは想定していたよりも欄干の部材はなく、すでに土砂が形成された時点でこのエリア



Fig. 5.62 Extension from test trench to south

members were scattered under the soil (Fig.5.63, 5.64).

This made it possible to fully repair and reinstall the T64.1 parapet (Figs.5.65, 5.66). In addition, parts of the parapets of T63.4 and T65.4 in the vicinity were also discovered and their original locations were identified, which enabled the replacement of the materials in these areas and many of the parapet members to be returned to their original positions. As for the Naga statue, in addition to the head that was already visible on the mound, another head fragment was excavated from within the mound, so it was joined and reinstalled on the base. As described above, this clearance work resulted in the excavation of many parapet members and the removal of the mound, leading to a significant improvement in the landscape around the T64 area (See p.6 Photos 3, 4).

In addition to chisels and iron clamps and nails that were likely used during the maintenance of the EFEO, the sediment contained clamps, Khmer black-brown glazed ceramic shards, Chinese ceramic shards, and bronze shards that were probably from the Angkor period.

The restoration work of Balustrade at T.64 was subsequently conducted from September to December 2019. See area report for details.

T62.2 の欄干部材の多くは失われていたことがわかった。

つづいて、テストトレンチより北側へ拡張した。T62.1 側では、当初の推定通り、土砂の下には多数の欄干部材が散乱しており (Figs.5.63, 5.64)、T64.1 基壇上に一部設置されていた欄干を含めた総合的な原位置の特定を行ったところ、T64.1 のすべての欄干部材が揃うことがわかり、これにより T64.1 欄干の全面的な修理と再設置が可能となった (Figs. 5.65, 5.66)。また、周辺の T63.4、T65.4 の欄干の一部も発見され原位置を特定することができたため、これら付近エリアを含めた部材の入れ替えを行い、多くの欄干部材を原位置に戻すことができた。ナーガ彫像についても、すでにマウンド上に見えていた頭部に加え、マウンド内からも別の頭部破片が出土したため、接合し、基壇上に再設置した。以上のように、本クリアランス作業を実施したことで、多くの欄干部材が出土し、マウンドが撤去され、T64 エリア付近の景観の大きな改善へとつながった (See p.6 Photos 3, 4)。

土砂の中には EFEO の整備時に使用したとみられる鑿や鉄製の鋸や釘に加え、アンコール期のものとみられる鋸やクメール黒褐釉陶磁器破片、中国陶磁器の破片、青銅の破片などが含まれていた。

T.64 での修復事業はその後 2019 年 9 月～ 12 月にかけて実施された。詳細はエリアレポートを参照。



Fig. 5.63 Finding of balustrade elements around T64.1



Fig. 5.64 Finding of balustrade elements around T64.1



Fig. 5.65(left), 5.66(right) Trial Assembling work on the ground including found elements

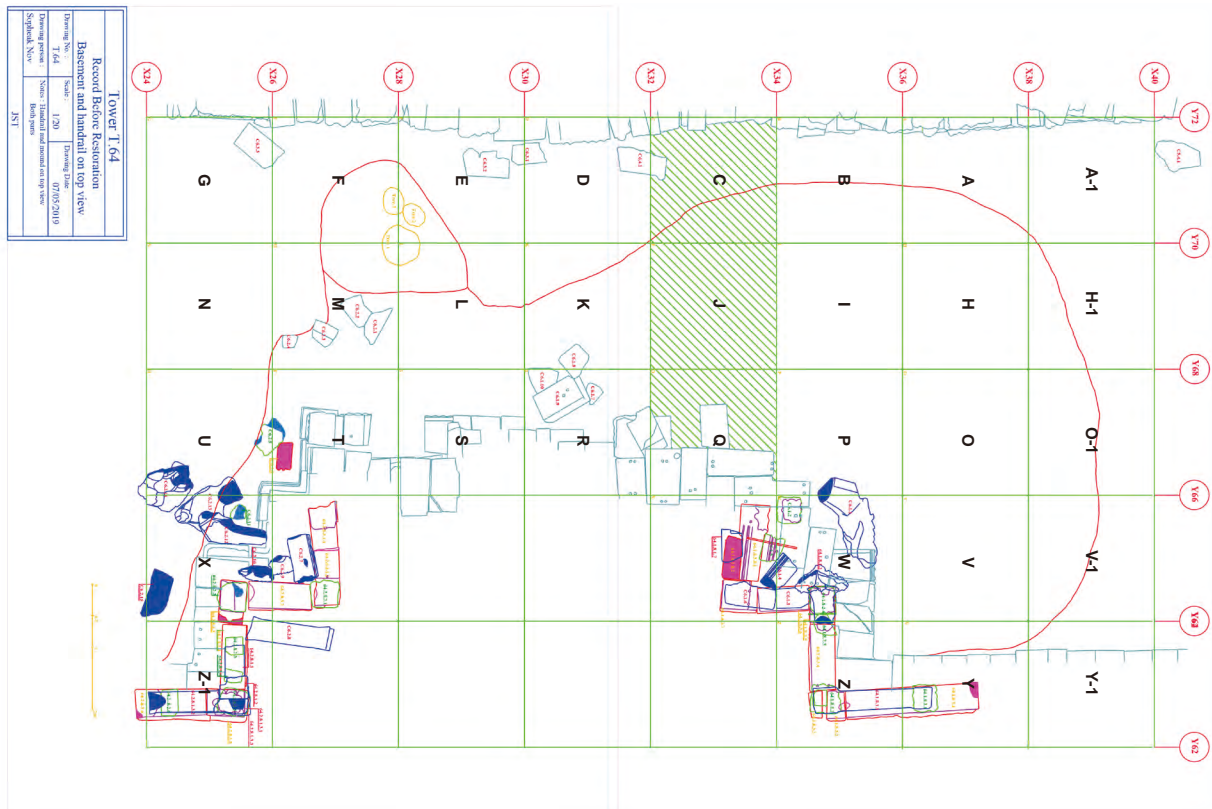


Fig. 5.67 Top Plan before mound clearance at T64

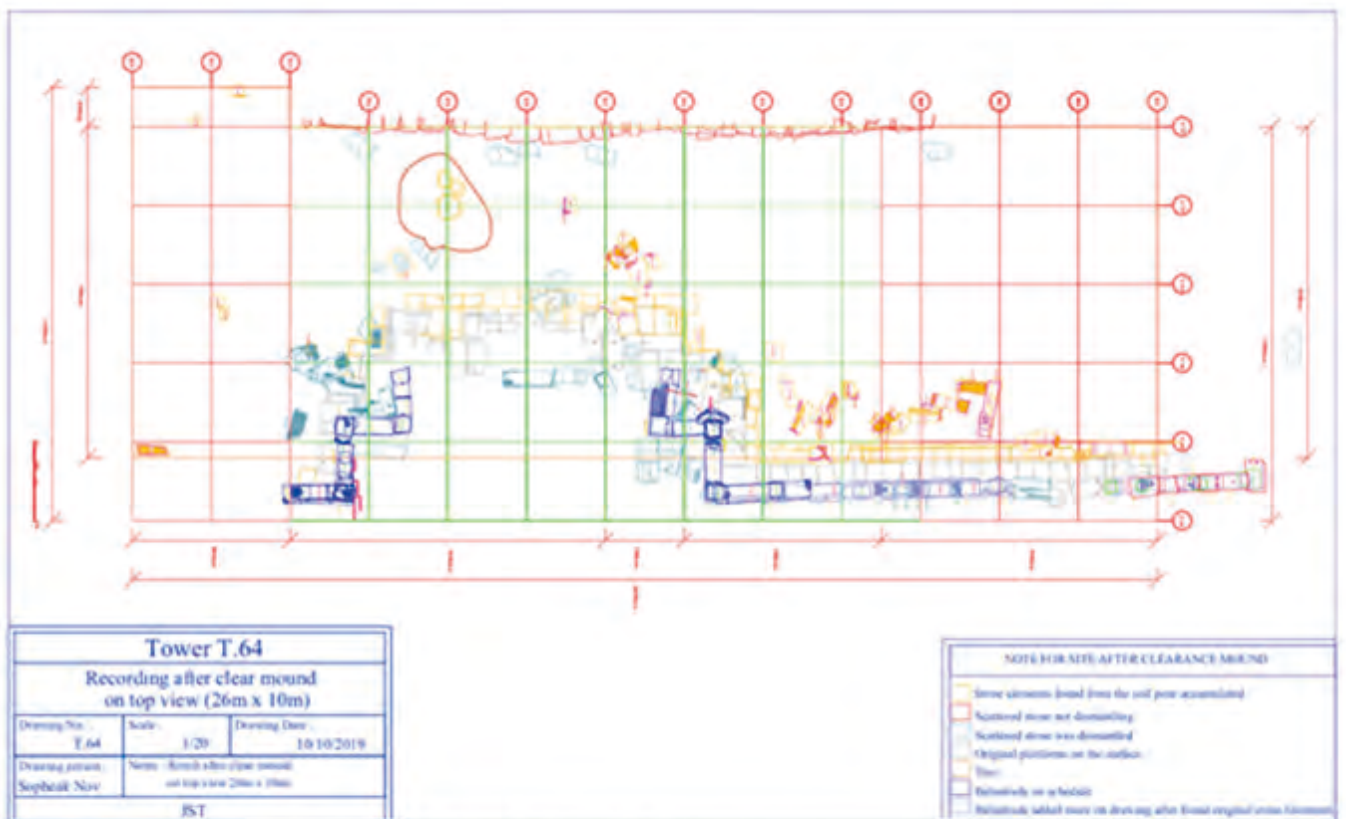


Fig. 5.68 Top Plan After mound clearance at T64



Fig. 5.69 Improvement of platform



Fig. 5.70 Repair of excavated balustrade elements



Fig. 5.71 Repair of excavated Naga Balustrade



Fig. 5.72 Repair of excavated balustrade elements



Fig. 5.73 Before and After of Repairing of excavated Naga Balustrade



Fig. 5.74 Reconstruction of Balustrade



Fig.5.75(Left, before restoration at T63.4), 76(right, During installing Naga from T64.2)

It became clear that Naga statue installed at T64.2 in previous restoration (left) was original installed at T63.4, and connected with the body scattered on the platform of T63.4



Khmer; earthen wear



Khmer ceramic



Chines ceramic



Glass?



Bronze



Piece of Naga head



Bullet(1970s)



1930s chisels and iron clamps
Ancient clamps



Small piece of earthenware



Chinese ceramic



Probably Chines, 13th
Dehua kiln

Fig. 5.77 Selected items from sediment around T64

6. Technical staff training, next generation human resource development activities

技能員育成、次世代人材育成活動



6.1 Onsite Training for Next Generation Technical Staff

次世代の技能員育成活動

In this project, the Cambodian technical staff members of this project were trained by JASA Cambodian technical staff members in all the techniques and skills related to the restoration. The fact that the Cambodian participants were able to acquire in a short period of time not only the methods of repairing and installing stones, but also the comprehensive knowledge and skills necessary to carry out restoration work, such as preparation and mixing of filler materials, drawing, installation and reading of surveying instruments, and operation and maintenance of mini-cranes, is a significant achievement of the training among the Cambodian participants .

In addition, a young Cambodian expert was in charge of the project on-site, and he too learned the knowledge and skills necessary for a site manager, such as how to plan the on-site schedule, staff allocation, and safety management, from the JASA experts on-site.

At the end of August, when the project was completed, a completion ceremony was held with the NFUAJ director and JST representatives in attendance, and one of the project's experts and eight technical staff were awarded certificates to mark their acquisition of skills. It was decided that the nine members would be re-employed as JASA staff after the project ended, and they are still active as JASA staff at the time of submission of this report.

本事業は修復に関わる全ての技術、技能の習得において、JASA カンボジア人技能員より本事業カンボジア人技能員が現場研修を実施しながら進められた。石材の修理方法や設置方法だけでなく、修復材料となる充填剤の準備や配合、図面の書き方、測量機の設置や読み方、ミニクレーンの操作やメンテナンス方法といった修復作業を実施するにあたり必要な総合的な知識と技術を、短期間で身に付けることができたことは、カンボジア人同士の研修による大きな成果と言えるだろう。

また、本プロジェクトには若手カンボジア人専門家が現場の指揮をとっていたが、彼も同様に現場で JASA の専門家から、現場のスケジュールの立て方、作業員の配置、安全管理などといったサイトマネージャーとして必要な知識やノウハウを学んだ。

事業が修了した 8 月末には NFUAJ の所長、JST の代表らを迎えて修了式がおこなわれ、当プロジェクトの専門家 1 名と、技能員 8 名には技能習得を示す修了証が授与された。9 名のメンバーは、当プロジェクト終了後は JASA のスタッフとして再雇用されることが決定され、その後本報告書提出時点も JASA スタッフとして活躍している。



Fig. 6.1 Onsite training from JASA expert and skilled technical staff to our Project member(December 2012)



Fig. 6.2 Onsite training from JASA expert and skilled technical staff to our Project member(May 2017)



Fig.6.3, 4 Certificate Award Ceremony (August 2020)

[Column1] Progress of training in the project

PHASE 1

September
2013

START OF THE PROJECT

The project started in 2012 with four people, three youth from the village of Lien Dai and one from the village of Krau, both near the Angkor monuments. They were completely inexperienced, but skilled restoration technical staffs from the JASA carefully and sometimes strictly taught them how to draw plans, make repairs, and process new sandstones. This was the first attempt to foster human resources among Cambodians, but as expected, the skills were quickly transferred, and the restoration skills were absorbed at an unprecedented speed. At the end of the year, two new workers and a Cambodian expert joined the team, making a total of seven people working on full-scale restoration work, including the installation of balustrades.



↑ Staff of the project learn how to process and repair stones from JASA technical staff.

PHASE 2

April 2014

New Sandstone Processing of Lion Statues

In the second phase, the location was moved to the east causeway of the Bayon temple. Here, many broken or in danger of collapsing Lion statues were lined up in rows. The staff, who had become quite accustomed to repairing the balustrades, struggled to restore the Sinha statues. In particular, the lost foot part had to be replaced by a replacement foot made from new sandstone material to match the missing shape, which requires advanced carving techniques. This is where JASA's workers, who specialize in carving, come into their own! They are taught how to make subtle adjustments to the joints between the original member and the new wood, and how to create beautifully shaped legs. After much training, the beautiful Sinha statues were finally lined up again at the entrance of the temple. Two new staffs joined the team this year, bringing the total number of workers to nine.



↑ Repair and new sandstone processing of Sinha statues that require skill and patience.

PHASE 3

April 2016

April 2018

Training in handling equipment and heavy machinery

Mini-cranes are used to move Naga and Lion statues, which sometimes weigh more than one ton. According to a staff member who received training in operating these heavy machines, "The operation was surprisingly simple and I learned quickly, but the difficult part is the fine-tuning techniques required to safely install the precious stones without damaging them, as well as how to manage the equipment. They also received training on the surveying equipment needed to draw the plans.



Learning how to operate a mini crane→

←Learning how to use surveying instruments from JASA experts



PHASE 4

Extention Term

June 2020

August 2020

Thank you and Congratulations for your great work over the past eight years!

The young youth staff, who had no experience in restoration work at the beginning of the project, have grown remarkably over the past eight and a half years. The new members who joined the project in 2016 were now in a position to teach themselves, and they were able to pass on what they had learned from the JASA technical staff. The fact that the Cambodians were able to steadily transfer their skills to other Cambodians is a major achievement of this project's human resource development, in addition to the restoration results. After the completion of this project, they will be employed as technical staff by JASA, and their future activities are highly expected!



↑ Nine staff members proudly line up in front of the Bayon temple with their skill acquisition certificates in hand.

【Column1】プロジェクトでの人材育成のあゆみ

第1フェーズ

2012年9月

プロジェクトスタート

2012年プロジェクト開始当初はアンコール遺跡近くのリエンダイ村の青年3名、クラウ村1名の4名でプロジェクトをスタート。全くの未経験者であった彼らに、日本国政府アンコール遺跡救済チーム（以下 JASA）の熟練の修復作業員が図面の書き方をはじめ、修理の仕方、新材の加工の仕方について丁寧に、そして時には厳しく教えてくれました。カン



↑石材の加工方法や修理方法について JASA 技能員から学ぶプロジェクトスタッフ

2014年4月

ボジア人同士での人材育成の試みはこれが初めてでしたが、やはり伝わり方も早く、これまでにないスピードで修復技能を吸収していきました。この年の終わりには新たに2名の作業員と1名のカンボジア人専門家が加わり、総勢7名で欄干の設置作業などの本格的な修復作業に着手しました。

第2フェーズ

2016年4月

ライオン彫像の新材加工

第2フェーズに入ると、場所はバイヨン寺院正面の参道に移動。ここは多くの割れたり、崩壊の危機にあるライオン彫像がずらりと並んでいました。欄干の修理作業にはかなり慣れてきた作業員も、このシンハ彫像の修復には苦戦。特に失われた足部分は、欠損した形に合わせて新材の砂岩を加工して代替の足を作らなければならず、高度な彫刻技術が必要になります。ここは JASA の彫刻を得意とする作業員の出番！オリジナルの部材と新材の接合部分の微妙な調節方法、そして美しい脚の造形の作り方などにつ



↑技術と根気を要するシンハ彫像の修理と新材加工。

2018年4月

いて教わります。こうしたトレーニングを重ね、最終的には美しいシンハ彫像が再び寺院の入り口に並びました！この年から新たに2名の作業員がチームに加わり、合計9名となりました。

第3フェーズ

機材や重機のトレーニングへ

時には1トン以上の重さになるナーガ彫像やシンハ彫像を移動する際にはミニクレーンを使います。これら重機の操縦トレーニングを受けたスタッフによると、「操縦方法は意外と単純なので、すぐ覚えられましたが、難しいのは、貴重な石材を安全に傷つけることなく設置するための微調整の技術や、機材の管理方法です」と話していました。

また、図面を書くために必要な測量機材のトレーニングを受けました。



↑ミニクレーンの操縦方法を学ぶ様子

← JASA 専門家から測量機器の使い方について学ぶ様子



第4フェーズ

2020年6月

8年間、お疲れ様でした！

プロジェクト開始当初、修復作業未経験であった若手青年スタッフらは、この8年半で目を見張る成長を遂げました。途中2016年から加わった新メンバーに対しては、今度は自分たちが教える立場となり、JASA 技能員から学んだことをきちんと伝えていました。着実にカンボジア人同士での技術の伝達を行うことができたことは、修復の成果に加え、本プロジェクトの人材育成の大きな成果といえるでしょう。本プロジェクト終了後は JASA の技能員として採用されることとなり、今後の活躍がますます期待されます！



←技能習得修了書を手に誇らしげにバイヨン寺院の前で並ぶ9名のスタッフ

2020年8月

延長期間

【Column 2】 Interview to Staff スタッフィンタビュー ～ 8 年間のプロジェクトを終えて～



Nov Sopheap ノヴ・ソピアククさん (33)
Cambodian Expert/ Site Manager
カンボジア人専門家・サイトマネージャー /
From Prei Veng province プレイ・ヴェン州出身

I studied archaeology at the Royal University of Fine Arts Phnom Penh and was involved as a site manager. I was in charge of research, excavation, drawing, and sculpture restoration, and I learned a lot. When I see the Bayon temple landscape transformed after the restoration of the balustrades and statues, I feel proud of my involvement in the project and a sense of accomplishment. Also, the eight of us who were able to work together as team members here are like brothers. I would like to grow even more so that I can pass on the knowledge I have gained from my experience to the next generation, and I hope that I will have the opportunity to do so. Thank you very much for your support over the past eight years.

私は王立プノンペン芸術大学で考古学を学び、現場マネージャーとして携わりました。調査、発掘、図面起こし、彫刻修復を担当し、たくさんの学びがありました。欄干や彫像の修復を終え、バイヨン寺院の景観が大きく変わったのを見ると、自分がこの事業に関わったことを誇りに思い、達成感を感じます。また、ここで一緒にチームメンバーとして働けた8人は兄弟のような存在です。これからは、これまでの経験で得た知識を次世代へと伝えられるようさらに成長したいと思うし、そういう機会があるといいと思っています。8年間にわたり応援してくださった皆様、本当にありがとうございました。

I was in charge of stone restoration, drawing, and crane operation. I learned the most in stone restoration. What I remember most is that my fellow workers and I became like a family and enjoyed talking about the restoration work. Whenever I did not understand something, my fellow technical staff members shared their knowledge and experience with each other, and we supported each other when we had difficulties. I would like to pass on the importance of this work and my experiences to the next generation.

私は石材の修復、図面おこし、クレーン操作などを担当しました。最も習熟できたのは石材修復です。一番心に残っているのは、仕事仲間と家族のようになり、修復の仕事についてとても楽しく話し合えたことです。わからないことがあるときは、技能員間で知識や経験を教えあい、困ったときには支え合いました。この仕事の大切さと、経験を次の世代へと伝えていきたいと思っています。



Kong Rasmey コン・ラクスメイさん (35)
Technical Staff 技能員 /
Lieag Dai Village リエンダイ村出身



Tien Tha ティエン・ターさん (26)
Technical Staff 技能員 /
Lieag Dai Village リエンダイ村出身

I was mainly responsible for processing new sandstone material to make up for the lost portion and for the crane. One of the most memorable moments for me was when I was carrying a huge stone with the crane, and the stone lost its balance and went toward another stone. Since then, I have become more concerned about the ruins than ever before and have become very careful in my work to ensure safety. I would like to pass on these various experiences to new technical staff.

私は失われた部分を補うための新砂岩材を加工する作業と、クレーンの作業を主に担当しました。とても印象に残っている出来事は、巨大な石材をクレーンで運んでいるとき、石材がバランスを崩して別の石材に向かっていってしまい、とっさに爪が折れてしまうほどの力で必死にその石を押さえ、石の動きを止めたことです。それ以来、今まで以上に遺跡への思いが強くなり、安全のためにもとても慎重に仕事を進めるようになりました。こうしたいろいろな経験を新しい技能員へと伝えていきたいと思っています。

My specialty was finding pieces among the scattered stones that could be joined to the stones being restored and locating their original locations. I also worked on new materials. I would search with my colleagues for lost pieces of statues and components from scattered stones and other places, and we would always be very happy and excited when we found the pieces we had worked so hard to find and put them together. I hope that one day I will be able to pass on what I have been taught to more younger workers. I would like to be the kind of person that the younger generation will aspire to this restoration work when they look me.

私が得意としていたのは、散乱している石材の中から、修復している石材と接合できるピースをさがしたり、それらのオリジナルの場所を探すことです。また、新材加工作業も行っていました。同僚とともに彫像や部材の失われてしまっていたピースを散乱石材や他の場所から探し、苦労して見つけたピースがピタリと合わさった瞬間はいつもとても嬉しくて興奮します。いつかもっと若い作業員に、自分の教わってきたことを伝えられる日が来るといいと思います。若い世代の人たちが、自分をみてこの修復の仕事を目指してくれるような人になりたいと思います。



Soan Ly ソアン・リーさん (30)
Technical Staff 技能員 /
Lieag Dai Village リエンダイ村出身



Dong Don ドーング・ドンさん (28)
Technical Staff 技能員 /
Angkor Krau Village アンコール・クラウ村出身

I am mainly good at recording drawings and handling and recording equipment such as level surveying and total stations. My colleagues I have met here are really dear friends, and the skilled workers at JASA are always willing to share their knowledge and tips with me when I need them, and thanks to them I have gained a lot of experience. I will be doing something different from now on (I will be restoring not only balustrades and statues, but also temple structures), and like them who have been working for more than 20 years, I would like to continue to gain more experience and become a professional.

私は主に図面記録や、レベル測量やトータルステーションなどの機材を扱い記録を行う作業を得意としています。ここで出会った同僚は本当に大切な友人です。JASAの熟練の作業員の方々は、いつも困ったときに知識やコツを教えてくれて、おかげでいろいろな経験をつむことができました。これからは今までとは違う作業もするようになるので(欄干や彫像修復だけでなく、寺院躯体部の修復をするようになる)、20年以上働いている彼らのように、私もこれから多くの経験をつみ、プロフェッショナルを目指したいと思っています。

6.2 Cultural education projects for the development of next-generation human resources 文化遺産教育としての社会見学会

Under this project, as part of cultural heritage education activities for the next generation, in collaboration with the World Heritage Education Project of NFUAJ, we held Study Visit which students could listen to talks by experts, for Cambodian elementary and junior high school students over a three-year period from 2016.

The students selected were from five classes from TERA KOYA (=CLC: Community Learning Center, NFUAJ) in Siem Reap Province, with priority given to those who had never visited an archaeological site before. These are the classes for children who were forced to leave school from the elementary school. The number of participants each year is shown in Tab. 1.

The social study tour was conducted with the following three main objectives

1. To give opportunity to students visit the monument so that they have a better understanding of the culture and heritage.
2. To Mainstream the value and raise awareness of World Heritage to equivalency students.
3. To improve the knowledge and skills of coloring and creativity by visit the real motif at the monuments.

The tour was divided into two groups, and the first part of the tour consisted of a lecture by JST representative Mr. Chea Nol and JASA expert Ms. Su Sothy about the Angkor monuments, Bayon Temple, and conservation activities (Figs. 6.5, 6). Next, move to restoration site where actually being restored, students received a lecture from Mr. Sothy and JST expert Mr. Sophiack about the restoration methods and difficulty (Figs. 6.7, 8). After that, the students received instruction from JST technical staff and had hands-on experience cleaning the stone using a brush, injecting reinforcement material using a syringe, and processing new sandstone using a chisel (Figs. 6.9, 10). After these experiences, the student listened to a lecture by APSARA expert on the Bayon Temple, including reliefs and decorations, as well as on the lifestyle of the time and the history of the Angkor period, and then used NFUAJ teaching materials to search for motifs (Figs. 6.12, 13). Finally, while reflecting on what they had seen, the student colored in a picture book and each gave their impressions (Fig. 6.15, 16), and the tour came to an end.

The full-day study field trip to Bayon was an important opportunity for the children, and it will have helped them to expand their knowledge of heritage, culture, coloring techniques and creativity. Furthermore, by participating in the restoration activities of a World Heritage site and learning about the history of the temple, it will have helped to foster a spirit of World Heritage protection. In addition, dividing the children into small groups was effective for both the children and the instructor, as the instructor was able to pay more attention to the children and the children were able to ask more questions.

本事業では、次世代への文化遺産教育活動として、日本ユネスコ協会の世界遺産教育事業と連携し、2016年度より3年間にわたり、カンボジアの小学生～中学生に該当する年代の生徒を対象として、現場にて修復体験や専門家の話を聞く社会見学会を実施した。対象としたのはシェムリアップ州のCLC (NFUAJの寺子屋)の5つのクラスの子供のうち、これまで遺跡を訪れたことのない生徒が優先して選出された。各年度の参加人数は Tab.1 の通りである。

Tab.1 Number of participants in each year

JFY	Participants
2016	120
2017	108
2018	99
TOTAL	327

社会見学会は主に以下を3点を目的として実施された。

1. 生徒たちに遺跡を訪問する機会を提供し、カンボジアの文化や遺産についてより深く理解してもらうこと。
2. 寺子屋の復学支援クラスの子供たちに世界遺産の価値を理解し、保全意識を向上してもらうこと。
3. 遺跡に描かれているモチーフを実際に見ることで、彩色や創造性に関する知識とスキルを向上させること。

見学会では2班にわかれて実施され、まず最初に、JST代表のチア・ノル氏とJASA専門家のスー・ソティ氏によるアンコール遺跡群やバイヨン寺院、そして保存活動などについてのレクチャーがおこなれた (Figs. 6.5, 6)。続いて修復現場にて実際に修復中の場所や部材を見ながらさらにソティ氏やJST専門家のソピアック氏から実際の修復方法についての話を聞いた (Figs. 6.7, 8)。その後、JSTの技能員らに指導をうけながら、子供達が実際にブラシを用いた石材のクリーニング、注射器を用いた補強材の投入作業、そして鑿を使った新材の加工といった体験をした (Figs. 6.9~10)。これらの体験を終えたあと、APSARAの専門家による、バイヨン寺院で浮彫や装飾などの話、当時の生活やアンコール時代の歴史についてレクチャーをうけ、NFUAJの塗り絵教材を用いてモチーフ探しなどの活動を行った (Fig. 6.12, 13)。最後に実際に見てきたことを振り返りながら、テキストの塗り絵を行い、感想をそれぞれ発表し、見学会は終了した。

バイヨンへの社会見学は、子どもたちにとって重要な機会となり、遺産や文化、彩色技術、創造性に関する知識を広げることに貢献したであろう。さらに、世界遺産の修復活動に参加し、寺院の歴史を学ぶことで、世界遺産保護の精神を育む助けとなるだろう。また、子どもたちを小グループに分けたことで、講師が子どもたちにより目を配り、子供達からも積極的な質問などがでるなど、双方にとって効果的であった。



Fig.6.5, 6 Lecture by JST representative Mr. Chea Nol(left) and JASA expert Ms. Su Sothy(right) about the Angkor monumentsayon Temple, and conservation activities



Fig.6.7, 8 Students received a lecture from Mr. Sothy and JST expert Mr. Sophiack about the restoration methods and difficulty



Fig.6.9, 10 Sudents received instruction from JST technical staff and had hands-on experience cleaning the stone using a brush, injecting reinforcement material using a syringe, and processing new sandstone using a chisel



Fig.6.11, 12 Lecture by APSARA expert on the Bayon Temple, including reliefs and decorations, as well as on the lifestyle of the time and the history of the Angkor period



Fig.6.13, 14 Student colored in a Coloring book text by NFUAJ and each gave their impressions

【Column 3】社会見学会に参加した子供達よりメッセージ



Ms. Cheng Solisa, (12)
1st year equivalency class at Ta Yaek CLC.

I am so excited to visit Bayon temple, because I have learned a lot from this study visit, especially the cleaning of the stones for the restoration of Bayon temple. Besides enjoying coloring activity, I learned Khmer culture and history related to Angkor Empire, especially the knowledge from the wall of the temple” she added.

バイヨン寺院を訪れるをととても楽しみにしていました。この学習訪問から多くのことを学びました。特にバイヨン寺院の修復のための石の清掃についてです。また、塗り絵の活動を楽しむだけでなく、アンコール帝国に関連するクメール文化や歴史についても学びました、特に寺院のレリーフから得られる知識からはたくさんのことについて知ることができました。

I am so impressed by construction and restoration at Bayon Temple, and I am excited to participate in temple restoration and maintenance by cleaning the broken and collapsed stones here. I not only enjoy visiting all the four motifs and the temple itself, but I also feel myself to love the temple even more because this temple is our precious heritage and also world heritage built by our ancient ancestors.

バイヨン寺院の建設と修復にすごく感動しました。壊れた石や崩れた石を掃除することで寺院の修復と維持に参加できるのがとても楽しみです。4つのモチーフと寺院そのものを訪れるのを楽しむだけでなく、この寺院が私たちの大切な遺産であり、古代の祖先が作った世界遺産なので、もっと寺院を好きになりました



Ms. Noy Sreynit(13)
1st year equivalency class at Ta Yaek CLC.



Ms. Toeu Toeut (14)
1st year equivalency class at Ta Trav CLC

This is the first time I visited Bayon Temple and saw it with my own eyes even though my village is quite near this temple, and I learned a lot about heritage I am very happy because this morning I contributed to heritage protection by cleaning and washing the collapsed stones with my own hand. I was also impressed by legacy and masterpiece of the carving on the walls of the temple, and I want to conserve this world heritage for the next generations.

村がこの寺院の近くにあるにもかかわらず、バイヨン寺院を訪れて自分の目で見たのはこれが初めてです。そして、遺産についてたくさん学びました。今朝、崩れた石を自分の手で掃除して洗うことで遺産保護に貢献できたので、とても嬉しいです。また、寺院の壁レリーフの素晴らしさにも感動しました。この世界遺産を次の世代のために保存したいと思います。

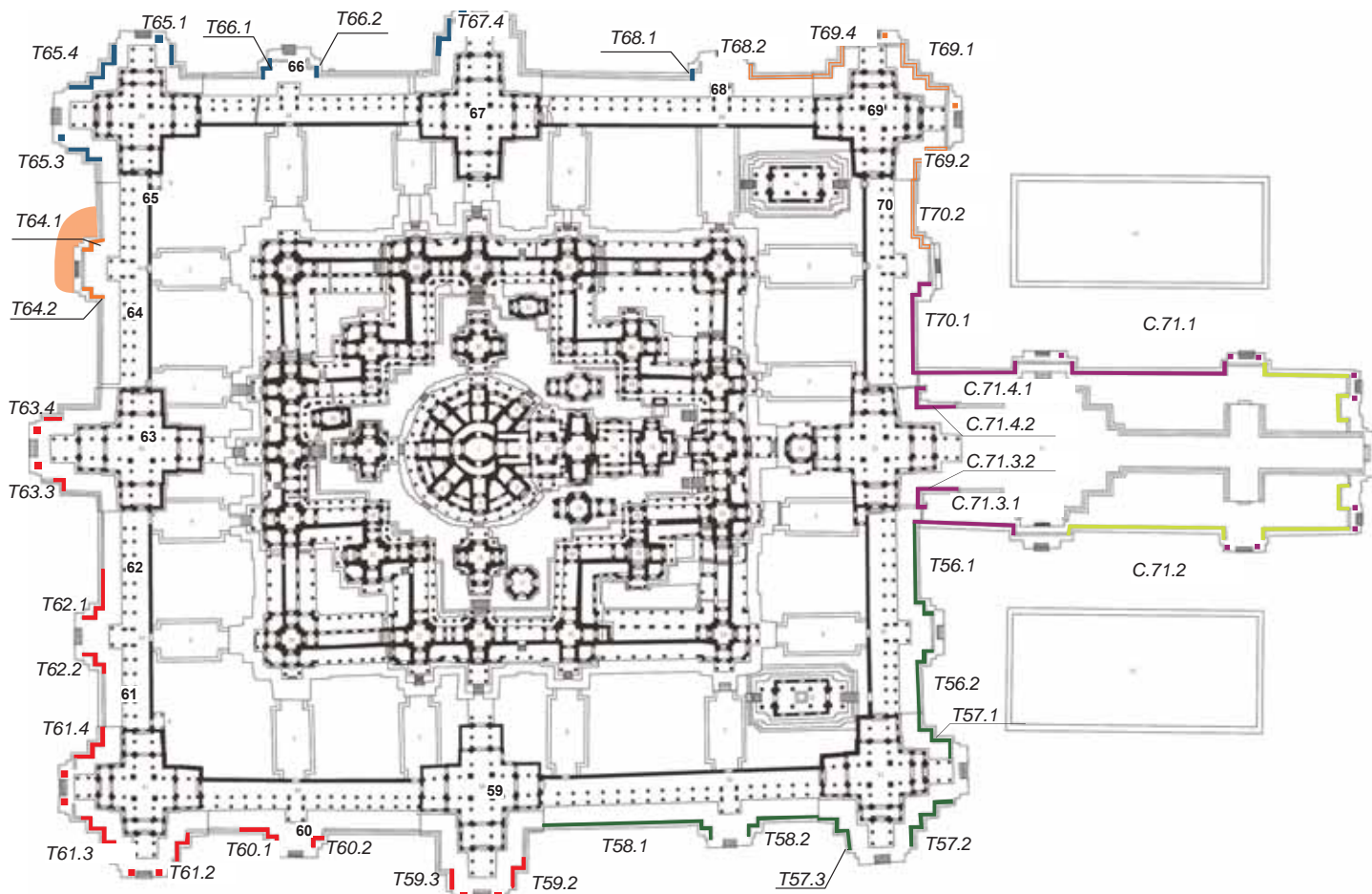


APPENDIX I

Restoration activities for each area

各エリアの修復内容レポート

*Report on the Conservation and Restoration work of
LION and NAGA Balustrades at the Causeway and Outer
Gallery of BAYON
Angkor, UNESCO World Heritage Site.*



Legend

- September 2012 - March 2014(1st phase)
- April 2014 - March 2016(2nd phase)
- April 2016 - March 2017(3rd phase - 1st year)
- April 2017- March 2018 (3rd phase - 2nd year)
- April 2018- March 2019 (4th phase - 1st year)
- April 2019- March 2020 (4th phase - 2nd year)
- April 2019- March 2020 (4th phase - 2nd year)
(T.69 under restoration by JASA at the moment of October 2024)

Area	APPENDIX I	APPENDIX II
	Pages	Pl. nos
C71.1-NE	104	Plate 1
C71.2-SE	110	Plate 2
C71.1-West	116	Plate 3
C71.2-West	122	
C71.3.1	128	Plate 4
C71.3.2		
C71.4.1	134	Plate 5
C71.4.2		
T70.1	140	Plate 6
T70.2		
T68.1	146	Plate 7
T67.4	151	Plate 8
T66.2	156	Plate 9
T66.1	161	
T65.1	166	Plate 10
T65.4	171	
T65.3	177	Plate 11
T64.1	182	Plate 12
T64.2	187	Plate 13

Area	APPENDIX I	APPENDIX II
	Pages	Pl. nos
T63.4	192	Plate 14
T63.3	197	
T62.1	202	Plate 15
T62.2	207	
T61.4	212	Plate 16
T61.3	216	Plate 17
T61.2	221	Plate 18
T60.1	226	Plate 19
T60.2	231	
T59.3	236	Plate 20
T59.2	240	
T58.1	245	Plate 21
T58.2	250	Plate 22
T57.3	255	Plate 23
T57.2	259	
T57.1	263	Plate 24
T56.2	268	Plate 25
T56.1	272	

Area : T71.1-1/NorthEast Operated Term : 5 month

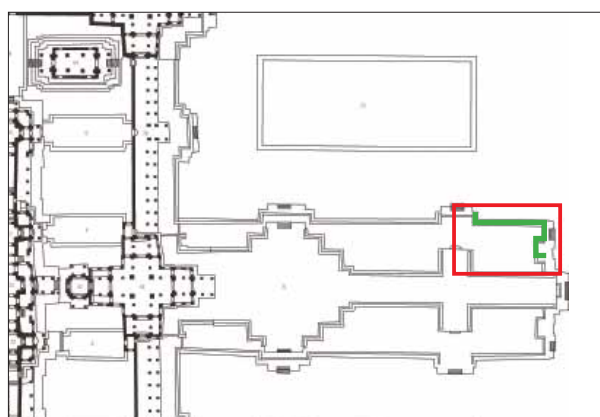


Before Restoration



After Restoration

Area : T71.1-1/NorthEast Operated Term : 5 month



Repaired number

■Lion Statues3

■Naga statue.....3

■Other Balustrade elements

Handrail.....10

Post.....6

Basement.....8

Total 30 elements

■ Restoration activity at T71.1-1/Northeast

In this area, platform was heavily distorted and some elements were fell down under the platform. After surveying and recording, we confirmed that some scattered elements of the balustrade around the platform could use and back as a handrail.

After dismantle the balustrade and started repairing of each elements, in parallel, maintenance platforms was started. It was obvious that one of the causes of inclination of balustrade was uneven subsidence of platform structure. The problems of such subsidence mainly be ascribed to the loss of the soil compacted inside the platform. However, in our project, we only reconstruct surface layer of the platform. Thus, it was difficult to make align the horizontal level and make stable condition to install balustrade. For such gap between platform and basement that could not keep stable condition, we insert new sandstone plate for support, and also filling gap with soil 4.

After finished maintenance of platforms, trail assembling work had started. We try to find the original location of each elements. If it was impossible to find the original location, we have to search the most appropriate order of the elements. After decide all the position of the elements and decide place to supply new sandstone, finally we move to reconstructing work.

For this Naga Head 71.1.1.8.1.23, two different parts are connected as one Naga statue in the previous restoration. We decided not to connect this two part again, and made new Naga body part for Naga head so that Naga statue can install in stable condition. The length of the Naga body were referred to the trace of post on the basement.

■Position change of the element(See Drawing T71.1.1)

Although the basements was not repositioned, the base was heavily distorted on the north face and had to be levelled and stabilized by inserting sandstone plates between the floor and the basement. The handrails were mostly repositioned except for the Naga heads. As many members had collapsed onto the platform or were placed in other positions, these had to be identified their original positions and repositioned. A number of substitute posts were used, and the positions of these were also changed to appropriate positions for levelling and stabilization.

■Repairing of Lion Statue

In this area, 1 Lion statue was restored (L-2: 71.1.1.9.1.2, 71.1.1.9.1.3, L-3:71.1.1.9.1.4).For 71.1.1.9.1.4, the ankle portion was lost due to breakage, and although it had been mortared and joined in the previous restoration, there was a risk that it would break again due to deterioration of this material. Therefore, new sandstone material was processed according to the required size, filled in, and joined.



Before Restoration

Area : T71.1-1/NorthEast Operated Term : 5 month

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
71.1.1.8.1.13	N.body	90	35	30	x	x
71.1.1.8.1.14	N.body	100	34	34	x	x
71.1.1.8.1.15	N.body	110	31	31	x	x
71.1.1.8.1.16(2)	N.body	141	32	29	3+5	Ø: 10 x 2 x 200
71.1.1.8.1.17(2)	N.body	157	33	52	3+4+5	Ø: 8 x 2 x 120/ 10 x 2 x 200
71.1.1.8.1.18	N.body	132	70	33	5	x
71.1.1.8.1.19	N.body	146	30	30	3+4+5	Ø: 8 x 2 x 100
71.1.1.8.1.20(2)	N.body	166	33	33	3+4+5	Ø: 8 x 2 x 100/ 10 x 2 x 200
71.1.1.8.1.21	N.body	173	33	30	5	x
71.1.1.8.1.22	N.body	164		34	x	x
71.1.1.8.1.23	N.head	104	70	145	3+4+5	Ø: 12 x 1 x 380/ 12 x 1 x 440/ 12 x 1 x 200
71.1.1.8.1.24(3)	N.head	234	71	144	3+4+5	x
71.1.1.8.1.25	N.body	74	33	28	3+4	x
71.1.1.8.1.26	N.body	106	31	28	x	x
71.1.1.8.1.27 + 29	N.body	143	36	33	3+5	Ø: 8 x 2 x 100
71.1.1.8.1.28	N.body	95	31	30	x	x
71.1.1.8.1.30(3)	N.head	211	84	155	1+3+5	Ø: 14 x 2 x 150/ 14 x 1 x 200
71.1.1.8.2.14	Sub-post	32	30	22	x	x
71.1.1.8.2.15	O-post	31	21	29	x	x
71.1.1.8.2.16	O-post	38	36	24	5	x
71.1.1.8.2.17	Sub-post	33	29	28	1+5	x
71.1.1.8.2.18	Sub-post	29	21	32	1	x
71.1.1.8.2.19	Sub-post	31	19	27	1	x
71.1.1.8.2.20	Sub-post	30	24	33	1	x
71.1.1.8.2.21	Sub-post	30	22	25	1	x
71.1.1.8.2.22	O-post	30	30	31	1	x
71.1.1.8.2.23	Sub-post	24	21	28	x	x
71.1.1.8.2.24	O-post	38	37	30	x	x
71.1.1.8.2.25	Sub-post	24	22	31	1	x
71.1.1.8.2.26	O-post	44	34	28	x	x
71.1.1.8.2.27	O-post	39	38	30	x	x
71.1.1.8.2.28	O-post	38	33	29	x	x
71.1.1.8.2.29	O-post	35	38	27	x	x
71.1.1.8.2.30	Sub-post	32	25	24	x	x
71.1.1.8.2.31	Sub-post	34	27	23	1	x
71.1.1.8.2.32	O-post	47	39	26	13+5	x
71.1.1.8.3.20 +24	Base	197	41	26	5	x
71.1.1.8.3.21	Base	83	43	24	x	x
71.1.1.8.3.22	Base	144	43	24	x	x
71.1.1.8.3.23	Base	169	43	24	3+4+5	Ø: 10 x 2 x 90
71.1.1.8.3.25	Base	38	27	30	x	x
71.1.1.8.3.26	Base	129	40	20	x	x
71.1.1.8.3.27	Base	150	44	26	x	x
71.1.1.8.3.28	Base	125	39	25	x	x
71.1.1.8.3.29	Base	183	40	24	x	x
71.1.1.8.3.30	Base	193	45	24	2+3+5	Ø: 10 x 2 x 200
71.1.1.8.3.31						
71.1.1.8.3.32	Base	103	44	25	3+4	Ø: 10 x 2 x 90
71.1.1.8.3.33	Base	143	42	20	2+3+5	Ø: 10 x 2 x 100
71.1.1.8.3.34						
71.1.1.8.3.35	Base	57	43	21	2+5	x
71.1.1.8.3.36	Base	128	48	26	3+5	x
71.1.1.8.3.37					x	x
71.1.1.8.3.38	Base	152	47	24	x	x
71.1.1.8.3.39	Base	177	48	24	x	x
71.1.1.8.3.40	Base	208	43	28	x	x
71.1.1.8.3.41	Base	193	53	27	x	x
71.1.1.8.3.42(2)	Base	141	44	25	2+3+4+5	Ø: 8 x 2 x 60

Area : T71.1-1/NorthEast Operated Term : 5 month

<Before and after restoration>



Area : T71.1-1/NorthEast Operated Term : 5 month

<After restoration>



Area : T71.1-1/NorthEast Operated Term : 5 month

<Photos during restoration>



Area : C71.2-1 / SouthEast part Operated Term : 5 month

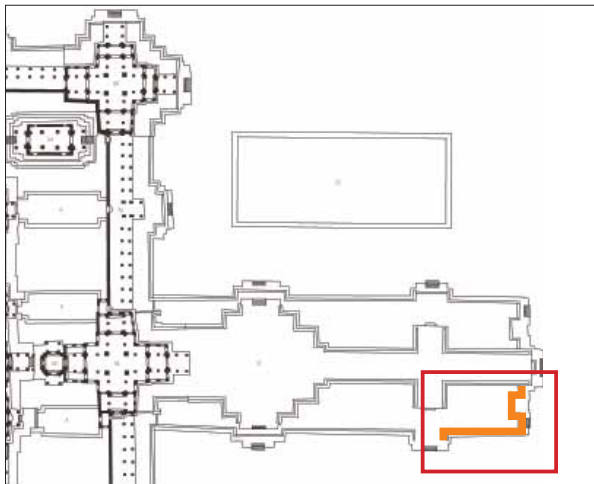


Before Restoration



After Restoration

Area : C71.2-1 / SouthEast part Operated Term : 5 month



Repaired number

■ Lion Statue 1

■ Naga statue 3

■ Other Balustrade elements

Handrail..... 14

Post..... 8

Basement..... 13

Total 39 elements



<Before restoration>

Restoration activity at T71.2-1/Southeast

From previous survey at the southern balustrade, we found that most basements are original and situated in original position. Although, some of the posts and handrails were fell down on the platform caused from distortion of platform. Also, most posts were substitute elements replaced in previous restoration, we decided to reuse these elements by result of trial assembling.

In our work, we installed these fallen handrails and posts. Also, mortar which inserted in the previous restoration between posts and handrails were replaced by new sandstone. For this area, the range of uneven subsidence of platform structure was more wide than other area to inner of causeway, and difficult to implement maintenance of platform only directly under the balustrade. Thus maintenance were performed 2m inside the balustrade.

Uneven subsidence of platform structure was most remarkable at west edge of the balustrade, southeast stair of causeway, as we could see more than 60cm subsidence around here. This cause very unstable situation of balustrade including Naga statue and needed large scale adjustment in order to keep every balustrade at same level. In the maintaining work of the platform, we filled vertical and horizontal gap of platform with laterite blocks or soil 4 as necessary. Although, it was not enough to make Naga statue at same level as other handrails, we insert 4 sandstone blocks under basement.

■Position change of the element(See Drawing T71.1.2)

In this area, many handrails had fallen onto the base, and the original positions of these components were identified. 71.2.1.8.1.9 and 71.2.1.8.1.8, which had fallen near the balustrade on the south side, were confirmed to be part of the balustrade on the north side, so they were moved. In addition, the balustrade on the southern side was not in its original position even if it had not fallen, so the original position was identified based on the position of the bundles, etc., and the location was switched. Since there were not many original posts and many substitute posts were used, they were moved to appropriate positions for leveling and stabilisation in conjunction with the relocation of the wooden beams, and sandstone plates were inserted as necessary. There was no change in the location of the basemenets.

Area : C71.2-1 / SouthEast part Operated Term : 5 month

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
71.2.1.8.1.1(2)	N.head	229	61	117	2+3+5	Ø: 10 x 2 x 150
71.2.1.8.1.2.1	N.body	117	33	29	5	x
71.2.1.8.1.2.2	N.body	110	31	27	5	x
71.2.1.8.1.3	N.body	31	30	34	x	x
71.2.1.8.1.4	N.body	75	31	27	5	x
71.2.1.8.1.5	N.body	62	33	27	5	x
71.2.1.8.1.6	N.body	24	19	28	x	x
71.2.1.8.1.7(6)	N.head	219	83	155	1+2+3+5	Ø: 14 x 3 x 150
71.2.1.8.1.8(2)	N.body	177	35	30	2+3+5	Ø: 10 x 2 x 100
71.2.1.8.1.9	N.body	139	37	41	5	x
71.2.1.8.1.10(2)	N.body	158	29	30	3+5	Ø: 10 x 2 x 100
71.2.1.8.1.11	N.body	160	30	33	5	x
71.2.1.8.1.12	N.body	169	33	32	5	x
71.2.1.8.1.13	N.body	136	34	32	3+4+5	Ø: 10 x 2 x 100
71.2.1.8.1.14(2)	N.body	169	33	32	1+3+4+5	Ø: 10 x 2 x 100
71.2.1.8.1.15.1	N.body	96	32	28	1+5	x
71.2.1.8.1.15.2	N.body	103	32	29	1+5	x
71.2.1.8.1.16(2)	N.body	170	32	33	1+2+3+5	Ø: 8 x 2 x 100
71.2.1.8.1.17	N.head	193	92	159	1+2+3+4+5	Ø: 8 x 2 x 100
71.2.1.8.1.18.1	N.body	51	31	32	x	x
71.2.1.8.2.1	O.post	39	31	26	5	x
71.2.1.8.2.2	O.post	33	30	28	x	x
71.2.1.8.2.3	O.post	39	30	23	x	x
71.2.1.8.2.4	O.post	47	37	32	2+5	x
71.2.1.8.2.5(2)	O.post	43	38	31	3+5	Ø: 6 x 2 x 100
71.2.1.8.2.6	O.post	40	39	26	1+5	x
71.2.1.8.2.7	S.post	35	34	26	x	x
71.2.1.8.2.8	S.post	38	34	22	x	x
71.2.1.8.2.9	S.post	32	30	24	5	x
71.2.1.8.2.10	S.post	33	26	18	1+5	x
71.2.1.8.2.11	S.post	36	31	24	5	x
71.2.1.8.2.12	S.post	32	30	24	5	x
71.2.1.8.2.13	O.post	40	16	30	1+5	x
71.2.1.8.2.14	O.post	41	34	26	1+3+5	x
71.2.1.8.2.15	O.post	36	34	29	1+5	x
71.2.1.8.2.16	O.post	40	42	38	1+5	x
71.2.1.8.3.1(2)	Base	203	40	28	2+3+5	Ø: 10 x 2 x 100
71.2.1.8.3.2+4	Base	235	51	34	2+3+4+5	Ø: 8 x 4 x 100/ 10 x 2 x 150
71.2.1.8.3.3	Base	95	46	24	5	x
71.2.1.8.3.5	Base	102	40	25	x	x
71.2.1.8.3.6(4)	Base	122	42	27	2+3+5	Ø: 8 x 4 x 100
71.2.1.8.3.7	Base	206	44	26	x	x
71.2.1.8.3.8	Base	143	41	24	5	x
71.2.1.8.3.9	Base	171	36	22	5	x
71.2.1.8.3.10(2)	Base	187	38	27	3+5	Ø: 10 x 2 x 100
71.2.1.8.3.11	Base	106	40	28	x	x
71.2.1.8.3.12(2)					3+5	Ø: 10 x 4 x 100
71.2.1.8.3.13(2)	Base	196	42	22	3+5	Ø: 10 x 2 x 100
71.2.1.8.3.14	Base	232	43	22	5	x
71.2.1.8.3.15					5	x
71.2.1.8.3.16	Base	122	43	22	1+5	x
71.2.1.8.3.17	Base	51	42	27	5	x

Area : C71.2-1 / SouthEast part Operated Term : 5 month

<Before and after restoration>



Area : C71.2-1 / SouthEast part Operated Term : 5 month

<After restoration>



Area : C71.2-1 / SouthEast part Operated Term : 5 month

<Photos during restoration>



Area : T71.1-1/West Operated Term : 8 month

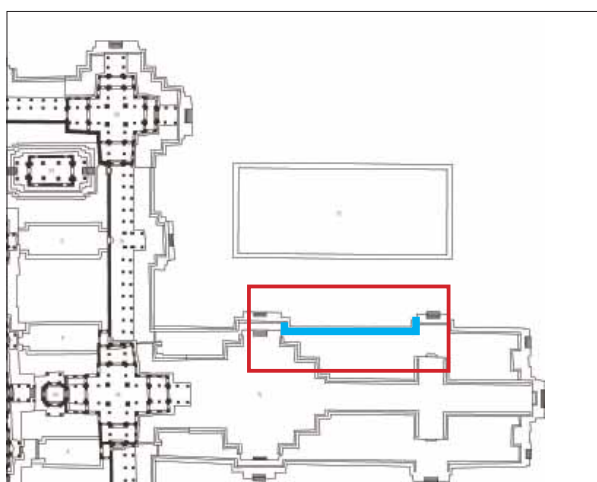


Before Restoration



After Restoration

Area : T71.1-1/West part Operated Term : 8 month



Repaired number

■ Naga statue.....1

■ Other Balustrade elements

Handrail.....8

Post.....4

Basement.....13

Total 26 elements



<Before restoration>

■ Restoration activity at T71.1-1/ West

In Area 71.1-1, many balustrade elements had collapsed onto the platform, and investigation confirmed that many balustrade elements installed in this area during restoration in the 1930s were not in situ, but had been replaced during previous restorations and moved from other locations. Close examination of these members revealed considerable deterioration, including cracks, peeling, damage, and breaks in many of them. In addition, there were many scattered stones piled up around this area and at the edge of the reservoir on the north side of the approach, and it was confirmed that some of these elements were related to the balustrade.

Platform: In addition to a large horizontal gap at the edge of the floor of the platform where the balustrade was to be installed, the floor of the platform was distorted due to the settlement of the slab construction fill inside the platform, and mud, plants, and other debris were entering the gap, making it unstable to reinstall the balustrade as is.

Several handrails and posts were found by arrangement of a scattering stone around north side of the area 71.1-1. These elements seem to have been installed in this place in the past restoration by inspection from an old picture taken just after past restoration by EFEO. When we considering the location of these scattering stone and elements fell the platform at reconstruction work, as far as it was possible, the original position was specified. And when the original position was unclear, the most stabilized location was considered. □Finally, we decide to put back 3 handrails and 2 posts from scatted elements found from north pond. Though these elements also need supplementation by new sandstone in order to set back on the platform.

■ Repairing of Lion Statue

In this area, 1 Lion statue was restored. This lion statue which lay down on the platform we decided to produce a new support pedestal for this statue and make a statue rise, for we judged that it would cause further degradation of a statue if we left the statue in the state.

Area : T71.1-1/West part Operated Term : 8 month

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
71.1.1.8.1.1(3)	N.head	196	74	160	1+2+3+5	Ø: 10 x 2 x 150, 10 x 2 x 60
71.1.1.8.1.2	N.Body	153	31	33	3+5	Ø: 6 x 2 x 100
71.1.1.8.1.3	N.Body	132	32	32	3+4+5	Ø: 10 x 2 x 100
71.1.1.8.1.4(4)	N.Body	169	32	29	2+3+5	Ø: 8 x 2 x 80 / 8 x 4 x 100 / 10 x 2 x 150
71.1.1.8.1.5	N.Body	134	31	35	3+4+5	Ø: 12 x 2 x 200 / 8 x 2 x 100
71.1.1.8.1.6(2)	N.Body	99	32	36	3+5	Ø: 10 x 2 x 150
71.1.1.8.1.7	N.Body	96	29	30	x	x
71.1.1.8.1.8	N.Body	46	32	28	2+5	x
71.1.1.8.1.9	N.Body	131	32	33	4+5	x
71.1.1.8.1.10	N.Body	136	31	30	4+5	x
71.1.1.8.1.11(2)	N.Body	183	30	30	3+5	Ø: 10 x 2 x 150
71.1.1.8.1.12(2)	N.Body	167	33	20	3+5	Ø: 10 x 2 x 150
L7.2.5 (2)	N.Body	172	33	30	3+5	Ø: 10 x 2 x 100 / 8 x 2 x 80
L6.3.13 + L7.1.17(2)	N.Body	139	32	32	3+5	Ø: 6 x 2 x 80 / 10 x 2 x 150
L7.2.7 + L7.2.11(2)	N.Body	158	32	28	3+5	Ø: 10 x 2 x 150
71.1.1.8.2.1	Post	35	34	30	1	x
71.1.1.8.2.2	Post	34	29	26	1	x
71.1.1.8.2.3	Post	29	17	35	x	x
71.1.1.8.2.4	Sub.Post	32	14	23	1	x
71.1.1.8.2.5	Sub.Post	26	22	31	x	x
71.1.1.8.2.6(2)	Sub.Post	31	22	35	1+3	Ø: 6 x 2 x 80
71.1.1.8.2.7	Sub.Post	25	25	32	1	x
71.1.1.8.2.8	Sub.Post	32	24	28	1	x
71.1.1.8.2.9	Sub.Post	26	23	28	1	x
71.1.1.8.2.10	Sub.Post	30	19	29	1+2	x
71.1.1.8.2.11	Sub.Post	38	35	30	x	x
71.1.1.8.2.12	Sub.Post	31	29	19	2	x
71.1.1.8.2.13	Sub.Post	31	27	13	2	x
L7.2.29	Sub.Post	37	36	27	x	x
M7.1.4	Sub.Post	35	31	21	x	x
71.1.1.8.3.1	Base	159	35	28	x	x
71.1.1.8.3.2	Base	105	30	23	5	x
71.1.1.8.3.3	Base	111	37	26	x	x
71.1.1.8.3.4	Base	158	48	28	1+5	x
71.1.1.8.3.5	Base	41	13	27	1	x
71.1.1.8.3.6(5)	Base	140	41	27	2+3+5	Ø: 8 x 2 x 100 / 8 x 2 x 80 / 10 x 2 x 100 / 6 x 2 x 80
71.1.1.8.3.7	Base	146	44	30	x	x
71.1.1.8.3.8	Base	144	45	24	x	x
71.1.1.8.3.9	Base	125	49	28	x	x
71.1.1.8.3.10	Base	45	21	27	x	x
71.1.1.8.3.11	Base	156	44	27	x	x
71.1.1.8.3.12(3)	Base	135	47	35	2+3+5	Ø: 6 x 2 x 80
71.1.1.8.3.13	Base	123	40	26	x	x
71.1.1.8.3.14(3)	Base	122	40	26	2+3+4+5	Ø: 6 x 2 x 80
71.1.1.8.3.15	Base	120	42	28	x	x
71.1.1.8.3.16	Base	141	44	31	x	x
71.1.1.8.3.17(2)	Base	129	26	27	3+4	Ø: 10 x 2 x 150
71.1.1.8.3.18	Base	139	46	23	4	x
71.1.1.8.3.19	Base	295	46	21	4	x

Area : T71.1-1/West part Operated Term : 8 month

<Before and after restoration>



Area : T71.1-1/West part Operated Term : 8 month

<After restoration>



Area : T71.1-1/West part Operated Term : 8 month

<Photos during restoration>



Area : C71.2-1 / West part Operated Term : 3 month

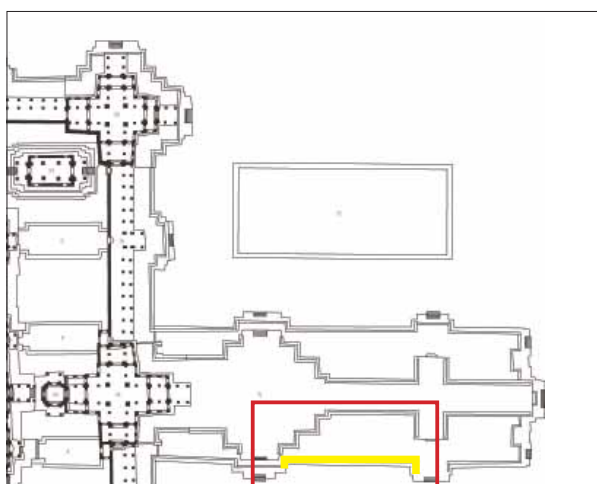


Before Restoration



After Restoration

Area : C71.2-1 / West part Operated Term : 3 month



Repaired number

■ Naga statue.....1

■ Other Balustrade elements

Handrail.....8

Post.....4

Basement.....13

Total 26 elements



<Before restoration>

■ Restoration activity at T71.2-1/Southeast

As for the state of Naga balustrade before restoration, many handrail and post elements were already missing at middle part, and also remaining basement elements were also scattering on the platform. For the western corner, some handrails were remaining and substitute elements of the post were inserted by past treatment but it could never be said that it was stable situation. Opposite eastern side, uneven subsidence of platform structure causing distortion of platform especially under the most eastern Naga head was inclined and in danger of falling.

After finished repairing all the elements, direction of the reconstructing was decided through trial assembling work. At west corner, we confirmed that to some of the substitute post would be difficult to reuse, we decided to make new substitute posts by new sandstone for supporting handrails. Also, new sandstone was supplied to some basements which were partially missing. At east corner, in order to stably install heavy Naga head, we judged the minimum platform improvement would be necessary to correct the distortion of the floor. Thus, in the range of 1.5 meter across the balustrade were dismantled. Also, some new sandstone support inserted under this Naga head for support.

With the above policy, the reconstructing work and the platform maintenance work were carried out, and finally the safety and the landscape of the balustrade could be improved.

Area : C71.2-1 / West part Operated Term : 3 month

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
71.2.1.8.1.18.2	N.head	142	86	122	1+3+4+5	x
71.2.1.8.1.19	N.body	144	30	30	5	x
71.2.1.8.1.20	N.body	178	33	31	5	x
71.2.1.8.1.21+24	N.body	147	31	32	3+5	Ø: 8x2x100
71.2.1.8.1.22	N.body	160	35	31	5	Ø: 8x2x100
71.2.1.8.1.23	N.body	153	31	33	5	x
71.2.1.8.1.25	N.body	69	32	32	5	x
71.2.1.8.1.26	N.body	170	33	34	x	x
71.2.1.8.1.27(2)	N.body	147	31	31	3+5	Ø: 8 x 2 x 100
71.2.1.8.1.28	N.head	175	80	116	x	x
71.2.1.8.2.17	O.post	42	35	29	1	x
71.2.1.8.2.18	O.post	36	36	27	1+5	x
71.2.1.8.2.19	S.post	38	20	27	1+5	x
71.2.1.8.2.20	O.post	39	37	22	1+5	x
71.2.1.8.2.21	S.post	32	30	27	1+5	x
71.2.1.8.2.22	S.post	47	25	28	5	x
71.2.1.8.2.23	S.post	31	28	26	1	x
71.2.1.8.2.24	O.post	43	34	32	1+3+4+5	x
71.2.1.8.2.25	S.post	48	34	s	x	x
71.2.1.8.2.26	S.post	46	36	19	x	x
71.2.1.8.2.27	O.post	39	30	28	x	x
71.2.1.8.2.28	S.post	28	22	27	1+5	x
71.2.1.8.2.29	S.post	31	19	25	x	x
71.2.1.8.2.30	S.post	31	22 ⁵	26	x	x
71.2.1.8.2.31	O.post	34	32	22	x	x
71.2.1.8.3.18(2)	Base	162	43	26	1+3+5	Ø: 10x2x150
71.2.1.8.3.19(2)	Base	111	40	25	3+5	Ø: 8x2x2100
71.2.1.8.3.20(2)	Base	185	43	28	1+3+4+5	Ø: 8x2x100
71.2.1.8.3.21(5)	Base	238	44	30	2+3+5	Ø: 8x2x100
71.2.1.8.3.22(2)	Base	215	40	17	3+5	Ø: 10x2x100
71.2.1.8.3.23	Base	55	29	23	x	x
71.2.1.8.3.24	Base	32	21	12	x	x
71.2.1.8.3.25	Base	42	27	18	x	x
71.2.1.8.3.26	Base	78	33	27	5	x
71.2.1.8.3.27(3)	Base	298	38	27	3+5	Ø: 8x2x100/ 10x2x150
71.2.1.8.3.28	Base	159	39	29	5	x
71.2.1.8.3.29	Base	94	41	24	5	x
71.2.1.8.3.30	Base	132	42	26	x	x
71.2.1.8.3.31	Base	103	42	24	x	x
71.2.1.8.3.32(2)	Base	214	39	20	3+5	Ø: 10x2x150
71.2.1.8.3.33	Base	136	37	21	x	x
71.2.1.8.3.34	Base	107	43	27	5	x
71.2.1.8.3.35	Base	82	35	25	3+5	Ø: 6x2x100
71.2.1.8.3.36	Base	123	45	29	5	x

Area : C71.2-1 / West part Operated Term : 3 month

<Before and after restoration>



Area : C71.2-1 / West part Operated Term : 3 month

<After restoration>



Area : C71.2-1 / West part Operated Term : 3 month

<Photos during restoration>



Area : C71.3 / Working Term : 5 month

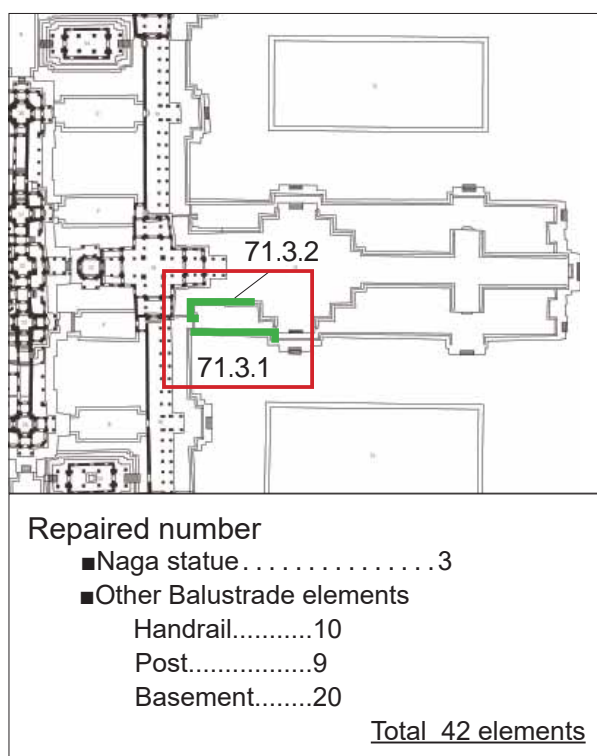


Before Restoration



After Restoration

Area : C71.3 / Working Term : 5 month



<Before restoration>

■ Restoration activity at T71.3

Area 71.4.1 is the place where we could see vivid influence of damage by fallen tree in some decades ago. Many elements of balustrade and Naga statues were broken and fell down on the platform. Platform was distorted by the changes over years, in particular, the most outer line of the surface layer were moved to the outside and causing the big gap with inner line that balustrade should be set on. Also, certain inclination could be seen that was too unstable to reconstruct without any treatment.

There were many gaps between the bottom of basements and surface of platform that we need to apply soil 4 and lead plate with cement too.

After basements finished put back, we start to back handrails. 3 of the posts need replacement by new sandstones because it was too unstable to use former substitute elements. Also one post out of 7 original posts need to fill with new sandstone to the missing part. Some of Naga body we put back as same place before dismantling, but some we changed the place according to the situation of the area. Such as; stone from scatter stones that we just found and connect, need to find the places to back it all.

In the process of adjustment work for making handrail horizontal, we need to fill 2 big gaps between post and Naga. This adjustment was done by new sandstones plate. When putting handrail on the post which is not in the original position or substitute element, the new sandstone plate for adjustment were inserted for the safety reason, but these are temporary disposal.

In another part, the new sandstone processing work for supplement missing part by the new sandstone where went on to 3 elements (1 post and 2 handrails). These were found from scattered stone around this area.

71.4.2 is a section that collapsed again after restoration in the early 20th century due to the collapse of a large tree. Many collapsed balustrade elements were scattered in situ and the elements were also damaged into small pieces. Preliminary investigation confirmed that all the original bundles were in place. Careful identification of the small piece combinations allowed us to restore them to their original appearance.

Area : C71.3 / Working Term : 5 month

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
71.3.1.8.3.1	Base	185	34	26	1+2+4+5	x
71.3.1.8.3.2 (3)	Base	100	40	24	3+4+5	Ø: 8 x 2 x 100/
71.3.1.8.1.3	Base	128	52	32	5	x
71.3.1.8.3.4 (2)	Base	116	44	30	3+5	Ø: 8 x 2 x 100
71.3.1.8.3.5 (2)	Base	48	37	14	3+5	Ø: 8 x 2 x 100
71.3.1.8.3.6 (4)	Base	174	38	25	2+3+5	Ø: 8 x 6 x 150
71.3.1.8.3.7	Base	40	39	16	5	x
71.3.1.8.3.8	Base	44	39	19	5	x
71.3.1.8.3.9	Base	103	39	12	5	x
71.3.1.8.3.10	Base	39	41	23	5	x
71.3.1.8.3.11	Base	49	39	30	5	x
71.3.1.8.3.12	Base	66	33	20	5	x
71.3.1.8.3.13	Base	140	40	24	5	x
71.3.1.8.3.14	Base	151	32	24	x	x
71.3.1.8.3.15 (6)	Base	299	32	25	2+3+5	Ø: 8 x 4 x 150/ 8 x 2 x 100
71.3.1.8.3.16 (2)	Base	202	42	33	2+3+5	Ø: 10 x 2 x 150
71.3.1.8.2.1	Ori-post	46	44	26	5	x
71.3.1.8.2.2	Sub-post	14	14	29	x	x
71.3.1.8.2.3	Sub-post	32	18	28	x	x
71.3.1.8.2.4	Ori-post	44	43	39	x	x
71.3.1.8.2.5	Ori-post	40	32	14	5	x
71.3.1.8.2.6	Sub-post	22	18	34	x	x
71.3.1.8.2.7	sub-post	18	38	29	5	x
71.3.1.8.2.8						
71.3.1.8.2.9						
71.3.1.8.1.1	N.head	101	42	100	5	x
71.3.1.8.1.2	N.body	94	28	28	x	x
71.3.1.8.1.3	N.body	184	34	36	2+5	x
71.3.1.8.1.4	N.body	77	30	31	5	x
71.3.1.8.1.5	N.body	70	32	29	5	x
71.3.1.8.1.6	N.body	74	34	31	x	x
71.3.1.8.1.7 (6)	N.head	145	81	110	1+2+3+5	Ø: 12 x 3 x 200/ 10 x 3 x 150/ 8 x 2 x 100
71.3.1.8.1.8(3)	N.body	72	40	20	3+5	Ø: 8 x 2 x 150, 8 x 2 x 100
71.3.2.8.3.1	N.body	82	40	32	5	x
71.3.2.8.3.2	N.body	51	36	30	2+5	x
71.3.2.8.3.3	N.body	84	36	32	x	x
71.3.2.8.3.4	N.body	176	39	40	2+3+4+5	Ø: 12 x 2 x 150/ 12 x 1 x 100/
71.3.2.8.3.5						8 x 4 x 100
71.3.2.8.3.6						
71.3.2.8.3.7	N.head	172	80	114	2+4+5	x
71.3.2.8.2.1	Ori.Post	44	41	34	3+4+5	Ø: 6 x 1 x 60
71.3.2.8.2.2	Ori.Post	42	42	34	3+4+5	Ø: 6 x 2 x 60
71.3.2.8.1.1	Base	113	32	29	x	x
71.3.2.8.1.2 + 4	Base	90	46	26	3+5	Ø: 12 x 2 x 150
71.3.2.8.1.3	Base	44	24	17	x	x
71.3.2.8.1.5	Base	122	42	23	x	x

Area : C71.3 / Working Term : 5 month

<Before and after restoration>



Area : C71.3 / Working Term : 5 month

<After restoration>



Area : C71.3 / Working Term : 5 month

<Photos during restoration>



Area : C71.4 / Operated Term : 6 month

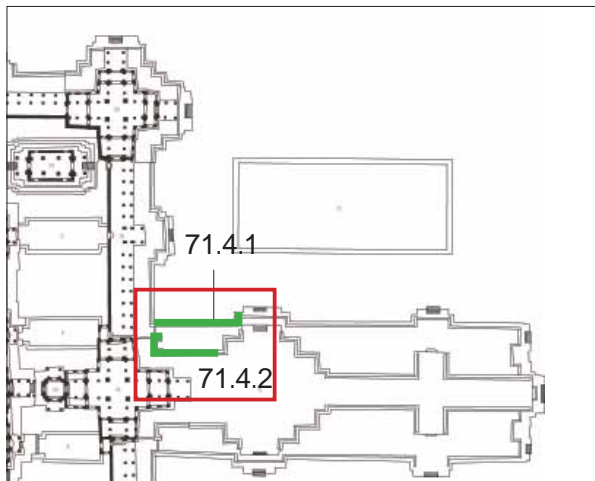


Before Restoration



After Restoration

Area : C71.4 / Operated Term : 6 month



Repaired number

- Naga statue.....2
- Other Balustrade elements
 - Handrail.....6
 - Post.....14
 - Basement.....22

Total 42 elements

■ Restoration activity at T71.4

Area 71.4.1 is the place where we could see vivid influence of damage by fallen tree in some decades ago. Many elements of balustrade and Naga statues were broken and fell down on the platform. Platform was distorted by the changes over years, in particular, the most outer line of the surface layer were moved to the outside and causing the big gap with inner line that balustrade should be set on. Also, certain inclination could be seen that was too unstable to reconstruct without any treatment.

There were many gaps between the bottom of basements and surface of platform that we need to apply soil 4 and lead plate with cement too.

After basements finished put back, we start to back handrails. 3 of the posts need replacement by new sandstones because it was too unstable to use former substitute elements. Also one post out of 7 original posts need to fill with new sandstone to the missing part. Some of Naga body we put back as same place before dismantling, but some we changed the place according to the situation of the area. Such as; stone from scatter stones that we just found and connect, need to find the places to back it all.

In the process of adjustment work for making handrail horizontal, we need to fill 2 big gaps between post and Naga. This adjustment was done by new sandstones plate. When putting handrail on the post which is not in the original position or substitute element, the new sandstone plate for adjustment were inserted for the safety reason, but these are temporary disposal.

In another part, the new sandstone processing work for supplement missing part by the new sandstone where went on to 3 elements (1 post and 2 handrails). These were found from scattered stone around this area .

71.4.2 is a section that collapsed again after restoration in the early 20th century due to the collapse of a large tree. Many collapsed balustrade elements were scattered in situ and the elements were also damaged into small pieces. Preliminary investigation confirmed that all the original bundles were in place. Careful identification of the small piece combinations allowed us to restore them to their original appearance.



<Before restoration>

Area : C71.4 / Operated Term : 6 month

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
71.4.1.8.3.1	N.Body	170	40	32	x	x
71.4.1.8.3.2	N.Body	130	34	32	x	x
71.4.1.8.3.3	N.Body	171	35	33	x	Ø: 8 x 2 x 100
71.4.1.8.3.4	N.Body	168	36	29	x	0
71.4.1.8.3.5	N.Body	155	37	33	4+5	x
71.4.1.8.3.6	N.Body	92	33	33		x
71.4.1.8.3.7(3)	N.head	231	60	124	2+3+5	Ø: 6 x 3 x 100/ 12 x 2 x 200
71.4.1.8.2.1	Sub-post	20	19	34	x	x
71.4.1.8.2.2	Post	50	48	30	x	x
71.4.1.8.2.3	Post	45	44	32	x	x
71.4.1.8.2.4	Post	41	40	31	x	x
71.4.1.8.2.5	Post	38	22	13	3+4+5	Ø: 12 x 2 x 100
71.4.1.8.2.6	Post	43	42	30	1+3+5	Ø: 12 x 3 x 200
71.4.1.8.2.7	Sub-post	44	39	34	x	x
71.4.1.8.2.8	Sub-post	46	19	32	x	x
71.4.1.8.2.9	Sub-post	40	19	39	x	x
71.4.1.8.2.10	Sub-post	20	24	35	x	x
71.4.1.8.2.11	Post	37	37	29	x	x
71.4.1.8.2.12	Post	36	35	38	x	x
71.4.1.8.1.1	Base	90	40	25	x	x
71.4.1.8.1.2	Base	91	52	31	x	x
71.4.1.8.1.3	Base	163	50	33	x	x
71.4.1.8.1.4(2)	Base	276	54	33	3+5	Ø: 8 x 2 x 130
71.4.1.8.1.5(2)	Base	269	51	31	x	
71.4.1.8.1.6(2)	Base	167	48	27	x	x
71.4.1.8.1.7	Base	303	52	24	x	x
71.4.1.8.1.8(2)	Base	270	53	30	x	Ø: 10 x 2 x 100
71.4.1.8.1.9	Base	254	53	36	x	x
71.4.1.8.1.10	Base	74	51	28	x	
71.4.1.8.1.11	Base	169	53	36	x	x
71.4.1.8.1.12	Base	210	42	21	x	x
71.4.1.8.1.13(2)	Base	270	42	27	3	Ø: 8 x 2 x 100
71.4.2.8.6.1(2)	N.Head	193	81	125	1+2+3+5	Ø: 8 x 2 x 100
71.4.2.8.5.1	Post	47	42	33	x	x
71.4.2.8.5.2	Post	42	39	29	x	x
71.4.2.8.4.1	Base	128	53	33	x	x
71.4.2.8.4.2	Base	80	43	32	x	x
71.4.2.8.4.3	Base	90	40	31	4	x
71.4.2.8.4.4	Base	141	44	36	x	x
71.4.2.8.4.5	Base	198	51	32	x	x
71.4.2.8.4.6	Base	49	45	26	3+5	x
71.4.2.8.4.7(2)	Base	92	50	26	2+5	x
71.4.2.8.4.8(2)	Base	214	46	33	2+5	x
71.4.2.8.4.9	Base	113	52	30	x	x

Area : C71.4 / Operated Term : 6 month

<Before and after restoration>



Area : C71.4 / Operated Term : 6 month

<After restoration>



Area : C71.4 / Operated Term : 6 month

<Photos during restoration>



Area : T70.1 & T70.2 Operated Term : 3 month/ T70.2, 3month/T70.1

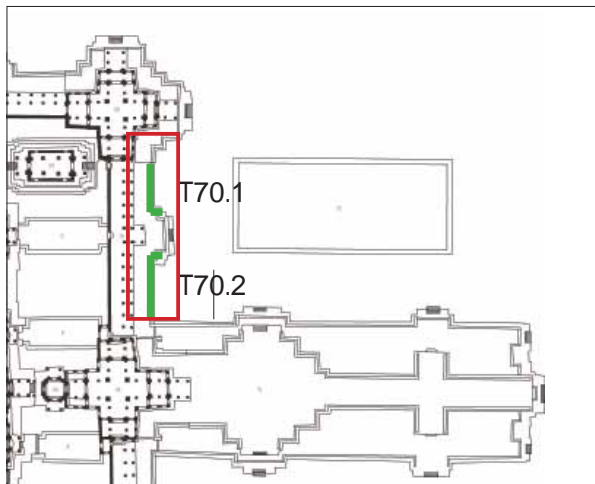


Before Restoration at T70.1



After Restoration at T70.1

Area : T70.1 & T70.2 Operated Term : 3 month/ T70.2, 3month/T70.1



<Before restoration at T70.1>

Repaired number

■ Naga statue.....	4
■ Other Balustrade elements	
Handrail.....	8
Post.....	14
Basement.....	25

Total 51 elements

■ Restoration activity at T70.2 and T70.1

2nd week of November 2014, dismantling, recording and repairing of each elements in area G70-2 was started. However after that, JASAdecided to start platform improvement at G70 for few months from December. Thus, after finish this work at the end of November, all the elements are moved and kept for drying at the storage hut until platform improvement will finish by JASAAfter the platform improvements by JASA were completed, the repaired balustrade was installed in October 2015.

As T70.1 was within the scope covered by JASA's restoration project, we carried out restoration activities with JASA staff from June to August 2020.

■ Position change of the element T70.2 (See Drawing Plate 6)

The Naga head J6.3.2, which had fallen to the ground, was installed at the northern end. As there were no suitable substitute posts available, a new support material was used. In addition, the original location of the balustrade was identified based on the position of the remaining of posts on the base, and the balustrade was moved to a new location within T70.2 area. It was confirmed that the railing component C71.4.1.8.3.1, which was located at 71.4, was next to T70.2.8.1.1, so it was moved to this area.

■ Position change of the element T70.1 (See Drawing Plate 6)

The Naga head J6.2.1, which had fallen to the ground, was confirmed to be a component that was adjacent to 70.1.8.1.1, and was installed at the southern end of T70.1. 70.1.8.1.2, 3, and 4, which had fallen onto the platform floor, and 70.1.8.1.8, which had been moved, are unlikely to be from this area, so they have been temporarily stored elsewhere and will be considered again when

The original locations of some of the pedestals were identified, so the locations were switched within T70.1.

Area : T70.1 & T70.2 Operated Term : 3 month/ T70.2, 3month/T70.1

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
70.2.8.1.1	N.Body	235	36	32	5	x
70.2.8.1.2 + 3	N.Body	200	36	32	3+5	Ø: 10 x 2 x 200
70.2.8.1.4.1	N.Body	102	35	29	5	x
70.2.8.1.4.2	N.Body	121	35	31	5	x
70.2.8.1.5	N.Body	211	37	34	5	x
70.2.8.2.1	Sub-post	37	12	33	x	No treatment
70.2.8.2.2	Sub-post	28	24	30	x	No treatment
70.2.8.2.3	Sub-post	43	28	32	x	No treatment
70.2.8.2.4	Post	54	37	23	x	No treatment
70.2.8.2.5	Sub-post	33	26	21	x	No treatment
70.2.8.2.6	Sub-post	33	18	28	x	No treatment
70.2.8.2.7	Sub-post	33	20	30	x	No treatment
70.2.8.3.1(2)	Base	180	60	33	3+5	Ø: 10 x 2 x 200
70.2.8.3.2	Base	71	45	29	5	x
70.2.8.3.3	Base	65	44	29	5	x
70.2.8.3.4	Base	53	15	27	5	x
70.2.8.3.5	Base	52	51	27	5	x
70.2.8.3.6	Base	130	49	23	5	x
70.2.8.3.7	Base	111	51	27	5	x
70.2.8.3.8	Base	76	51	27	5	x
70.2.8.3.9(2)	Base	240	50	28	5	Ø: 12 x 2 x 200
70.2.8.3.10	Base	142	43	33	5	x
70.2.8.3.11.1	Base	96	44	22	5	x
70.2.8.3.11.2	Base	85	45	27	5	x
70.2.8.3.12	Base	77	47	27	5	x
70.2.8.3.13	Base	101	48	25	5	x
70.2.8.3.14	Base	104	43	33	5	x

<Before and after restoration at T70.2>



Area : T70.1 & T70.2 Operated Term : 3 month/ T70.2, 3month/T70.1

<Before and after restoration at T70.1>



<After Restoration at T70.2>



Area : T70.1 & T70.2 Operated Term : 3 month/ T70.2, 3month/T70.1

<During restoration at T70.2>



<After restoration at T70.1>



Area : T70.1 & T70.2 Operated Term : 3 month/ T70.2, 3month/T70.1

<Photos during restoration at T70.1>



Area : T68.1 work period : 8 weeks

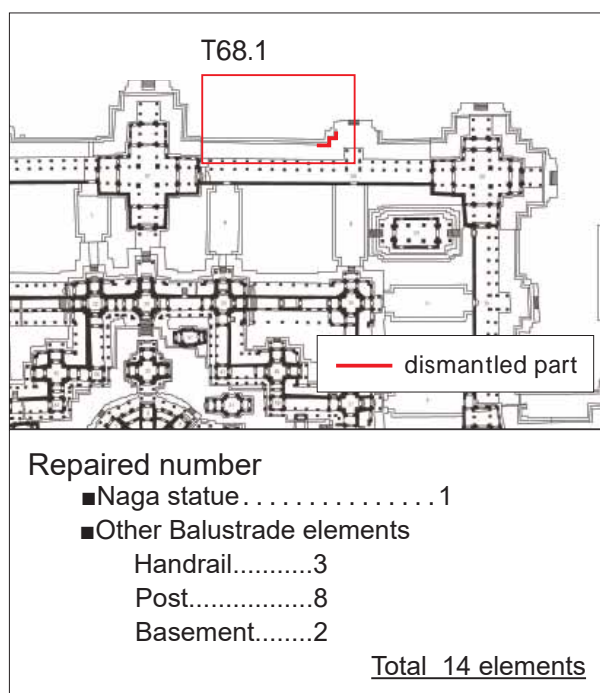


Before Restoration



After Restoration

Area : T68.1 work period : 8 weeks



Stone Number	Type	Applied Case	notes (Ø x num. x L)
68.1.8.1.1	N.body	5	x
68.1.8.1.2	N.body	5	x
68.1.8.1.3	N.body	5	x
68.1.8.1.4(2)	Naga	1+3+5	Ø: 10x3x200
68.1.8.2.1	S.post	5	x
68.1.8.2.2	S.post	5	x
68.1.8.2.3	S.post	5	x
68.1.8.2.4	S.post	5	x
68.1.8.2.5	S.post	5	x
68.1.8.2.6	S.post	5	x
68.1.8.2.7	S.post	5	x
68.1.8.2.8	O.post	5	x
67.1.8.3.1	Basement	5	x
67.1.8.3.2(3)	Basement	3+5	Ø: 10x4x200

1. Result of previous survey

Except around porch, most handrails and posts were missing in this area. There are two Naga statues at this area. Whereas eastern Naga statue was in stable condition, western Naga (68.1.8.1.4) statue was broken in two pieces and in unstable situation. Thus we decided only dismantle western Naga statue. Previous treatment of this NAGA was already deteriorated and again broken. Also the basements under this statue were in unstable condition caused from horizontal direction gap between the floor of platform. One basement (67.1.8.3.2) were broken in 2 pieces, thus we decide to dismantle this basement and related posts and handrails.

2. Restoration activity at T68.1

In this area, we set mini crane at northwest of this area. Dismantled elements were moved to JASA restoration hat and had repairing. At reconstruction work after connection of Naga statue and basements, Some sandstone plates were inserted between basement and platform floor, as platform around porch caused serious uneven subsidence. Also, small piece of sandstone support was inserted under a handrail.

3. Position change of the element(See Drwaing 68.1)

Position change of the element(See Drwaing 59.2)

No movement in the Handrails or the Basements. The substitute Post that supported the joint in the previous restoration was removed by re-joining the naga head 68.1.8.1.1 and 68.1.8.1.2.

Area : T68.1 work period : 8 weeks

<Before and after restoration>



Area : T68.1 work period : 8 weeks

<After restoration>



<Photos during restoration>



Area : T68.1 work period : 8 weeks

<Photos during restoration>



Area : T67.4 work period : 16 weeks

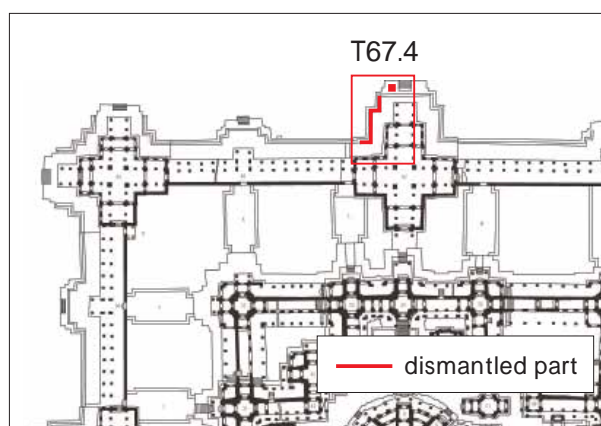


Before Restoration



After Restoration

Area : T67.4 work period : 16 weeks



Repaired number

■Lion Statue	1
■Naga statue	2
■Other Balustrade elements	
Handrail.....	3
Post.....	10
Basement.....	2
<u>Total 18 elements</u>	

Stone Number	Type	Applied Case	notes (Ø x num. x L)
67.4.8.1.1	Naga	5	x
67.4.8.1.2	N.body	5	x
67.4.8.1.3	N.body	5	x
67.4.8.1.4(2)	Naga	3+5	Ø: 10x2x200
67.4.8.1.5	N.body	5	x
67.4.8.2.1	O.post	2+5	x
67.4.8.2.2	S.post	5	x
67.4.8.2.3	S.post	5	x
67.4.8.2.4	S.post	5	x
67.4.8.2.5	S.post	5	x
67.4.8.2.6	S.post	5	x
67.4.8.2.7	O.post	5	x
67.4.8.2.8	S.post	5	x
67.4.8.2.9	S.post	5	x
67.4.8.2.10	S.post	5	x
67.4.8.3.1(2)	Base	1+3+5	Ø: 10x2x200
67.4.8.3.2	Base	5	x
67.4.8.3.3	Base	5	x
67.4.8.3.4(4)	Base	3+5	Ø:
67.4.8.3.5	Base	5	x
67.4.8.1.1(2)	Singha	1+2+3+5	Ø: 10x3x200

1. Result of previous survey

There are 2 Naga statues in this area. For the eastern Naga statue(67.4.8.1.1), two elements of the platform directly under the Naga statue's basement were missing and concrete support was inserted under the basement of Naga statue. However this concrete support was deteriorate and needed replacement with new sandstone supports. Also, the trunk of the other western Naga statue (67.4.8.1.4) was broken and had no previous repairing, just supported by substitute post. Thus we decided to connect this broken Naga statue and so that we could remove substitute support.

Also, one lion statue in this area was broken into two pieces(front legs and pedestal was separated) and also very unstable situation caused from uneven subsidence around the statue.

2. Restoration activity at T67.4

There were scattering stones around this are, thus first of all, we had to secure the space for set mini crane. We took photo records before moving these scattering stones and move to other place. Also many tourist walk pass T67 for gate, we set temporary enclosure around restoration area in consideration of safety and noise. After that, we carefully dismantle lion statue and other balustrade. After repairing of each elements, we confirmed how much and where sandstone plates and lead plates should be inserted. From discussion with JASA experts, we decided to insert two new sandstone support under Naga statue 67.4.8.1.1. For this new supports, we mark rough texture for surface finishing. Naga statue 67.4.8.1.4 was connected and install without substitute post when reconstructing.

For lion statue, after having joining and other appropriate treatment, sandstone plate were inserted at four corners between platform and the bottom of the statue.

3.Position change of the element(See Drwaing T67.4)

No movement in the Handrails or the Basements.New sandstone was inserted into the platform to stabilize the base directly below the Naga head 67.4.8.1.1. As a result of joining 67.4.8.1.4.1, the substitute post that was supporting the joint became unnecessary, so it was moved to a different location to maintain the overall levelness.

4. In this area, 1 Lion statue was restored.

Area : T67.4 work period : 16 weeks

<Before and After restoration>



Area : T67.4 work period : 16 weeks

<After restoration>



<Photos during restoration>



Area : T67.4 work period : 16 weeks

<Photos during restoration>



Area : T66.2 work period : 8 weeks

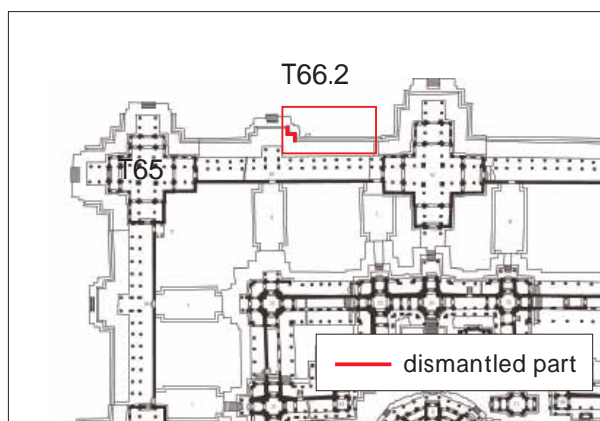


Before Restoration



After Restoration

Area : T66.2 work period : 8 weeks



Stone Number	Type	Applied Case	notes (Ø x num. x L)
66.2.8.1.1(2)	N.Head	1+3+5	Ø: 10x2x200
66.2.8.2.1	O.post	5	x
66.2.8.2.2	S.post	5	x
66.2.8.2.3	S.post	5	x
66.2.8.2.4	O.post	5	x

1. Result of previous survey

Eastern Naga statue(66.2.8.1.1) was broken into 2 pieces and combined with post and basement by iron belt in past restoration in order to stand. Although, the iron belt was nearly fall out and in danger of fall. Thus we decided to dismantle this Naga statue and elements concerning to this statue.

2. Restoration activity at T66.2

We set mini crane at northeast space of this area and started work. In this area we didn't move dismantled elements to other area, repaired at the on-site platform, as dismantled elements were few. Remove previous iron belt of Naga statue, and combined using 3 stainless steel. We could remove one substitute post under this statue when reconstructing. Also, the outer edge of the platform was subsided and the Naga statue was inclined to outside, thus we inserted sandstone plate and lead plate under the basement in order to secure stable situation.

3. Position change of the element(See Drwaing T66.2

No movement in the Handrails or the Basements.By rejoining 66.2.8.1.1.1,2, which had been installed using an iron belt in a previous restoration, the substitute 66.2.8.2.2 was moved.

Area : T66.2 work period : 8 weeks

<Before and after restoration>



Area : T66.2 work period : 8 weeks

<After restoration>



<Photos during restoration>



Area : T66.2 work period : 8 weeks

<Photos during restoration>



Area : T66.1 work period : 11 weeks

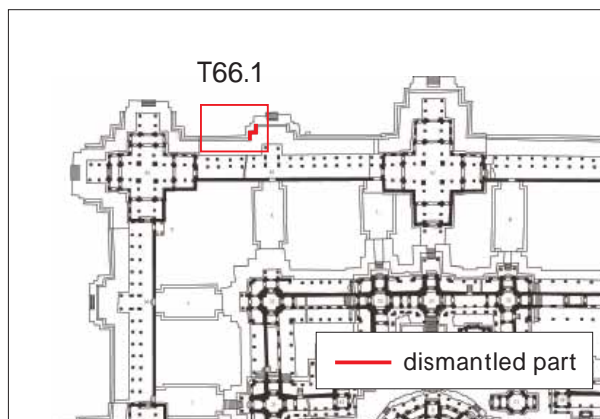


Before Restoration



After Restoration

Area : T66.1 work period : 11 weeks



Stone Number	Type	Applied Case	notes (Ø x num. x L)
66.1.8.1(7)	Naga	1+3+5	
66.1.8.1.2	Naga	1+5	x
66.1.8.2.1	O.post	1+5	x
66.1.8.2.2	O.post	1+5	x
66.1.8.2.3	O.post	1+5	x
66.1.8.2.4	O.post	1+5	x
66.1.8.2.5	S.post	1+5	x

1. Result of previous survey

There were two Naga statues in this area. For the north statue (66.1.8.1.1), it was largely broken into four parts and also trunk part was broken into several fragments. By the previous restoration, this part was connected with iron pin, and fixed with iron belt around the trunk part. However, the mortar filled to this joint had deteriorated and became meaningless, already joint part was broken again into several fragments. Also, although there was no major deterioration in the Naga statue on the south side (66.1.8.1.2), in order to prevent the falling of the statue, the iron belt were inserted into the basement and fixed. However, the mortar fixed this belt also began to deteriorate, there was a danger of falling down due to this iron belt detaching. Therefore, in this area, we decided to dismantle this 2 Naga statues and concerning 5 posts under these Naga statue. It was relatively stable and had no distortion or inclination for bamsements, we decided not to dismantle.

2. Restoration activity at T66.1

For this area, as same as T66.2, it was difficult to set mini-crane around the site. Thus we set up scaffolding and trochlea. For this reason, dismantled elements were repaired on the platform. At first of dismantling work, we had to remove the mortar and iron belt of two Naga statues (66.1.8.1.1 and 66.1.8.1.2) which installed at previous restoration. Especially for 66.1.8.1.1, the broken part was again broken into fragments, thus we need to remove and dismantle this statue carefully. After remove all, we connected each statue by using stainless steel bolt. Thus, we could reconstruct Naga statue without substitute posts that were supporting Naga broken part.

Position change of the element(See Drwaing T66.1)

No movement in the Handrails or the Basements. By re-joining Naga head 66.1.8.1, which had been joined with an iron belt and mortar in a previous restoration, the iron belt was removed and the post 66.1.8.2, which was underneath it, was moved.

Area : T66.1 work period : 11 weeks

<Before and after restoration>



Area : T66.1 work period : 11 weeks

<After restoration>



<Photos during restoration>



Area : T66.1 work period : 11 weeks

<Photos during restoration>



Area : T65.1 work period : 6 weeks

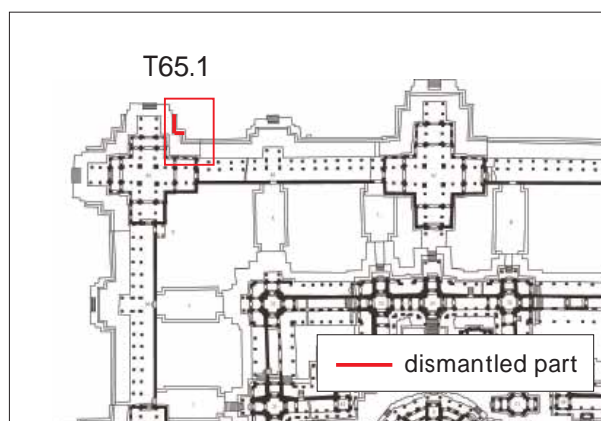


Before Restoration



After Restoration

Area : T65.1 work period : 6 weeks



Repaired number

- Naga statue..... 1
- Other Balustrade elements
 - Handrail.....1
 - Post.....3
 - Basement.....2

Total 7 elements

1. Result of previous survey

The Naga statue of this area (65.1.8.1.1) was inclining to the outside due to broken of the basement. For the other part, is seems comparatively stable.

2. Restoration activity at T65.4

In this area, we decided to dismantle only Naga statue and handrail beside this statue, and posts and basement under these handrails. As a result of dismantle, as there some were uneven settlement of the platform, there were no gaps at floor, thus we decided to re-install the elements without touching platform. For the Naga statue 65.1.8.1.1, part of Naga head was broken and connected in the previous restoration, though deterioration of the connection was concerned, we reconnect this part. Also, we also connected broken basement which caused inclination of Naga statue. When reconstructing, some leadplate were inserted between basement and post and Naga statue to eliminate the inclination of the Naga statue.

3.Position change of the element(See Drwaing T65.1)

No movement in all the elements.

Area : T65.1 work period : 6 weeks

<Before and after restoration>



Area : T65.1 work period : 6 weeks

<After restoration>



<Photos during restoration>



Area : T65.1 work period : 6 weeks

<Photos during restoration>



Area : T65.4 work period : 20 weeks

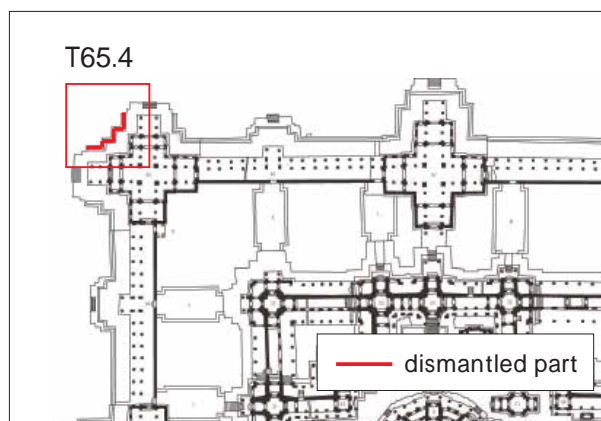


Before Restoration



After Restoration

Area : T65.4 work period : 20 weeks



Repaired number

■Naga statue..... 3

■Other Balustrade elements

Handrail.....8

Post.....10

Basement.....13

Total 34 elements

1. Result of previous survey

Uneven settlements of the platform forming big gaps and breakage of the basement, and caused many falling of handrails and posts. Also, it was clearly visible that rest unfallen NAGA statue was installed at unoriginal position by previous restoration. Furthermore, in the rain season, ground around this area was covered with rain water, these fallen elements was also submerged in water and causing further deterioration.

As for these situation, we decided to dismantle all the balustrade elements in this area.

2. Restoration activity at T65.4

First of all, we begun from setting site around this area after records of the scattering stone. Specific work was which find the combination of fragments that could be joined and identification work of the original position was carried out carefully. One of the largest progress in this work is we found that one Naga statues installed at T64.2 and piece of handrail could be joined and originally positioned at western edge of balustrade in this area. Finally all scattering stones on the ground and platform could installed in this area. Also simple platform improvement was done before reconstructing work.

3. Position change of the element(See Drwaing T65.4)

In this area, almost all of the wooden beams were either on the platform or on the ground below the platform, except for 65.4.8.1.1, so we identified their original positions and made significant changes to their positions.

- 64.1.8.1.2, which was installed in T64.1, was moved to this area because it was confirmed that it was joined with T65.4.8.1.2 and that it was in situ in T65.4.
- 65.4.8.1.1 was installed next to it, and the Naga heads C4.4.6.1 and C4.4.6.2, which had fallen to the ground below the platform, and C4.4.5.2+5.1, which was joined to these, were installed in the northeast corner of this area.

The location of the ground cover has not changed. The majority of the Posts were installed in their original positions, in association with the identification and installation of the original positions of the Handrails.

Area : T65.4 work period : 20 weeks

<Before and after restoration>



Area : T65.4 work period : 20 weeks

<After restoration>



<Photos during restoration>



Area : T65.4 work period : 20 weeks

<Photos during restoration>



Area : T65.4 work period : 20 weeks

<Photos during restoration>



Area : T65.3 work period : 10 weeks

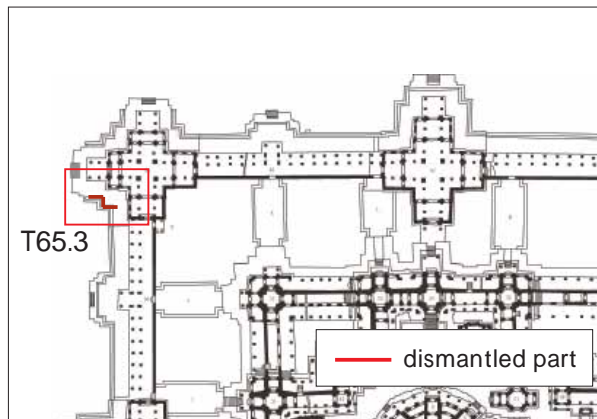


Before Restoration



After Restoration

Area : T65.3 work period : 10 weeks



Repaired number

■Lion Statue	1
■Naga statue	2
■Other Balustrade elements	
Handrail.....	4
Post.....	8
Basement.....	10

Total 18 elements

1. Result of previous survey

There are 2 Naga statues in this area. Western Naga statue (65.3.8.1.1) was missing whole trunk and fixed with iron clamps and pin to the substitute post and basement. The other Naga statue (65.3.8.1.5) was broken into two pieces. Also, some of the basements has delamination and broken into fragments.

For one lion statue stood in this area, some cracks and other deterioration are recognized. Thus we decided to dismantle this statue and implement filling of cracks exfoliation.

2. Restoration activity at T65.3

For the situation as above, we decided to dismantle most of the elements of balustrade except few basements and posts at western edge. Also, these deterioration of the elements caused from uneven settlement of the platform. Thus we dismantle first upper layer of the platform in order to remove the soils which enter into the gap and eliminate the gap between platform floor.

When we dismantle the Naga statue 65.3.8.1.1, we find 9 iron pins which inserted at previous restoration (2 pins between Naga statue and substitute-post, 4 pins between substitute-post and substitute-basement, 3 pins between substitute-basement and platform). Fortunately, we could find the trunk piece that can be connected to this statue, we were able to re-install this Naga statue without using any pins, only with height adjustment. For the other Naga statue 65.3.8.1.5 and other handrails and basements, we implement needed treatment such as connecting, and consolidation.

However, only by the improvement of floor of the platform, it could not solved fundamental inclination. Thus we insert some sandstone plate between basement and platform.

3. Position change of the element(See Drawing T65.3

No movement in all the elements. It was confirmed that C5.4.1, which had fallen onto the platform, was joined to 65.3.8.1.1, so it was joined. When installing, the concrete material used for the naga head, which was unstable before restoration, was removed, and by using the 65.3.8.2.6 and 65.3.8.2.1 substitute Post, it was possible to install it in a stable state.

Area : T65.3 work period : 10 weeks

<Before and after restoration>



Area : T65.3 work period : 10 weeks

<After restoration>



<Photos during restoration>

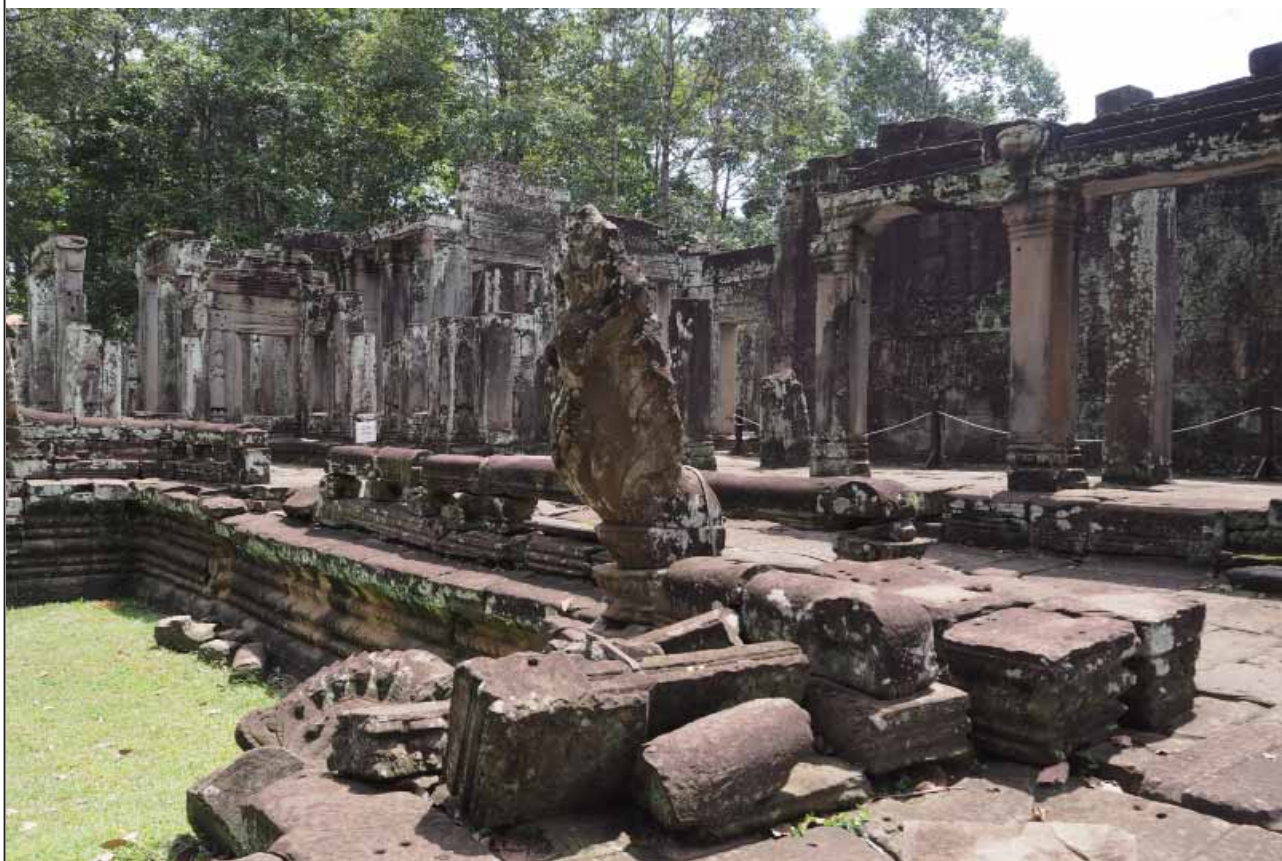


Area : T65.3 work period : 10 weeks

<Photos during restoration>



Area : T64.1 work period : 8 weeks

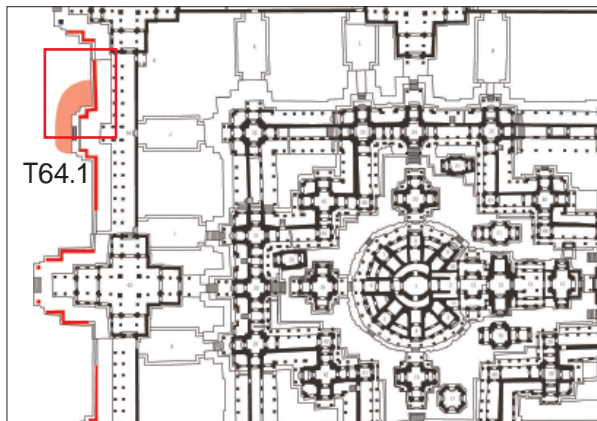


Before Restoration



After Restoration

Area : T64.1 work period : 8 weeks



Repaired number

■ Naga statue..... 1

■ Other Balustrade elements

Handrail.....6

Post.....10

Basement.....13

Total 30 elements

■ Restoration activity at T64.1

Restoration work in this area began in October 2019, after the completion of the earth clearance work around the platform of Area T64. As a result of the clearance work, many balustrade elements and fragments related to the Naga statues were found, so investigations were carried out in T64.1, T64.2 and the adjacent area T63.4 to determine which elements could be combined and to identify their original locations. Finally, it was found that many elements could be returned to the previously missing parts, in particular, all the elements of the T64.1 Handrails were found in perfect order. Also, many small fragments were found that could be joined to the Naga statues that had collapsed on the platform.

■ Position change of the element(See Drawing 64.1)

For area T64.1, we could find many lost elements and pieces of balustrade as below.

- One collapsed Naga statue □ C6.1.1, can connected not only with also collapsed body, but also with small head pieced found from mound by clearance work.
- It was confirmed that C6.1.19, C6.1.12-15 were joined with 64.1.8.
- C5.2.10 + C5.1.11.1 + C5.1.11.3, C5.2.8.1 + C5.2.9.1, were also confirmed to have formed a single handrail element, so they were joined and installed.
- In order to install the newly discovered handrail in places where had been lost, a new sandstone basement (N64.1.8.3.1) was inserted.

Area : T64.1 work period : 8 weeks

<Before and after restoration>



Area : T64.1 work period : 8 weeks

<After restoration>



Area : T64.1 work period : 8 weeks

<Photos during restoration>



Area : T64.2 work period : 12 weeks

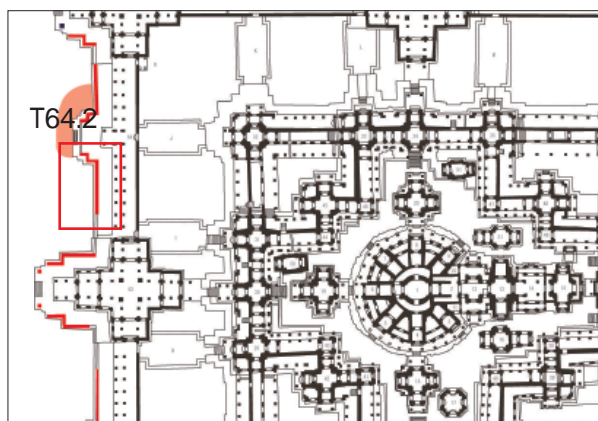


Before Restoration



After Restoration

Area : T64.2 work period : 12 weeks



Repaired number

■ Naga statue..... 2

■ Other Balustrade elements

Handrail..... 10

Post..... 13

Basement..... 24

Total 49 elements

■ Restoration activity at T64.2

During clearance at T64 in August-September 2019, several elements associated with T64.2 were also excavated.

Typically, the Naga head (No. C6.2.13) and body (64.2.8.1.7(2)), which had been identified prior to clearance and had fallen by the staircase, were found to be in situ at the balustrade corner directly above it, and were joined and reinstalled.

T64.2 was complicated by the fact that the restoration of the existing structure had originally connected two elements that did not match, and almost the entire structure was installed in an out-of-situ location. In the adjacent area T64.1, the missing elements were excavated from the mound immediately below, so it was relatively easy to determine the original location by lining them up, but T64.2 was more difficult because it was necessary to identify the elements over a wide area, including the surrounding area.

The results of the identification revealed that the elements in the surrounding area T64.2 were originally from T65.3, T65.4, and T63.4, and that some of the elements should be moved from these areas to T64.2.

■ Position change of the element(See Drawing 64.2)

Following is a description about moving elements

- -Initially, both C6.2.13 and C6.2.14, which had fallen just below the platform, were considered to belong to T64.2, but after identification research, it was found that 63.4.8.1.3, which was installed at T63.4, belonged to T64.2. Accordingly, C6.2.14 and its debris elements are now installed in T63.4.
- -Since C6.2.20 excavated from the ground was part of 64.2.8.1.7, it was possible to join these pieces and recover the complete form of the original Handrail. Similarly, 64.2.8.14 + 64.2.8.1.13 and T64.2.8.1.8 + 64.2.8.1.5 were also confirmed to be one piece of the elements found in the ground.
- -No. C6.2.20 was connected to 64.2.8.1.7(2) in the previous restoration, and it was confirmed that it originally formed a single piece with 64.2.8.1.13 and 64.2.8.1.14. Following this single timber, 64.1.8.1.8, C6.1.52, and 64.2.8.5(2) were found to be in their original positions.
- -Since the location of the balustrade handrails was identified and the size of the missing handrails could be accurately determined, new sandstone material was inserted here to compensate for the missing handrails in two places.

Area : T64.2 work period : 12 weeks

<Before and after restoration>



Area : T64.2 work period : 12 weeks

<After restoration>



Area : T64.2 work period : 12 weeks

<Photos during restoration>



Area : T63.4 work period : 4 weeks

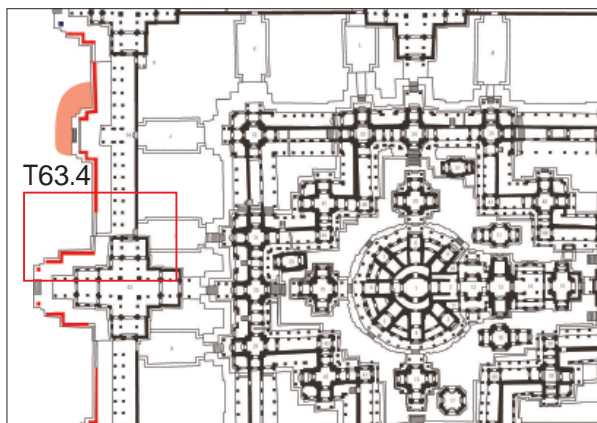


Before Restoration



After Restoration

Area : T63.4 work period : 4 weeks + 1 week



Repaired number

■ Naga statue..... 2

■ Other Balustrade elements

Handrail.....5

Post.....10

Basement.....8

Total 25 elements

■ Restoration activity at T63.4

Restoration in this area began in March 2018. In this area, the balustrade seems to have been installed from the original in a special construction method, in which a part of the basement was directly installed as the floor stone of the platform. These platform and basement of balustrade were relatively in stable condition, firstly we decided to dismantle only one Naga and another 3 handrails and 1 Lion. This Naga statue was fixed with iron belt in the previous restoration, but this iron belt was about to come off. Also, a handrail next this Naga statue was easy to move, and recently some tourist changed the position, it was in danger of falling from platform. Furthermore when dismantle started, we found that one more Naga need some repairing, thus we also include this Naga statue for dismantling.



Dismantled part

■ Position change of the element(See Drawing 63.4)

For T63.4, for which restoration was once completed in April 2018, there had been several elements that had not been found in their original location and had been re-installed in positions in accordance with the previous restoration, but as a result of the sediment clearance around T64 (see 5.3) and identification work, these were instead found in their original location. As a result, this area was also able to be fully aligned with the trestle following T64.1.

- Of the two Naga statues at T63.4, the southern Naga statue 63.4.8.1.3 was known not to be from T63.4, but as the Naga statue (C6.2.14 and associated elements) excavated during clearance was found to be from 63.4, it was decided to install this at T63.4. Accordingly, Naga 63.4.8.1.3.2, which had been installed at T63.4, was to be moved to T64.2.
- The handrail 65.4.8.1* from T65.4 was joined with C6.2.13 excavated from near T64 and its original location was found to be the Naga head C6.2.14 matching element mentioned above, so this element was also moved from 65.4.
- It was observed that 6.2.8.1.4, installed at T64.2, joined 63.4.8.1.4 and 63.2.8.1.10 to form a single handrail element.
- It was confirmed that girders 62.8.1.9 and 62.8.1.11, also located at T64.2, were joined to elements at 63.4 to form a single handrail element.

■ Repairing of Lion Statue

In this area, 1 Lion statue was restored (63.4.8.1.1, L-2). Injection work for reinforcement was implemented.

Area : T63.4 work period : 4 weeks

<Before and after restoration>



Area : T63.4 work period : 4 weeks

<After restoration>



<Photos during restoration>



Area : T63.4 work period : 4 weeks

<Photos during restoration>



Area : T63.3 work period : 4 weeks

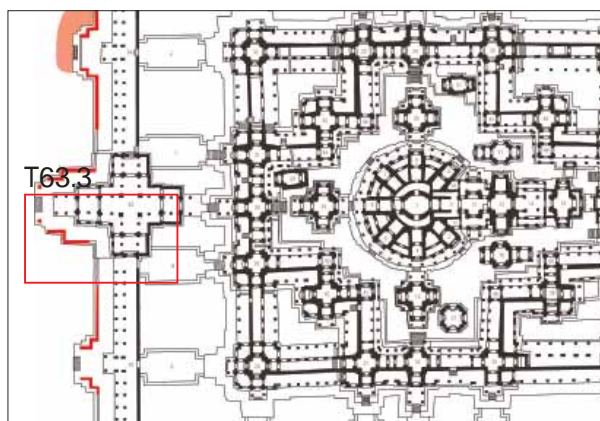


Before Restoration



After Restoration

Area : T63.3 work period : 4 weeks

**Dismantled part****Repaired number**

■Lion Statue	1
■Naga statue	2
■Other Balustrade elements	
Handrail.....	2
Post.....	5
Basement.....	5

Total 15 elements**Restoration activity at T63.3**

Work in this area started in April 2018.3 The elements that were dismantled at T63.3 are as follows.

Lion statue: 1

Naga statues: 2

Balustrade elements: 2 elements

Post: 2 elements

The Lion and Naga statues were not initially planned to be dismantled, but during the process of dismantling the balustrade elements, it was confirmed that these statues were also in a serious condition, so it was decided to carry out dismantling and repairs. The treatment of the statues is as follows.

Lion statue (No. 63.3.9.1.1): many cracks were found on all four legs, which were already nearly broken and threatened to collapse. Therefore, the statue was partially dismantled, the body and pedestal sections, which were on the verge of breaking, were separated, reinforced and then joined together.

Naga statue (No. 63.3.8.1.1): a fragment of this Naga statue could be found in the scattered stone material on the west side of T63.3, so it was joined to the Naga statue. In addition, the previous restoration work carried out on the base of the head of the statue was not in good condition, so it was removed and rejoined.

Naga statue (No. 63.3.8.1.5): the cracks were reinforced by injections.

■Position change of the element(See Drawing 63.4)

In this area, all elements were in place from before the restoration, so no elements were moved.

■Repairing of Lion Statue

In this area, 1 Lion statue was restored (63.3.8.1.1, L-2). Injection work for reinforcement was implemented.



Area : T63.3 work period : 4 weeks

<Before and after restoration>



Area : T63.3 work period : 4 weeks

<After restoration>



<Photos during restoration>



Area : T63.3 work period : 4 weeks

<Photos during restoration>



Area : T62.1 work period : 14 weeks

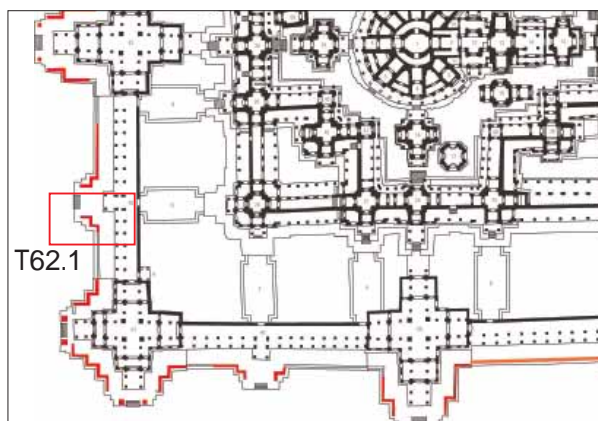


Before Restoration



After Restoration

Area : T62.1 work period : 14 weeks



Dismantled part

Repaired number

■Naga statue.....	2
■Other Balustrade elements	
Handrail.....	5
Post.....	9
Basement.....	11
<u>Total 27 elements</u>	

Restoration activity at T62.1

-The body of the Naga balustrade on the south side(C.8.4.1 and 62.1.8.1.8.2) was broken into 2 pieces. There were no connecting treatment at previous restoration, and supported by only substitute post.

-The head of the Naga statue on the north side (62.1.8.1.6) was hung over, thus it was supported by concrete support by previous restoration. From our perspective, after dismantled basement and first layer of the platform, and reconstruct removing extra



soils and gaps between the floor of the platform, upper balustrade including this southern Naga statue can be moved backward. Thus it seems that Naga statue can be set without support after restoration.

For the northern Naga statue, due to the improvement work in order to reduce large gap between floor of the platform under the northern balustrade of this Naga statue, we could bring these balustrades near to wall of the outer gallery. Thus Naga statue no more needs concrete support inserted at previous restoration. Also for the southern Naga statue, before restoration, upper half was broken and already lost. Though after survey by workers, they could found that one scatter stone lying in front of T63.2 would be connected with this Naga statue. Some of the elements of platform around these 2 Naga statue were already lost and distortion could be seen at this area, new sandstone plate were needed when reconstruct Naga statues.

Position change of the element(See Drwaing T62.1)

No movement in the Handrails or the Basements. The joining of C8.4.1 and Naga head 62.1.8.1.8.2, which had fallen on the platform, was confirmed.

Area : T62.1 work period : 14 weeks

<Before and after restoration>



Area : T62.1 work period : 14 weeks

<After restoration>



<Photos during restoration>



Area : T62.1 work period : 14 weeks

<Photos during restoration>



Area : T62.2 work period : 10 weeks

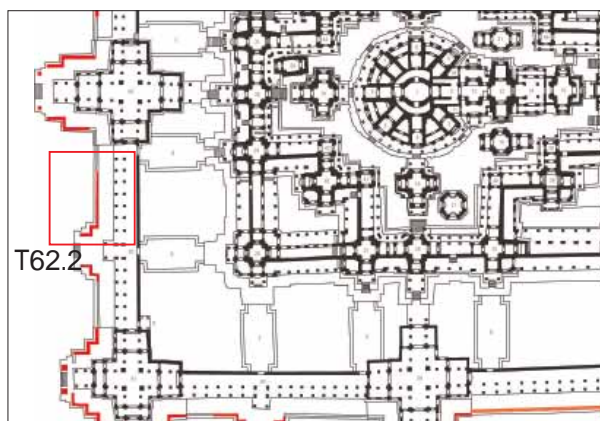


Before Restoration



After Restoration

Area : T62.2 work period : 10 weeks



Dismantled part

Repaired number

■ Naga statue..... 2

■ Other Balustrade elements

Handrail.....5

Post.....9

Basement.....8

Total 24 elements

■ Restoration activity at T62.2

There are 2 Naga statue at T62.2, though both of Naga head are not in original position. The body of northern Naga(62.2.8.1.3) was broken in 2 pieces which was not restored and only supported by substitute post. Also we confirmed heavy depression under the balustrade, thus we insert many sandstone plate under the basement for adjustment the height. Also, we changed position of basement, post and substitute post in order to make most stable situation.

Position change of the element(See Drwaing T62.2)

For the basements, some elements that had broken into several pieces were jointed and repaired. For the Handrails, it was observed that the positions of 62.2.8.1.1 and 62.2.8.1.3 on the Naga head were interchanged, so these locations were replaced. Due to the large distortion of the platform near the commandment, it was necessary to insert many sandstone plates during the installation of the basement.

Area : T62.2 work period : 10 weeks

<Before and after restoration>



Area : T62.2 work period : 10 weeks

<After restoration>



<Photos during restoration>



Area : T62.2 work period : 10 weeks

<Photos during restoration>



Area : T61.4 work period : 10 weeks

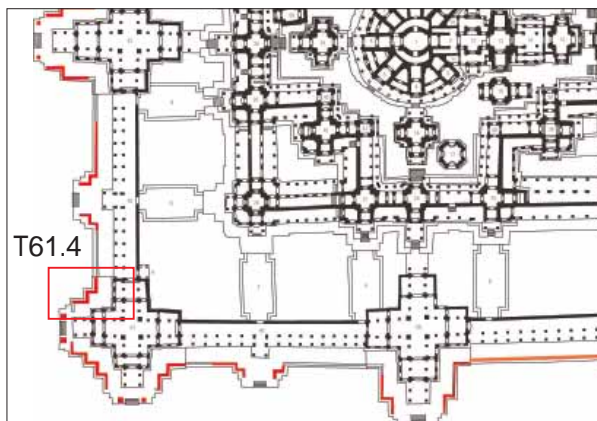


Before Restoration



After Restoration

Area : T61.4 work period : 10 weeks



T61.4

Repaired number

- Lion Statue1
- Naga statue 2
- Other Balustrade elements
 - Handrail.....5
 - Post.....7
 - Basement.....6

Total 21 elements



Dismantled part

■ Restoration activity at T61.4

-Among two naga which existed in this area, the head of southwestern Naga statue(61.4.8.1.8) was broken into two parts, and broken half has fallen into the platform. In addition, the balustrade part was broken on some small pieces and tied up by restoration in the past, but this iron belts were about almost came out, and there was the risk that the whole Naga statue collapsed. After restoration, these pieces of the head and trunk was connected, and it was stable and came to be able to stand without any support.



Before restoration



Before restoration



■Position change of the element(See Drwaing T61.4)

The position of the Handrails was not changed, however, 61.4.8.1.8.4, part of the Naga head 61.4.8.1.8, which had collapsed on the floor, was joined. In addition, since it was confirmed that 61.4.8.3.1 and 61.4.8.3.2 were originally one element, they were joined and, accordingly, substitute post that were no longer needed due to the joining were inserted in place of the basement cover where 61.4.8.3.2 was placed (61.4.8.2.8, 61.4.8.2.4, and 61.4.8.2.7).

■Repairing of Lion Statue

In this area, 1 Lion statue was restored (61.4.9.1.1). The head of this Lion statue was broken and fell down on the ground near the platform. In the rain season, this head part was soaked in the water and caused further deterioration. By the restoration work, this head part could be connected to the body.

Area : T61.4 work period : 10 weeks

<Before and after restoration>



Area : T61.4 work period : 10 weeks

<After restoration>



<Photos during restoration>



Area : T61.3 work period : 13 weeks

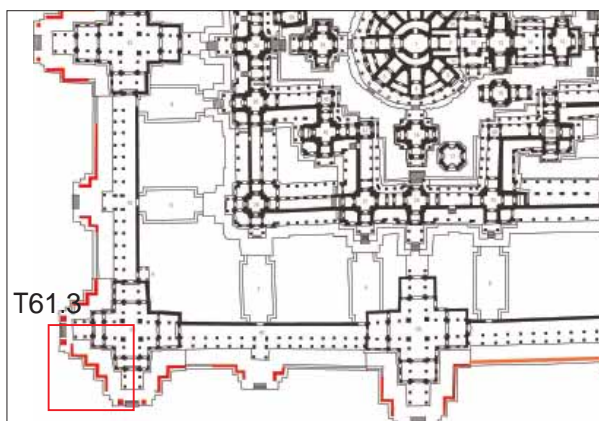


Before Restoration



After Restoration

Area : T61.3 work period : 13 weeks



Dismantled part

Restoration activity at T61.3

Area 61.3 was large area that include many balustrade elements and statues. Though most of the elements are not sure that were in the original position.

-There were 4 Naga statues in this area, and 2 of them were supported by iron belt in previous restoration. Among these 2 Naga statues, for one Naga statue we confirmed that could be connected with another body, thus connected and set without support. For another Naga statue could not connected with any other body, though set without any support by adjusting horizontal level.

-One lion statue which all the 4 legs were broken and restored in the previous restoration by cement, but it was already deteriorated, thus we decided to remove previous treatment and connect by using stainless pin.

-Also, some platform maintenance were needed in this area.

- From our survey, we found that one handrail from T61.2 and one more another handrail from T60.1 could be originally set at T61.3. Thus we set these two handrails to original position at T61.3.

■Position change of the element(See Drwaing T61.3)

Although the position of the Handrails and Basements were not changed, many of the elements had been broken, so they were joined and re-installed. The substitute Posts, which was no longer needed due to the jointing of the handrail, was removed. 61.3.8.1.4.1 had an iron belt used in the previous restoration, but the iron belt was removed because it was confirmed that it could be installed stably by jointing it with 61.3.8.1.4.2.

The original location of 61.2.8.1.1(B) in the 61.2 (southeast) area was identified as being in contact with 61.2.8.1.7, so this element was moved from 61.2 and installed in 61.3.

■Repairing of Lion Statue

In this area, 2 Lion statue was restored (61.3.9.1.1 & 61.3.9.1.2). 61.3.9.1.1, the statue part and the pedestal part were completely broken at the ankle of the statue and had been joined by previous restoration, but the mortar used here had deteriorated and was in danger of breaking again, so they were rejoined using stainless steel pins. The pedestal was also ruptured and was repaired. 61.3.9.1.2 was injected for reinforcement.

Repaired number

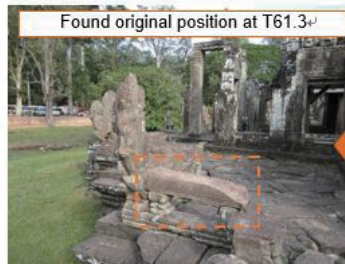
■Lion Statue	2
■Naga statue.....	4
■Other Balustrade elements	
Handrail.....	7
Post.....	10
Basement.....	12

Total 35 elements

Found original position at T61.3



Before restoration at T60.1



Found original position at T61.3



Before restoration at T61.2



Area : T61.3 work period : 13 weeks

<Before and after restoration>



Area : T61.3 work period : 13 weeks

<After restoration>



<Photos during restoration>



Area : T61.3 work period : 13 weeks

<Photos during restoration>



Area : T61.2 work period :9 weeks

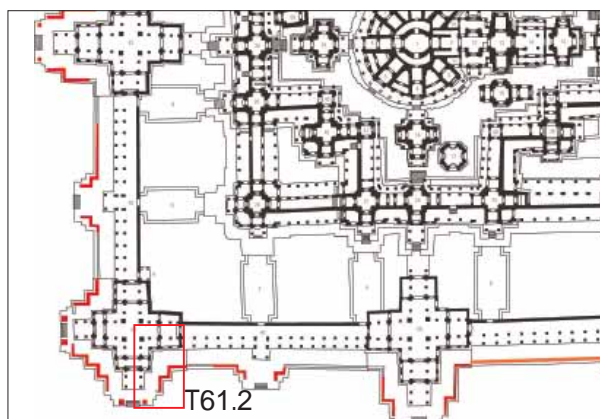


Before Restoration



After Restoration

Area : T61.2 work period :9 weeks



■ Restoration activity at T61.2

In this area, platform situation was not so bad, though most of the balustrade elements were not in the original position, thus these could only be installed in an unstable form, and cement and iron pin were used to fix these part in the previous restoration which was already deteriorated. Thus we decide to dismantle all of the balustrade and reconstruct at same situation as before. Though when we reconstructing these balustradem we insert new sandstone plate and lead plate instead of previous cement.

Place where fragments that are not originally the same element were joined in the previous restoration, we removed and reconstruct seperately.

We found one of the balustrade piece was originally belongs to 61.3, thus move to the original place.

Also, Lion statue at this area had many small cracks and scaled part, thus we dismantled this statue and appropriate treatment was implemented. When put back this statue, we inserted sandstone plate in order to make stable and fill gaps between platform and statue. Maintenance of platform was needed around Lion statue and Naga statues.

Dismantled part

Repaired number

- Lion Statue1
- Naga statue 2
- Other Balustrade elements
 - Handrail.....5
 - Post.....8
 - Basement.....9

Total 25 elements

■Position change of the element(See Drwaing T61.2)

The original location of 61.2.8.1.1(B) was confirmed to be at 61.3, so this element was moved, but otherwise there was no change in location of the Handrails and Basements. C8.4.1, which had collapsed into a platform, was confirmed to have been part of 62.1.8.1.8, so these were joined. As a result of the stabilization and joint repair of the handrail, substitute Posts that were no longer needed were removed, and some of the substitute Posts were repositioned and reinstalled.

■Repairing of Lion Statue

In this area, 1 Lion statue was restored(61.2.8.1.1).The base of the pedestal was completely cracked, which could lead to further collapse of the entire statue, so it was fixed by grazing.



Area : T61.2 work period :9 weeks

<Before and after restoration>



Area : T61.2 work period :9 weeks

<After restoration>



<Photos during restoration>



Area : T61.2 work period :9 weeks

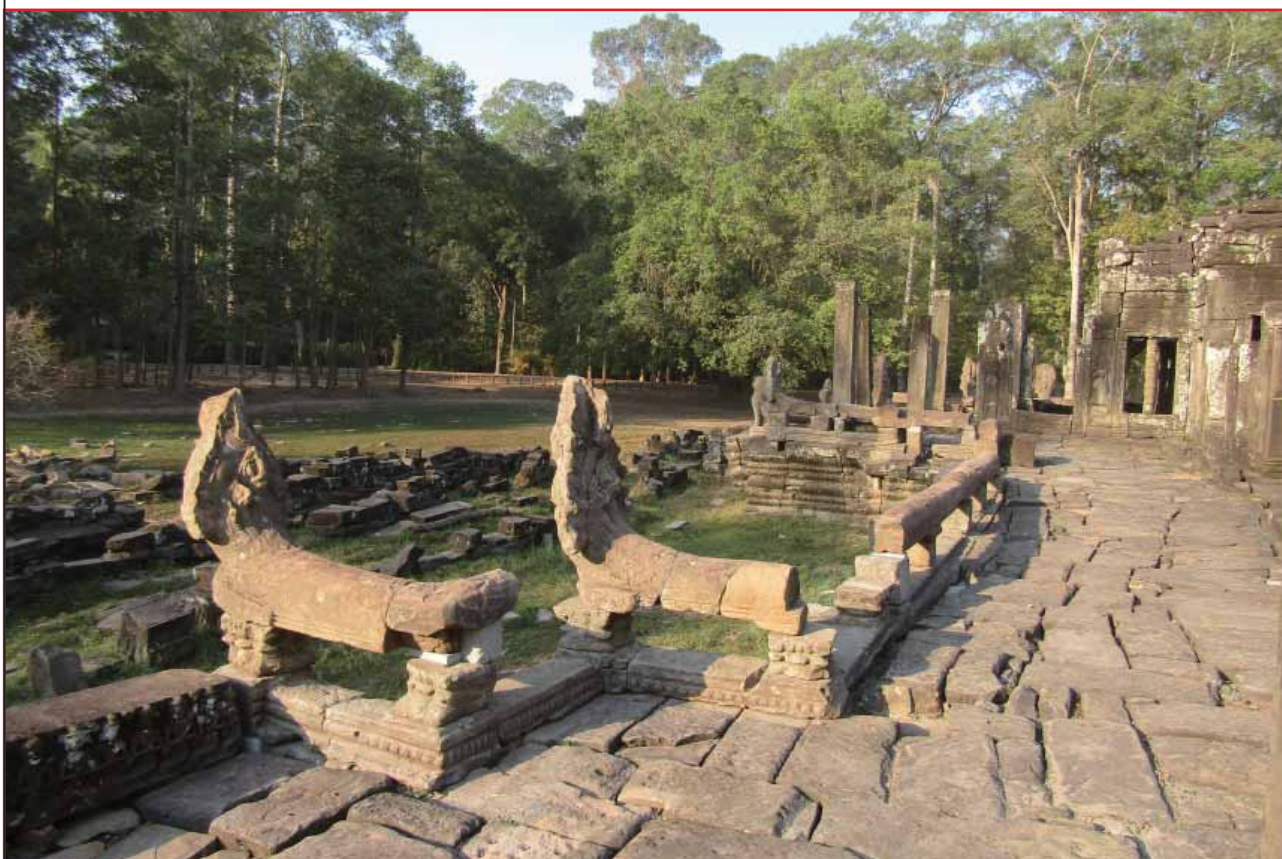
<Photos during restoration>



Area : T60.1 work period : 16weeks

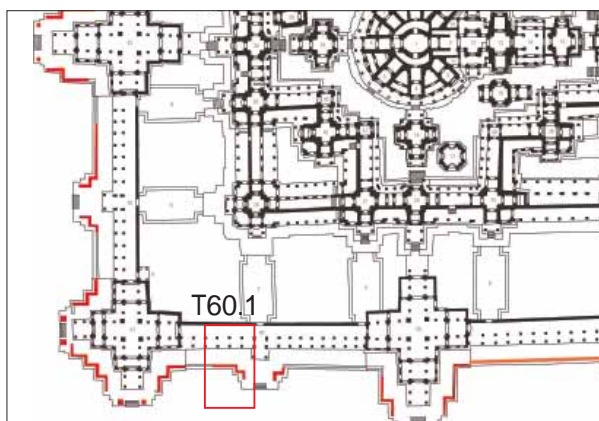


Before Restoration



After Restoration

Area : T60.1 work period : 16weeks

**Restoration activity at T60.1**

For T60.1, the situation before restoration was very complicated, as most of the element of balustrade were moved wrong pieces were connected or lined in not original position by previous restoration. As a result of our survey, we found many pieces that can be connect as an original element, and could identify original position so that can be back to safely. Also, due to uneven subsidence, floor of the platform directly under the balustrade was subsided, thus we had to implement platform maintenance with supplying many new sandstone plate to these subsided line. The process of the work was done with supplying new sandstone plat and lead plate. One more problem at this area was some heavy rain instead of dry season. Due to rain, sometime it was difficult to set up Mini Crane.

**Dismantled part****Repaired number**

- Naga statue..... 2
- Other Balustrade elements
 - Handrail.....6
 - Post.....14
 - Basement.....10

Total 22 elements**■ Position change of the element(See Drwaing 60.1)**

There was no change in the position of the naga head, but there was a significant change in the position of the other rafters. It was confirmed that 60.1.8.1.3, 60.1.8.4 and 60.1.8.1.1, which had been placed separately before restoration, were originally a single piece, so were joined together. It was also discovered that E11.1.2 and 60.1.8.1.6, which had fallen onto the platform, could be joined together. After carrying out these kinds of joins, the original positions of the handrails could be identified by the distance between the post, and the positions of the other joists were changed and installed accordingly.

The many substitute posts that had been used before the restoration became unnecessary due to the repair and joining of the handrails that had fallen to the base of the platform, so these were removed. Sandstone plates were inserted under the basements to stabilize them.

Area : T60.1 work period : 16weeks

<Before and after restoration>



Area : T60.1 work period : 16weeks

<After restoration>



<Photos during restoration>



Area : T60.1 work period : 16weeks

<Photos during restoration>



Area : T60.2 work period : 10 weeks

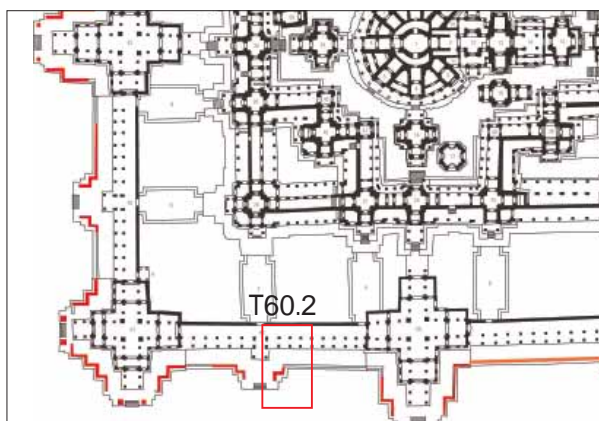


Before Restoration



After Restoration

Area : T60.2 work period : 10 weeks



Dismantled part

Repaired number

■Naga statue..... 1

■Other Balustrade elements

Handrail.....1

Post.....3

Basement.....3

Total 8 elements

Restoration activity at T60.2

Naga statue at this area was broken into some pieces and this part was combined with iron belt installed in precious restoration. Though iron belt was deteriorated and almost fell out. We dismantled and repaired elements of the balustrade including this Naga statue.

■Position change of the element(See Drwaing 60.2)

Although there was no change in the position of the handrails or the basements, sandstone plates were inserted to stabilize the basements. E11.2.3, a fragment of the naga head that had also fallen onto the platform, was repaired and installed after it was confirmed that it could be joined with 60.2.8.1.1.

Area : T60.2 work period : 10 weeks

<Before and after restoration>



Area : T60.2 work period : 10 weeks

<After restoration>



<Photos during restoration>



Area : T60.2 work period : 10 weeks

<Photos during restoration>



Area : T59.3 work period : 7 weeks

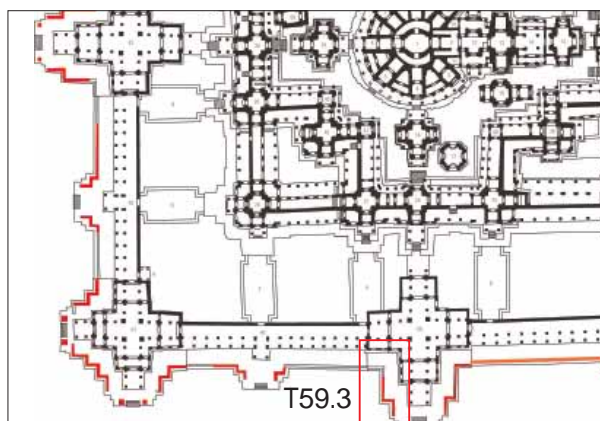


Before Restoration



After Restoration

Area : T59.3 work period : 7 weeks



Dismantled part

Repaired number

■Lion Statue	1
■Naga statue.....	2
■Other Balustrade elements	
Handrail.....	5
Post.....	8
Basement.....	9
<u>Total 25 elements</u>	

■ Situation before restoration at T59.3

Balustrade: For this area, some of the basements were missing and most elements were not situated in the original position and it changed place. Also, because of inclination of the platform to the outside, balustrade are also inclined to the outside and causing unsafety situation.

Lion statue: One lion statue stands on this area, though this statue had many scale and cracks, thus we decided to dismantle this statue and implement repairing.

■ Restoration activity at T59.3

After dismantling balustrade, One basement were broken and had scaled part. We found that this basement can be connected with other basement part in this area, also could found original position. Though before set back these repairing basement, this area need some improvement of platform.

There was only one original post in this area, and others were all substitute elements put at past restoration and is was put in unsafe balance which causing further danger of balustrade. Thus when reconstructing balustrade, we again reuse these substitute element, though carefully seek for safe and horizontal position.

■ Position change of the element(See Drawing 59.3)

There were no changes to the position of Basements or Handrails. The positions of the substitute posts (59.3.8.2.11, 59.3.8.3.5, and 59.3.8.2.6) were changed to stabilize the handrails.

■ Repairing of Lion Statue

In this area, 1 Lion statue was restored (59.3.8.1.1, L-2). Injection work for reinforcement was implemented.

Area : T59.3 work period : 7 weeks

<Before and after restoration>



Area : T59.3 work period : 7 weeks

<After restoration>



<Photos during restoration>



Area : T59.2 work period : 8 weeks

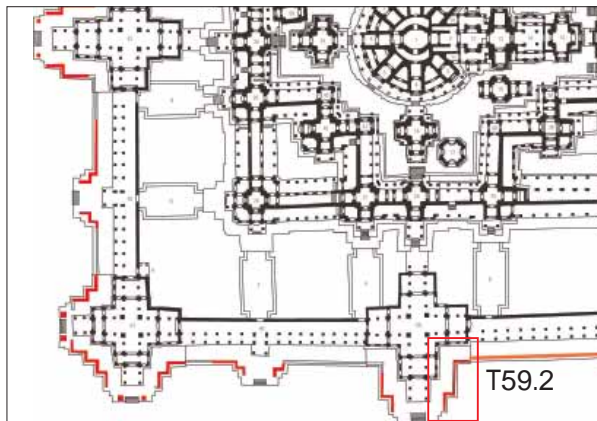


Before Restoration



After Restoration

Area : T59.2 work period : 8 weeks



Dismantled part

Repaired number

■Naga statue.....	3
■Other Balustrade elements	
Handrail.....	4
Post.....	8
Basement.....	12
<u>Total 27 elements</u>	

Restoration activity at T59.2

Before the restoration, T59.2 had a very complicated situation because of the many changes of elements. Also, there were little different construction method for balustrade, that elements of platform were directly curved like basement, and used instead of basement. We tried to find the best position to make better platform in trial assembly work, and found some elements that can be back to original place and safe. There were two Naga statues in this area. For the southern Naga, half part of the head was broken and fall down to the ground, so we connected, also we found original connection with another element at the corner of this area, so we can make it safe situation and better landscape.

■Position change of the element(See Drwaing 59.2)

The H11.1VX fell onto the ground in the southeast of 59.2 and <P>Since it was confirmed that this element was originally connected to the handrail placed on the platform at the northern end of 59.2, and the original location of 59.2.8.1.6 was identified as the northern end, the positions of the two naga head balustrade elements were switched. As a result of these changes and repairs, some of the posts (59.2.8.2.7, 59.2.8.2.6) were moved.



■Repairing of Lion Statue

In this area, 1 Lion statue was restored (59.2.8.1.1, L-2). Injection work for reinforcement was implemented. During reinstallation, sandstone plates were inserted for stabilization.

Area : T59.2 work period : 8 weeks

<Before and after restoration>



Area : T59.2 work period : 8 weeks

<After restoration>



<Photos during restoration>



Area : T59.2 work period : 8 weeks

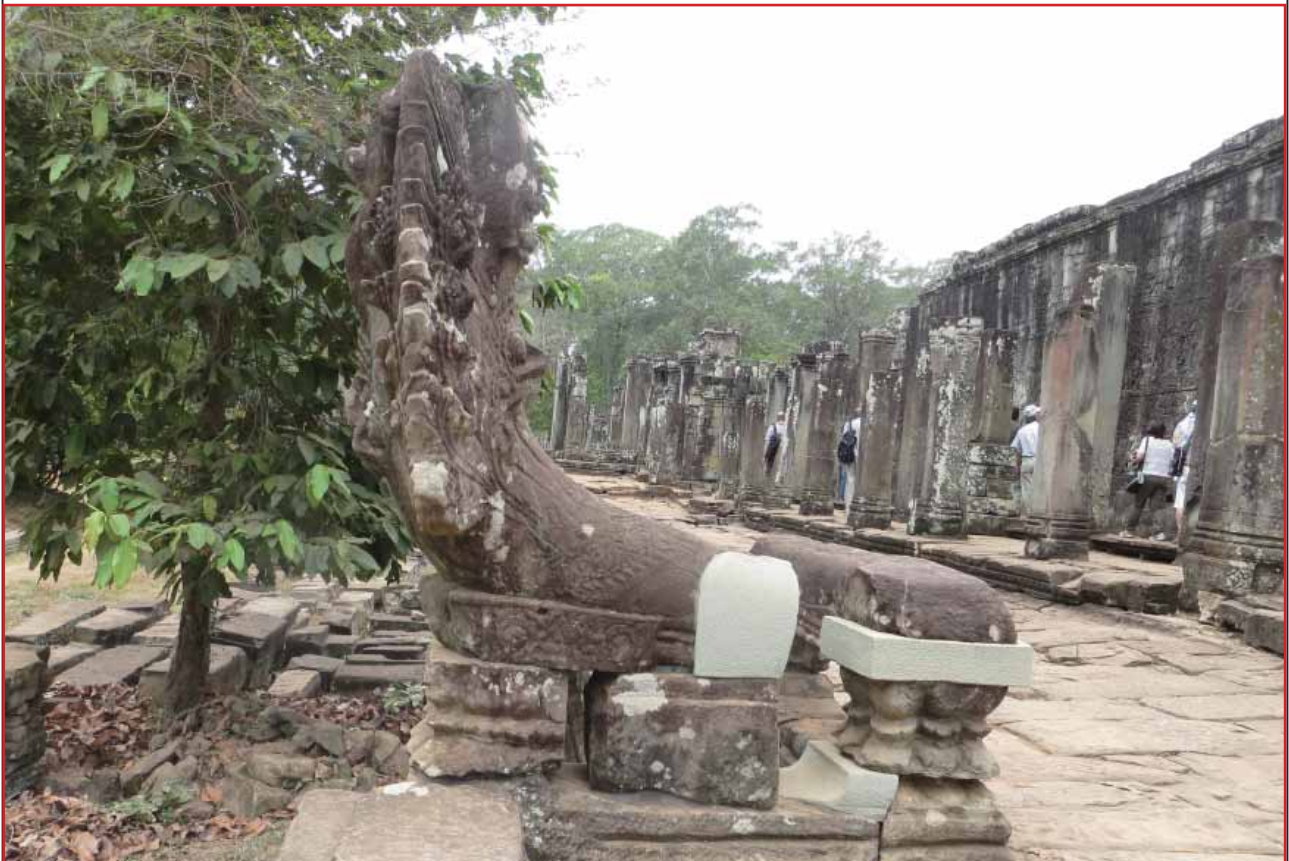
<Photos during restoration>



Area : T58.1 / West Operated Term : 2 month

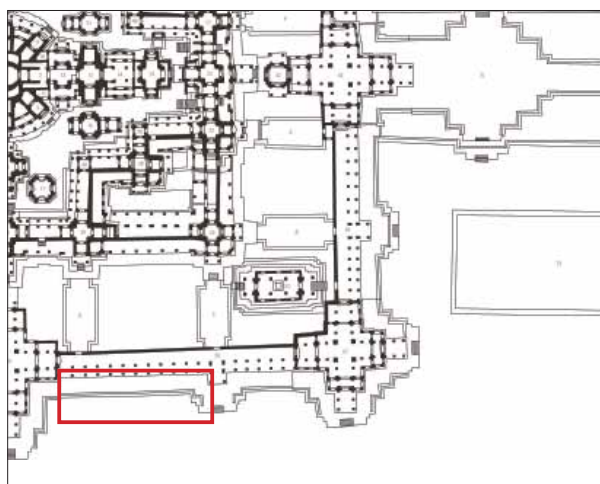


Before Restoration



After Restoration

Area : T58.1 / West Operated Term : 2 month



<Before restoration>

Repaired number

■Naga statue..... 1

■Other Balustrade elements

Handrail.....6

Post.....5

Basement.....19

Total 31 elements

■ Restoration activity at T58.1/ East

When the third phase of JASA started in 2006, a ramp for bringing in and installing heavy equipment was installed on the south side of the outer gallery of the Bayon (Fig. 1). In the second half of February, the stones of these T58.1 blocks were moved to the restoration site and the stones were repaired, which took about two weeks. The balustrades were then reinstalled at the site where the base had already been maintained.

Position change of the element(See Drawing T58.)

No movement in the Handrails or the Basements.

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
58.2.8.3.1	N.head	108	91	148	1+3+5	Ø: 6 x 3 x 150
58.2.8.3.2(2)	N.body	177	39	35	3+5	
58.2.8.3.3	N.body	63	35	21	5	x
58.2.8.3.4*	N.body	65	36	30	x	x
58.2.8.3.5*	N.body	30	27	12	x	x
58.2.8.3.6	N.body	64	32	22	5	x
58.2.8.3.7*	N.body	99	26	25	x	x
58.2.8.2.1*	Post	41	39	27	x	x
58.2.8.2.2	Post	45	37	32	1+5	x
58.2.8.2.3*	Post	40	36	25	x	x
58.2.8.2.4	Post	43	34	17	5	x
58.2.8.2.5*	Post	44	36	19	x	x
58.2.8.1.1*	Base	100	41	22	x	x
58.2.8.1.2	Base	120	39	24	1+5	x
58.2.8.1.3(3)	Base	122	48	32	3+5	Ø: 5 x 2 x 80/ 8 x 2 x 150
58.2.8.1.4(5)	Base	208	40	25	2+3+5	Ø: 5 x 2 x 80/ 8 x 4 x 100/ 8 x 2 x 150
58.2.8.1.5	Base	109	47	32	3	x
58.2.8.1.6*	Base (2)	104	36	27	3+5	Ø: 8 x 2 x 100
58.2.8.1.7*						
58.2.8.1.8	Base	42	34	30	5	x
58.2.8.1.9	Base	41	30	19	5	x
58.2.8.1.10	Base	99	41	22	5	x
58.2.8.1.11	Base	93	43	21	5	x
58.2.8.1.12	Base	39	38	21	5	x
58.2.8.1.13	Base	55	31	22	5	x
58.2.8.1.14*	Base (2)	163	40	28	3+5	Ø: 8 x 2 x 100
58.2.8.1.15*						
58.2.8.1.16*	Base (2)	152	42	19	3+5	Ø: 8 x 2 x 100
58.2.8.1.17*						
58.2.8.1.18*	Base	38	42	12	3+5	Ø: 6 x 2 x 100
58.2.8.1.19*		177	38	25		
58.2.8.1.20(2)	Base	222	42	26	3+5	Ø: 8 x 2 x 100
58.2.8.1.21(2)*	Base (3)	186	38	21	3+5	Ø: 8 x 2 x 100/ 8 x 2 x 200
58.2.8.1.22*						
58.2.8.1.23(2)	Base	108	40	20	3+5	Ø: 8 x 2 x 100
58.2.8.1.24*	Base (2)	97	48	26	3+5	Ø: 8 x 2 x 100
58.2.8.1.25*						

Area : T58.1 / West Operated Term : 2 month

<Before and after restoration>



Area : T58.1 / West Operated Term : 2 month

<After restoration>



Area : T58.1 / West Operated Term : 2 month

<Photos during restoration>



Area : T58.2 / East part Operated Term : 1 Months

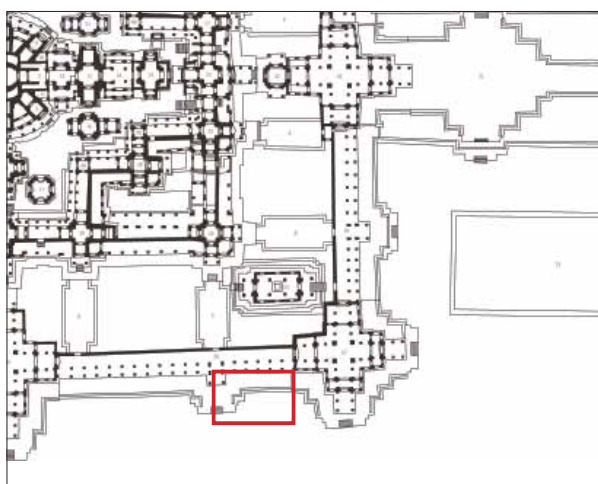


Before Restoration



After Restoration

Area : T58.2 / East part Operated Term : 1 Months



<Before restoration>

Repaired number

■Naga statue..... 1

■Other Balustrade elements

Handrail.....12

Post.....16

Basement.....15

Total 44 elements

■ Restoration activity at T58.1/ East

When the third phase of JASA started in 2006, a ramp for bringing in and installing heavy equipment was installed on the south side of the outer gallery of the Bayon (Fig. 1). In the second half of February, the stones of these T58.1 blocks were moved to the restoration site and the stones were repaired, which took about two weeks. The balustrades were then reinstalled at the site where the base had already been maintained.

■Position change of the element

In this area, work was done to identify the original position whenever possible, and when it could not be identified, most of the handrails were repositioned from the standpoint of leveling, etc. No positional changes were made for the basements. Many substitute posts were also repositioned and installed for leveling of the handrails.

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
NB1.1	N.head	190	68	93	5	x
NB1.2	N.body	118	35	40	5	x
NB1.3	N.body	66	30	30	5	x
NB1.4 + 13	N.body	117	67	66	5	x
NB1.5	N.body	111	35	32	5	x
NB1.6	N.body	100	32	29	x	x
NB1.7(2)	N.body	93	36	32	3+5	Ø: 6 x 2 x 100
NB1.8	N.body	90	35	32	5	x
NB1.9 + 10	N.body	174	34	38	5	x
NB1.11	N.body	81	36	30	5	x
NB1.12	N.body	27	18	27	5	x
NB1.14	N.body	86	31	29	x	x
NB1.15	N.body	90	42	29	5	x
NB2.1	Post	41	37	17	5	x
NB2.2	Post	45	43	25	5	x
NB2.3	Post	39	40	23	5	x
NB2.4	Sub-Post	25	21	31	x	x
NB2.5	Sub-Post	33	30	19	x	x
NB2.6	Sub-Post	23	19	28	x	x
NB2.7	Post	42	42	25	5	x
NB2.8	Post	20	30	24	x	x
NB2.9	Post	30	19	32	x	x
NB2.10	Post	25	20	18	x	x
NB2.11	Post	25	26	19	x	x
NB2.12(2)	Post	26	25	17	3+5	Ø: 5 x 2 x 80
NB2.13	Sub-Post	13	25	25	x	x
NB2.14	Sub-Post	23	23	25	x	x
NB2.15	Sub-Post	27	26	37	x	x
NB2.16	Post	38	33	23	x	x
NB3.1(2)	Base	50	41	24	3+5	Ø: 8 x 2 x 100
NB3.2	Base	90	36	26	5	x
NB3.3	Base	60	36	26	5	x
NB3.4(2)	Base	224	44	28	3+5	Ø: 10 x 2 x 180
NB3.5	Base	134	37	25	5	x
NB3.6(2)	Base	120	33	14	3+5	Ø: 6 x 2 x 100
NB3.7	Base	49	41	27	x	x
NB3.8	Base	37	50	27	x	x
NB3.9	Base	104	37	31	x	x
NB3.10(2)	Base	123	63	20	3+5	Ø: 10 x 2 x 120
NB3.11	Base	26	37	13	5	x
NB3.12	Base	98	39	26	3+5	Ø: 8 x 2 x 100
NB3.13	Base	65	36	25	x	x
NB3.14(3)	Base	82	32	28	3+5	Ø: 8 x 2 x 100/ 8 x 2 x 120
NB3.15	Base	90	37	30	x	x

Area : T58.2 / East part Operated Term : 1 Months

<Before and after restoration>



Area : T58.2 / East part Operated Term : 1 Months

<After restoration>



Area : T58.2 / East part Operated Term : 1 Months

<Photos during restoration>



Area : 57.3 / Southwest Operated Term : 4 month

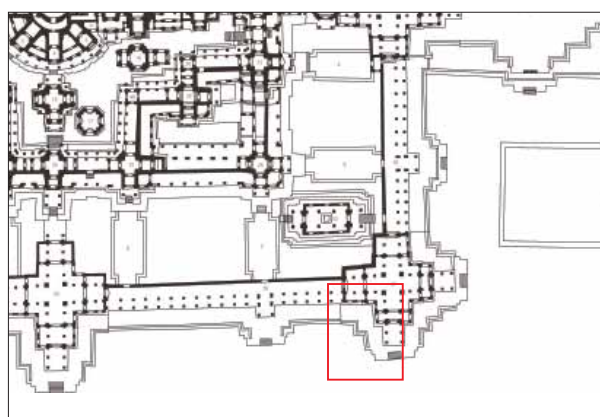


Before Restoration



After Restoration

Area : 57.3 / Southwest Operated Term : 4 month

**Restoration activity at T57.3 /Southwest**

Since this area was the first area to be restored in this project, which started in September 2012, and also the first area to be restored by JASA, the repair of the parapet components was carried out under the guidance of JASA technicians, one by one, according to the specifications of each component.

The mortar on the lion statue had deteriorated due to the previous restoration, the mortar and iron pins were removed and replaced with new stainless steel pins and new sandstone material. The new wood processing was led by JASA technicians because the skills of the project staff were not yet sufficient.

■Position change of the element

Naga heads 57.3.8.3.5 and 57.3.8.5.1 were identified as being in the same position, so the east and west locations were switched. The size of the post under the original handrail was determined from the traces remaining in the basement and other original post, thus a new post was made from a new sandstone.

■Repairing of Lion Statue

In this area, 1 Lion statue was restored (57.3.9.1.1, L-3). The ankle portion was lost due to breakage, and although it had been mortared and joined in the previous restoration, there was a risk that it would break again due to deterioration of this material. Therefore, new sandstone material was processed according to the required size, filled in, and joined. The finishing process was based on other Lion statues, but was done in a way that would make it easy possible to distinguish it from the original.

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
57.3.8.3.1	N.head	125	44	153	1+3+5	Ø: 12 x 3 x 300
57.3.8.3.2	N.Body	75	30	29	1+5	x
57.3.8.3.3	N.Body	89	36	39	5	x
57.3.8.3.4	N.Body	144	37	36	4b+5	Ø: 6 x 1 x 100
57.3.8.3.5(3)	N.head	151	33	38	1+3+5	Ø: 12 x 2 x 100/ 18 x 3 x 200
57.3.8.2.1	Post(S)	40	26	23	x	x
57.3.8.2.2*	Post(S)	30	27	22	x	x
57.3.8.2.3*	Post(S)	34	27	29	x	x
57.3.8.2.4*	Post(S)	36	26	27	x	x
57.3.8.2.5*	Post(S)	39	27	25	x	x
57.3.8.2.6*	Post(S)	41	26	26	x	x
57.3.8.2.7	Post	48	41	26	5	x
57.3.8.2.8*	Post(S)	41	27	24	x	x
57.3.8.2.9*	Post(S)	50	37	26	x	x
57.3.8.1.1	Base	39	32	20	5	x
57.3.8.1.3(.1)	Base	274	44	20	3+4b+5	Ø: 5 x 4 x 100/ 6 x 2 x 100
57.3.8.1.3.1(2)	Base	52	37	20	5	x
57.3.8.1.3.2 + 3	Base	109	36	22	3+5	Ø: 5 x 2 x 100
57.3.8.1.4(2)	Base	215	53	55	3+5	Ø: 10 x 2 x 100

**Repaired number**

- Lion Statue 1
- Naga statue..... 2
- Other Balustrade elements
- Handrail.....3
- Post.....9
- Basement.....5

Total 20 elements

Area : 57.3 / Southwest Operated Term : 4 month

<Before and after restoration>



Area : 57.3 / Southwest Operated Term : 4 month

<Photos during restoration>



Area : 57.2 / SouthEast Operated Term : 3 month

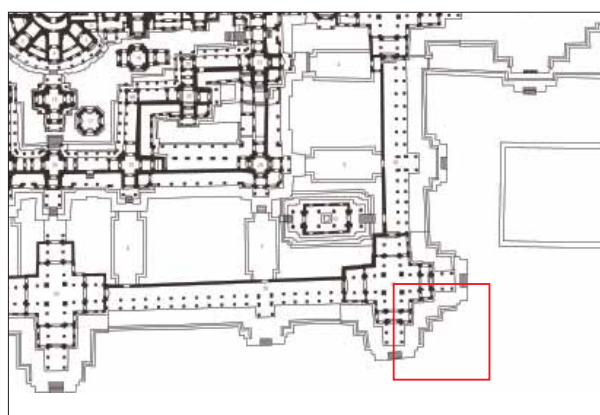


Before Restoration



After Restoration

Area : 57.2 / SouthEast Operated Term : 3 month



Repaired number

■Lion Statue	2
■Naga statue	3
■Other Balustrade elements	
Handrail.....	6
Post.....	16
Basement.....	15
<u>Total 42 elements</u>	

Restoration activity at T57.2 /Southeast

Since this area was subject to restoration by JASA, after repairing the parapet components and before reinstalling them, the base was prepared with guidance from JASA technicians on how to fill in the gaps and stabilize the stones.

In the vicinity of T57, JASA had already sorted and numbered the scattered stones that had fallen and been buried around the platform. Among these scattered stones, 21 members related to the parapet were identified. Three of these members were identified as being in situ at T57.2, and were placed in the identified locations when they were reinstalled.

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
57.2.8.3.1	N.head	106	83	81	5	Ø: 10 x 2 x 100
57.2.8.3.7(2)	N.head	160	37	139	1+3+4+5	Ø: 14 x 2 x 300/ 14 x 1 x 230
57.2.8.3.10(2)	N.head	165	47	150	3+5	Ø: 18 x 3 x 175
57.2.8.3.2*	N.Body	67	30	27	x	x
57.2.8.3.3*	N.Body	85	32	33	x	x
57.2.8.3.4*	N.Body	92	36	32	x	x
57.2.8.3.5	N.Body	127	36	32	5	x
57.2.8.3.6*	N.Body	61	36	30	x	x
57.2.8.3.8*	N.Body	86	35	31	x	x
57.2.8.3.9*	Post	56	49	32	x	x
57.2.8.2.1*	Post	51	43	35		x
57.2.8.2.13	Post	63	46	28	5	x
57.2.8.2.14	Post	42	40	25	5	x
57.2.8.2.15	Post	64	39	28	1+5	x
57.2.8.2.16	Post(S)	45	45	31	5	x
57.2.8.2.2	Post(S)	28	27	34	x	x
57.2.8.2.3	Post(S)	37	29	19	x	x
57.2.8.2.4	Post(S)	39	29	26	x	x
57.2.8.2.5	Post(S)	42	27	24	x	x
57.2.8.2.6	Post(S)	40	27	26	x	x
57.2.8.2.7	Post(S)	30	28	24	x	x
57.2.8.2.8	Post(S)	39	25	26	x	x
57.2.8.2.9	Post(S)	39	27	25	x	x
57.2.8.2.10	Post(S)	30	27	21	x	x
57.2.8.2.11	Post(S)	37	29	25	x	x
57.2.8.2.12	Base	39	26	21	x	x
57.2.8.1.3(2)	Base	231	48	33	3+5	Ø: 8 x 4 x 100
57.2.8.1.4	Base	87	45	27	4+5	x
57.2.8.1.5	Base	70	39	26	3+5	Ø: 5 x 1 x 60
57.2.8.1.6	Base	129	44	28	4+5	Ø: 8 x 2 x 60
57.2.8.1.7	Base	30	40	27	1+4+5	Ø: 6 x 2 x 60
57.2.8.1.8(3)	Base	167	49	27	2+3+5	Ø: 8 x 4 x 100
57.2.8.1.9	Base	113	46	22	5	x
57.2.8.1.10	Base	104	48	27	5	x
57.2.8.1.11(2)	Base	194	49	26	3+5	Ø: 4 x 4 x 100/ 8 x 2 x 100
57.2.8.1.12(4)	Base	275	48	28	3+5	Ø: 5 x 1 x 100/ 8 x 1 x 120/ 10 x 4 x 100
57.2.8.1.13	Base	131	53	29	2+5	x
57.2.8.1.14	Base	89	45	22	5	x
57.2.8.1.15	Base	41	18	23	5	x
57.2.8.1.16(4)	Base	89	46	22	2+3+5	x

Area : 57.2 / SouthEast Operated Term : 3 month

<Before and after restoration>



Area : 57.2 / SouthEast Operated Term : 3 month

<Photos during restoration>



Area : T57.1 / NorthEast part Operated Term : 3 Weeks

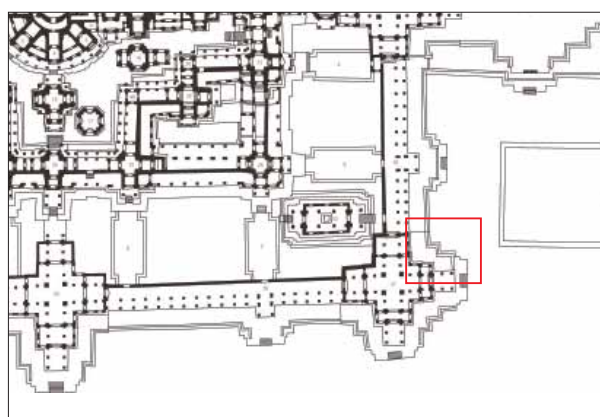


Before Restoration



After Restoration

Area : T57.1 / NorthEast part Operated Term : 3 Weeks



Repaired number

- Lion Statue 1
- Naga statue 2
- Other Balustrade elements
 - Handrail.....1
 - Post.....6
 - Basement.....18

Total 28 elements

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
57.1.8.3.1	N.Body	125	36	32	5	x
57.1.8.3.2	N.head	98	51	95	5	x
57.1.8.3.3	N.head	202	38	150	5	x
57.1.8.2.1*	Post	42	35	28	x	x
57.1.8.2.2	Post	38	38	16	5	x
57.1.8.2.3*	Post	41	37	27	x	x
57.1.8.2.4	Post	44	37	26	5	x
57.1.8.2.5	Post	40	32	26	5	x
57.1.8.2.6(2)	Post	52	45	30	3+5	Ø: 6 x 1 x 80
57.1.8.1.1	Base	70	48	19	5	x
57.1.8.1.2	Base	39	48	19	2+5	x
57.1.8.1.3	Base	77	41	29	2+5	x
57.1.8.1.4	Base	76	46	25	5	x
57.1.8.1.5	Base	83	43	25	5	x
57.1.8.1.6(2)	Base	95	45	29	3+5	Ø: 8 x 2 x 100
57.1.8.1.7*	Base(2)	42	10	29	3+5	Ø: 6 x 2 x 100
57.1.8.1.8*		64	20	34		
57.1.8.1.9	Base	59	40	17	5	x
57.1.8.1.10	Base	141	42	27	5	x
57.1.8.1.11	Base	113	54	37	5	x
57.1.8.1.12	Base	109	52	37	5	x
57.1.8.1.13(3)	Base	268	52	37	3+5	Ø: 8 x 2 x 100/ 10 x 2 x 100
57.1.8.1.14*	Base	131	50	36	x	x
57.1.8.1.15*	Base	54	42	25	x	x
57.1.8.1.16	Base	44	19	27	5	x
57.1.8.1.17(2)	Base	106	44	26	3+5	Ø: 8 x 2 x 100
57.1.2.1.16 *	Base	70	42	19	x	x
57.1.3.3.27	Base/part of floor	91	35	22.5	5	x

Restoration activity at T57.3 /Southwest

Since this area was the first area to be restored in this project, which started in September 2012, and also the first area to be restored by JASA, the repair of the parapet components was carried out under the guidance of JASA technicians, one by one, according to the specifications of each component.

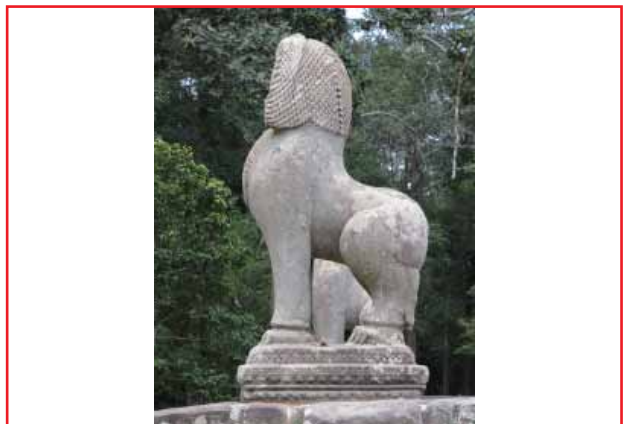
The mortar on the lion statue had deteriorated due to the previous restoration, the mortar and iron pins were removed and replaced with new stainless steel pins and new sandstone material. The new wood processing was led by JASA technicians because the skills of the project staff were not yet sufficient.

■Position change of the element(See Drawing T57.1)

The position of the basement was not changed and was partially supplemented with new material. Fragments of Naga head 57.1.8.3.3 were identified among the scattered elements and were joined together. The body elements of the other Naga head, 57.1.8.3.2, and the original post beneath it were also found among the scattered stones, so they were joined and installed.

Area : T57.1 / NorthEast part Operated Term : 3 Weeks

<Before and after restoration>



Area : T57.1 / NorthEast part Operated Term : 3 Weeks

<Photo during restoration>



Area : T57.1 / NorthEast part Operated Term : 3 Weeks

<Photos during restoration>



Area : T56.2 / Working Term : 3 month

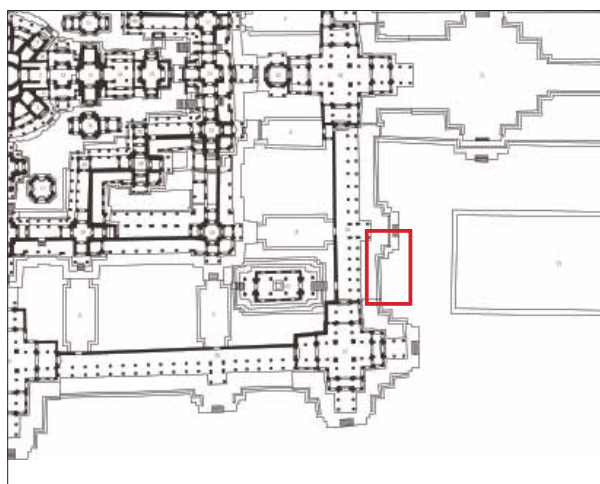


Before Restoration



After Restoration

Area : T56.2 / Working Term : 3 month



<Before restoration>

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
56.2.8.1.1	Naga	177	80	148	1	x
56.2.8.1.2	N.body	266	36	30	3+5	Ø: 8 x 2 x 120 (1+2)
56.2.8.1.3	N.body	156	40	32	5	x
56.2.8.1.4	N.body	224	39	32	5	x
56.2.8.1.5*	N.body	218	36	32	x	x
56.2.8.2.1*	Post	44	36	31	x	x
56.2.8.2.2	Post	38	42	22	x	x
56.2.8.2.3*	Post(S)	28	13	31	x	x
56.2.8.2.4(2)	Post	51	41	23	1+3+5	Ø: 6 x 2 x 100
56.2.8.2.5	Post	45	43	22	x	x
56.2.8.2.6	Post	39	37	26	1	x
56.2.8.2.7	Post	44	36	24	x	x
56.2.8.3.1	Base	129	46	26	1	x
56.2.8.3.2(3)	Base	137	49	28	3+5	Ø: 8 x 4 x 100
56.2.8.3.3	Base	42	46	26	5	x
56.2.8.3.4(6)	Base	127	44	31	3+5	Ø: 6 x 2 x 80/ 8 x 2 x 80/ 8 x 2 x 95/ 8 x 4 x 100
56.2.8.3.5	Base	49	56	33	5	x
56.2.8.3.6	Base	193	43	30	5	x
56.2.8.3.7	Base	211	44	28	5	x

■Restoration activity in T56.2(south of T56)

Restoration work in this area began in April 2013. Although many original posts were used in this area, it was not possible to identify their original locations, so it is thought that all the posts were brought from different locations. Therefore, sandstone plates needed to be inserted to keep the horizontal level of the handrails, and plates were inserted between the posts and the handrails to stabilize the handrails in Nos. 56.2.8.2.5 and 56.2.8.2.7. For the newly made sandstones plate insert between post and handrail for adjusting, we don't use epoxy or some other materials to connect these support and elements in order to make it easy to remove when original post under these handrails will be found in the future. Although following our restoration policy, some new sandstone for filling missing part of handrails, we used stainless steel bonding. Also, we attached small lead plate with new numbering and JST 2013 to these new sandstone plate.

Later, due to a change in JASA's plan, the platform of T56 was also partially restored, so the balustrade was dismantled and reconstructed by JASA in 2016, but the position was not changed from when it was temporarily assembled in this project.

■Position change of the element(See Drwaing 59.2)

There are no elements in this area that have been moved before or after restoration.

Repaired number

■Naga statue..... 1

■Other Balustrade elements

Handrail.....4

Post.....7

Basement.....7

Total 19 elements

Area : T56.2 / Working Term : 3 month

<After restoration>



Area : T56.2 / Working Term : 3 month

<Photos during restoration>



Area : T56.1 / Working Term : 3 month

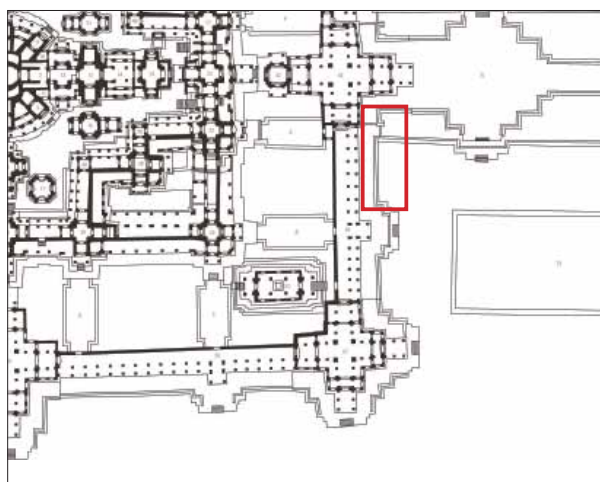


Before Restoration



After Restoration

Area : T56.1 / Working Term : 3 month



Repaired number

■Naga statue..... 1

■Other Balustrade elements

Handrail.....9

Post.....9

Basement.....15

Total 34 elements

■Restoration activity in T56.1

It was revealed that platform under Naga head has many crack, breakage and has big gaps between elements. Also, some elements of platform are not original that was brought from other place in the past restoration. This area was too unstable to reconstruct balustrade and need some maintenance. Thus discussed with JASA experts, we made decision to do minimum maintenance for platform to make stable enough to reset balustrade. Thus, firstly we dismantled some of outer surface elements of the platform, and gave appropriate treatment to the elements which has problem and then reconstructed. However this project target is to ensure the safety of balustrade, we continue to use the same situation as before and only change position, for example elements that have curve on it (it seems belong to outer gallery relief), we put it on the surface of the platform, so that it is easy to understand in the future. After that, place that has big gaps we filled by laterite and clay powder and also soil 4 on the gaps the top layer.

In addition, before the restoration, some of the handrails were scattered around the north side, but these were decided to be lined up neatly on the platform.

■Position change of the element(See Drwaing 56.1)

No movement in the Handrails or the Basements. For some of the posts, the position was changed to level and stabilize the handrail.

Stone Number	Type	L	W	H	Applied Case	notes(Ø x num. x L)
56.1.8.1.1(2)	N.body	55	26	26	3+5	Ø: 6 x 2 x 80
56.1.8.1.2	N.body	54	33	31	5	x
56.1.8.1.3	N.body	85	33	29	5	x
56.1.8.1.4	N.body	80	23	35	5	x
56.1.8.1.5	N.body(2)	106	32	29	3+4?+5	Ø: 8 x 2 x 140
56.1.8.1.6						
56.1.8.1.7(2)	N.body	251	36	29	3+5	Ø: 8 x 2 x 140
56.1.8.1.8(2)	N.body	151	32	31	3+5	Ø: 8 x 2 x 100
56.1.8.1.9	N.body	145	35	39	5	x
56.1.8.1.10	N.body	209	36	33	5	x
56.1.8.1.11(4)	N.head	246	67	112	1+2+3+5	Ø: 12 x 3 x 140/ 12 x 3 x 100/ 8 x 3 x 130
56.1.8.2.1*	Post(S)	22	26	17	x	x
56.1.8.2.2	Post(S)	24	29	28	1	x
56.1.8.2.3	Post(S)	28	29	24	1	x
56.1.8.2.4	Post(S)	27	27	27	1	x
56.1.8.2.5*	Post(S)	29	25	21	x	x
56.1.8.2.6	Post	40	34	23	5	x
56.1.8.2.7	Post	41	29	24	1+5	x
56.1.8.2.8	Post	47	35	24	1+5	x
56.1.8.2.9(2)	Post	52	37	33	1+3+5	Ø: 6 x 2 x 80
56.1.8.3.1(2)	Base	145	43	20	3+4	Ø: 6 x 1 x 100/ 8 x 2 x 110
56.1.8.3.2	Base	184	42	19	5	x
56.1.8.3.3(2)	Base	110	42	18	3+5	Ø: 8 x 2 x 100
56.1.8.3.4.1	Base	49	42	22	4?+5	x
56.1.8.3.4.2	Base	62	43	20	4?+5	x
56.1.8.3.5 (4)	Base	172	42	27	3+5	Ø: 8 x 6 x 100
56.1.8.3.6	Base	175	46	28	2+5	x
56.1.8.3.7	Base	46	36	27	5	x
56.1.8.3.8	Base	133	49	30	5	x
56.1.8.3.9	Base	44	47	29	5	x
56.1.8.3.10	Base	80	59	32	1+5	x
56.1.8.3.11(3)	Base	145	46	20	3+5	Ø: 8 x 2 x 100/ 8 x 2 x 80
56.1.8.3.12(2)	Base	137	59	23	3+5	Ø: 8 x 4 x 80/ 8 x 2 x 100
56.1.8.3.13						
56.1.8.3.14(3)	Base	129	29	11	3+5	Ø: 6 x 2 x 80/ 3 x 2 x 80
56.1.8.3.15*	Base	69	42	20	5	x
58.2.8.1.25*						

Area : T56.1 / Working Term : 3 month

<Before and after restoration>



Area : T56.1 / Working Term : 3 month

<After restoration>



Area : T56.1 / Working Term : 3 month

<Photos during restoration>

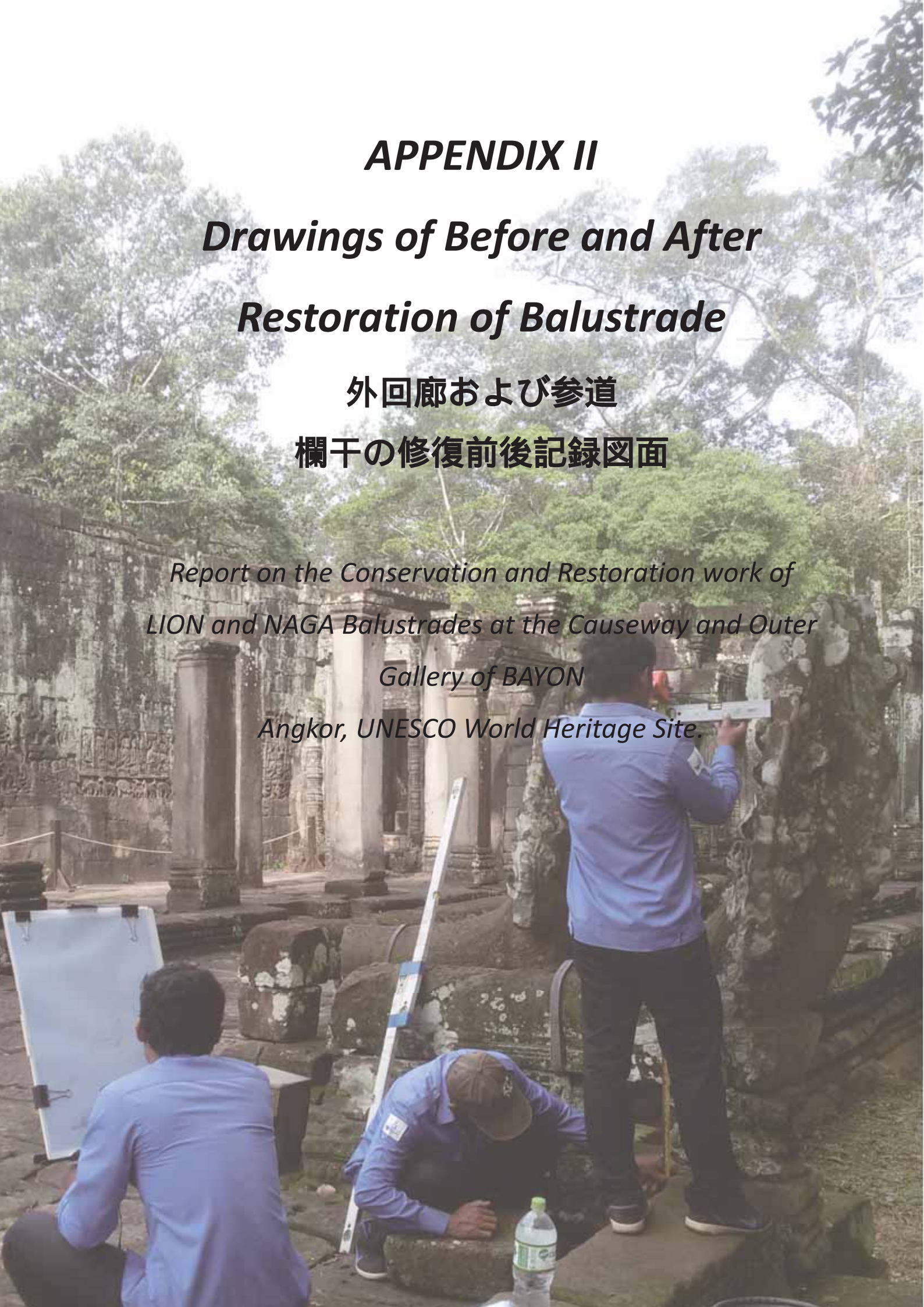


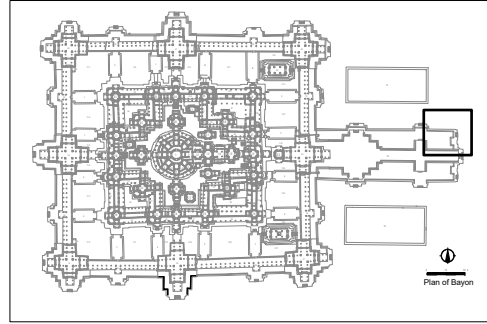
APPENDIX II

Drawings of Before and After Restoration of Balustrade

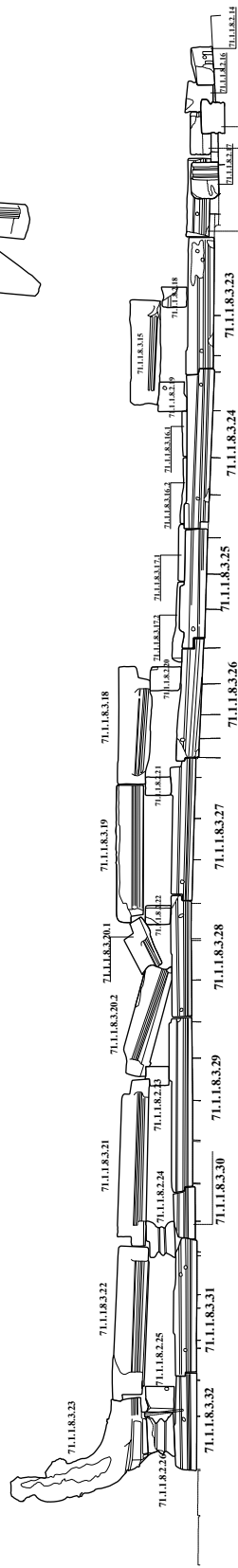
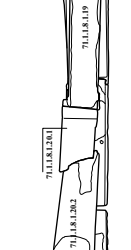
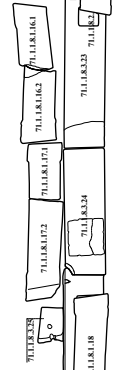
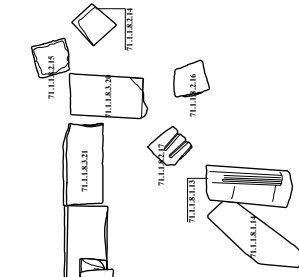
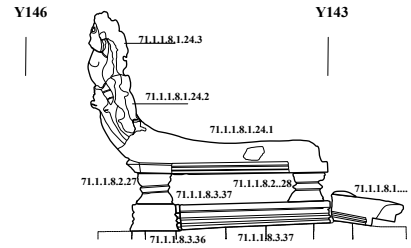
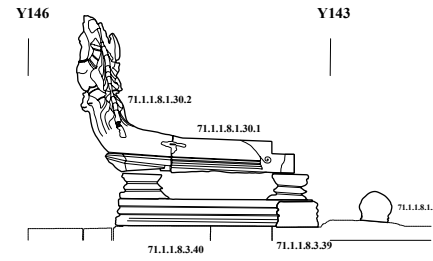
外回廊および参道 欄干の修復前後記録図面

*Report on the Conservation and Restoration work of
LION and NAGA Balustrades at the Causeway and Outer
Gallery of BAYON
Angkor, UNESCO World Heritage Site.*





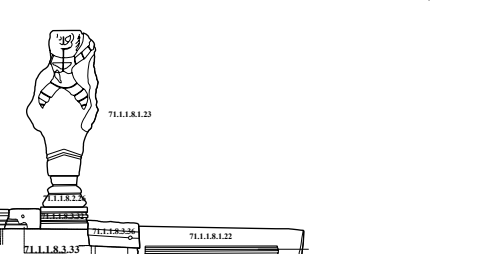
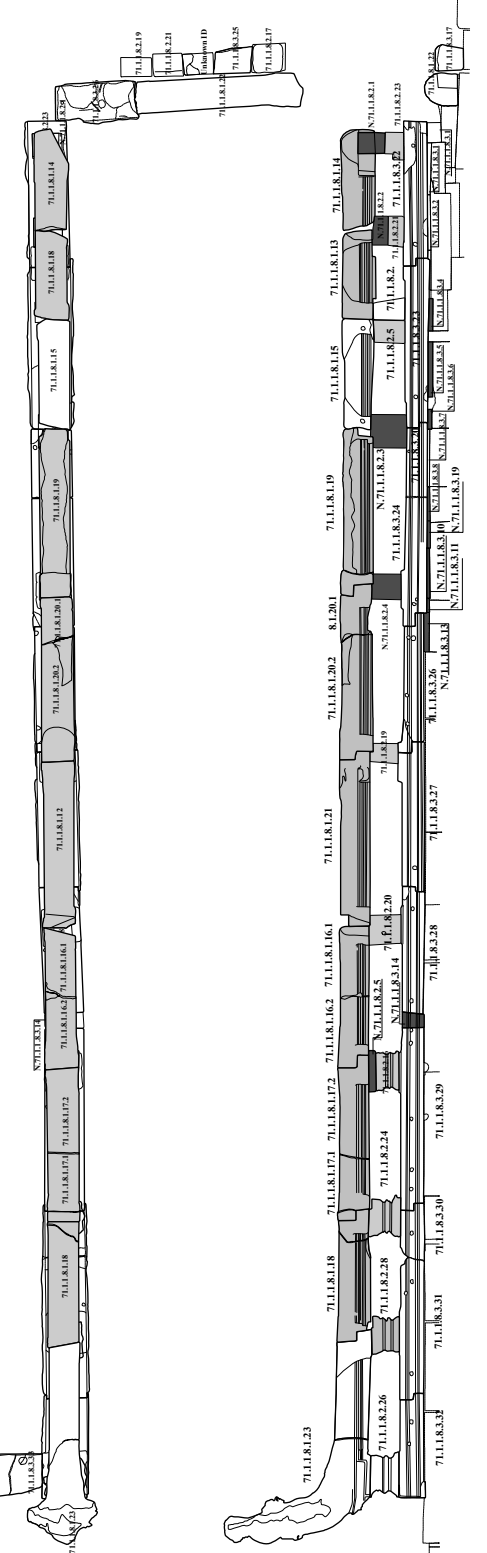
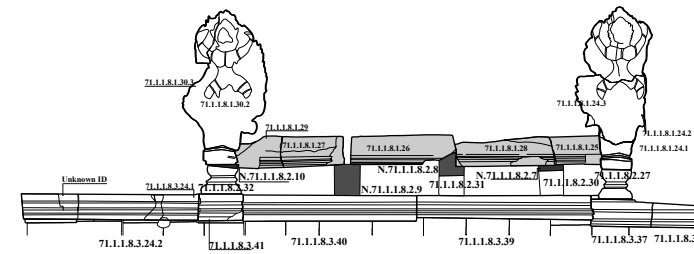
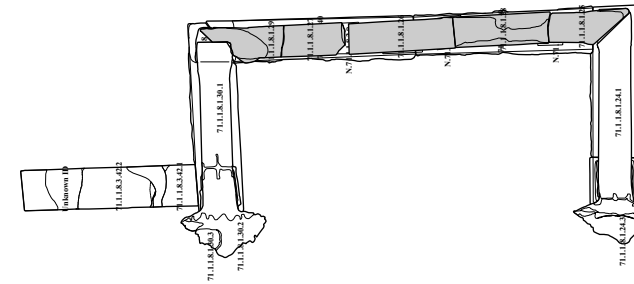
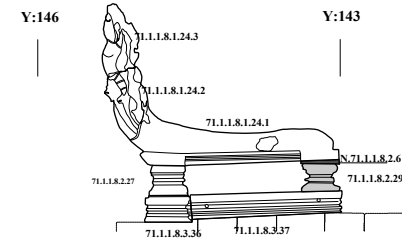
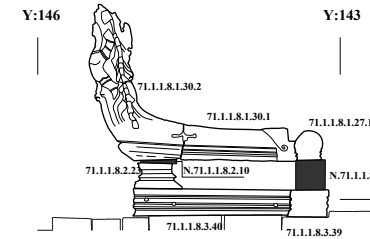
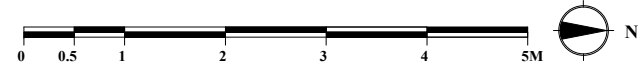


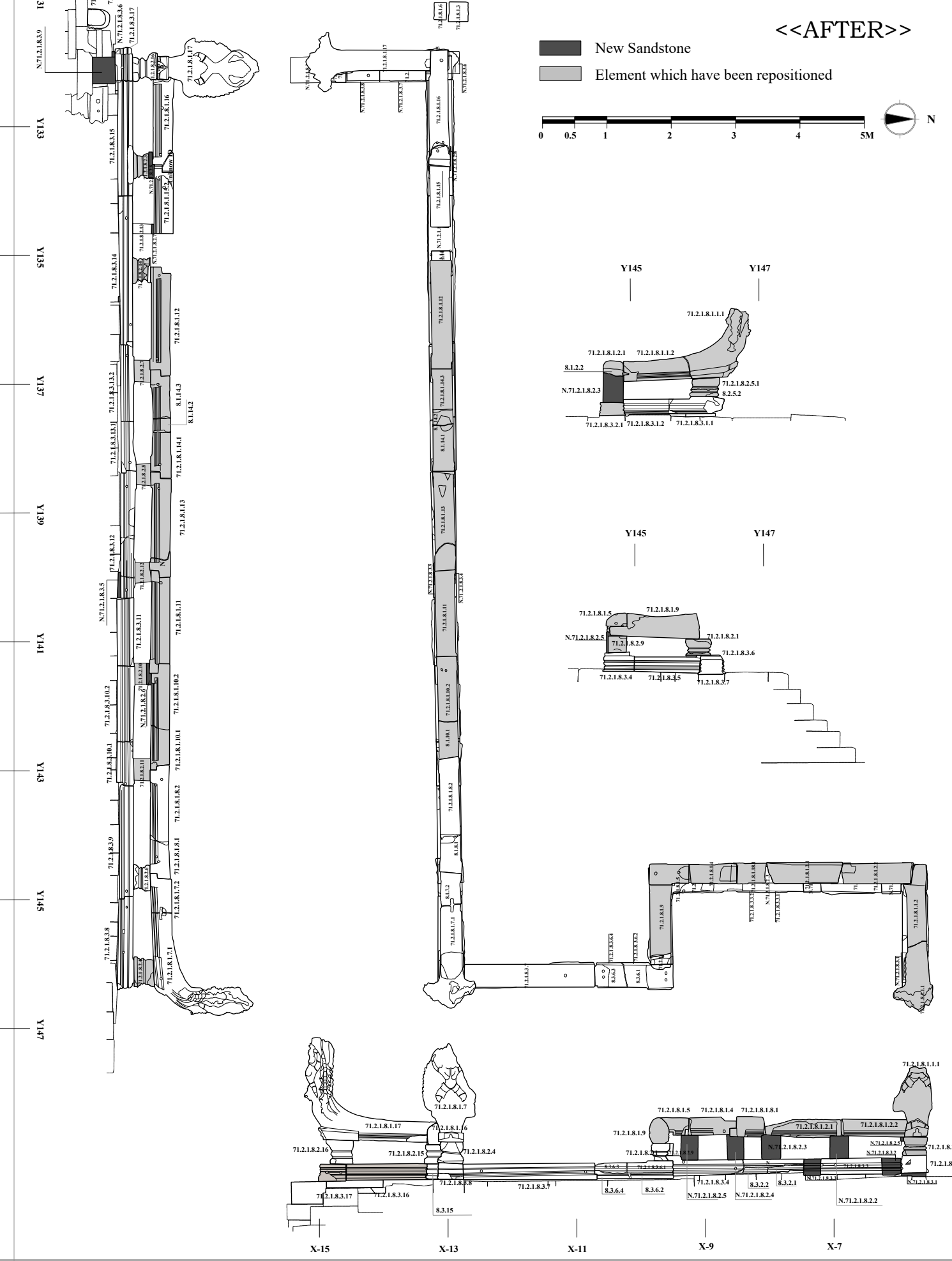
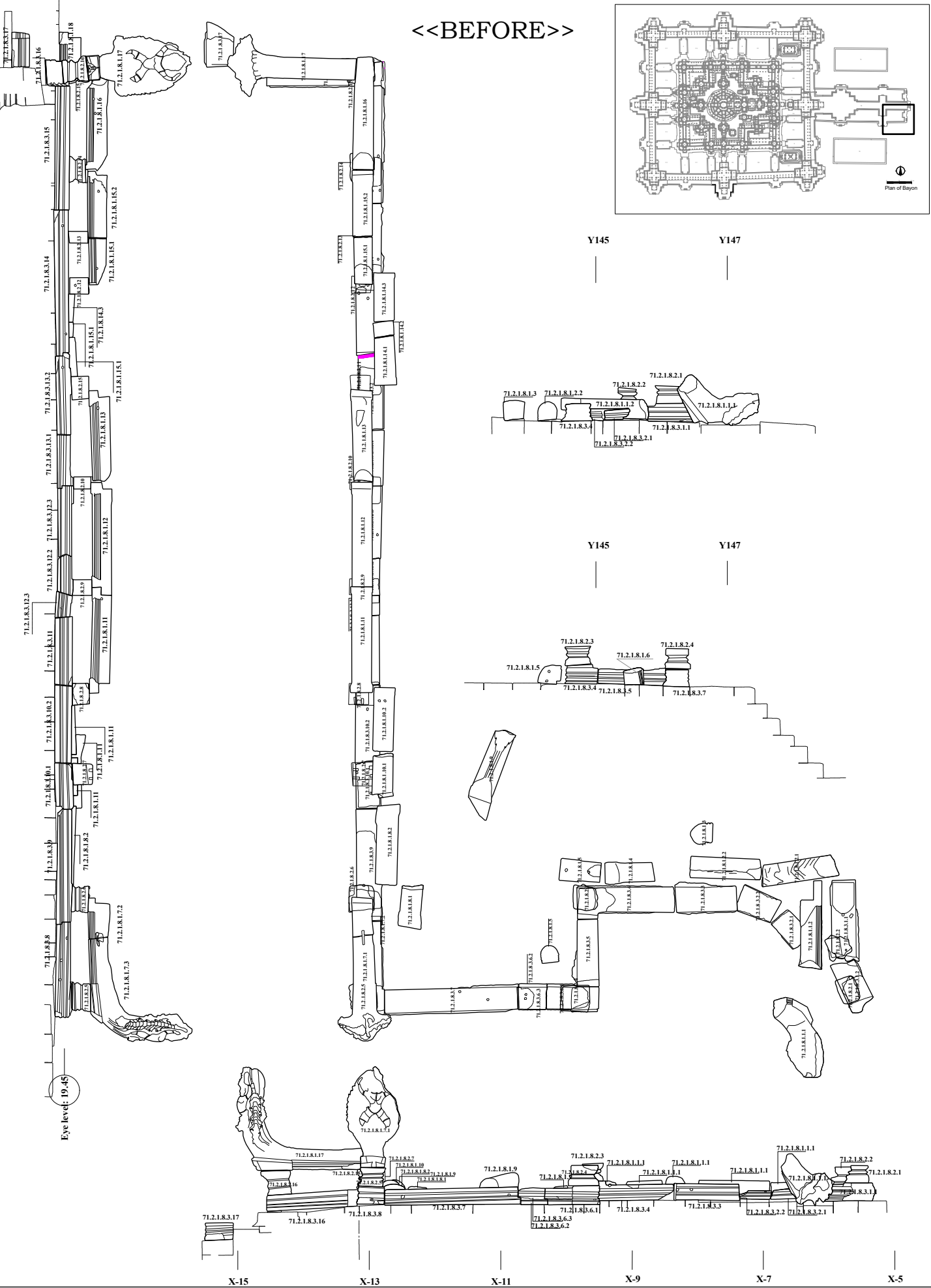
<<BEFORE>>

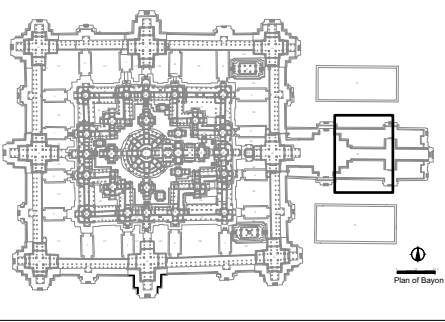


<<AFTER>>

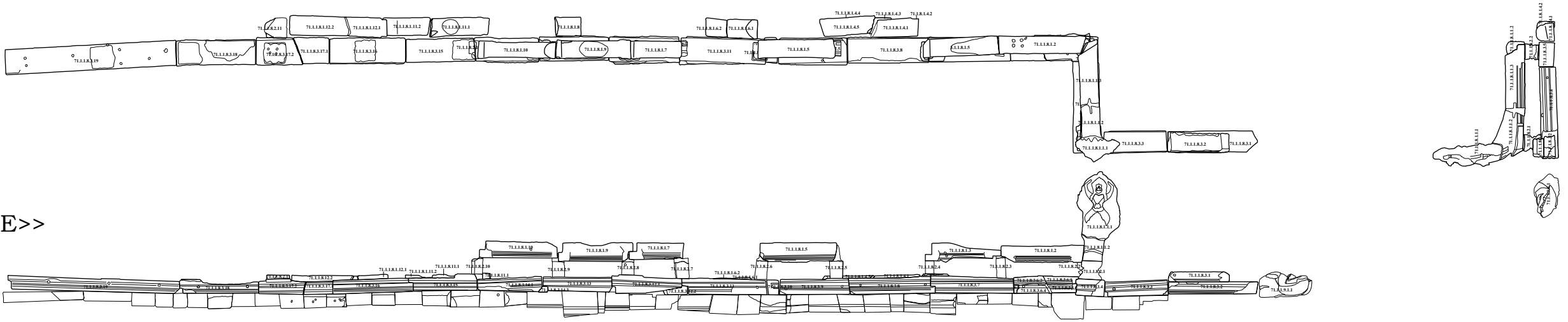
 New Sandstone
 Element which have been repositioned



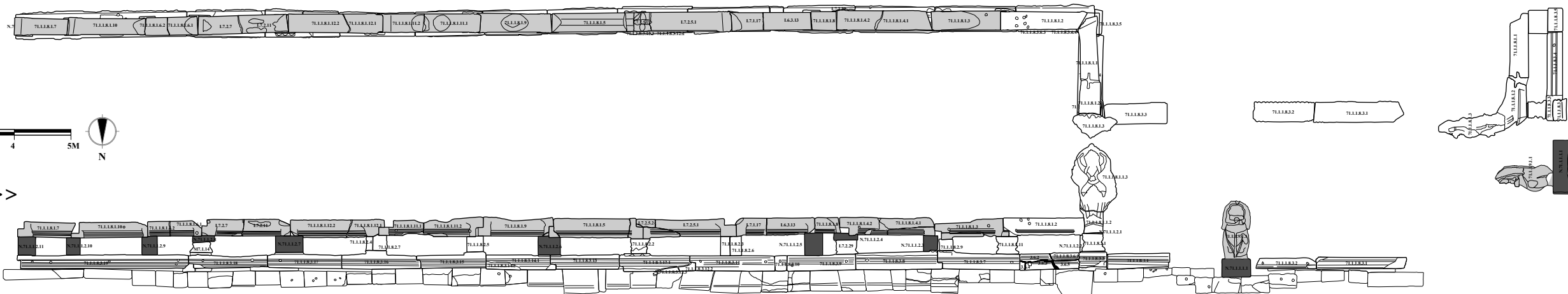




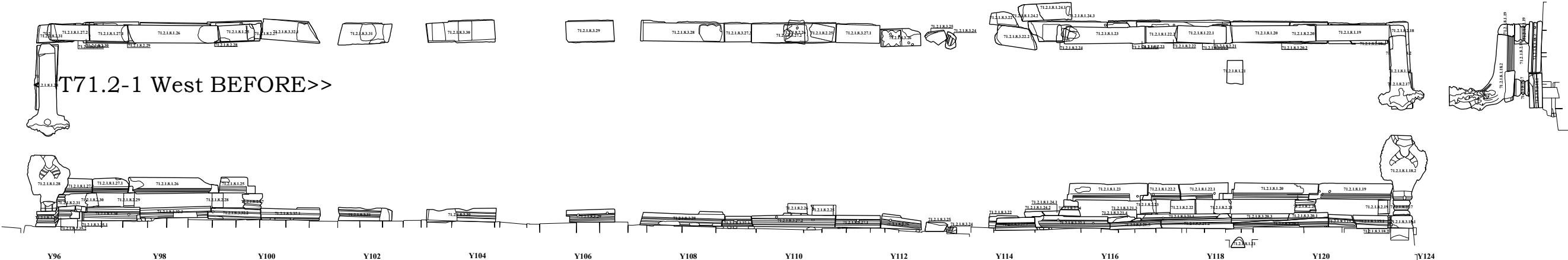
<<T71.1-1 West BEFORE>>



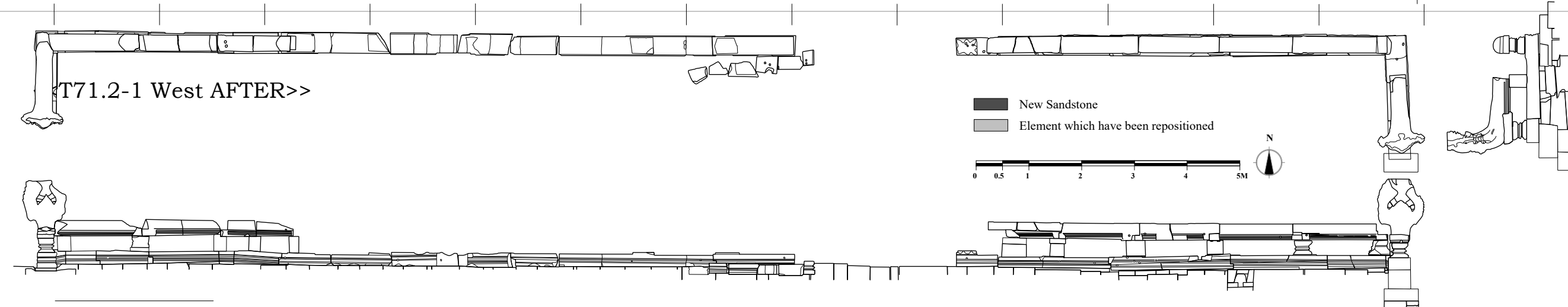
<<T71.1-1 West AFTER>>

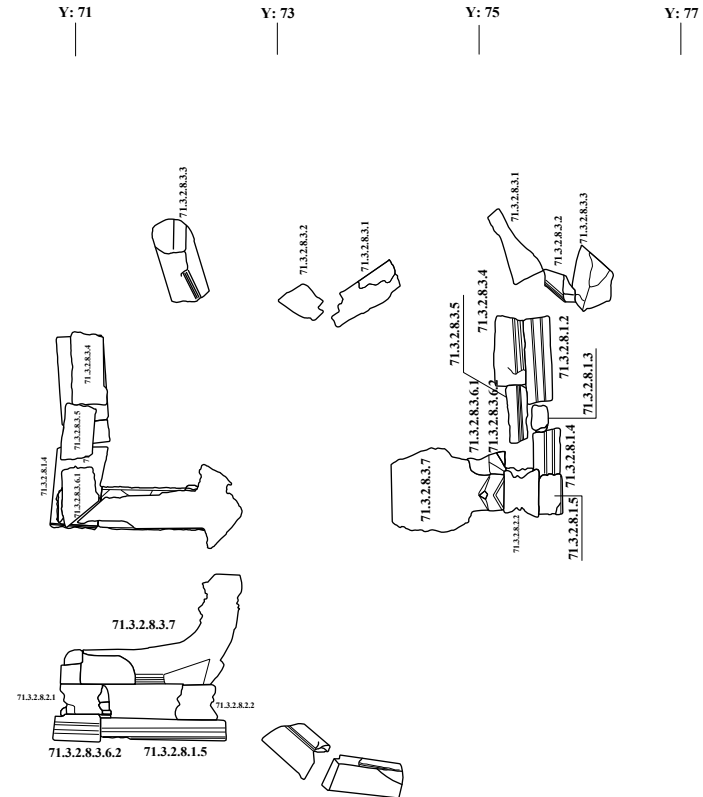
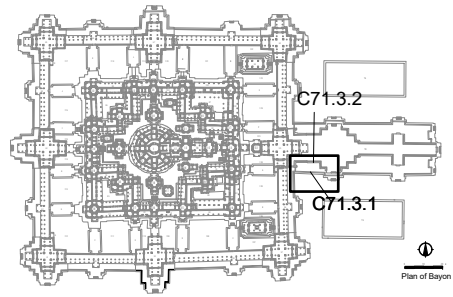


T71.2-1 West BEFORE>>

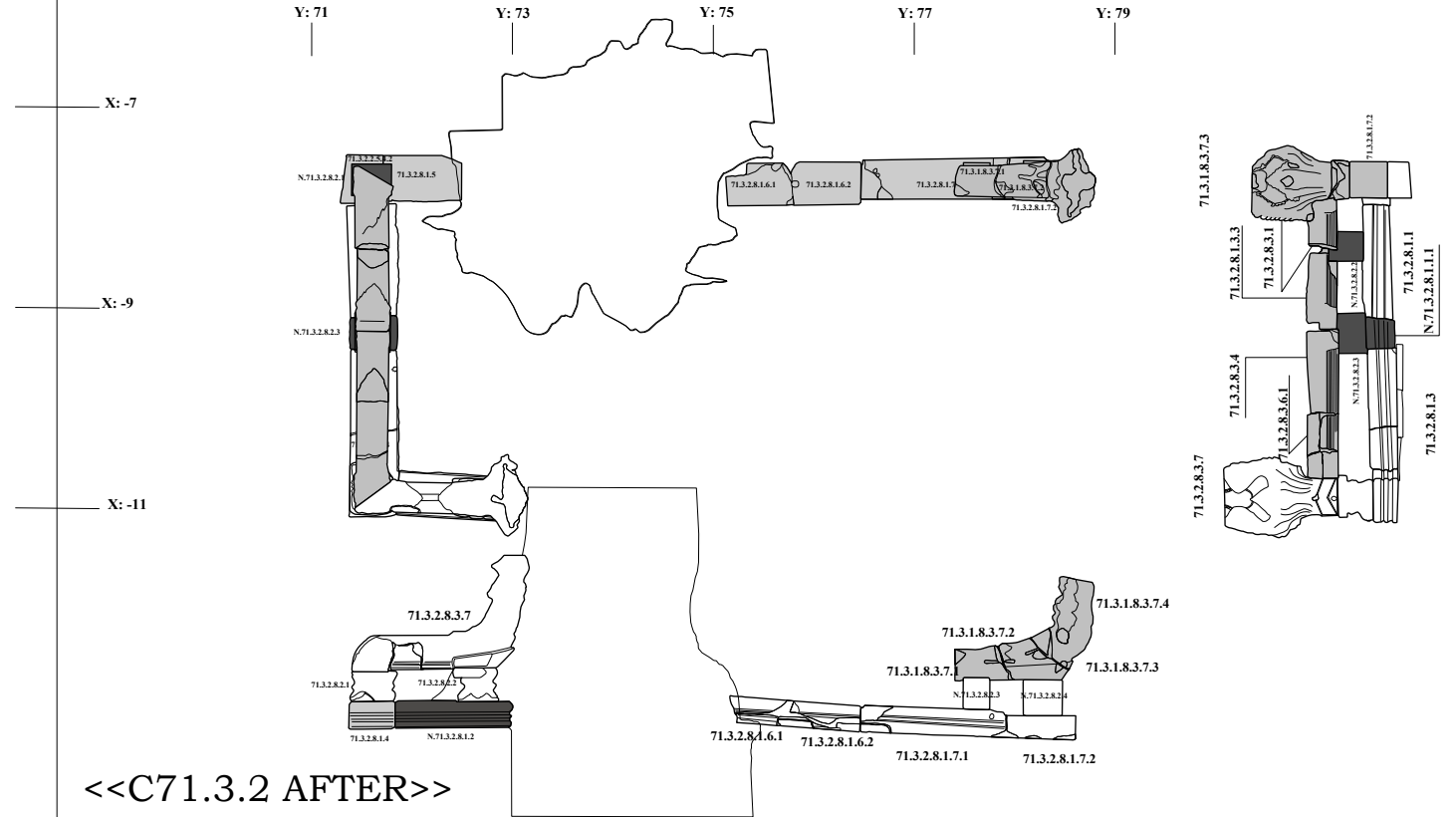


T71.2-1 West AFTER>>

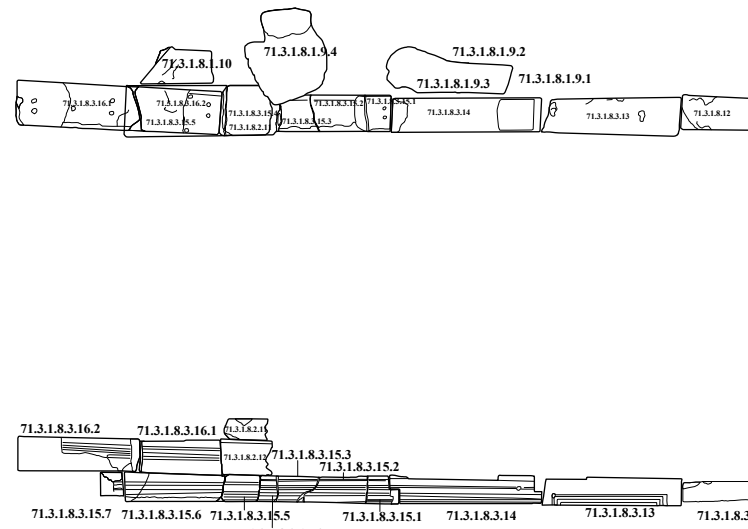




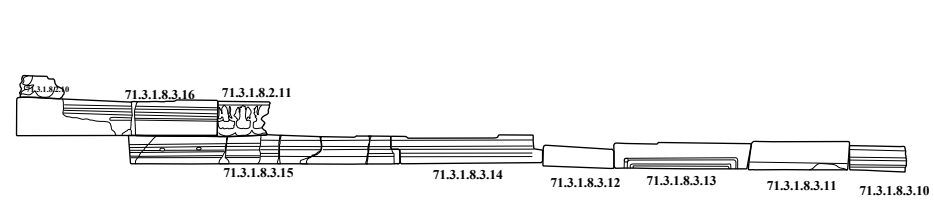
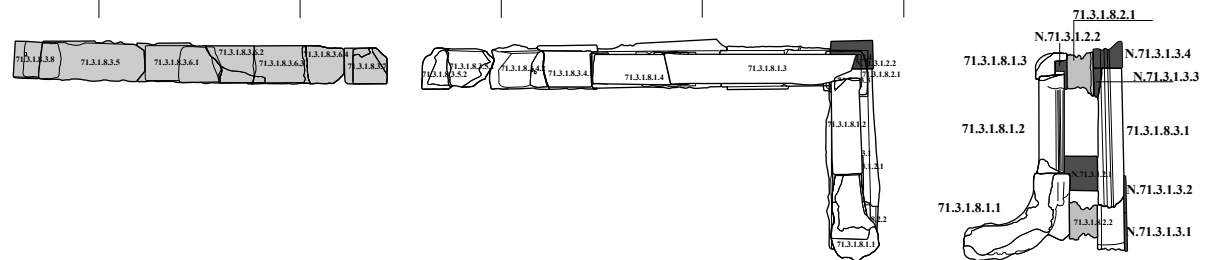
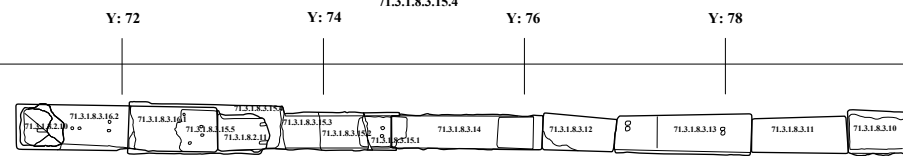
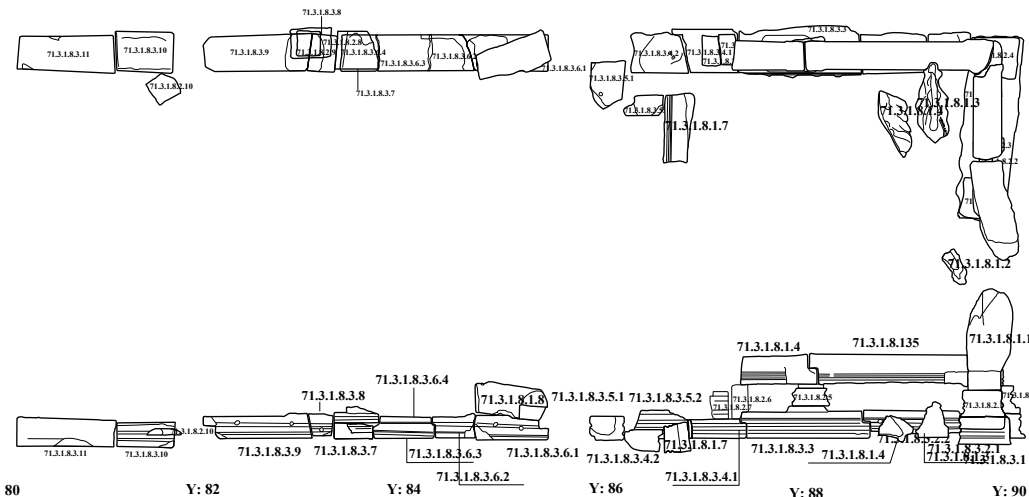
<<C71.3.2 BEFORE>>



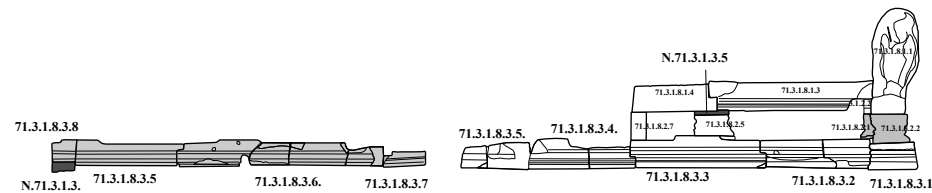
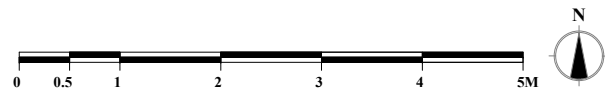
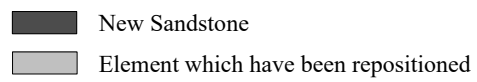
<<C71.3.2 AFTER>>

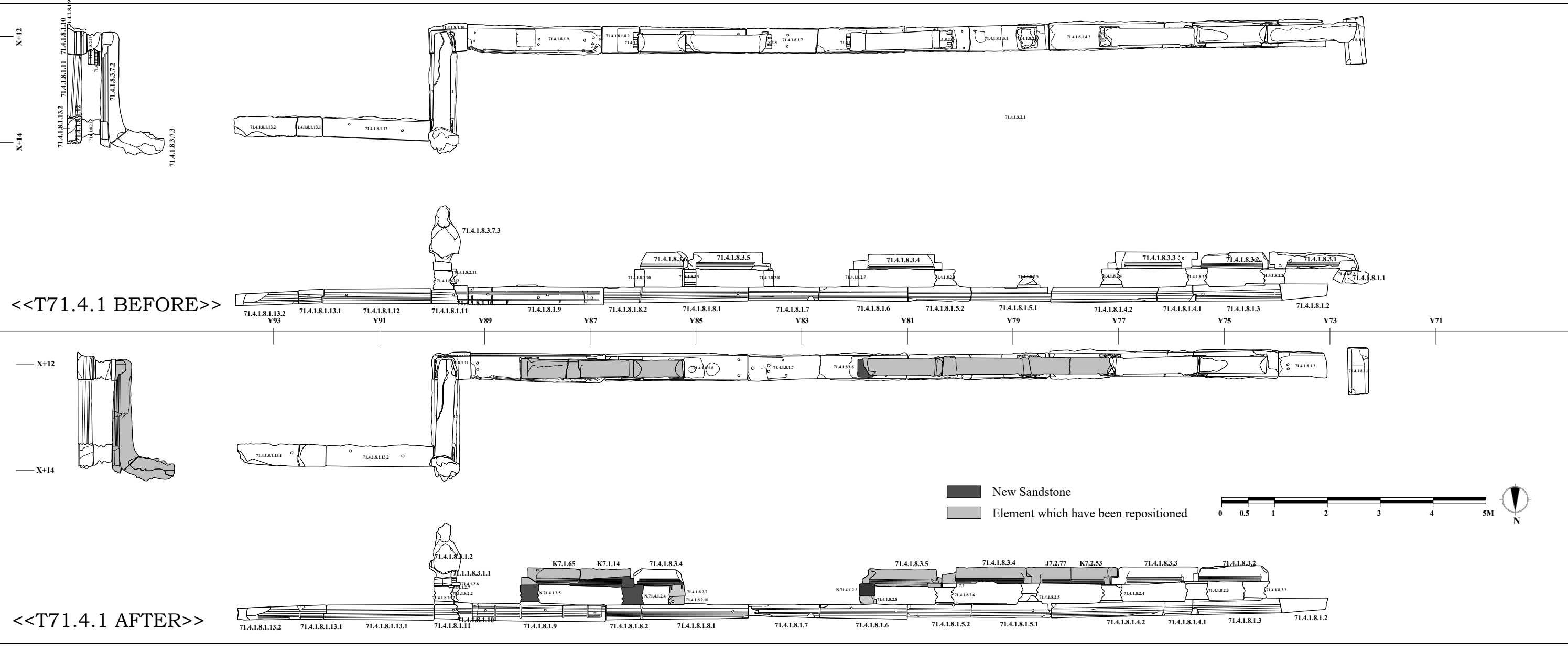
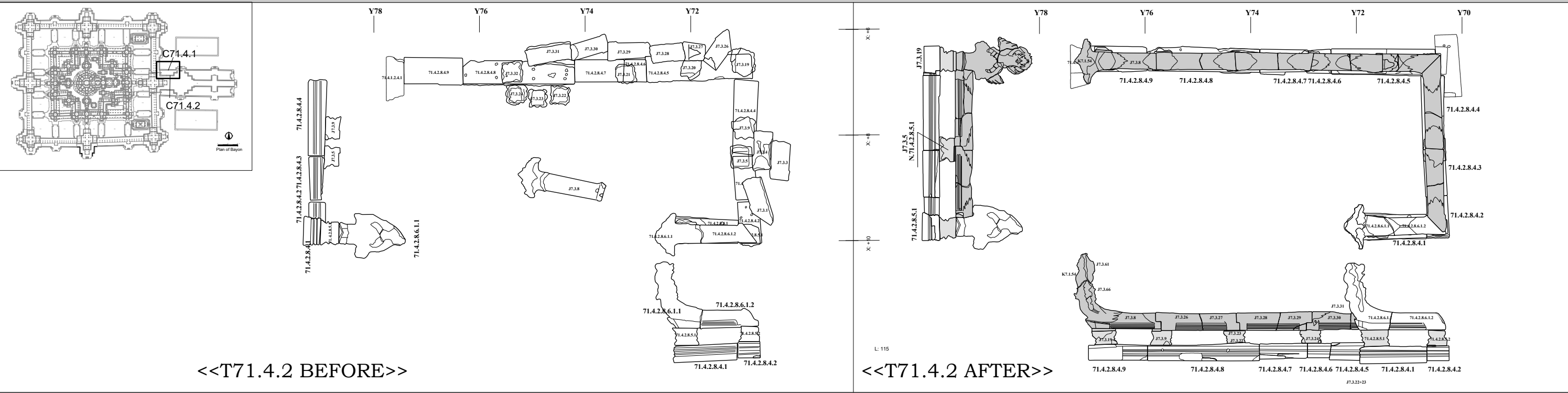


<<C71.3.1 BEFORE>>

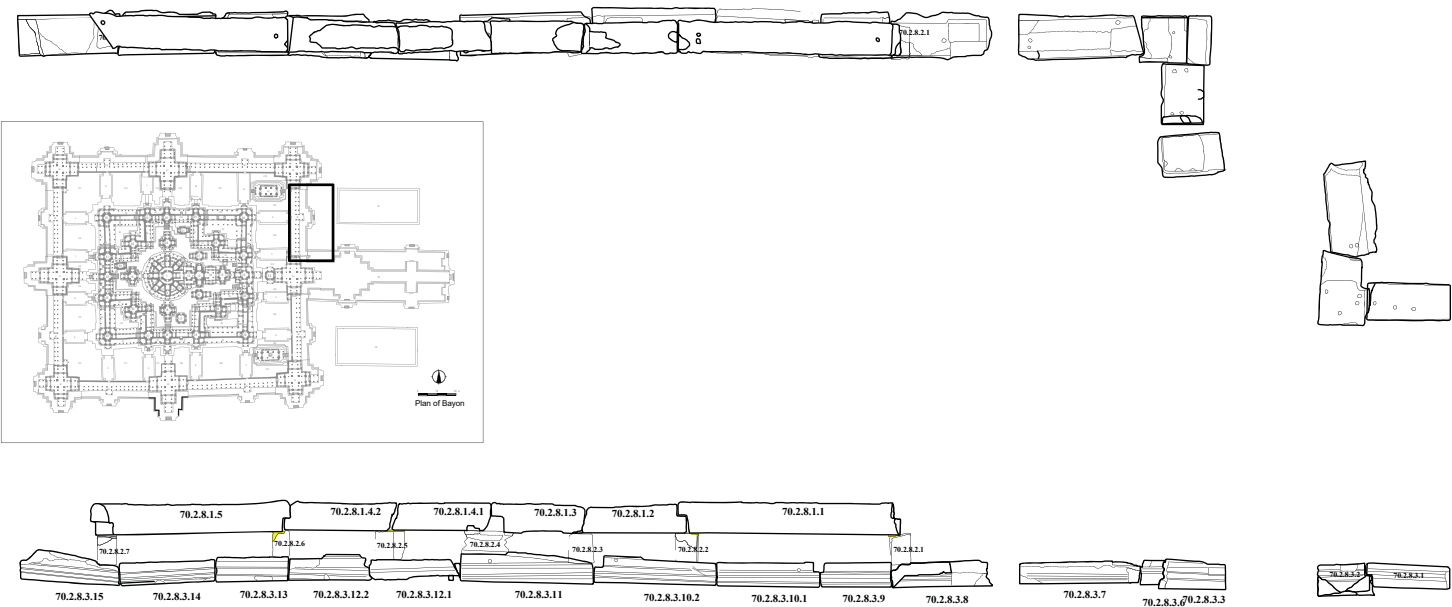


<<C71.3.1 AFTER>>

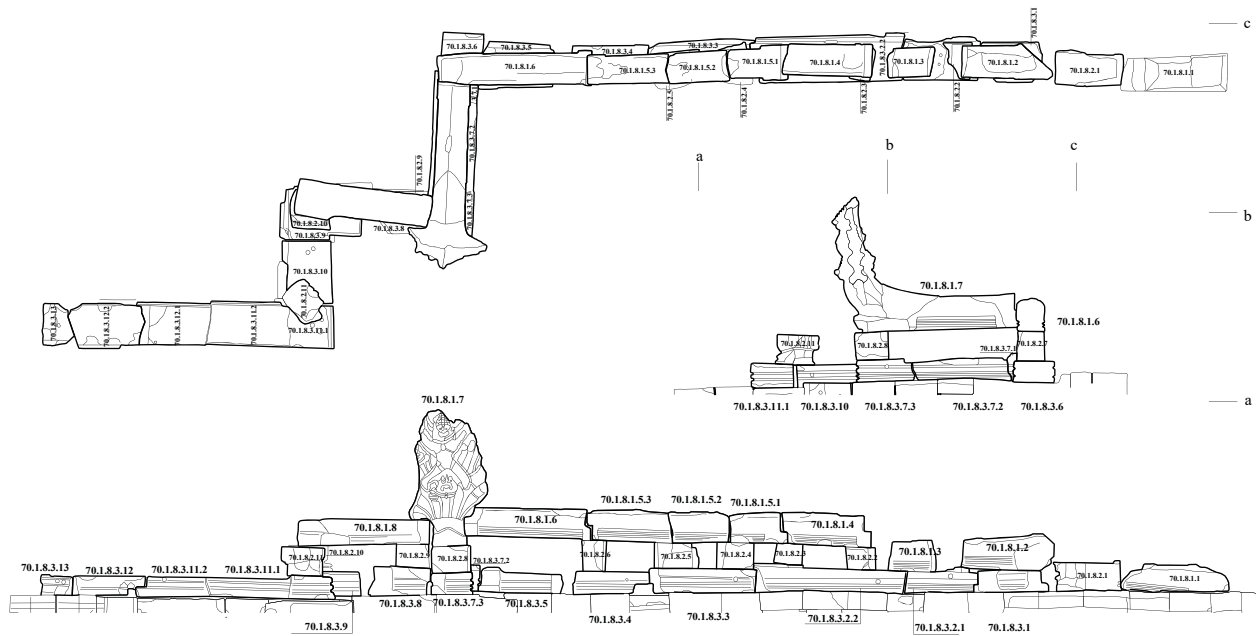




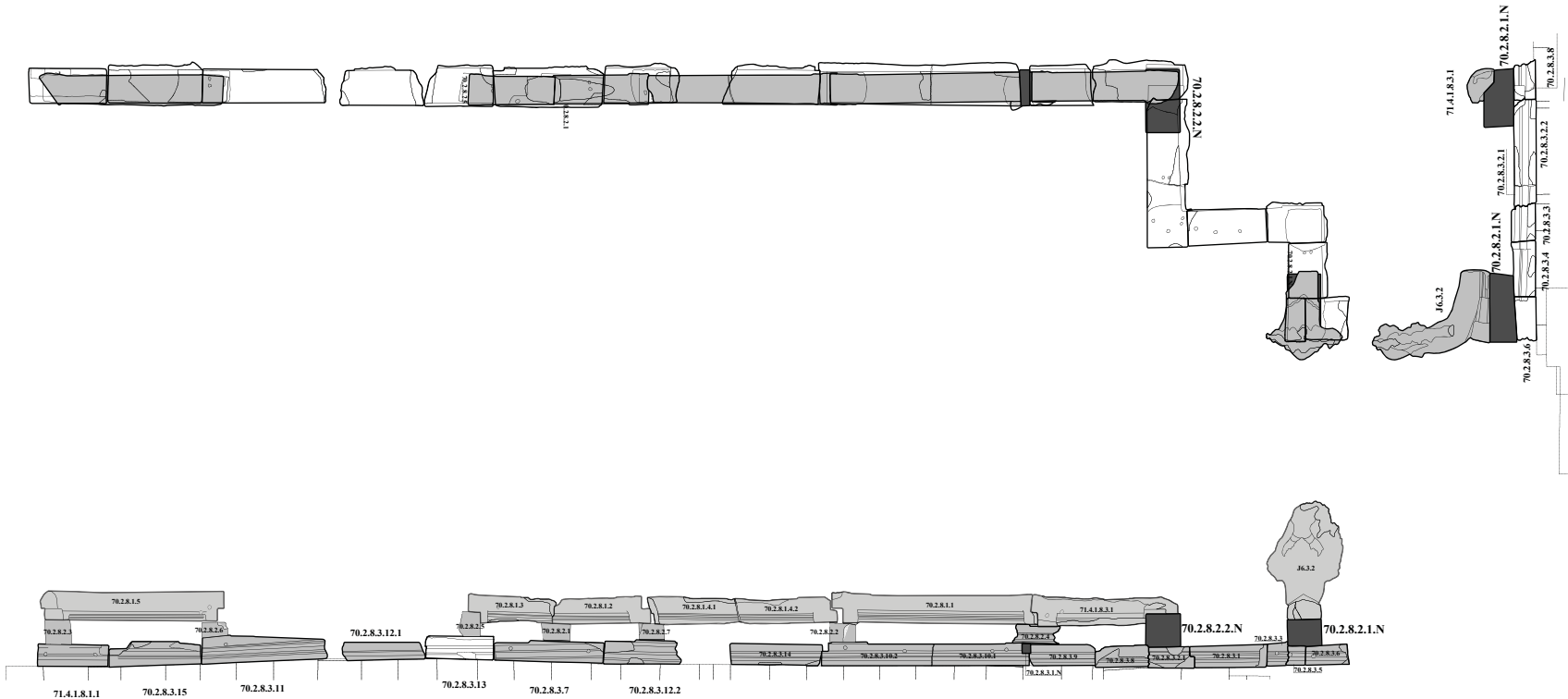
<<T70.2 BEFORE>>



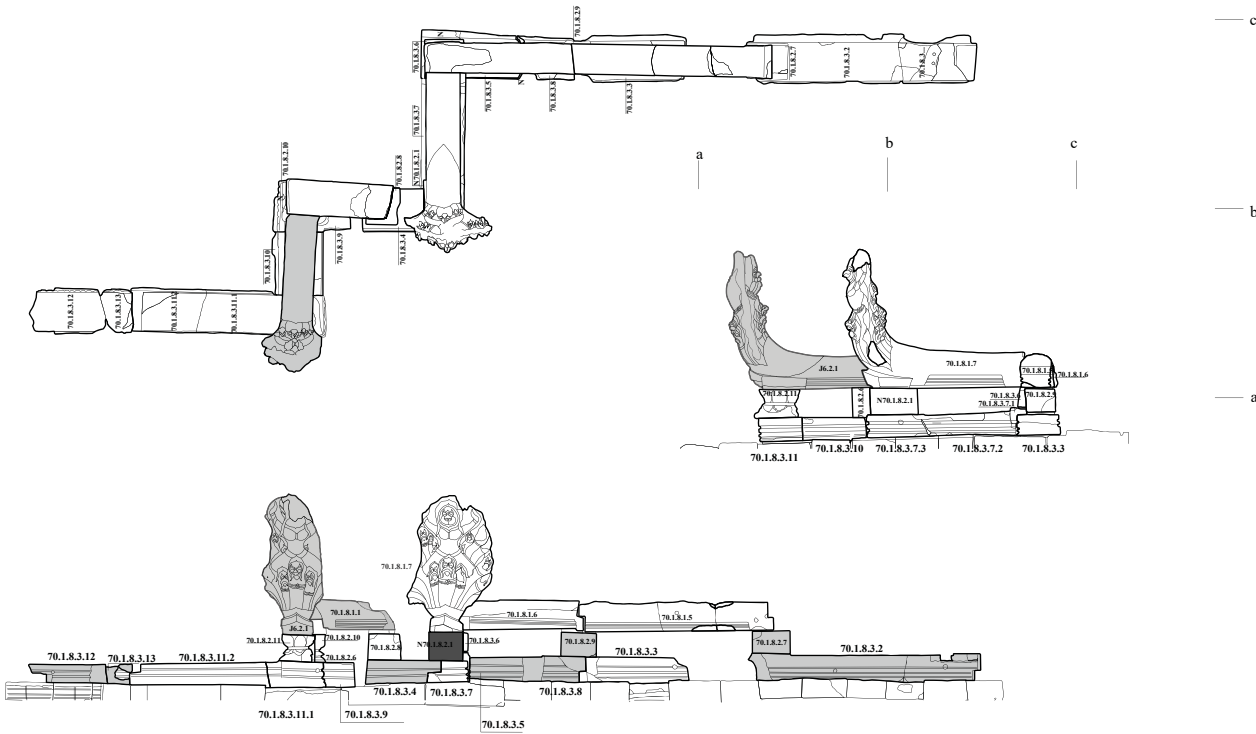
<<T70.1 BEFORE>>



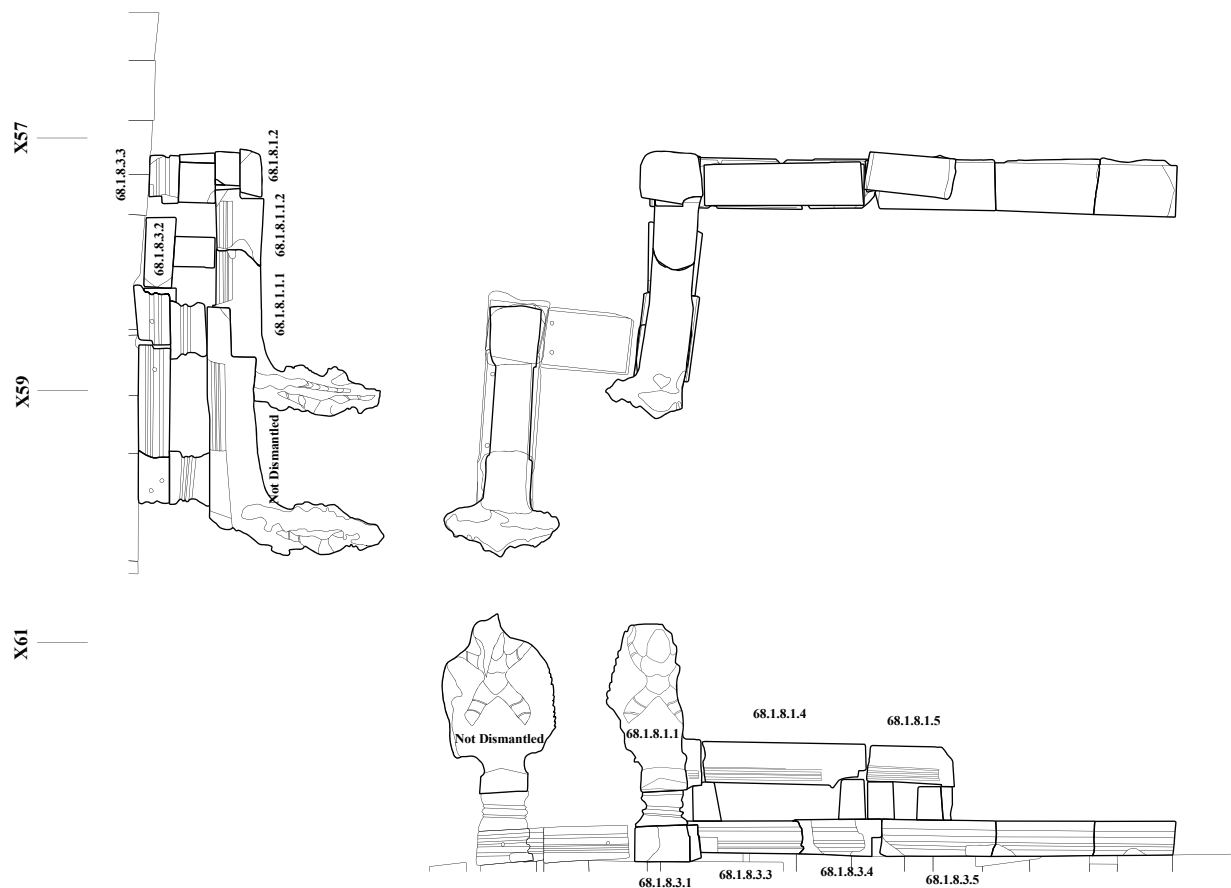
<<T70.2 AFTER>>



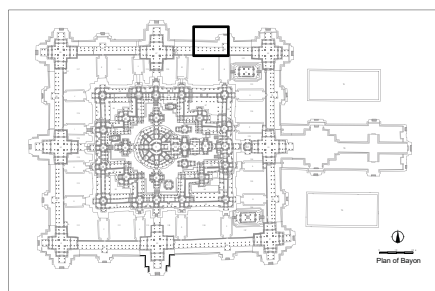
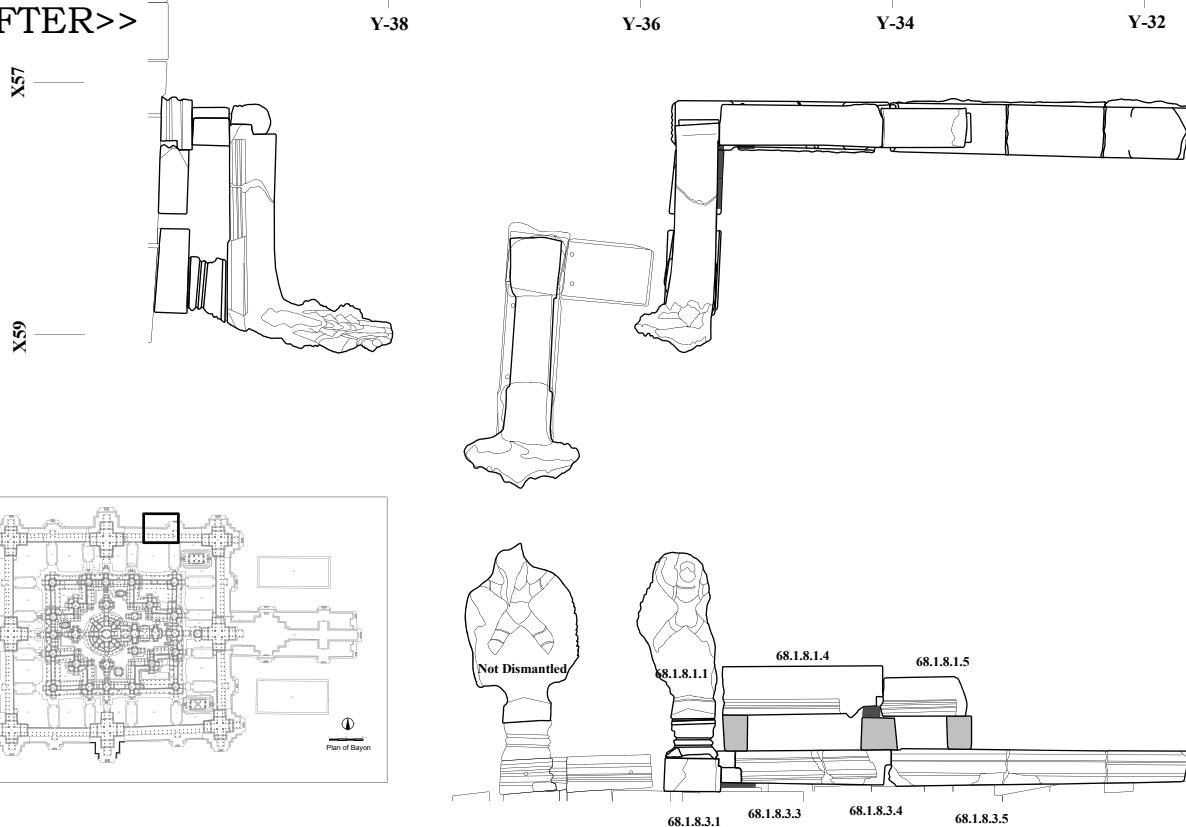
<<T70.1 AFTER>>



<<BEFORE>>



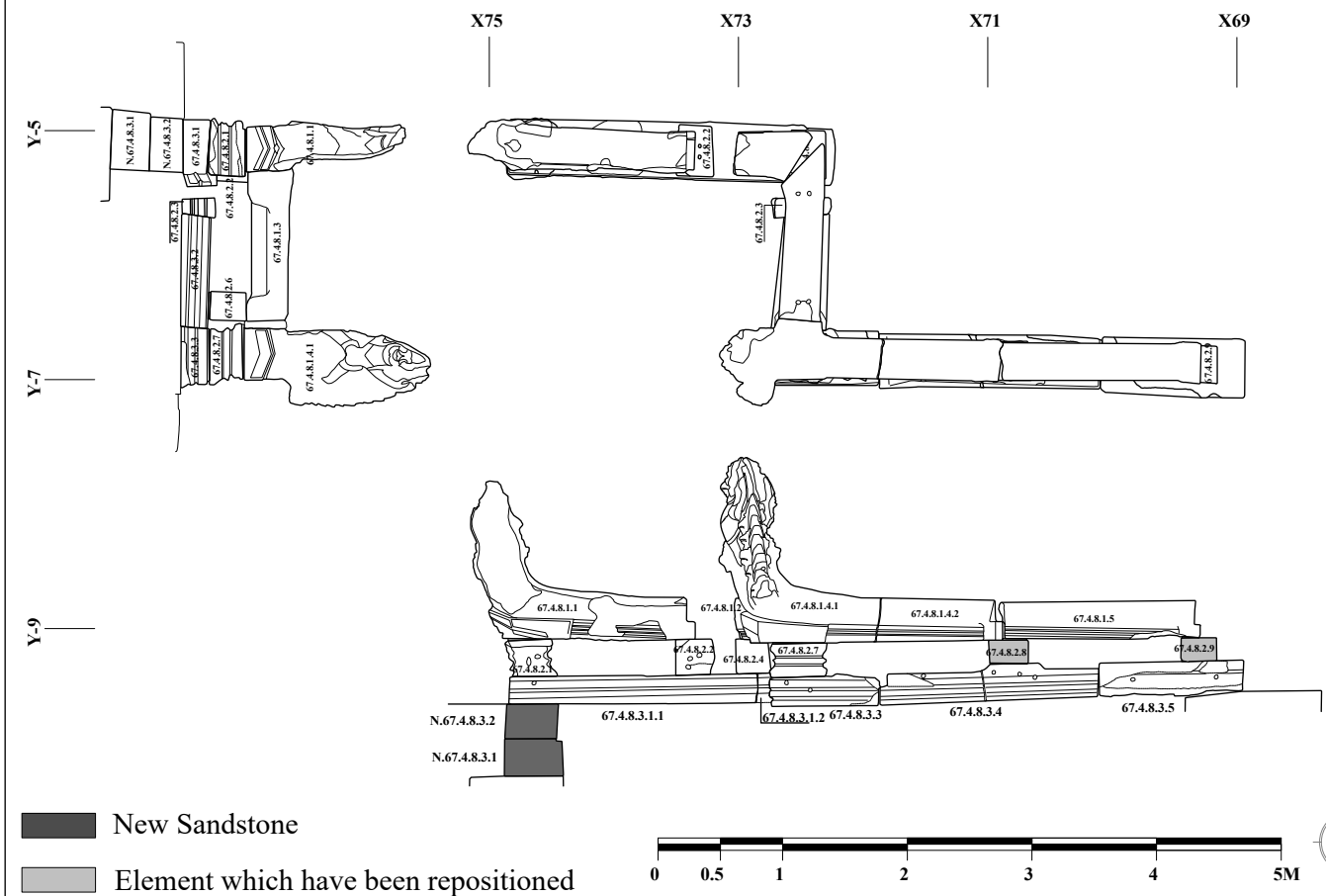
<<AFTER>>

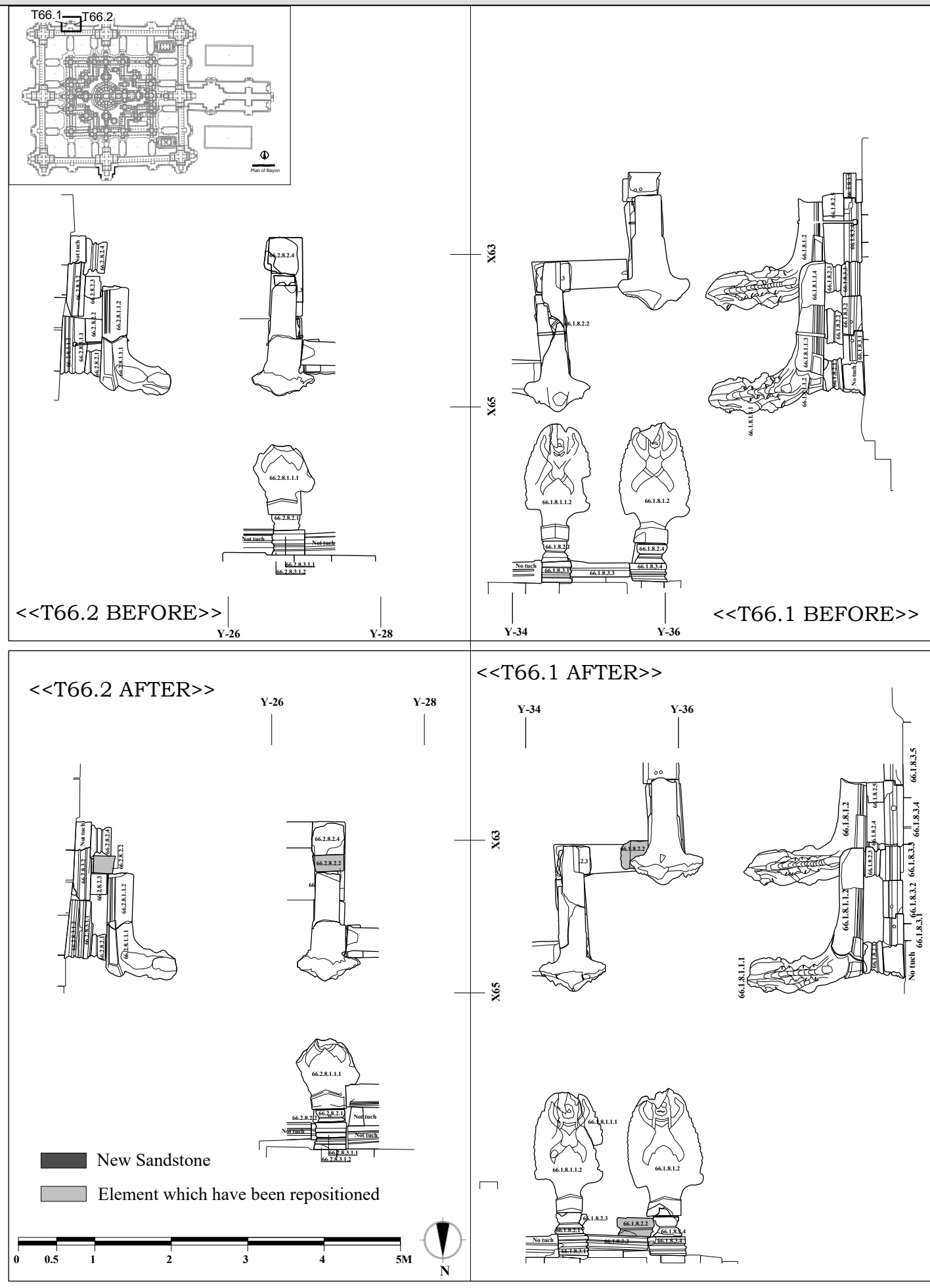


■ New Sandstone
 ■ Element which have been repositioned

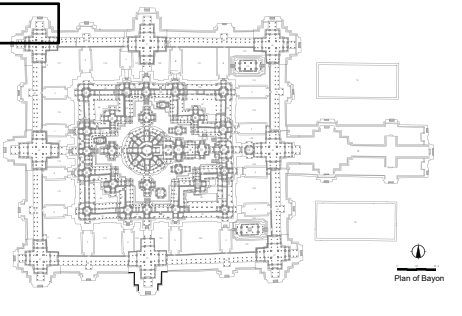
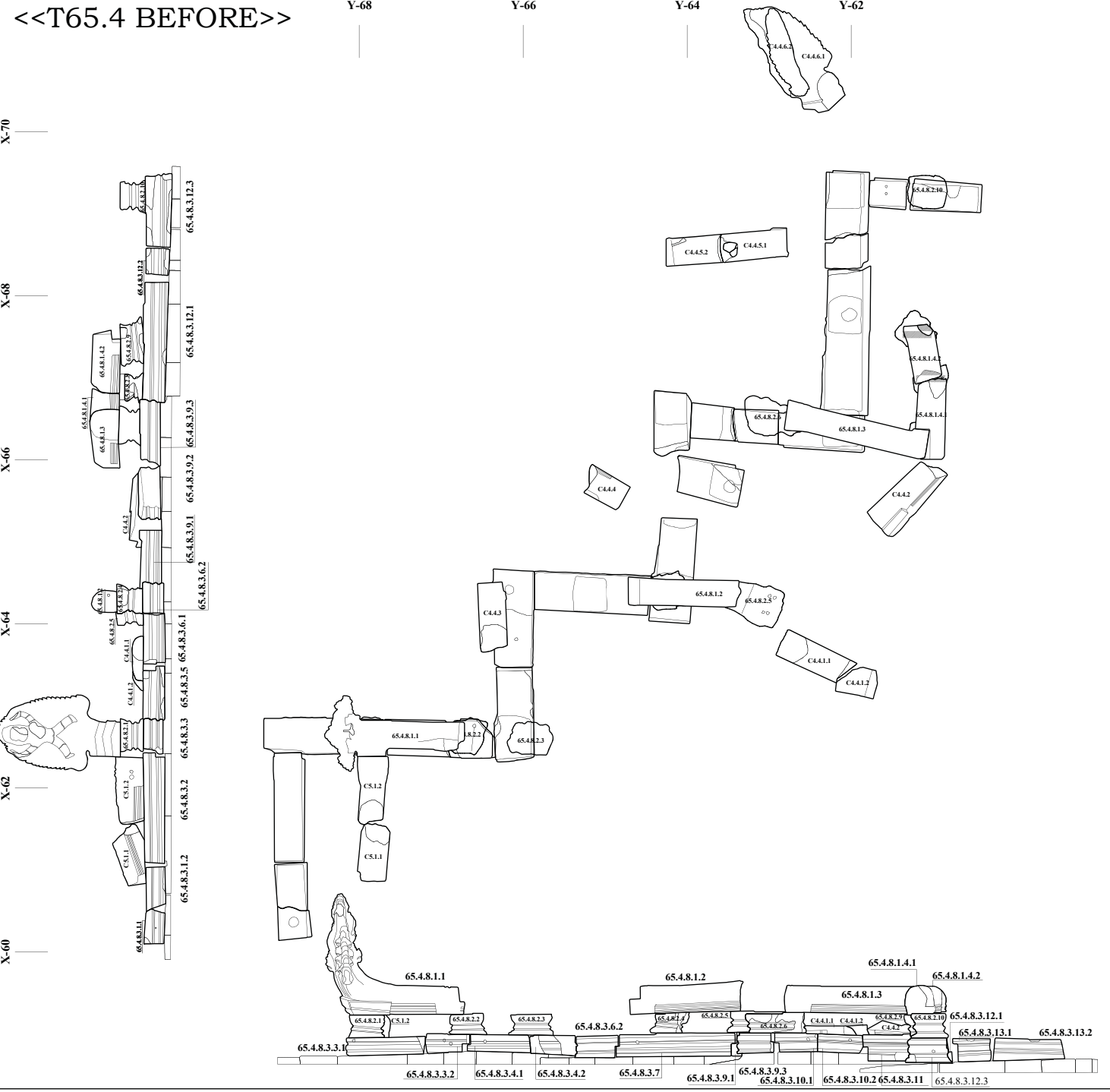
0 0.5 1 2 3 4 5M



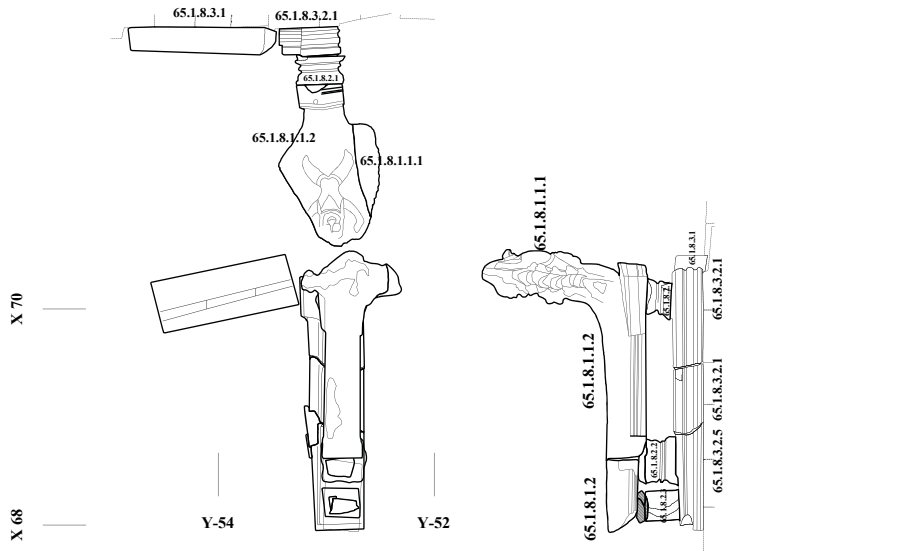




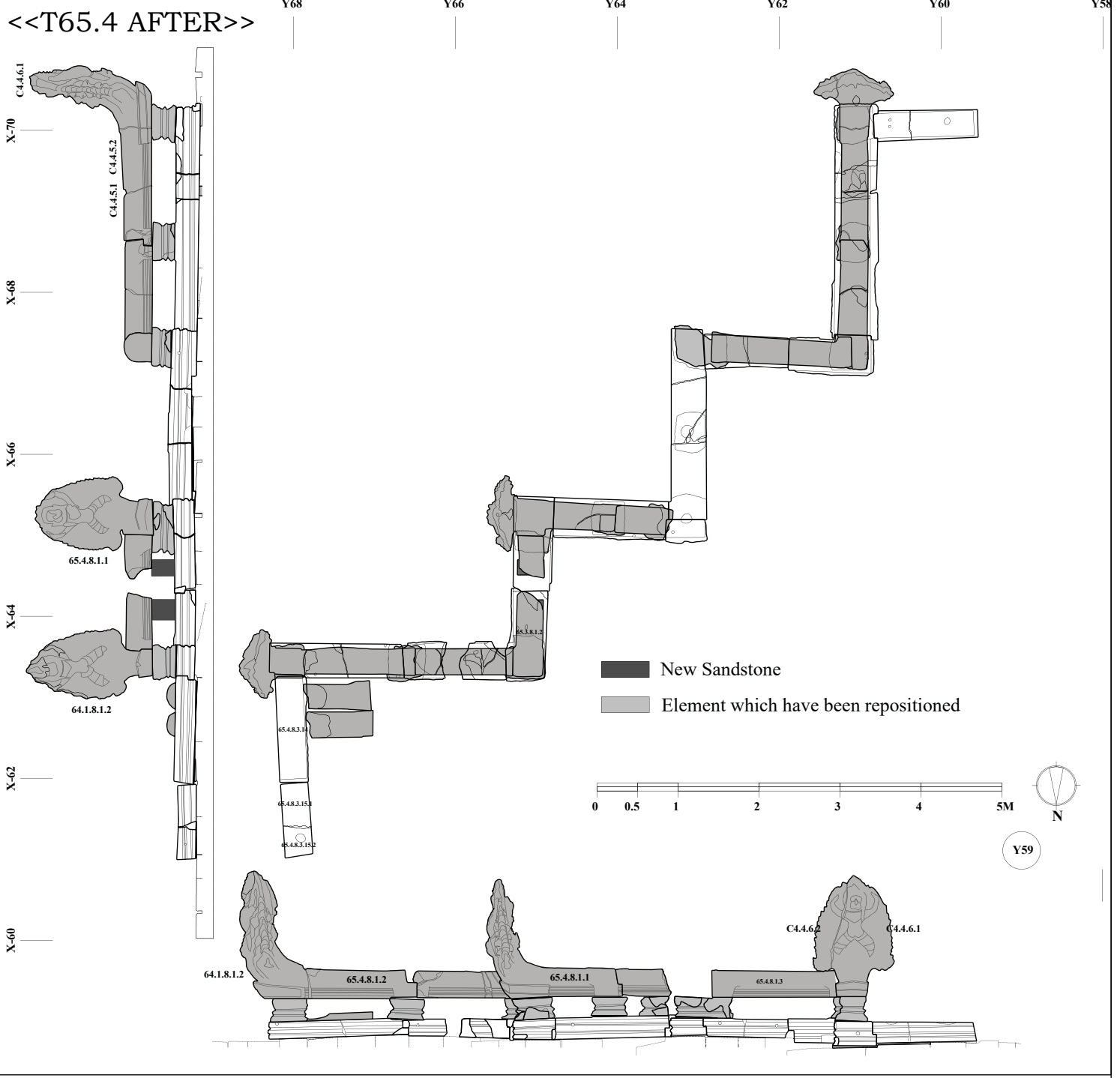
<<T65.4 BEFORE>>



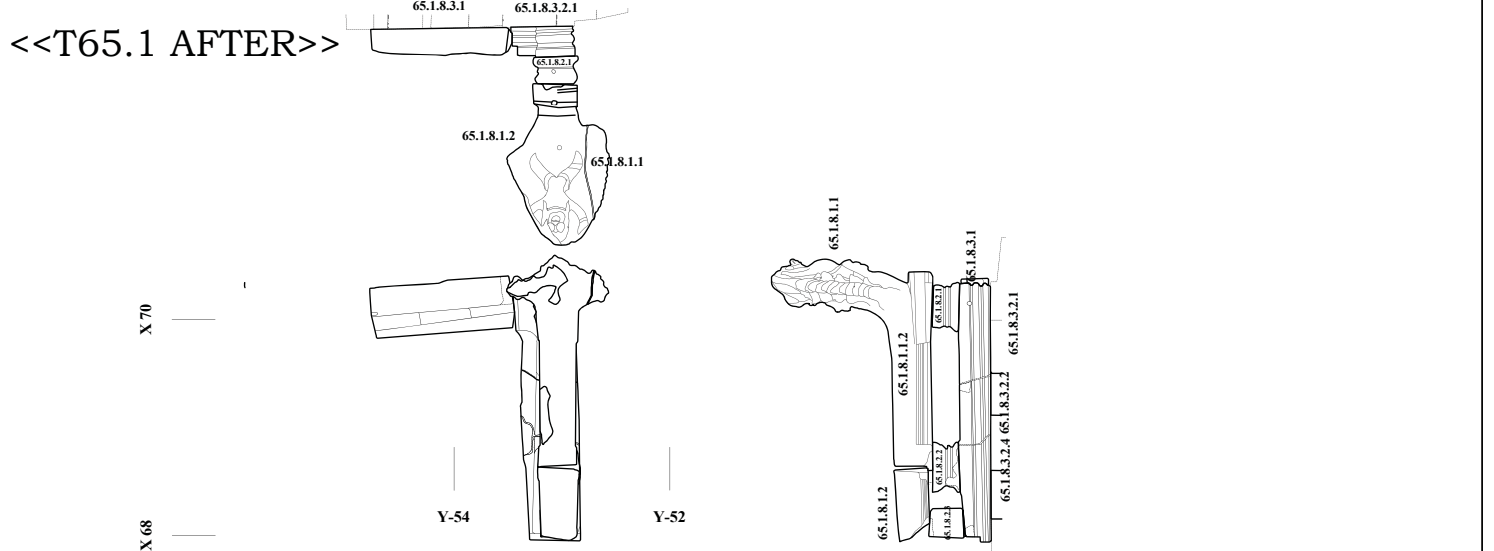
<<T65.1 BEFORE>>

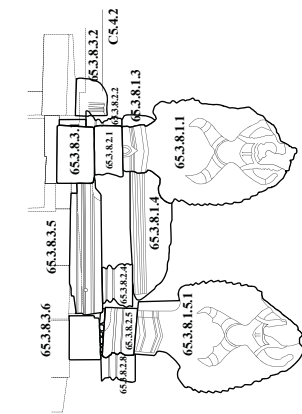


<<T65.4 AFTER>>

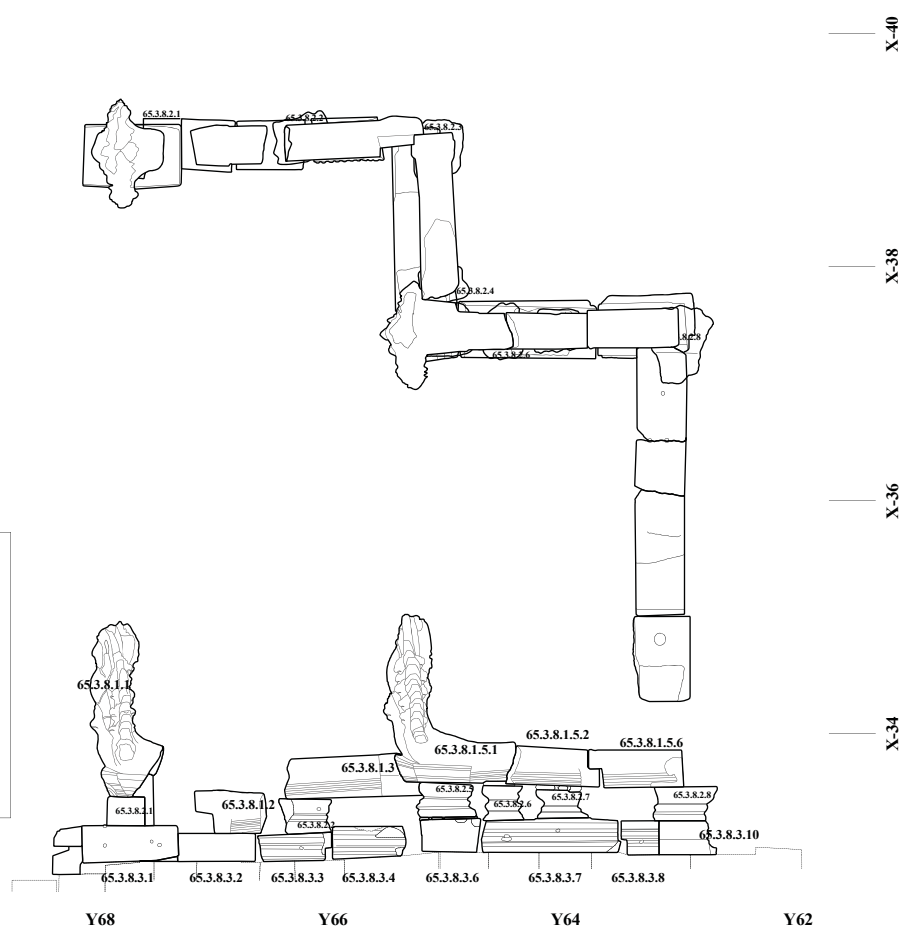
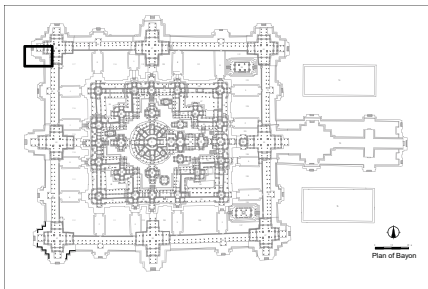


<<T65.1 AFTER>>





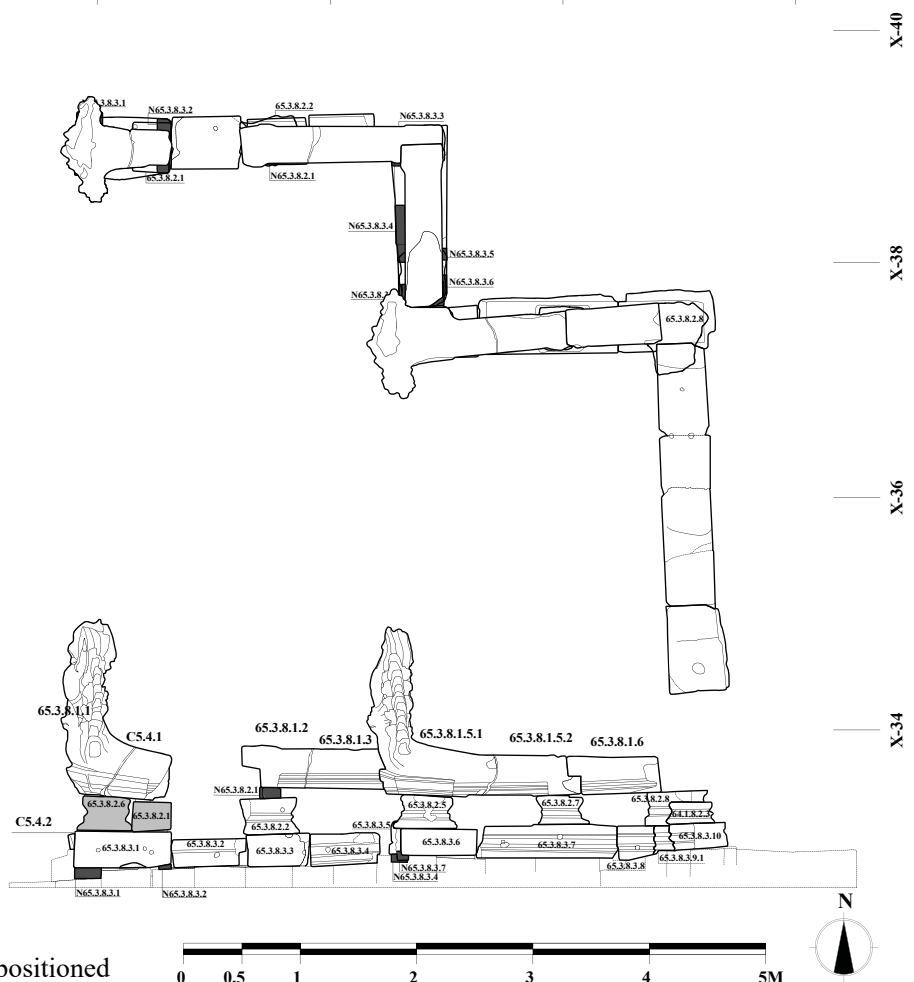
<<BEFORE>>

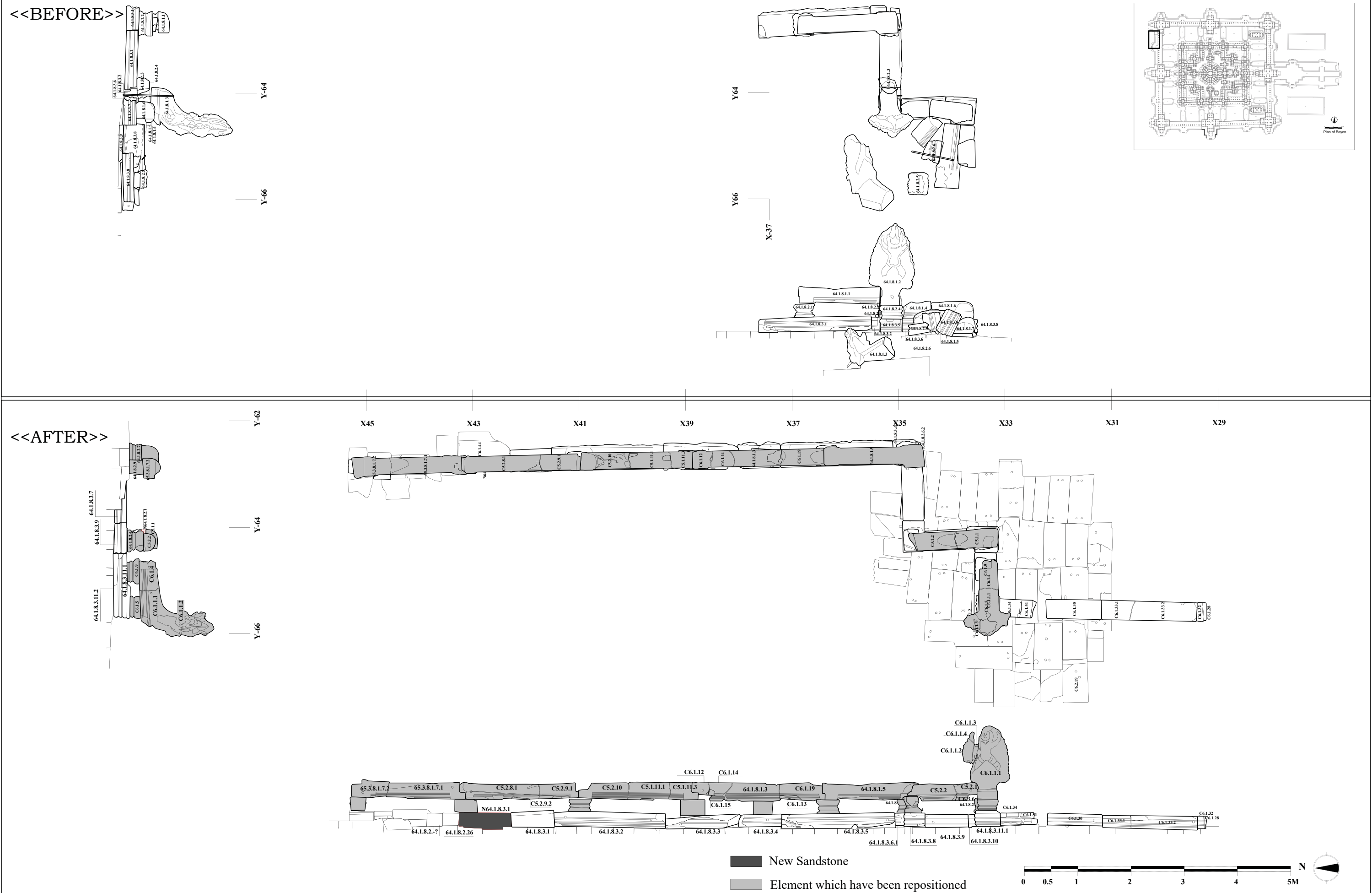


<<AFTER>>

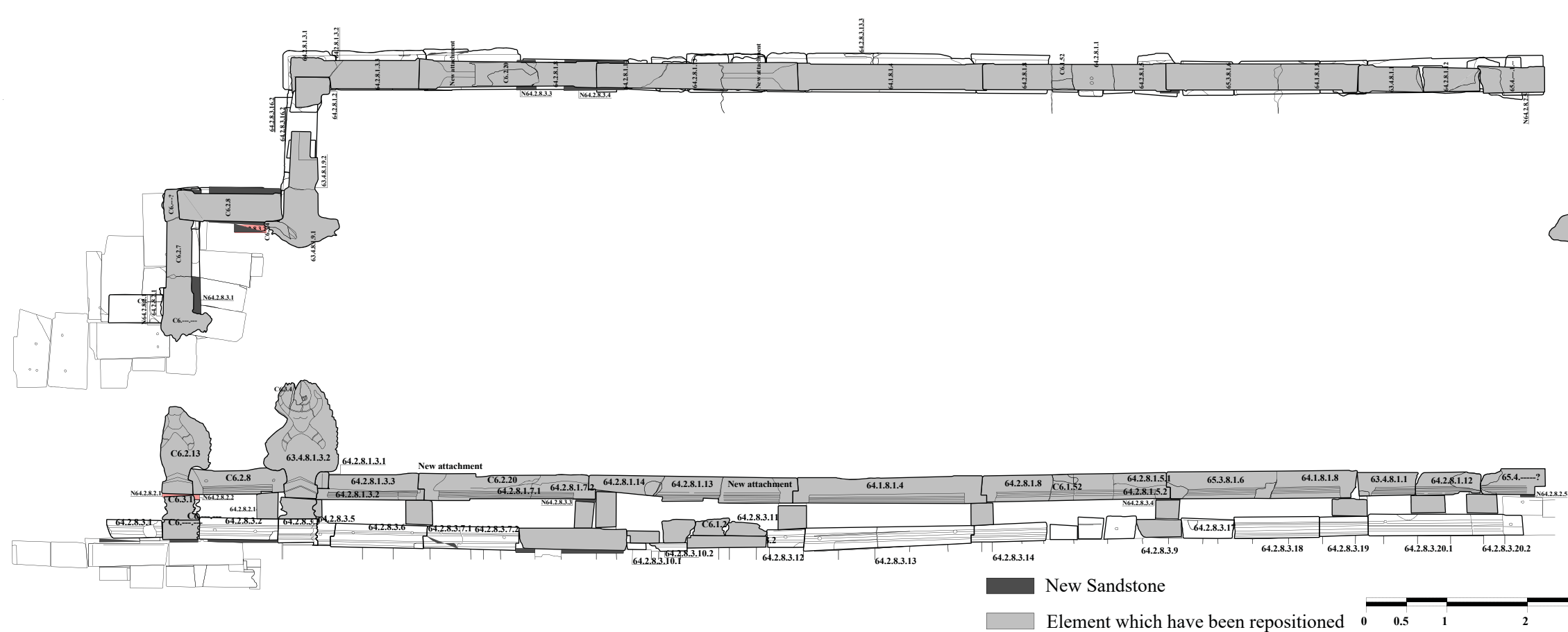
New Sandstone

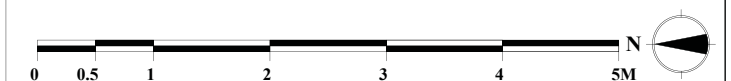
Element which have been repositioned

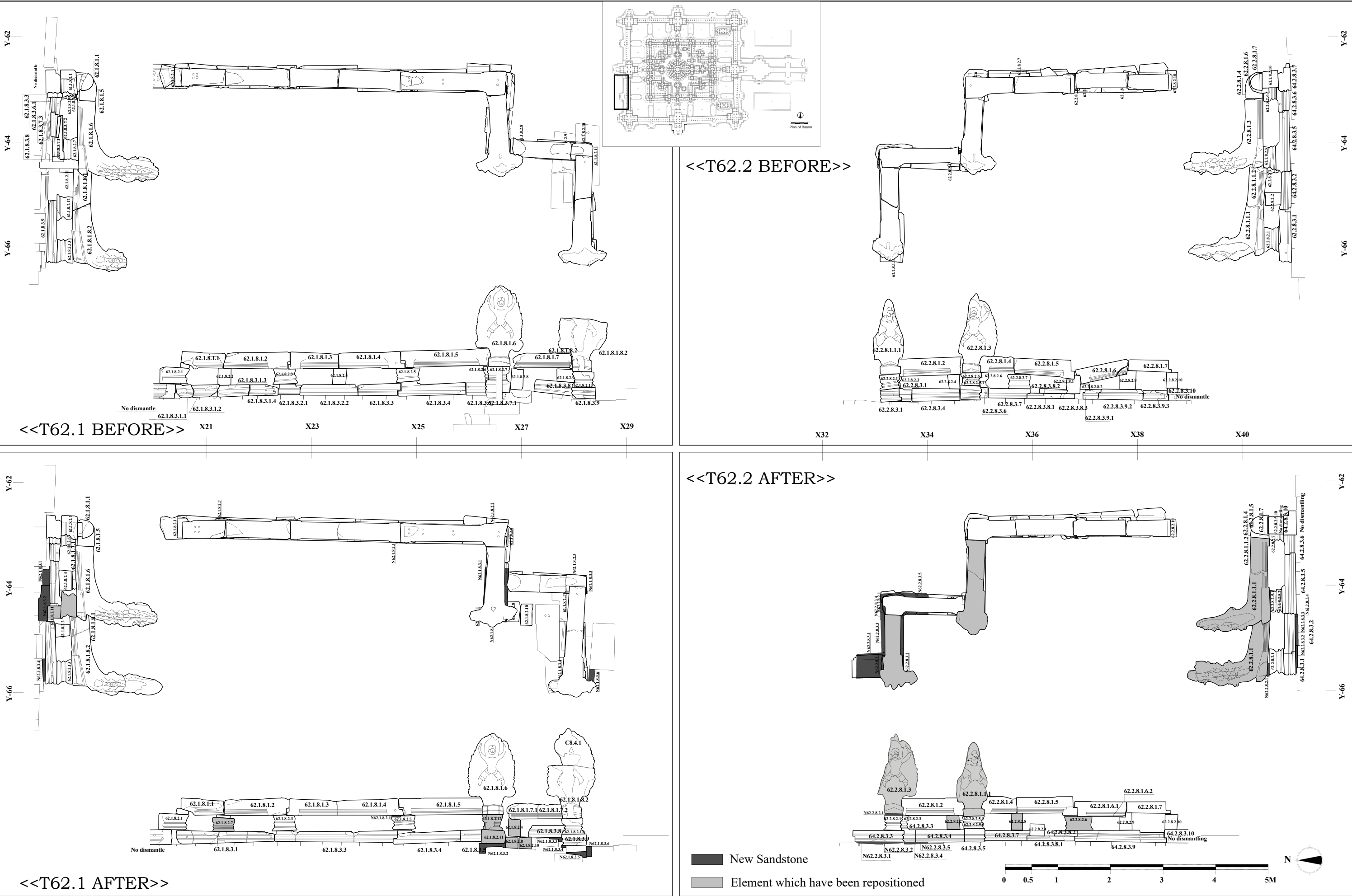




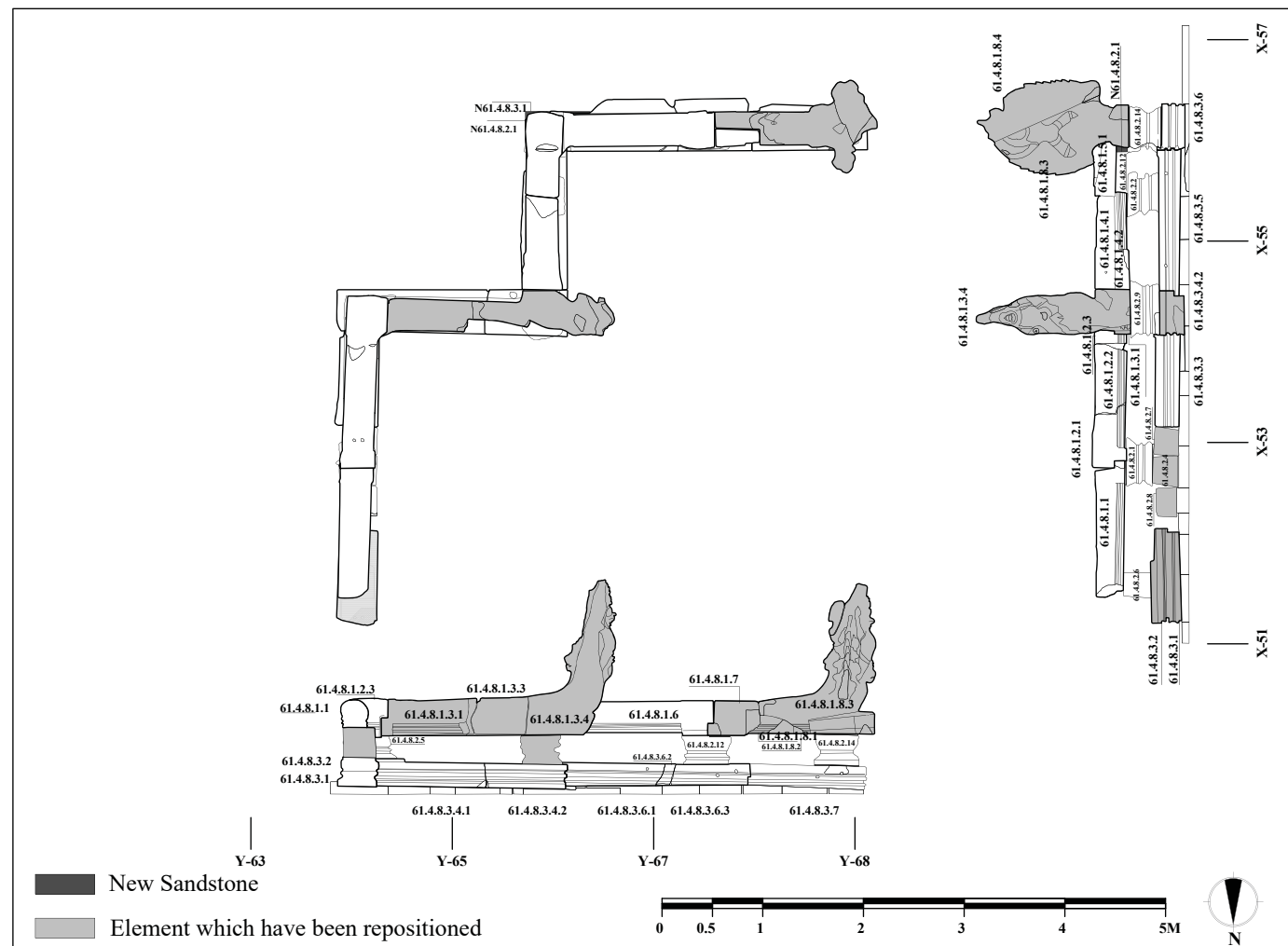
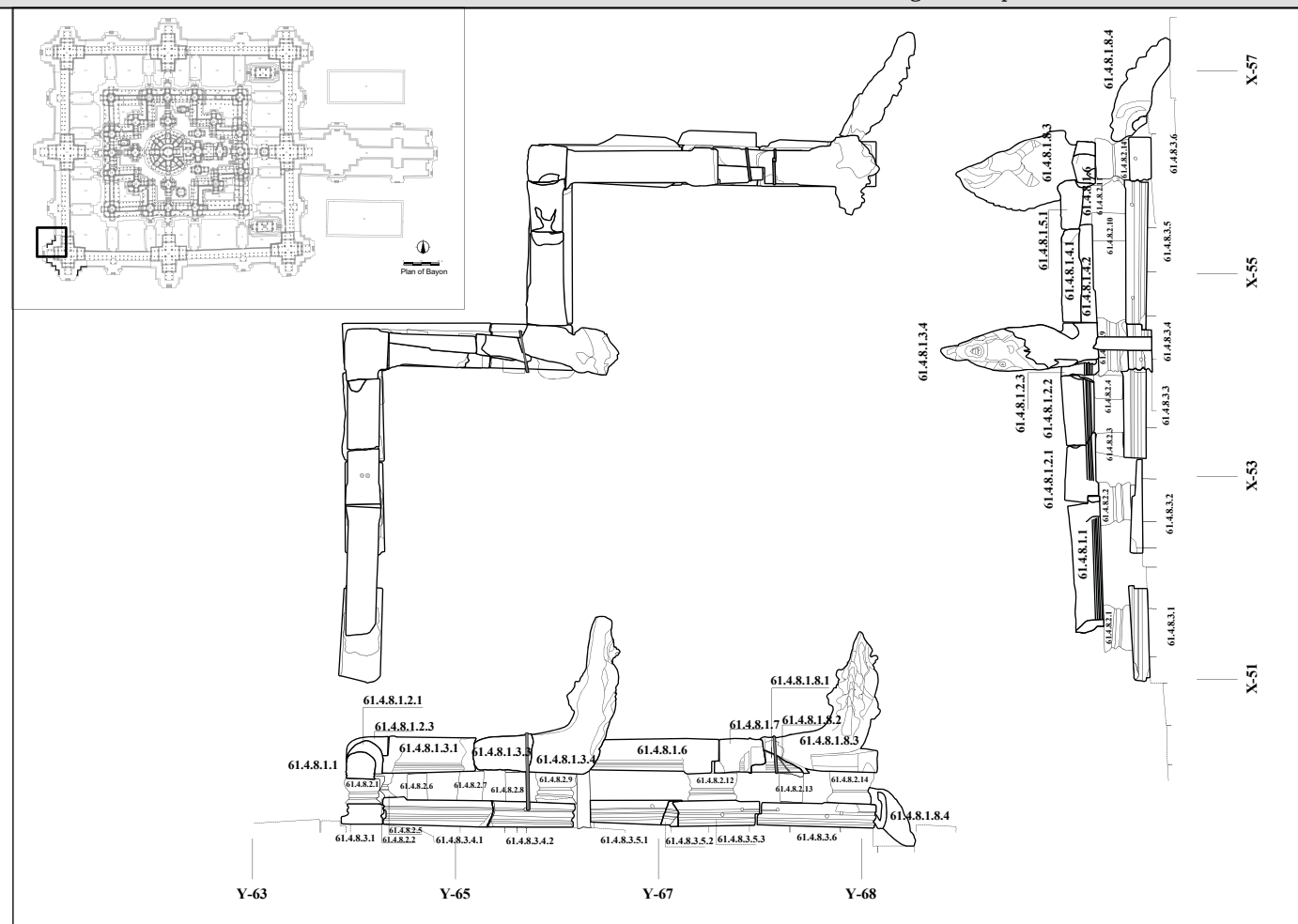
Restoration Project of Naga and Lion Statues and Balustrade at Outer Gallery and East Causeway of Bayon

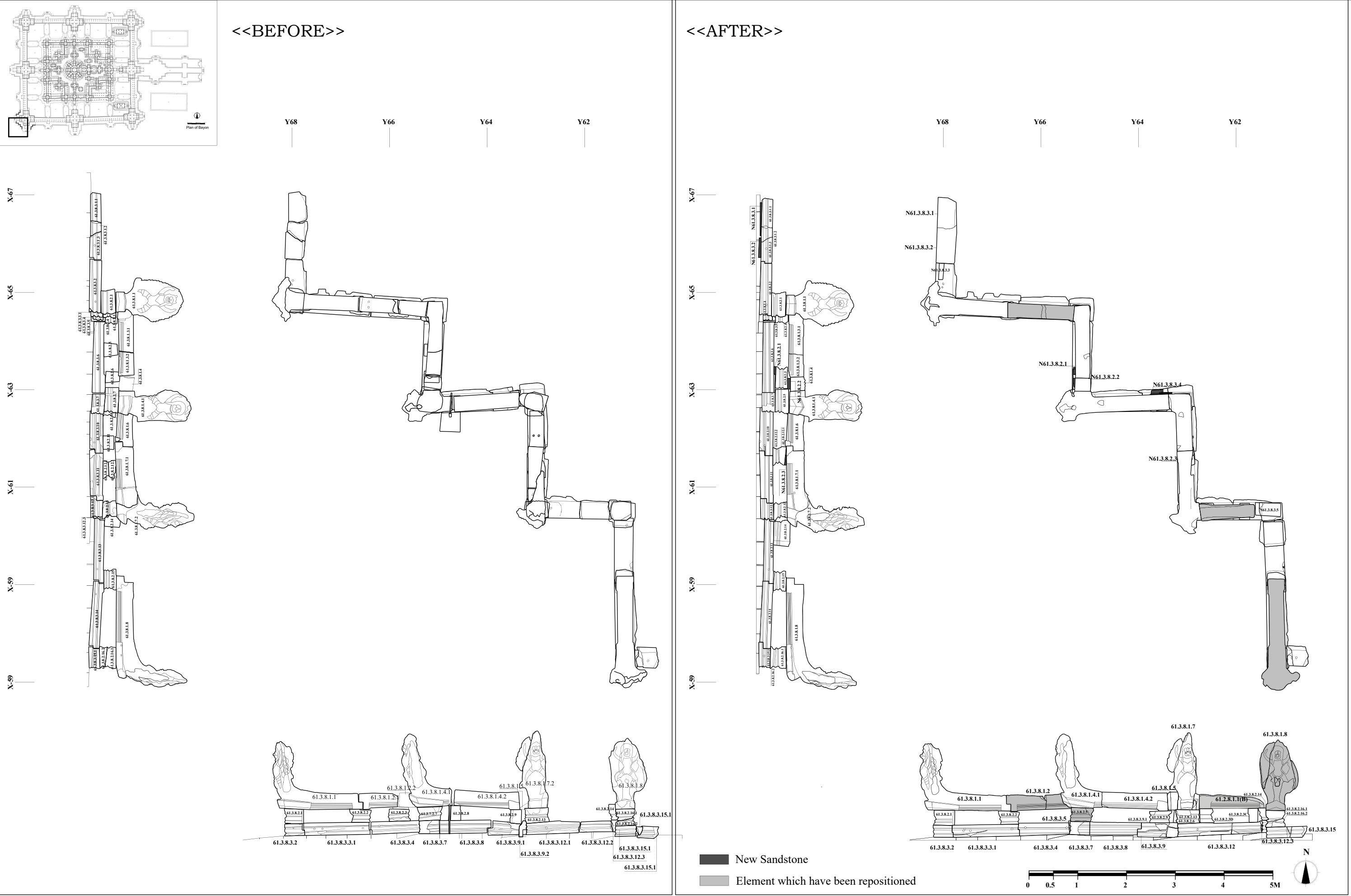




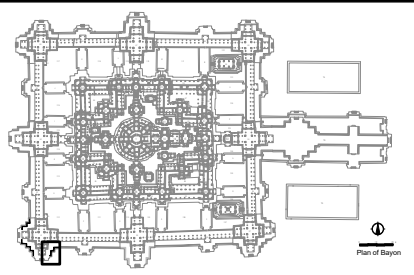


Restoration Project of Naga and Lion Statues and Balustrade at Outer Gallery and East Causeway of Bayon

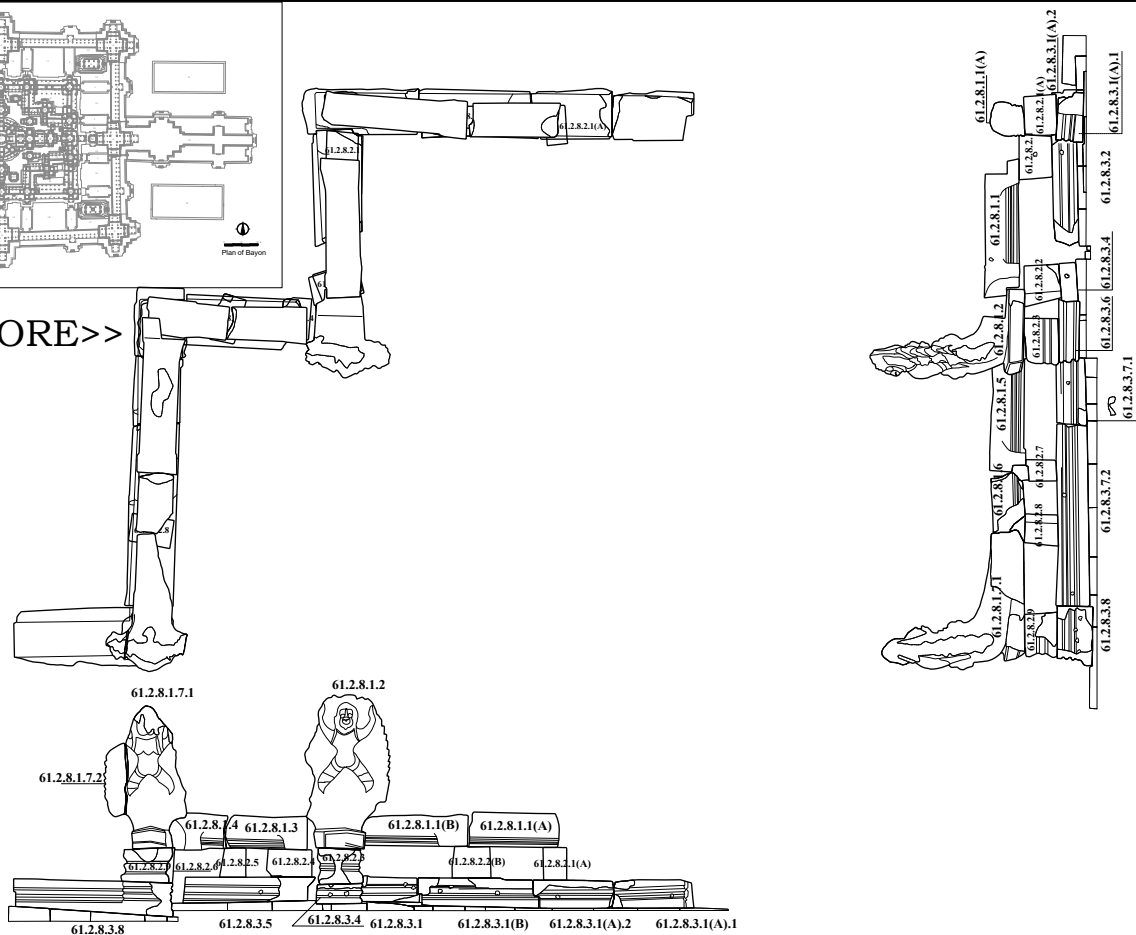




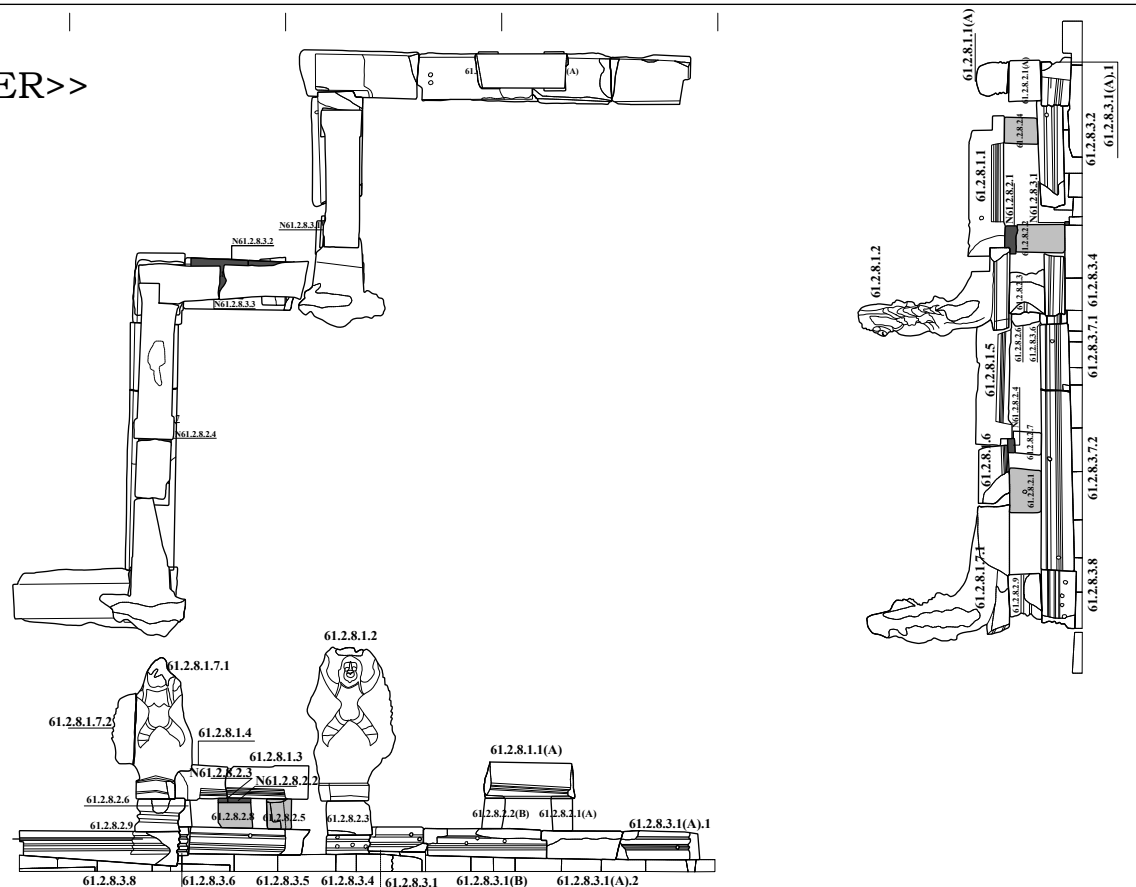
Restoration Project of Naga and Lion Statues and Balustrade at Outer Gallery and East Causeway of Bayon



<<BEFORE>>



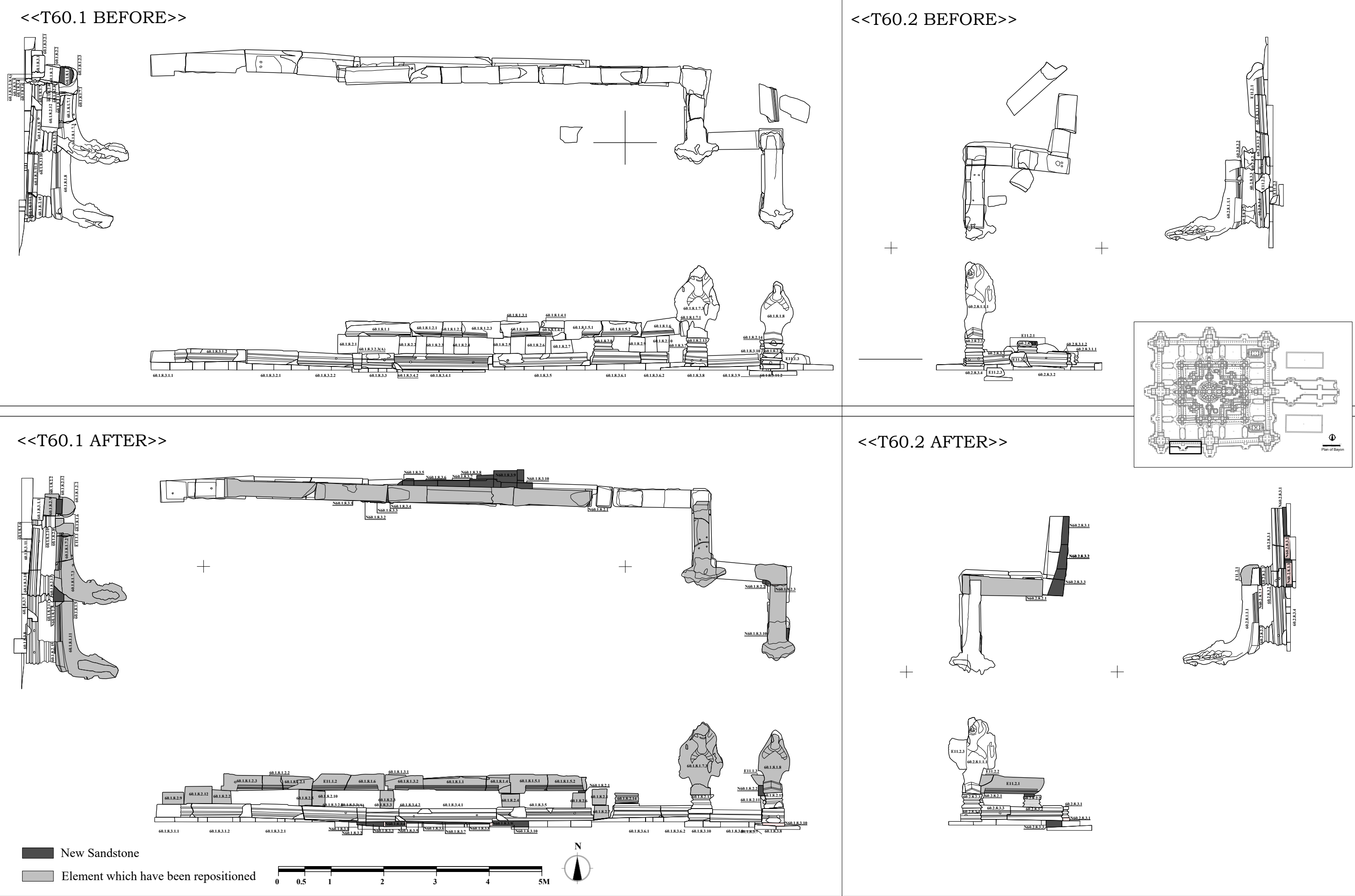
<<AFTER>>



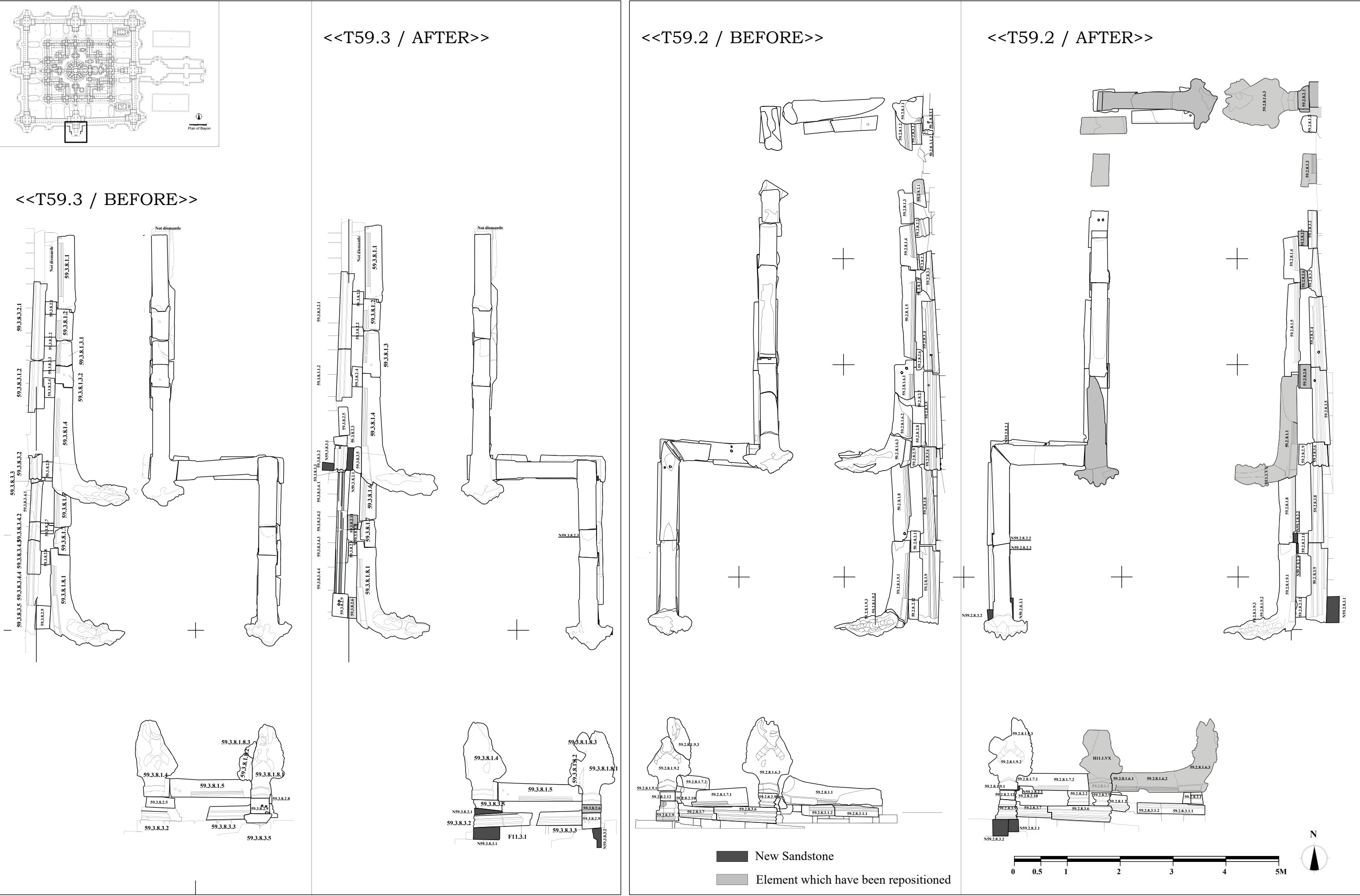
■ New Sandstone
■ Element which have been repositioned

0 0.5 1 2 3 4 5M

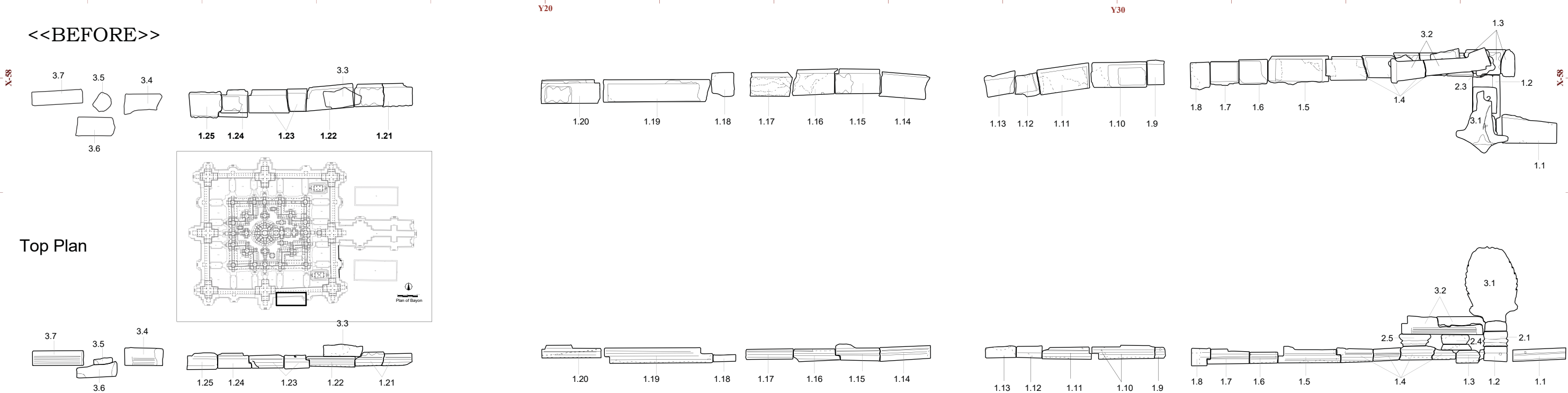




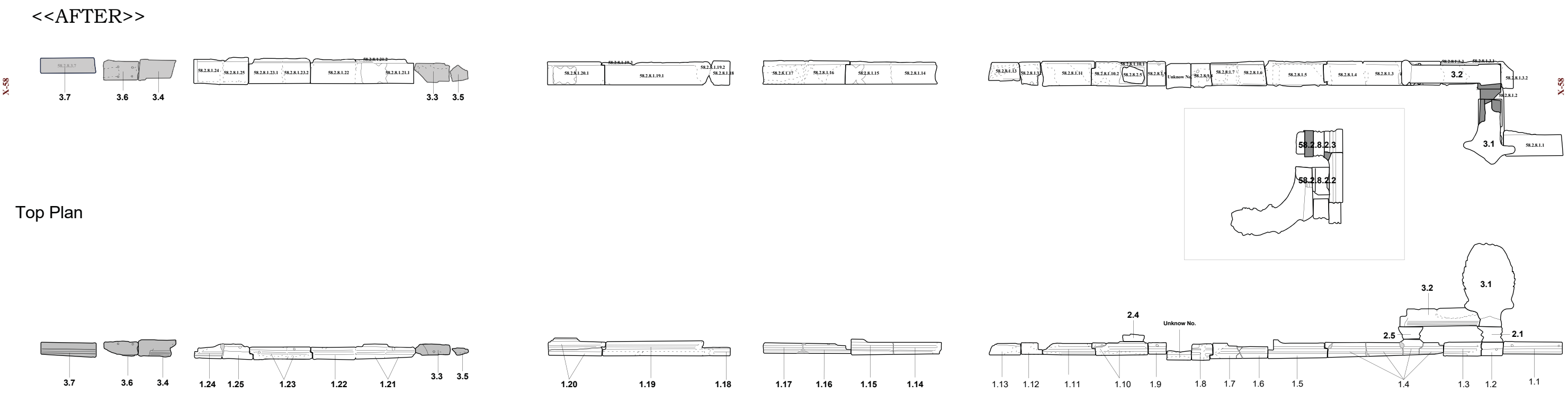
Restoration Project of Naga and Lion Statues and Balustrade at Outer Gallery and East Causeway of Bayon



Restoration Project of Naga and Lion Statues and Balustrade at Outer Gallery and East Causeway of Bayon



South Elevation [A]



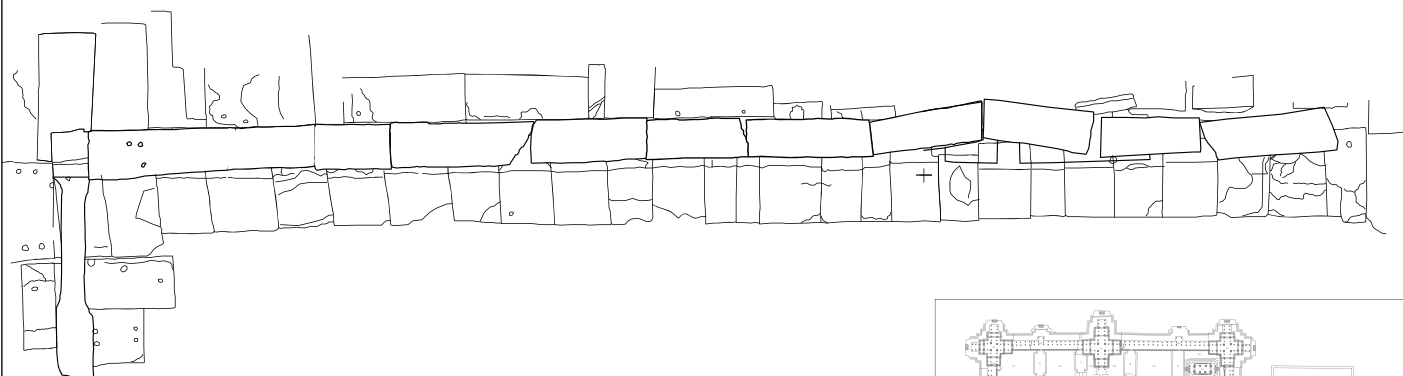
South Elevation [A]

Numbering without [*] follows after [58.2.8.]

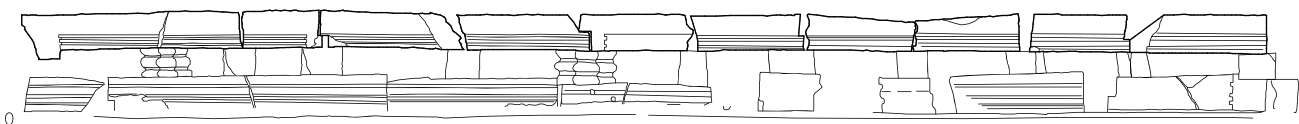
New Sandstone
Element which have been repositioned



<<BEFORE>>

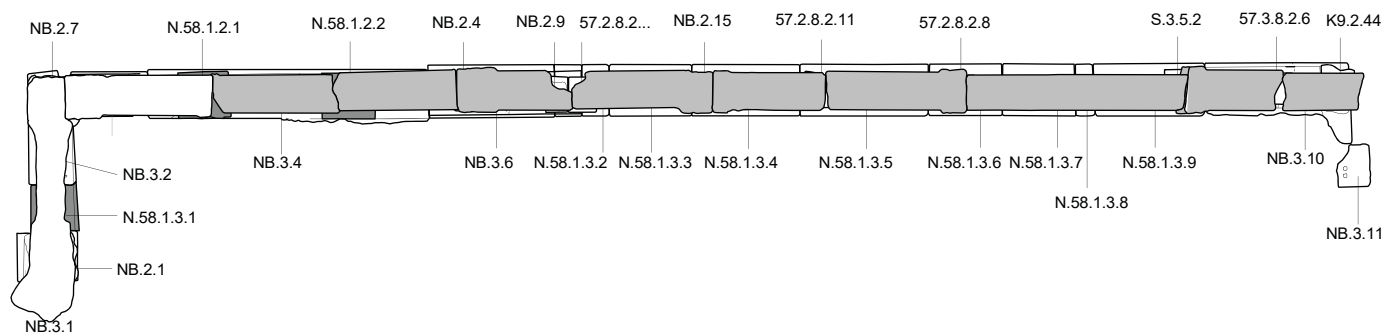


Top Plan

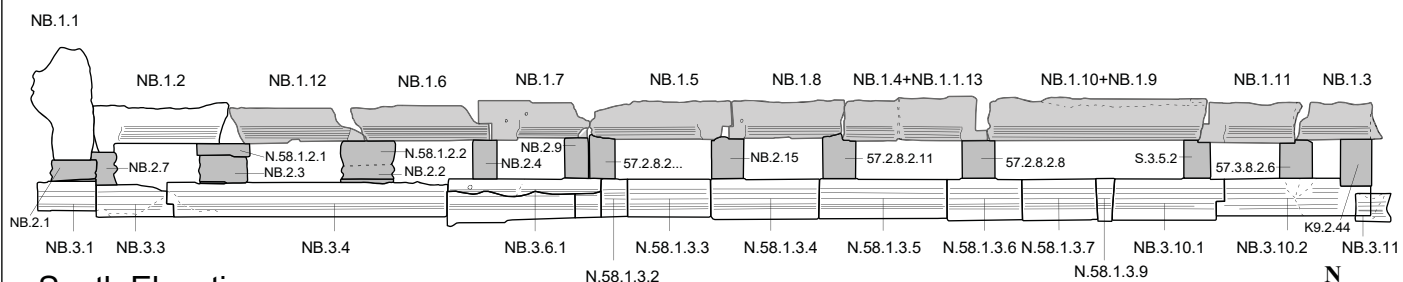


South Elevation

<<AFTER>>



Top Plan



South Elevation

New Sandstone
Element which have been repositioned



<<T57.3 BEFORE>>

Y60

X60

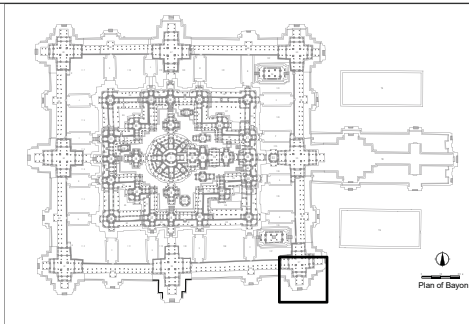
<<T57.3 AFTER>>

Y60

X60

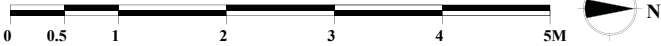
<<T57.2 BEFORE>>

Y70



<<T57.2 AFTER>>

New Sandstone
Element which have been repositioned

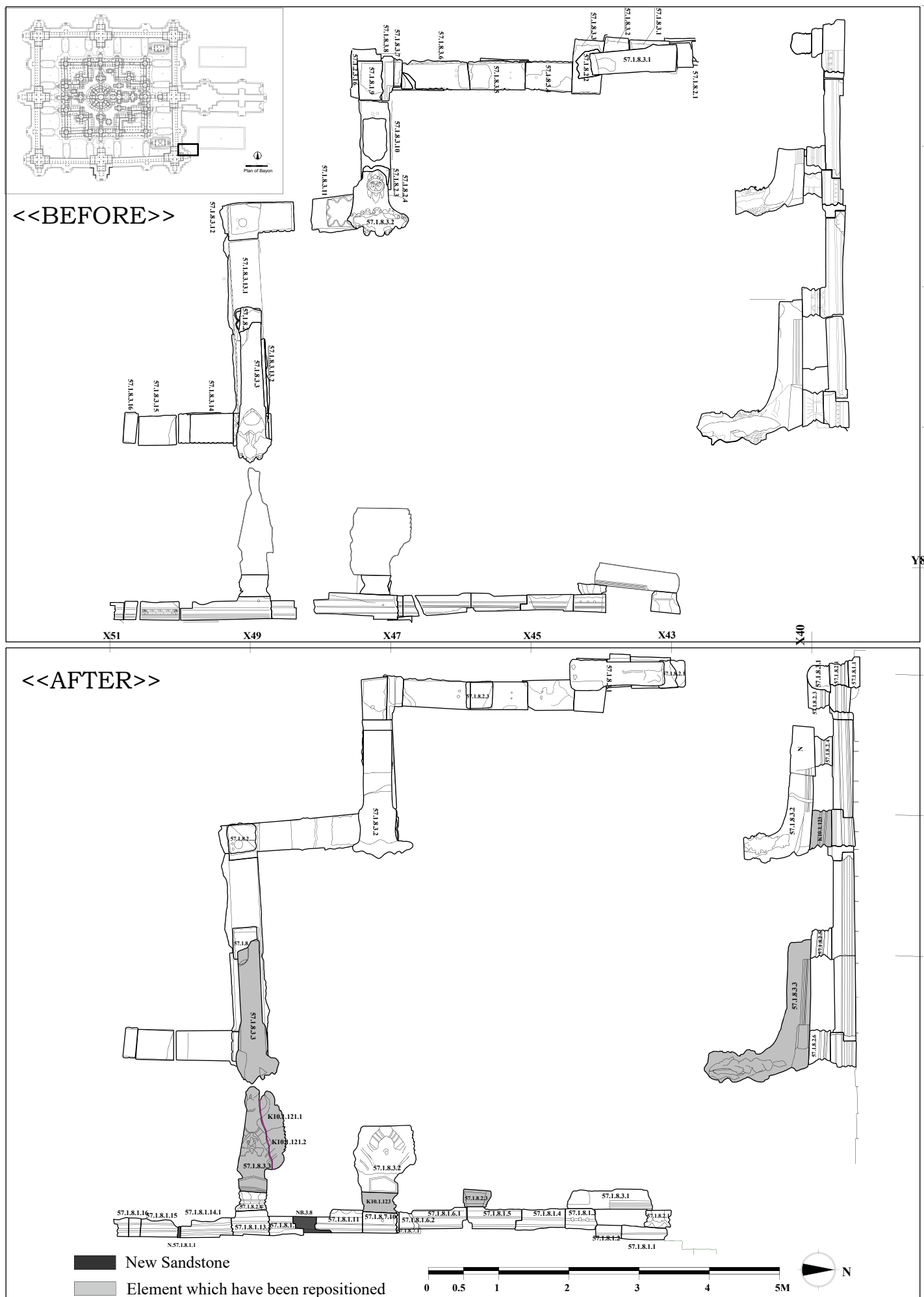


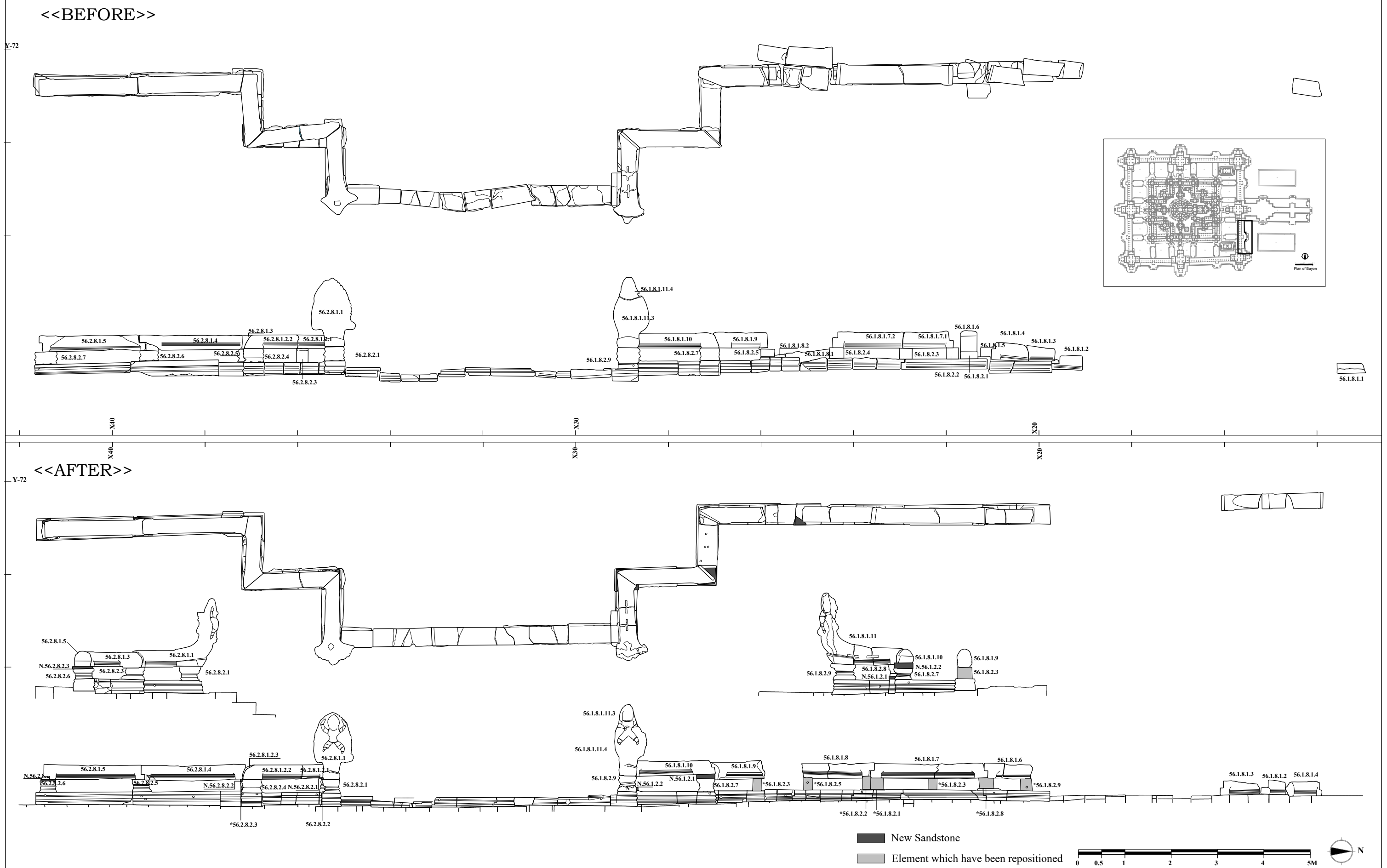
No Plan

Y80

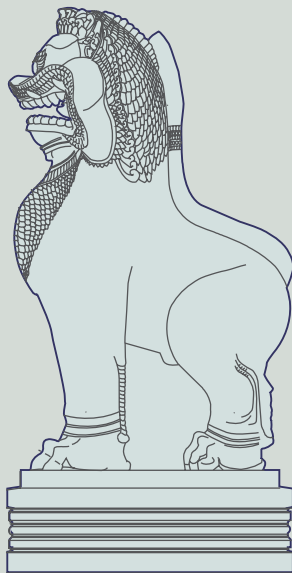
X60

X78 X-67 X-65 X-63 X-61 X-59 X-57





Restoration Project of Naga and Lion Statues and Balustrade at Outer Gallery and East Causeway of Bayon



NFUJ
JST
JASA

