

APPENDIX A

PROGRESS REPORT

1. Fundraising

UNESCO Emergency Assistance

World Heritage Center Director Alfeo Tonellotto confirmed by telephone yesterday that UNESCO has approved a grant \$US 20,000 to the Patukva project. This money which comes from a fund for emergency assistance to structure in World heritage Sites grew out of discussions during the recent UNESCO mission. The money will be granted directly to the Trust per our request to HMG Ministry of Education. Together with the \$5,000 contribution of the Patukva Guthi, this brings total project funding to a respectable 75% mark.

1994 Fundraising drive-K.V.P.T.

Meanwhile, Board member Mary Slusser (author of *Nepal Mandala*) has secured the voluntary services of a professional fundraiser, a woman who raised millions of dollars for the National Building Museum in Washington D.C. I will brief this woman in the next few weeks during a short reporting trip to Boston.

Other applications in process

Under the guidance of Dr. Sekler, the Trust has submitted the following applications for funding (the 1994 round):

Skaggs Foundation

Warhol Foundation

American Himalayan Foundation

selected individual donors.

Preparations are underway to apply in the coming months to the National Science Foundation for support of seismic reinforcement research, a key component of the Patukva project (see appended report). An application process to register with US AID in Washington, a pre-condition for applying in Kathmandu, is underway.

2. Training

Architectural apprentice

We believe we've found another training candidate as potentially talented as Trust architect Rohit Ranjitkar. Our search for suitable candidates is, of course, always ongoing. Recently, we found a clever recent masters level graduate in architecture, keen to work in conservation. Binay Shrestha, aged 28 of Patan, joins the project this month as part-time trainee. He received his degree from the Belyorussian Polytechnical Institute.

On-the-job documentation

We continue our model efforts at documentation with drawings prepared by Rohit Ranjitkar, Prayag Joshi, and draftsman Sushil Rajbhandari. For documentation, the KVPT team has demonstrated its ability to handle any challenge, see attached sample drawings.

Department of Archaeology

Last spring, our documentation of the Uma Maheswar and Radha Krishna projects, in particular, the historic structures reports were widely distributed to and discussed with members of the Department of Archaeology. As the first conservation projects to prepare such detailed documentation and discussion of conservation issues, these documents are models for future local and international efforts.

KVPT Computer Literacy

Key project team members Rohit Ranjitkar and Raju Roka have studied intensively word processing and accounting software over summer 1993. Together they prepared the first draft of the Patukva Agam Historic Structure report and project financial statement on the computer.

3. Protective covenants-legal agreements to protect a preserved Patukva Agam

After a challenging year of research and negotiations with various lawyers, an agreement has been designed and approved by the various parties. It is expected to be signed this week.

Simultaneous work by the Department of Archaeology with Patan Programme on the extension of the Patan Monument Zone has been successful; the application to gazette an extended zone (including both sides of the street and of course Patukva Agache) is now in process, based on the completion of detailed mapping of the refined boundary and affected properties. The most conservative estimate for how long this will take is one year.

Thus, and most critically, the Patukva structure will be inside the monument zone before restoration is completed. The provisions for control by the Department in a Monument Zone are quite considerable (even if until now they have been under-exercised for various reasons).

Upon signing, another \$5,000 will be contributed to project construction material expenses by the Guthi. This represents the largest donation by a local group to an internationally coordinated conservation project.

4. Construction/construction schedule

Provision of critical materials

Certain custom-made and/or imported materials have been ordered over the last months to assure smooth running of the job. These include: traditional common brick (*maapa*) for interior wall construction; imported stainless steel hardware fittings, specialty terracotta cornice bricks for the principal facade. At present we are securing all of the timber for the project.

Temporary roof to speed up works

Related preparation works have positioned the project to work at maximum efficiency as it takes up the actual construction work this month. Because of delays in start-up, we have decided to provide a temporary roof over the lower three floors. This will allow work which was scheduled to be finished this June to run continuously through the summer. In effect, we intend to catch up to our former proposed schedule by this fall.

Insulation of electrical lines

Critical insulation of electrical lines in front of the building took place this week, allowing construction workers free access to the facade and roof.

Budget

The construction budget submitted summer 1993 is still effective; revisions will be made after construction work has been taken up.

PATUKVA AGACHIE

REVISED PHASE 1 CONSTRUCTION COMPONENTS AND SEQUENCE FEBRUARY, 1994.

S.N	Description of Works 1993	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
0.	Dismantling									
1.	Negotiate legal agreement.									
2.	Signboard.									
3.	Insulation of electric wires.									
4.	Insert damp proof course									
5.	Repair of masonry walls upto level 3.									
6.	Insert seismic reinforcements in masonry structure.									
7.	Timber order/scouting dev't of preservative.									
8.	General timber consolidation incl. beams, joists, gallery, wallplates.									
9.	Scaffolding for lower roof repair.									
10.	Lower roof repair (rafter, wallplates).									
11.	Temporary zinc sheet on lower roof rafters to protect from monsoon rain.									
12.	Timber framework developed as seismic reinforcement.									
13.	Provide new toilet + stair.									
14.	Repair of front facade (replace broken bricks, repair cornices, lintels etc.).									
15.	New plinth + stone pavement on edge of plinth.									
16.	Electrical wiring.									
17.	Install timber floor planking.									

This page from summer 1994 correspondence to Department of Archaeology and British Ambassador, for comparison. Please note that by fall, 1994, we plan to be back on original schedule.

KATHMANDU VALLEY PRESERVATION TRUST
24 QUINCY STREET CAMBRIDGE, MA 02138
TELEFAX (617) 495-8197

Patukva Agam Restoration Project

Implementation schedule

July 20, 1993

Spring-summer 1993

- *Legal negotiations to secure "Deed of responsibility under Ancient Monuments Act".
- *Documentation, preparation of historic structures report esp. design of structural consolidation and seismic improvements.
- *Design and implementation of fund-raising campaign
- *Emergency shoring up of lower structure to prevent further damage. Site clearance.
- *Small repairs and emergency cover to upper pagoda to prevent further damage.
- *Relocation of electrical lines to allow work to proceed.

October 1993

Submission of historic structures report for review .

November 1993-June 94 -

Construction Phase I

Structural consolidation and seismic improvements to lower three storeys up to 3rd floor rafters with temporary roof cover. Interior arrangements of lower three stories.

October 1994-June 1995

Construction Phase I

Restoration of pagoda superstructure. Principal facade restoration including repairs of openings.

June 1995

Completion of project. Preparation of project report.

7. Deed of Responsibility, the Ancient Monuments Act, and the protection of monuments in Nepal

Nb. this section is omitted from a report submitted in parallel to the Department

Patukva Agam Chronology

February 28, 1994

In the past two years, a general strategy has been identified by the author together with Patan Programme to take advantage of an existing provision in the Ancient Monuments Act to protect monuments under private ownership. This provision, called in its English translation a "deed of responsibility", defines a legal relationship between the owners of a building of artistic, historical or archaeological importance and the Department of Archaeology. Although enforcement procedures are not made explicit by the Act, a general proviso for the Department to intercede to protect any structure of great importance also exists.

Spring 1993

Legal consultant Divarkar Pant in spring 1993 supported an hypothesis that the Act in general--although imperfect--was strong enough that energies should focus rather on clarification of enforcement procedures than on revisions to the law. A critical quirk in the existing Act is a focus on monument *areas* rather than on the monuments themselves. In sum, one can only protect something that is inside a *zone*--the law says nothing in particular about the historical fabric itself. Nevertheless, like the Nepalese building bylaws for new construction, one can say that if existing law had been enforced even fifty percent of the time, then much of the recent destruction of the Valley could have been avoided.

Thus, Pant, a senior legal advisor in the Law and Justice Ministry, developed several drafts of the Deed of Responsibility in spring 1993. He had been recommended by the present Director General of Archaeology. Additionally, a brief on how enforcement procedures and mechanisms could be clarified and strengthened to assist the Department of Archaeology was requested of Pant.

Pant's draft submission in May 1993 of the deed of responsibility and the brief were rejected on the grounds that they tended to cloud rather than clear up the critical issues of enforcement. During discussion of these drafts, the destruction of a resthouse at the east end of Patan, the Tyagah *capah*, took place and formed a basis for discussion of the Department's ability and will to enforce the law. The Tyagah *capah*, a nineteenth century structure standing outside of the protected monument zone, incorporated some of the finest carved timber roof truts in the country dating to the 13th century. Given the location outside a monument zone, the building provided a litmus test about how far the Department would go to enforce its non-specific mandate to protect artistic heritage of national importance.

Unfortunately, this was not very far. The Director General did not show up at a meeting arranged by the author (with the Director General's consent and after having been briefed about the importance of the structure) to discuss what to do about the dismantled Tyagah *capah* with the Patan Town Controller and Chief District Officer. A general tendency to avoid short term confrontation at any cost characterized the Department's actions. (The legal advisor even conceded that the non-committal quality of his recommendations had been expressly *requested* by the Director General.)

One month later, the Nepalese government received a formal warning from the World Heritage Commission regarding the lost Tyagah structure (which the Commission mistakenly construed to be within the World Heritage Site); six months later a visiting UNESCO mission focused its criticism of the Department on its lack of initiative in the Tyagah case.

Nevertheless, trusting that the earlier draft of the deed of responsibility was effective for the protection of individual buildings, Nepali translations and refinements of the English text were completed. By this time, such agreements were under discussion for three monuments in Patan: Patukva Agam, Vabaha, and the northern wing of Patan Darbar, the latter two projects under the auspices of the German-financed Patan Programme. When at the end another lawyer, Mr. P. M. Sakya, was consulted to make a final check of these drafts, new problems and opportunities were identified.

Fall 93

The gist of Sakya's review was that

(1) the term deed of responsibility would not apply to Patukva as it is technically outside the Protected Monument Zone and thus cannot be called a monument.

(2) The most effective document for the time being would be an agreement between the Department and the Guthi holding the Guthi financially liable for the cost of the restoration if their negligence or actions affected the preserved state of the monument. This agreement takes its power not from the Ancient Monuments Act, but rather from the general contract law of Nepal.

(3) Furthermore, Mr. Sakya includes in the agreement a dispute resolution process which depends on Nepali common law and precludes lengthy and unproductive litigation.

(4) Lastly, as the Department of Archaeology is in the process of applying to gazette an extended monument zone in Patan, it is certain that the Patukva Agam will within one year be protected by the existing provisions of the Ancient Monuments Act for Monument Zones. In particular, this empowers the Department of Archaeology to control any modifications to buildings or construction.

(5) Meanwhile the Department of Archaeology, in response to criticism from UNESCO is redefining their monument law to include a category of National Monuments which can be inside or outside of protected monument areas.

Winter 1994

A key strategic point of both Pant's and Sakya's drafts for contractual agreements had been to name the Department of Archaeology as the exclusive contracting party, i.e. with a sub-clause that the Department could use an agent (such as the KVPT) to execute its responsibilities. This was seen as a way of strengthening the Department's image as coordinator of executing agencies.

Nevertheless, the present Director General rejected the draft agreement recently, maintaining that the Department might be held liable by the Guthi if the KVPT did not complete the project. Although, it was explained that the agreement between HMG and the Trust (constituted by HMG's 1992 approval of the project proposal) would preclude such an event, the agreement was rewritten to include the Trust as one of the contracting parties.

PATKO AGANCHHEN RESTORATION AGREEMENT

This PATKO AGANCHHEN RESTORATION AGREEMENT made in Patan, Lalitpur, Nepal, as of Baisak 2051 (.5 day of May 1994)

BETWEEN

- (1) DEPARTMENT OF ARCHEOLOGY/HMG, its office located in Maitighar, Kathmandu (hereinafter called DOA)
- (2) KATHMANDU VALLEY PRESERVATION TRUST, a charitable organisation working in Nepal with the approval of HMG (Hereinafter referred to as the Trust)
- (3) PATKO AGANCHHEN GUTHI, located in Patko, Patan, Lalitpur (Hereinafter referred to as the Guthi).

RECITALS

WHEREAS, the Guthi is aware of the fact that the Aganchhen, located in Patko, Patan is a unique cultural heritage of Nepal and has its own historical significance;

WHEREAS, the Guthi is interested in restoration of the Aganchhen with the financial and technical support of the Trust; and

WHEREAS, the Trust is desirous to provide the financial and technical support to the Guthi for the restoration of the Aganchhen:

NOW, THEREFORE, in view of these premises and in consideration of the mutual covenants and subject to proviso hereinafter set forth, DOA, the Guthi and the Trust agree to the following:

ARTICLE I

MUTUAL COVENANT

1. In pursuance of this agreement the Trust undertakes to restore the Aganchhen located in Patko, Patan (proposed by Department of Archeology/HMG to be included in protected monument zone in near future) according to the plans and specifications annexed hereto and the Guthi also undertakes to assist, cooperate and extend all possible means of support in the restoration work of the Aganchhen as agreed upon by the parties. DOA on its part agrees to provide liaison assistance to help the trust to realize and implement the project and continue fundraising. The parties, further, mutually agree to abide by their respective rights and responsibilities enumerated below.

ARTICLE II

RIGHTS AND RESPONSIBILITIES OF THE TRUST

1. The Trust shall execute the programme as agreed above for restoration of the Aganchhen and bear all cost of restoration including cost of construction materials, labours and other directly related incidental expenses, except the financial contribution to be made by the Guthi under section 3 of Article III.
2. The Trust shall present the cost estimate and estimated time frame for the restoration of the Aganchhen before the actual start of the restoration work. The Trust shall notify the Steering Committee and DOA at least one month in advance if it feels that the restoration work cannot be completed without major adjustment in cost estimate and time frame for the completion of the work. The Trust shall inform DOA if it has to make minor adjustments in the cost estimates and construction design. The Trust in any case shall bear all additional expenses, if there is any, under the revised cost estimate.
3. The Trust shall not change the original art, architecture and status of the Aganchhen while carrying out restoration work. DOA shall not do any thing with the Aganchhen which will violate the requirement of Ancient Monument Protection Act 2013 B.S or the rules and regulations made there under. Provided that this clause shall not be construed to restrict the Trust from introducing conservation measures as necessary with the approval of the Department of Archeology.
4. The Trust shall hand over the Aganchhen to the Guthi within the shortest possible time after the restoration work is completed on turn key basis.
5. The Trust shall provide, as long as it is actively working in Kathmandu Valley, technical assistance to the Guthi for the repair and restoration of the Aganchhen in compliance with the requirements of Ancient Monuments Act 2013 and the rules and regulations made there under.
6. The Trust shall have the right to execute its responsibility under the agreement on its own or through its agents including contractors.
7. The Trust shall submit the statement of income and expenditure related to the Patko Aganchhen restoration project) audited by registered auditor within six months after the lapse of the fiscal year to DOA.

ARTICLE III

RIGHTS AND RESPONSIBILITIES OF THE GUTHI

1. The Guthi shall make the Aganchhen and the adjacent courtyard available and accessible to the Trust, its agents and contractors for all kinds of activities related to restoration work on the request being made by the latter to that effect. The Guthi shall also provide other incidental facilities required for restoration purpose.

2. The Guthi shall provide appropriate and adequate space to the Trust for storing construction materials during restoration period. It shall also make necessary arrangement for their safety and protection.

3. The Guthi shall make all the necessary arrangement for the smooth operation of the restoration work and avoid unnecessary disturbances thereof. The Guthi shall make an upfront contribution of Rs.250,000/- as a token of support to the restoration work carried out by the Trust. The amount so contributed shall be kept in a separate account in the Bank and (the amount and interest there of) shall only be used for buying construction materials required for restoration of the Aganchhen.

4. The Guthi shall allow Department of Archeology, Lalitpur municipality, Kathmandu Valley Preservation Trust and their official guests and bonafide scholars to inspect the Aganchhen after its restoration and thereafter as and when it deems necessary. Provided that the inspections shall be subject to ritual restrictions applicable to outsiders.

5. It shall be the duty of the Guthi to look after day to day maintenance of the Aganchhen and carry out necessary minor repairs without changing the art, architecture and state of preservation of the Aganchhen. The Guthi shall not do any thing with the Aganchhen which will violate the requirement of Ancient Monument Protection Act 2013 B.S or the rules and regulations made there under. The Guthi shall not sell, lease or change the status of the Aganchhen. It shall be the obligation of the Guthi to protect, preserve, and conserve the Aganchhen as a cultural heritage.

Provided that the Guthi shall have the right to lease or use the ground floor only for commercial purpose. The income earned by way of rent or otherwise shall be exclusively used for the future maintainance of the Aganchhen. The use of ground floor for commercial purpose shall not in any case adversely affect the safety or status of the Aganchhen.

ARTICLE IV

RIGHTS AND RESPONSIBILITIES OF DOA

1. DOA shall have the right to monitor, evaluate and inspect the restoration activities work carried out by the Trust. It may give necessary directions to the Trust, including work stoppage order, to ensure the compliance of the Ancient Monuments Act 2013 B.S.

2. DOA shall have the right to review the technical details, procedures and progress of the restoration work.

ARTICLE V

PROVISO AND RESERVATION

This Patko Aganchhen Restoration Agreement shall not be construed or interpreted or used as an evidence to create the rights and duties of the parties other than the ones enumerated in this agreement, either against each other or against any person or institution not a party to this contract.

ARTICLE VI

DISPUTE RESOLUTION PROCESS

1. The parties hereby agree to resolve disputes and differences arising under this contract through negotiation between the Trust or its representative and Chairman, Management Board of the Guthi or his representative.
2. In the event such dispute is unable to be resolved between the parties pursuant to section 1 above, then such dispute shall be settled exclusively by arbitration.
3. Each arbitral tribunal shall consist of three arbitrators. Each disputing party shall appoint one arbitrator for each arbitration and the arbitrators appointed shall appoint the third arbitrator for such arbitration.

ARTICLE VII

EVENTS OF DEFAULT AND REMEDIES

1. Event of default shall occur if a party to the agreement fails to discharge the material obligation under the agreement and such failure shall continue uncured for sixty days after notice thereof by the aggrieved party.
2. If an event of default occurs and is continuing, the non-defaulting party may terminate this contract by giving written notice to that effect and shall have the right to recover all the losses suffered or expenses incurred so far for the restoration of the Aganchhen.

IN WITNESS WHEREOF, the parties hereto have agreed to sign this agreement.

.....
Mr/Ms. Khadgs Man Shrestha
For Department of Archeology,
His Majesty's Government of Nepal

.....
Mr/Mrs. Dr. Pradyumn
For Kathmandu Valley Preservation
Trust.

Witness:
1. Mr/Mrs. Bekha Ratna Sarker
2. Mr/Mrs.
3. Mr/Mrs.
4. Mr/Mrs.
5. Mr/Mrs.
6. Mr/Mrs.

.....
Mr/Ms. Kedar Prasad R. R. R.
For Patko Aganchhen Guthi

Witness: [Signature]
1. Mr/Mrs.
2. Mr/Mrs.

PATKO AGANCHHEN RESTORATION AGREEMENT

This PATKO AGANCHHEN RESTORATION AGREEMENT made in Patan, Lalitpur, Nepal, as of Fagun 2050 (....day of February 1995)

BETWEEN

- (1) DEPARTMENT OF ARCHEOLOGY/HMG, its office located in Maitighan, Kathmandu (hereinafter called DOA)
- (2) KATHMANDU VALLEY PRESERVATION TRUST, a charitable organisation working in Nepal with the approval of HMG (Hereinafter referred to as the Trust)
- (3) PATKO AGANCHHEN GUTHI, located in Patko, Patan, Lalitpur (Hereinafter referred to as the *Guthi*).

RECITALS

WHEREAS, the *Guthi* is aware of the fact that the *Aganchhen*, located in Patko, Patan is a unique cultural heritage of Nepal and has its own historical significance;

WHEREAS, the *Guthi* is interested in restoration of the *Aganchhen* with the financial and technical support of the Trust; and

WHEREAS, the Trust is desirous to provide the financial and technical support to the *Guthi* for the restoration of the *Aganchhen*:

NOW, THEREFORE, in view of these premises and in consideration of the mutual covenants and subject to proviso hereinafter set forth, DOA, the *Guthi* and the Trust agree to the following:

ARTICLE I
MUTUAL COVENANT

1. In pursuance of this agreement the Trust undertakes to restore the *Aganchhen* located in Patko, Patan (proposed by Department of Archeology/HMG to be included in protected monument zone in near future) according to the plans and specifications annexed hereto and the *Guthi* also undertakes to assist, cooperate and extend all possible means of support in the restoration work of the *Aganchhen* as agreed upon by the parties. DOA on its part agrees to provide liaison assistance to help the trust to realize and implement the project and continue fundraising. The parties, further, mutually agree to abide by their respective rights and responsibilities enumerated below. *

ARTICLE II
RIGHTS AND RESPONSIBILITIES OF THE TRUST

1. The Trust shall execute the programme as agreed above for restoration of the *Aganchhen* and bear all cost of restoration including cost of construction materials, labours and other

directly related incidental expenses, except the financial contribution to be made by the *Guthi* under section 3 of Article III.

2. The Trust shall present the cost estimate and estimated time frame for the restoration of the *Aganchhen* before the actual start of the restoration work. The Trust shall notify the *Guthi* ^{and Department} at least one month in advance if it feels that the restoration work cannot be completed without major adjustment in cost estimate and time frame for the completion of the work. However the Trust shall have the authority to make minor adjustments in the cost estimates and construction design without prior information to the *Guthi*. The Trust in any case shall bear all additional expenses, if there is any, under the revised cost estimate.

3. The Trust shall not change the original art, architecture and status of the *Aganchhen* while carrying out restoration work. Provided that this clause shall not be construed to restrict the Trust from introducing necessary structural consolidation to the *Aganchhen*.

4. The Trust shall hand over the *Aganchhen* to the *Guthi* within the shortest possible time after the restoration work is completed.

5. The Trust shall provide, as long as it is actively working in Kathmandu valley, technical assistance to the *Guthi* for the repair and restoration of the *Aganchhen* in compliance with the requirements of Ancient Monuments Act 2013 and the rules and regulations made thereunder.

6. The Trust shall have the right to execute its responsibility under the agreement on its own or through its agents including contractors.

7. The Trust shall execute restoration work of the *Aganchhen* in two phases. The activities and cost estimates in phase I and phase II shall be described in the plans and specifications of the restoration work to be annexed with this agreement. Provided that if incase The Trust, despite of its best effort, is unable to execute phase II of the restoration work due to financial constraint it shall inform the *Guthi* accordingly. In such case the Trust shall be discharged of its obligation for phase II restoration work without any financial liability.

ARTICLE III RIGHTS AND RESPONSIBILITIES OF THE *GUTHI*

1. The *Guthi* shall make the *Aganchhen* and the adjacent courtyard available and accessible to the Trust, its agents and contractors for all kinds of activities related to restoration work on the request being made by the latter to that effect. The *Guthi* shall also provide other incidental facilities required for restoration purpose.

2. The *Guthi* shall provide appropriate and adequate space to the Trust for storing construction materials during restoration period. It shall also make necessary arrangement for their safety and protection.

3. The *Guthi* shall make all the necessary arrangement for the smooth operation of the restoration work and avoid unnecessary disturbances thereof. The *Guthi* shall make an upfront contribution of Rs.250,000/- as a token of support to the restoration work carried out by the Trust. The amount so contributed shall be kept in a separate account in the Bank and (the amount and interest there of) shall only be used for buying construction materials required for restoration of the *Aganchhen*.

4. The *Guthi* shall allow Department of Archeology, Lalitpur municipality, Kathmandu Valley Preservation Trust and their official guests and bonafide scholars to inspect the *Aganchhen* after its restoration and thereafter as and when it deems necessary. Provided that the inspections shall be subject to ritual restrictions applicable to outsiders.

5. It shall be the duty of the *Guthi* to look after day to day maintenance of the *Aganchhen* and carry out necessary minor repairs without changing the art, architecture and state of preservation of the *Aganchhen*. The *Guthi* shall not do any thing with the *Aganchhen* which will violate the requirement of Ancient Monument Protection Act 2013 B.S or the rules and regulations made thereunder. The *Guthi* shall not sell, lease or change the status of the *Aganchhen*. It shall be the obligation of the *Guthi* to protect, preserve, and conserve the *Aganchhen* as a cultural heritage.

Provided that the *Guthi* shall have the right to lease or use the ground floor only for commercial purpose. The income earned by way of rent or otherwise shall be exclusively used for the future maintainance of the *Aganchhen*. The use of ground floor for commercial purpose shall not in any case adversely affect the safety or status of the *Aganchhen*.

ARTICLE IV RIGHTS AND RESPONSIBILITIES OF DOA

1. DOA shall have the right to inspect the restoration activities work carried out by the Trust. It may give necessary directions to the Trust to ensure the compliance of the Ancient Monuments Act 2013 B.S.

2. DOA shall have the right to review the technical details and progress of the restoration work.

3. Carry out its membership role...

ARTICLE V PROVISO AND RESERVATION

This Patko *Aganchhen* Restoration Agreement shall not be construed or interpreted or used as an evidence to create the rights and

duties of the parties other than the ones enumerated in this agreement, either against each other or against any person or institution not a party to this contract.

ARTICLE VI DISPUTE RESOLUTION PROCESS

1. The parties hereby agree to resolve disputes and differences arising under this contract through negotiation between the Trust or its representative and Chairman, Management Board of the *Guthi* or his representative.
2. In the event such dispute is unable to be resolved between the parties pursuant to section 1 above, then such dispute shall be settled exclusively by arbitration.
3. Each arbitral tribunal shall consist of three arbitrators. Each disputing party shall appoint one arbitrator for each arbitration and the arbitrators appointed shall appoint the third arbitrator for such arbitration.

ARTICLE VII EVENTS OF DEFAULT AND REMEDIES

1. Event of default shall occur if a party to the agreement fails to discharge the material obligation under the agreement and such failure shall continue uncured for sixty days after notice thereof by the aggrieved party.
2. If an event of default occurs and is continuing, the non-defaulting party may terminate this contract by giving written notice to that effect and shall have the right to recover all the losses suffered or expenses incurred so far for the restoration of the *Aganchhen*.

IN WITNESS WHEREOF, the parties hereto have agreed to sign this agreement.

.....
Mr./Ms.....
For Department of Archeology,
His Majesty's Government of Nepal

.....
Mr./Mrs.....
For Kathmandu Valley Preservation
Trust.

.....
Mr./Ms.....
For *Patko Aganchhen Guthi*.

Witness:
1. Mr./Mrs.....
2. Mr./Mrs.....

More witnesses for Guthi?

Agreement
Draft, Winter 1994 - Sakya.

PATKO AGANCHHEN RESTORATION AGREEMENT

This PATKO AGANCHHEN RESTORATION AGREEMENT made in Patan, Lalitpur, Nepal, as of Fagun 2050 (....day of February 1995)

BETWEEN

- (1) DEPARTMENT OF ARCHEOLOGY/Ministry of Education and Culture/HMG (hereinafter referred to as DOA); and
- (2) *PATKO AGANCHHEN GUTHI*, located in *Patko*, Patan, Lalitpur (Hereinafter referred to as the *Guthi*).

RECITALS

WHEREAS, the *Guthi* is aware of the fact that the *Aganchhen*, located in *Patko*, Patan is a unique cultural heritage of Nepal and has its own historical significance;

WHEREAS, the *Guthi* is interested in restoration of the *Aganchhen* with the financial and technical support of DOA; and

WHEREAS, DOA is desirous to provide the financial and technical support to the *Guthi* for the restoration of the *Aganchhen*:

NOW, THEREFORE, in view of these premises and in consideration of the mutual covenants and subject to proviso hereinafter set forth, the *Guthi* and DOA agree to the following:

ARTICLE I

MUTUAL COVENANT

1. In pursuance of this agreement DOA undertakes to restore the *Aganchhen* located in *Patko*, Patan (proposed by DOA to be included in protected monument zone in near future) according to the plans and specifications annexed hereto and the *Guthi* also undertakes to assist, cooperate and extend all possible means of support in the restoration work of the *Aganchhen* as agreed upon by the parties. Both the parties, further, mutually agree to abide by their respective rights and responsibilities enumerated below.

ARTICLE II

RIGHTS AND RESPONSIBILITIES OF DOA

1. DOA shall execute the programme as agreed above for restoration of the *Aganchhen* and bear all cost of restoration including cost of construction materials, labours and other directly related incidental expenses, except the financial contribution to be made by the *Guthi* under section 3 of Article III.

2. DOA shall present the cost estimate and estimated time frame for the restoration of the *Aganchhen* before the actual start of the

restoration work. DOA shall notify the *Guthi* at least one month in advance if it feels that the restoration work cannot be completed unless there is major adjustment in cost estimate and time frame for the completion of the work. However DOA shall have the authority to make minor adjustments in the cost estimates and construction design without prior information to the *Guthi*. DOA in any case shall bear all additional expenses under the revised cost estimate.

3. DOA shall not change the original art, architecture and status of the *Aganchhen* while carrying out restoration work. Provided that this clause shall not be construed to restrict DOA from introducing necessary structural consolidation to the *Aganchhen*.

4. DOA shall hand over the *Aganchhen* to the *Guthi* within the shortest possible time after the restoration work is completed.

5. DOA shall provide technical assistance to the *Guthi* for the repair and restoration of the *Aganchhen* in compliance with the requirements of Ancient Monuments Act 2013 and the rules and regulations made thereunder.

6. DOA shall have the right to execute its responsibility under the agreement through Kathmandu Valley Preservation Trust, a charitable organisation working in Kathmandu with the approval of DOA.

7. DOA shall execute restoration work of the *Aganchhen* in two phases. The activities and cost estimates in phase I and phase II shall be described in the plans and specifications of the restoration work to be annexed with this agreement. Provided that if incase DOA, despite of its best effort, is unable to execute phase II of the restoration work due to financial constraint it shall inform the *Guthi* accordingly. In such case DOA shall be discharged of its obligation for phase II restoration work without any financial liability.

ARTICLE III

RIGHTS AND RESPONSIBILITIES OF THE *GUTHI*

1. The *Guthi* shall make the *Aganchhen* and the adjacent courtyard available and accessible to DOA, its agents and contractors for all kinds of activities related to restoration work on the request being made by the latter to that effect. The *Guthi* shall also provide other incidental facilities required for restoration purpose.

2. The *Guthi* shall provide appropriate and adequate space to DOA for storing construction materials during restoration period. It shall also make necessary arrangement for their safety and protection.

3. The *Guthi* shall make all the necessary arrangement for the smooth operation of the restoration work and avoid unnecessary disturbances thereof. The *Guthi* shall make an upfront contribution of Rs.250,000/- as a token of support to the restoration work carried out by DOA.

4. The *Guthi* shall allow Department of Archeology, Lalitpur municipality, Kathmandu Valley Preservation Trust and their official guests to inspect the *Aganchhen* after its restoration and thereafter as and when it deems necessary. Provided that the inspections shall be subject to ritual restrictions applicable to outsiders.

5. It shall be the duty of the *Guthi* to look after day to day maintenance of the *Aganchhen* and carry out necessary minor repairs without changing the art, architecture and state of preservation of the *Aganchhen*. The *Guthi* shall not do any thing with the *Aganchhen* which will violate the requirement of Ancient Monument Protection Act 2013 B.S or the rules and regulations made thereunder. It shall be the obligation of the *Guthi* to protect, preserve, and conserve the *Aganchhen* as a cultural heritage.

ARTICLE V

PROVISO AND RESERVATION

This Patko *Aganchhen* Restoration Agreement shall not be construed or interpreted or used as an evidence to create the rights and duties of the parties other than the ones enumerated in this agreement, either against each other or against any person or institution not a party to this contract.

ARTICLE VI

DISPUTE RESOLUTION PROCESS

1. The parties hereby agree to resolve disputes and differences arising under this contract through negotiation between the Director General, DOA or his representative and Chairman, Management Board of the *Guthi* or his representative.

2. In the event such dispute is unable to be resolved between the parties pursuant to section 1 above, then such dispute shall be settled exclusively by arbitration.

3. Each arbitral tribunal shall consist of three arbitrators. Each party shall appoint one arbitrator for each arbitration and the arbitrators appointed shall appoint the third arbitrator for such arbitration.

ARTICLE VII

EVENTS OF DEFAULT AND REMEDIES

1. Event of default shall occur if a party to the agreement fails to discharge the material obligation under the agreement and such failure shall continue uncured for sixty days after notice thereof by the aggrieved party.

2. If an event of default occurs and is continuing, the non-defaulting party may terminate this contract by giving written notice to that effect and shall have the right to recover all the losses suffered or expenses incurred so far for the restoration of the *Aganchhen*.

IN WITNESS WHEREOF, the parties hereto have agreed to sign this agreement this day ofFagun 2050 (...Feb,1995).

.....
Mr./Ms.....
Director General, DOA

For Department of Archeology/
Ministry of Education and Culture/
HMG.

.....
Mr./Ms.....

For *Patko Aganchhen Guthi*.

Witness: 1. Mr./Mrs.....

2. Mr./Mrs.....

How Effic

संस्कृत

Most recent draft
Nepali-text.

नवलपरासी नगर पालिका क्षेत्र नं. १ मा स्थित ऐतिहासिक
पुरातात्विक एवं फलामक मन्दिरको संरक्षणको लागि
जिम्मेदार गरीने कुरा महसुस गर्दै
यो क्षेत्र सरकार (पुरातत्व विभाग) यस पछि विभाग अनिवार्य
(यस पछि अनिवार्य) देहायका शर्तहरू पालना
गर्ने कुरामा मजबुरी एवं बलवद् गरीने उपरोक्त ऐतिहासिक, पुरातात्विक
एवं फलामक मन्दिरको राष्ट्रिय स्मारकको रूपमा रहेको संरक्षण गर्ने
सन्दर्भमा सम्भावित जोडो सुझावहरू गरिएको छ।

यस संस्कृतमा उल्लेख गरिएको सबै बुझाई प्राक्कित स्वरूप संरक्षण क्षेत्र २०१३
को को-मैनेजमेन्ट र यथासंभव रक्षा (उत्तरागत) लिइएको छ। यस संस्कृतमा
उल्लेखित शर्त र जोडो संरक्षणको परिधि बाहिर कुनै दायित्व मानिने छैन।

शर्तहरू

१. यो अनुसंधान माथि उल्लेखित संरक्षण कार्यको लागि उक्त क्षेत्र
माथि विभाग आधिकारिक रूपमा कोटि गरिने गर्ने गराउने छ।

२. संरक्षण र उक्त गुणस्तर कार्यमा गर्नका लागि गर्न पर्ने सबै कुरा कम्पनापदहरूको
अनुमानको जिम्मेवारी विभाग आफैले लिने छ। विभागले लिएको सुझाव, विवरण,
निर्देशन, आदेश पालना, संरक्षणको कुरा कम्पनापदमा जिम्मेवारीको रूपमा
सबै पक्षहरूको फाइदा हुनेछ।

३. उल्लेखित संरक्षण कार्यको माथि नबन्धनको लागि उक्त क्षेत्र आधिकारिक संरक्षण
निर्माण सामग्री वा अन्य उपलब्ध गराउने बाहेक विभागले हो संरक्षण
सिक्का गर्न सक्नेछ।

४. उल्लेखित स्मारकको संरक्षण पश्चात मजिरी संरक्षण क्षेत्र कार्यको
जिम्मेवारी को हुनेछ। यथा लिखितमा राखेने संरक्षण
अथवा सहित विवरण कुरा यहाँ संस्कृतमा साथ संरक्षण गरिने छ।

1. CAN DOA DELEGATE THE AUTHORITY TO SIGN THE DEED OF RESPONSIBILITY TO THE MAYOR ?
2. SHOULD HE NOT INCLUDE AN ARBITRATION CLAUSE WITH AUTHORITY BOTH TO APPEAL TO ----- ?

राष्ट्रिय स्मारक का कन मर्मित स्मारक पर चर आदि गर्नु परेक पुरातत्व विभागक निरिक्षण उपरान्त पुर्वे लिखिते लिखि मात्र गर्नु परेक ही यह सन्दर्भमा विभागले नियमको परिधी मिर रही ~~अथ~~ ३० दिन आधिकार निर्देशनका पालना गर्नुकै यदि निर्देशन विपरीत काम गरमा विभाग आफैले वा अरु कोही मर्मित काम संचालि सके सम्बन्ध लागेका रक्खे - - - - - गर आहुल उपर गर्नु सक्नेछ।

६. राष्ट्रिय स्मारक लाई यथा स्थितिमा राख्न - - - - - ला अनुरोध गरेका रक्खमा विभागले आवश्यकता अनुसार लिक्का छ तथा प्राविधिक सहयोग उपलब्ध गराउन सक्नेछ।

७. विभागले आवश्यक काममा राष्ट्रिय स्मारकका निरिक्षण गर्नु सक्नेछ र आवश्यकता अनुसार निर्देशन दिन सक्नेछ जसका पालना गर्नु - - - - - को कर्तव्य हुनेछ।

८. यस सम्झौताको हेरफेर - - - - - प्रचलित प्राचित स्मारक हेरफेर गर्नका परिधी मिर रही दुवै पक्षका मन्जुरीमा गर्नु सकिनेछ।

९. यो सम्झौता दुवै पक्षका सहिदाय भएका भिति देखि लागु हुनेछ र यस भन्दा अगाडि भए सम्बन्धमा गरेको काम कारवाहीहरू यस सम्झौता बमोजिम गरफा मानिनेछ।

पुरातत्व विभागका तर्फबाट सहो गर्नु - - - - - तर्फबाट सहो गर्नु

नाम

नाम

पद

पद

कामालियका छाप

कामालियका छाप

सहो - - - - -

सहो - - - - -

तारीख - - - - - २०२० साल

महिला राज - - - - - अमर

लक्ष्मी

A20

(माकसिद : नाम - - - - - सहो - - - - -)

Deed of Responsibility

Whereas it has been proposed to preserve the _____,
a building of artistic and historical importance, located in

Ward # _____, _____ Municipality.

Whereas His Majesty's Government Department of Archeology (hereafter referred to as the Department) and _____ (hereafter referred to as _____) are committed and agree to the following conditions in the course of the preservation of said building of historical and artistic importance, hereafter referred to as the National Monument.

All the legal provisions described in this document derive from the Ancient Monuments Act of 1956 and its subsequent amendments, in particular as described under Section 9; in no case does this agreement go beyond the existing provisions of the Ancient Monuments Act of 1956 and its amendments.

Conditions

1. At the request of _____, the Department shall undertake or cause to have executed by its agent of choice the works necessary for the preservation of this National Monument.
2. The Department itself will be responsible for the monitoring of preservation activities according to its standards to achieve high quality. The guidance and specifications ordered by the Department shall be respected by all those concerned in the preservation activities.
3. The Department may accept contributions of funds or contributions in kind (labor, materials, etc.) to be used exclusively for the implementation of said preservation activities.

4. After said preservation work is completed, _____ shall be responsible for maintaining the National Monument in its preserved state. The specifications and description of said preserved state will be elaborated in words and drawings and attached to this document.

5. Any construction, alteration, or renovation work to the National Monument must be approved in writing by the Department of Archaeology before it is commenced. The specifications and instructions of the Department must be followed for this work. If unauthorized work is done, or if work is not completed according to the specifications of the Department, the Department shall correct the work or have such corrections executed through its agent of choice. The cost of such work will be realized as compensation from _____.

6. The Department shall provide advice and technical assistance as requested by _____ to maintain the preserved state of the National Monument.

7. The Department may inspect the National Monument if it deems necessary and may issue a directive .

8. The conditions of this contract may be altered with the consent of both parties.

9. This contract shall come into force from the date of signature of both parties in the contract; any other activities performed previously shall be deemed to have been performed under this contract.

On behalf of the
Department of Archaeology

Name

Title

Seal

On behalf of the Guthi

Name

Name

Executed in _____ this _____ day
of _____ in the year _____

Deed of Responsibility
Draft, Spring 1993 - Pant.

Whereas it has been felt to renovate Rajopadhya Agan Temple (Building) of historical and archaeological importance place, located in patuko Tole ward No 18 of Lalipur Municipality. Whereas His Majesty's Government Department of Archaeology (herein after referred to as Department) and the Rajopadhya Agan Temple Guthi (herein after referred to as Guthi) have been committed and agreed to follow the following conditions in course of the preservation of the said Building ^{of} historical importance; hereafter referred to as a National Monument

Now, therefore the Department and committee have now entered into the following contract, having the following conditions:-

Conditions

1. At the request of the Guthi, the Department shall do itself or cause to do through any other agency the maintenance works along with the renovation works of the above stated Building Under this contract which has been done Under Section 9 of Ancient Monument preservation Act, 2013 (1956).
2. The Department itself shall look after and control the preservation activities or it shall be get it done through any other agency as designated by the Department. The guidance provided by the Department shall have to be followed by ^{those} ~~the~~ all concerned in this respect
3. In ^{the} course of preservation activities if some sorts of financial assistance or labour donation is intended to be provided by Guthi or by ~~somebody~~ ^{others} else, the Department may accept such types of things

(2)

4. After the completion of Preservation works the Guthi shall have the sole responsibility of keeping the said preserved ^{National Monument} ~~area~~ in its original shape ^{*} and shall manage all sorts of security arrangements in that respect.
5. The Guthi shall regularly perform the cleaning activities and minor maintenance works of the preserved area. But any types of work which have adverse impacts or negative effects on its archaeological shape and importance may not be done or cause to be done. ^{*}
6. In course of maintenance, if some sorts of renovation or alteration is required to be done, the Department shall have to be pre-informed and the said works shall be done or cause to be done according to the guideline, methods provided by the Department, which shall be ultimately finalized by the mutual consent of both the parties. In course of doing reconstruction or maintenance works, if after demolition or maintenance works is left haphazard after leaving the work undone, then such works shall be performed by the Department itself or cause to be performed and the amount incurred on such works shall be realized as compensation from the Guthi.

* specify** specify

(3)

7. No work shall be done or cause to be done, which ~~can~~ have adverse impacts upon ~~archaeological~~, ancient and original shape of the preserved areas.
8. The Guthi shall submit a report alongwith the photos showing full shape of ^{the building} ~~preserved areas~~ and with other details to the Department, every year. Besides, these things, if any other informations are deemed to be provided the Department shall be informed at any time. The Department may issue proper guidance, deemed appropriate.
9. It shall be the liability of the Guthi to keep the preserved area in secured and original condition having full security over it.
10. The religious activities done in the preserved areas, may be continued or caused to be continued as usual.
11. The Department shall ~~render~~ advice and co-operation as requested by the Guthi in relation to preserved areas.
12. The Department if feels necessary may inspect the preserved areas and may issue directive deemed necessary.
13. In case the original shape of the preserved area is altered and as a result there is adverse effects in its archaeological and historical importance or there is some sort of damage, due to not performing of activities which are required to be performed by the Guthi, the

- 4 -

Department shall have right to made decision in matter of compensation along with initiate proceeding Under Ancient Monument preservation Act, 2013 (1956) and other prevailing Nepalese laws.

14. The conditions of this contract may be altered with the consent of both the parties.
15. This contract shall come into force from the date of signature of both the parties in the contract, and any other activities done before in this regard shall be deemed to have been performed under this contract.

On behalf of Department
of Archaeology

Name :-

Designation :

Seal of the office :

on behalf of Gutli

Name :-

Name :-

Done in..... inday of monthof 2050
B.S.(.....AD)

8. Patukva Agam Conservation Project Technical Update

Seismic reinforcement: background

Any monument repair in seismically active Nepal must consider the introduction of additional reinforcements in addition to the consolidation of existing historical structure in order to withstand earthquakes. Previous and parallel work by the project team (Erich Theophile, Rohit Ranjitkar, and Prayag Joshi) has provided certain springboards for the design of reinforcements at Patukva .

Uma Maheswar Temple and Vabaha: development of a timber ring beams

At both Uma Maheswar and Vabaha, seismic reinforcements were undertaken with the following considerations and strategies.

* Strengthening with a ring beam made out of timber was seen as both seismically effective and aesthetically sympathetic to the historical structure. Only in the case of Uma Maheswar was there an existing and historical timber tie structure strong enough and properly configured which allowed simple reinforcement to create the ring beam effect.

Vabaha shock absorber

*At Vabaha (Patan Programme Conservation Pilot Project of a Buddhist shrine house), the most effective location for reinforcement was at the level of greatest load, i.e. just under the pinnacle structure which was to be rebuilt. Based on this analysis, the choice of a conventional perimeter ring beam as the principal reinforcement strategy was logical, the alternative would have been insertion of rigid plate at floor level. Both attempt the development of a more cohesive, rigid, and cell-like structure, the basic principle of all seismic retrofitting.

*The unexpected visit of Sir Bernard Feilden, a world authority on seismic reinforcement of historical structures, led to the discussion of alternative materials for the construction of the proposed ring beam. Sir Bernard argued the generally *under-represented* view that the introduction of reinforced concrete into mud mortar structures would create a potential for battering of the historical structure-- the different materials vibrating at different frequencies. Sir Bernard applauded the use of timber for strengthening at Uma Maheswar.

*His encouragement to develop a more sympathetic solution in timber led to a collaborative design for Vabaha led by Prayag Joshi with inputs from building consultant Thomas Schrom, whose experience in timber ring beams used for adobe construction in the American Southwest was especially relevant. Timber was agreed by all to be psychologically and aesthetically preferable to reinforced concrete; it even continued an historical trend among the Newarss to keep adding layers of reinforcing timber structure to failing buildings.

*The design began as a multi-layered timber beam, i.e. composed of side-by-side and stacked plank-like layers approximately 2"x12" . These different pieces were lapped with staggered joints and all nailed together. The design of several layers in joined lengths was certainly more economical (as a single large section of appropriate length 30' would have been unavailable) but more importantly was conceived as part of the structural design--the many joints of the composite timber ring beam providing it some flexibility. Flexibility is seen as a positive characteristic in earthquake performance, especially in relation to the loose historical walls in mud mortar, the mud providing another *flexibility factor*.

*Joshi's key innovation was to refine this notion of a timber ring beam, a somewhat flexible reinforcing element, into a "shock absorber". To this end the three stacked layers of timber in the beam were fastened in the following way. The lower layer was structurally linked with the walls below by iron reinforcing rods; the top layer linked with above by bolted connections to the large beams of the pinnacle. Most critically, structural connections were not made between the middle timber layer to the upper and lower layers. The hypothesis for this intentional *lack of* connection is that the lateral force of an earthquake could be absorbed by the ability of the timber beam to shift slightly. At the same time, the significant load of the pinnacle above would prevent displacement of more than a few inches.

In sum, the building is structurally reinforced with a new timber tie member whose novel configuration also provides a shock absorbing functioning.

Patukva Agam

These experiences with timber reinforcement at Vabaha and Uma Maheswar have led to ongoing experiments at Patukva which include: (1) use of timber planking to create a rigid plate system and (2) strengthening of building-scale vertical connections through development of a timber framework.

Rigid floor plates

The development of a rigid plate, like the ring beam, is a consolidating measure to help the structure react as a larger whole in the event of an earthquake. At Patukva Agam, unlike past projects in "floorless" temple structures, there are three floor levels which can be easily rebuilt incorporating the great rigidity of two layers of planking laid at 45 degrees and through-nailed. The use of timber planking, much more sympathetic to the historical structure, comes at the suggestion of Sir Bernard Feilden.

Vertical connections

In the West, the technique of drilling continuous vertical rods into historical and "loose" masonry structures is a norm. In Nepal, however, not only is that technology unavailable, but the buildings are extraordinarily "loose", made up as they are of a composite, three-layered masonry wall with very few through connections. (This is why on a great number of historical buildings here walls visibly splay out.)

Here, the project team decided to explore a strategy of making vertical continuity in the Patukva structure by development of a timber framework. On many levels timber posts were found in the historical configuration: what remained was to establish consistent connections between these historical members and adjacent tie beams, as well as to add the missing pieces to make these post and beam elements add up to a kind of reinforcing framework or rigid frame.

This timber rigid frame was modeled and studied by a computerized seismic engineering program, specially imported for the Patukva project. The results confirm that insertion of timber posts, strengthened connections with timber wall plates, and improvement of timber joinery can achieve a state-of-the-art seismic reinforcement.

Seismic reinforcement: appropriate local and imported materials

If one could use reinforced concrete in conservation projects, then metal reinforcements would be fabricated in iron and mild steel, protection against corrosion being provided by the embedding of these members in the concrete. When working with traditional mud mortar, however, anything that is put in the wall and subject to moisture should be made of a metal which resists corrosion. To date, conservation projects in Nepal have not used metal for seismic reinforcements; iron and mild steel hardware has been used for timber joining and miscellaneous applications, generally these pieces are painted with anti-corrosive iron oxide paint.

Stainless steel is the international norm for such metalwork, although experience attempting to import this material from India for Patukva over the last six months has proved challenging and expensive (200% duty, three month delay).

Alternatives include locally available brass and copper, as well as custom-ordered and locally cast brass, copper, and bronze. Available in the market are a range of wire and rods in copper and brass varying in diameter up to 10 mm.

Specific applications for such metal rods, pieces, and wires would include

- (a) thru-wall connections linking the outer wall with a newly reinforced floor structures (rigid plate concept)
- (b) introduction of wire stranding in mud mortar joints to increase overall tensile strength of the traditional multi-layered wall in mud mortar.

Hardware for timber joinery would preferably use corrosion-resistant metal, although as these applications are generally protected from water, non-corrosive materials would not be absolutely necessary.

Ongoing testing

Meanwhile we have had fabricated appropriately sized sample sections in less corrosive copper, brass, and bronze. In early February the tensile strength of these pieces were measured at the Institute of Engineering Materials Strength Testing Laboratory, the goal being to compare locally available sections with each other and with imported stainless steel.

Promising results show that locally available copper and brass wires and rods are up to 40% as strong as imported stainless steel. If appropriately sized, this appears to be sufficiently strong for use in most seismic reinforcement applications, especially in a building the scale of Patukva Agam.

Meanwhile, the Patan Conservation Laboratory (under the Department of Archaeology) is currently and at our request testing silicone coating of brass and copper rods to determine how the limited corrosion of these metals can be further controlled, results forthcoming.

The goal of these experiments are to use locally available materials to achieve international norms of seismic retrofitting.

Timber preservation

To date, no timber preservatives have been manufactured in Nepal. Only internationally-assisted conservation projects have been able to afford costly imports of Japanese and German products including Wykamol, Xylamon, and Xylophene.

There has been criticism that application of the preservatives was often not necessary (a) because the necessary re-application was not anticipated after five years and (b) because the sal wood is extremely resistant if protected by roof cover...i.e. fix the roof rather than treat the wood. Nevertheless, there are times when preservative is appropriate including treatment of ground floor timbers, pine (which is much more susceptible than sal), and historical timbers which have shown signs of insect infestation. The historical interior framing of Patukva is exclusively pine. We propose refitting of pine members and repair of existing members, thus making this preservative extremely critical.

On this and related subjects we have had ongoing discussions with the Conservation Laboratory. Very recently we determined that one especially effective preservative chemical, a copper-chrome-arsenic compound, can be produced locally with chemical ingredients presently available. Tests are underway to produce this chemical compound and make sample applications. If successful, we will produce the preservative not only for the Patukva project, but also for use by the Department of Archaeology.



TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS

Central Material Testing Laboratory

Pulchowk, Lalitpur.

TENSILE STRENGTH OF BAR

Name : Kathmandu Valley Preservation Trust

Date : 2050/11/5

Location : P.O. Box 5, Bhaktapur Darbar Square, Bhaktapur. Tested by : R.R. Pant

Type of Bar : ~~XXX~~ Brass, bronze, copper, Rods and Wires.

Machine : U.T.M.

S.No.	No.	Ø of Bar mm.	Area Cm ²	Breaking Load kg.	Types of Samples	Final Length m.	Breaking Strength kg/cm ²	Yield Strength kg/cm ²
1.	1	15	1.76	6,325	Copper Rod	-	3,593.75	-
2.	1	13.4	1.41	3,050	Bronze Rod	-	2,163.12	-
3.	1	10	0.78	7,850	Stainless Steel Rod	-	10,064.10	-
4.	1	6	0.28	1,120	BRASS Bronze Wire	-	4,000.00	-
5.	1	3.3	0.08	368	Copper Wire	-	4,600.00	-
6.	1	1.5	0.018	88	,, ,,	-	4,888.89	-

Remarks : The Rods & Wires supplied by
Kathmandu Valley Preservation Trust.

[Signature]

APPENDIX B

ENGINEER'S REPORT

Calculation of weight of the structure :-

AUGUST, 1993

① Top Roof El. 11.24 m from plinth level.

② Dead Load

(i) Dead load of Gajur = 8.0 kg

(ii) Dead load from roof = 1848.0 kg (support on wall)

(iii) Dead load from wall = $\frac{1}{2} \times 0.5 \times 0.4 \times 1.4 \times 4 \times 2000 \text{ kg/m}^3 = 1120 \text{ kg}$

Total D.L = 2976 kg

③ Live Load on roof (Taking 45 kg/m²)

i, L.L = 462 kg

② Fourth floor

① Dead Load

i, D.L from top roof = 2944 kg (Transferred from the slant)

ii, D.L from wall (deduct $4 \times 0.3 \times 0.3 \times 0.35$) = $2000 \text{ kg/m}^3 \times (4 \times 1.72 \times 0.35 \times 1.1 - 4 \times 0.3 \times 0.3 \times 0.35)$
= 5045.6 kg

Total D.L = 7789.6 kg

② Live Load

i, L.L = 686 kg

C. Third floor

① Dead Load

i, D.L from the middle slope roof = 10350 kg

ii, D.L from the wall = $2000 \text{ kg/m}^3 \times 2.4 \text{ m} \times 28 \times 0.85 \times 4 = 18816 \text{ kg}$

Total D.L = 29166 kg

② Live Load Total L.L = 2587.5 kg

683.5 kg
523.9 kg

D. Second Floor :-

① Dead Load

- i, D.L from front roof = 4178 kg
 - ii, D.L from left side roof = 5526 kg
 - iii, D.L from right side roof = 3059 kg
 - iv, D.L from back side roof = 4872 kg
 - v, D.L from 0.75m thick front wall = $2000 \text{ kg/m}^3 \times 0.75 \times 2 \times (4.1 - 1.3) = 8400 \text{ kg}$
 - vi, D.L from 0.55m thick front wall = $2000 \text{ kg/m}^3 \times 0.55 \times (4 \times 2.2 - 2 \times 0.65 \times 0.65) = 8750.5 \text{ kg}$
 - vii, D.L from 0.75m thick middle wall = $2000 \text{ kg/m}^3 \times 0.75 \times 2.2 \times 2.0 = 6600 \text{ kg}$
 - viii, D.L from 0.55m thick middle wall = $2000 \text{ kg/m}^3 \times 0.55 \times 2.7 \times 2.0 = 5940 \text{ kg}$
 - ix, D.L from 0.45m thick back wall = $2000 \text{ kg/m}^3 \times 0.45 \times 6.4 \times 1.8 = 10368 \text{ kg}$
 - x, D.L from floor slab = $300 \text{ kg/m}^2 \times (2.2 \times 7.7 + 1.5 \times 7.7) = 8547 \text{ kg}$
- Total D.L = 66235.5 kg

② Live Load :-

- i, L.L from front roof = 1043.25 kg
 - ii, L.L from left side = 1381.5 kg
 - iii, L.L from right side = 764.4 kg
 - iv, L.L from back side = 1218 kg
 - v, L.L from the floor slab = $200 \text{ kg/m}^2 \times (2.2 \times 7.7 + 1.5 \times 7.7) = 5698 \text{ kg}$
- Total L.L = 10105.15 kg

First floor :-

① Dead Load

- i, D.L from 0.75m thick front wall = $2000 \text{ kg/m}^3 \times 0.75 \times (4.1 \times 2.52 - 1 \times 1 - 2 \times 0.5^2) = 13248 \text{ kg}$
- ii, D.L from 0.55m thick front wall = $2000 \text{ kg/m}^3 \times 0.55 \times (4.0 \times 2.52 - 2 \times 0.65 \times 0.65) = 10159 \text{ kg}$
- iii, D.L from 0.75m thick middle wall = $2000 \text{ kg/m}^3 \times 0.75 \times (4.9 \times 2.52 - 2 \times 0.9 \times 1.2) = 15282 \text{ kg}$
- iv, D.L from 0.45m thick back wall = $2000 \text{ kg/m}^3 \times 0.45 \times (4.6 \times 2.52) = 10482.8 \text{ kg}$
- v, D.L from 0.45m thick side wall = $2000 \text{ kg/m}^3 \times 0.45 \times (3.4 \times 2.52 - 2 \times 0.9 \times 1.2) = 5767.2 \text{ kg}$

vi, D.L from the floor slab = $200 \text{ kg/m}^2 \times (22 \times 7.7 + 15 \times 7.7) = 8547 \text{ kg}$

Total D.L = 63436 kg

⑧ Live Load :-

i, L.L from the floor slab = 5698 kg.

F. Ground floor :-

① Dead Load

i, D.L from 0.75 m thick front wall = $2000 \text{ kg/m}^3 \times 0.75 \times (4.1 \times 2.02 - 0.9 \times 1.6) = 10,263 \text{ kg}$

ii, D.L from 0.55 m thick front wall = $2000 \text{ kg/m}^3 \times 0.55 \times (4.0 \times 2.02 - 2 \times 0.9 \times 1.5) = 5918 \text{ kg}$

iii, D.L from 0.75 m thick middle wall = $2000 \text{ kg/m}^3 \times 0.75 \times (8.1 \times 2.02 - 2 \times 0.9 \times 1.5) = 20,493 \text{ kg}$

iv, D.L from 0.45 m thick back wall = $2000 \text{ kg/m}^3 \times 0.45 \times (4.6 \times 2.02 - 2 \times 0.9 \times 1.5) = 5933 \text{ kg}$

Total D.L = 42,607 kg.

② Live Load

i, Live Load on the floor = 5698 kg.

Therefore, in summary.

Floor.	Dead Load (kg)	Live Load (kg)	Total Load (kg)
1. Roof.	2976	462	3438
2. Fourth	7790	686	8476
3. Third	29166	2588	31,754
4. Second	66236	10105	76,341
5. First	63436	5698	69,134
6. Ground	42607	5698	48,305
Total	212,211 kg	25237 kg	237,448 kg

Total building load = 237,448 kg

2. Earthquake Analysis of Structure :-

Method used — Seismic Coefficient Method (Ref NBC-83 Section I, clause 5.4)

$$\begin{aligned} \text{Total weight of structure} - W &= \text{Total dead load} + 25\% \text{ Live load} \\ &= 212,211 + 0.25 \times 25237 = 218522 \text{ kg} \end{aligned}$$

Each floor weight w_i (dead load + 25% Live Load)

$$\text{Roof } w_5 = 3072 \text{ kg}$$

$$\text{Fourth } w_4 = 7962 \text{ kg}$$

$$\text{Third } w_3 = 29813 \text{ kg}$$

$$\text{Second } w_2 = 68,762 \text{ kg}$$

$$\text{First } w_1 = 64,861 \text{ kg}$$

$$\text{Ground } w_0 = 44082 \text{ kg}$$

$$\text{Total} = 218,522 \text{ kg}$$

Seismic Coefficient for zone V, $\alpha_0 = 0.08$

$$\text{Base Shear } V_B = C \alpha_h W$$

$$\alpha_h = \beta I \alpha_0$$

β = coefficient depending upon soil foundation system = 1.0

I = Importance of structure = 1

$$\alpha_h = 1 \times 1 \times 0.08 = 0.08$$

C = Coefficient defining the flexibility of structure with the increase in number of storeys depending upon fundamental time period.

Time period $T = \frac{0.09 H}{\sqrt{d}}$

$H = \text{Total height of structure} = 11.24 \text{ m}$

$d = \text{maximum box dimension of building in metres in a direction parallel to the applied seismic force.}$
 $= 5.35 \text{ m}$

$\therefore T = \frac{0.09 \times 11.24}{\sqrt{5.35}} = 0.44 \text{ sec}$

$\therefore C$ from fig 15 of NBC-83 (Section I Page 16)
 $C = 0.88$

$\therefore \text{Base Shear } V_B = 0.88 \times 0.08 \times 218,522 \text{ kg}$
 $= 15384 \text{ kg}$

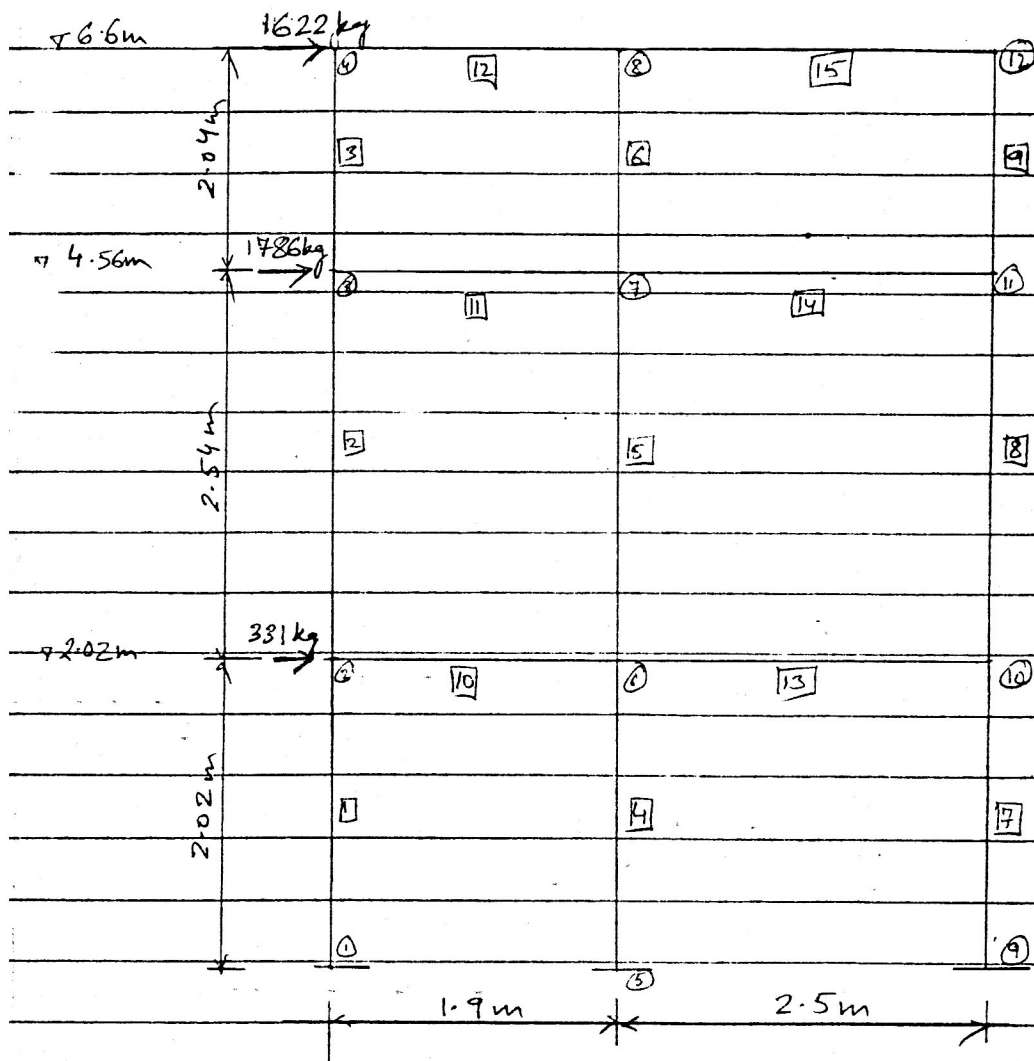
Distribution of forces is given by $Q_i = \frac{V_B w_i h_i^2}{\sum w_i h_i^2}$

Storey	$w_i (\text{kg})$	$h_i (\text{m})$	$w_i h_i^2$	$Q_i (\text{kg})$	Force in Each frame (kg)
5	3092	11.24	390636	1464	488
4	7962	9.52	721599	2704	902
3	29813	6.6	1298654	4866	1622
2	68762	4.56	1429810	5358	1786
1	64861	2.02	264659	992	331

$\sum w_i h_i^2 = 4105358$

Pages 6-11 show design calculations for timber skeleton frame. Frame configuration has been modified, see sample calculation May 1994.

3. Frame Dimension and Applied Lateral Force :-



Assumed Column and beam Size = 150 mm x 200 mm

$$\text{Area} = 0.15 \times 0.2 = 0.03 \text{ m}^2$$

$$\text{Moment of Inertia} = I = \frac{bh^3}{12} = \frac{0.15 \times 0.2^3}{12} = 1.0 \times 10^{-4} \text{ m}^4$$

$$\text{Modulus of Elasticity} = E = 1.26 \times 10^6 \text{ t/m}^2 = 1.26 \times 10^9 \text{ kg/m}^2$$

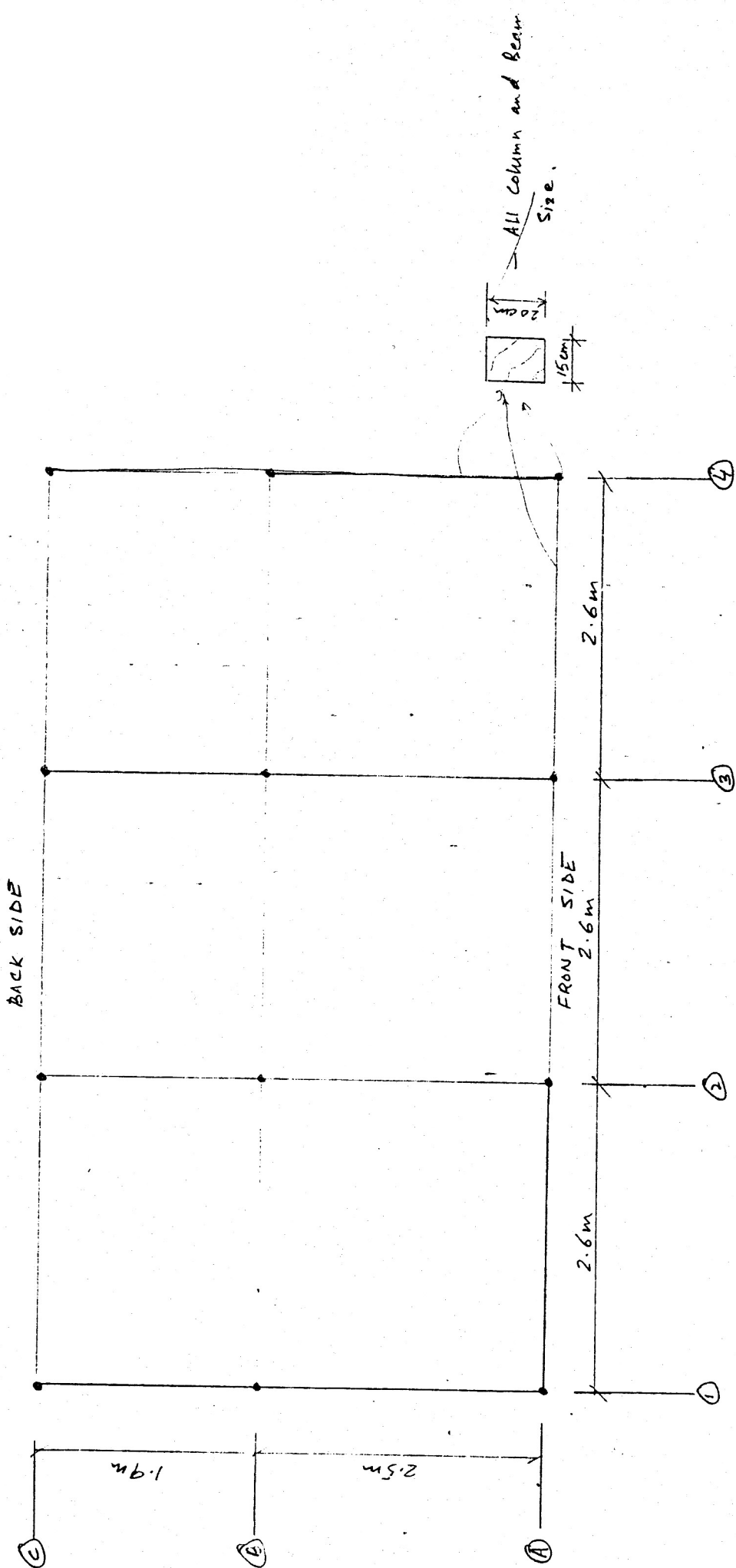
timber type = Salwood.

4.) Analysis and Design :—

Analysis of frame structure of three storey is done by finite element method of analysis by using a computer program called MICROFEAP - P1. Analysed structure and its output is attached.

For the analysis, four frame of each three storey is provided in the building. Frame is analysed only for horizontal static force from earthquake. All the vertical load is considered to be taken by the masonry unit.

The timber columns are spaced in 2.6 m centre to centre in the longitudinal direction. In transverse direction the columns are spaced in 1.9 m and 2.5 m consisting two bay.



A/ Beam design :-

From finite element analysis of 3 story, two bay frame structure

for beam $\rightarrow$ Maximum bending Moment $M = 2.04 \times 10^3 \text{ kg m}$
Maximum Shear $V = 1.9 \times 10^3 \text{ kg m}$

Permissible stresses

(a) Bending and tension $\sigma = 182 \text{ kg/cm}^2$

(b) Shear $\tau = 12 \text{ kg/cm}^2$

Above stresses increased by 33% for earthquake analysis.

(i) Check for Moment :-

$$\text{Bending stress } \sigma = \frac{M y}{I} \quad \text{where } y = \frac{d}{2}$$

$$I = \text{moment of inertia} = \frac{b d^3}{12}$$

$$\therefore \sigma = \frac{M \times \frac{d}{2}}{\frac{b d^3}{12}} = \frac{6 M}{b d^2}$$

$$\therefore d = \sqrt{\frac{6 M}{b \sigma}} = \sqrt{\frac{6 \times 2.04 \times 10^3 \text{ kg cm}}{15 \text{ cm} \times 1.33 \times 182}} = 18.36 \text{ cm} < 20 \text{ cm} \text{ provided}$$

ii, check for shear

$$\tau = \frac{3 V}{2 b D} = \frac{3 \times 1.9 \times 10^3}{2 \times 15 \times 20} = 9.5 \text{ kg/cm}^2 < 1.33 \times 12 = 16 \text{ kg/cm}^2$$

$\therefore$ Safe against Shear.

By Column Design

i) Ground and Second floor column :-

Ground & Second floor column : designed for two cases.

a) Tension with bending

(b) Compression with bending

column is designed as short column, as

$$\frac{L}{d} = \frac{204 \text{ cm}}{20 \text{ cm}} = 10.2 < 11$$

Case a

$$\begin{aligned} \text{Maximum tension} &= 4.2 \times 10^3 \text{ kg} \\ \text{bending moment} &= 1.54 \times 10^3 \text{ kg m} \end{aligned}$$

$$\text{Tension stress } f_{at} = \frac{4.2 \times 10^3 \text{ kg}}{15 \times 20} = 14 \text{ kg/cm}^2$$

$$\begin{aligned} \text{allowable tension stress } f_t &= 182 \text{ kg/cm}^2 \times 1.33 = 242.1 \text{ kg/cm}^2 \\ &\geq \text{bending stress } f_b \end{aligned}$$

$$\text{bending stress } f_{ab} = \frac{6 \times 1.54 \times 10^3 \text{ kg cm}}{15 \times 20^2} = 154 \text{ kg/cm}^2$$

$$\therefore \frac{f_{at}}{f_t} + \frac{f_{ab}}{f_b} = \frac{14}{242.1} + \frac{154}{242.1} = 0.694 < 1 \text{ So O.K. //}$$

Case b :-

$$\begin{aligned} \text{Maximum compression} &= 2.7 \times 10^3 \text{ kg} \\ \text{bending Moment} &= 1.46 \times 10^3 \text{ kg m} \end{aligned}$$

$$\therefore \text{compression stress } = f_{ac} = \frac{2.7 \times 10^3}{15 \times 20} = 9 \text{ kg/cm}^2$$

$$\text{bending stress } = f_{ab} = \frac{6 \times 1.46 \times 10^3 \text{ kg cm}}{15 \times 20^2} = 146 \text{ kg/cm}^2$$

$$\text{allowable compression stress, } f_c = 120 \text{ kg/cm}^2 \times 1.33 = 159.6 \text{ kg/cm}^2$$

$$\text{allowable bending stress, } f_b = 182 \text{ kg/cm}^2 \times 1.33 = 242.1 \text{ kg/cm}^2$$

$$\therefore \frac{f_{ac}}{f_c} + \frac{f_{ab}}{f_b} = \frac{9}{159.6} + \frac{146}{242.1} = 0.66 < 1 \text{ so o.k.}$$

(ii) First floor column :-

Column is designed for two cases.

- (a) tension with bending.
- (b) compression with bending

Column is designed as Intermediate column as

$$\frac{L}{d} = \frac{254}{20} = 12.7 > 11 \text{ but } < K_8$$

$$K_8 = \frac{0.702 \sqrt{E}}{\sqrt{f_{cp}}} \\ = \frac{0.702 \sqrt{1.26 \times 10^5}}{\sqrt{120}}$$

$$f_{cp} = 120 \text{ kg/cm}^2 \\ E = 1.26 \times 10^5 \text{ kg/cm}^2$$

$$= 22.75$$

$$\therefore \text{compression stress } f_c = f_{cp} \left[1 - \frac{1}{3} \left(\frac{L}{K_8 d} \right)^4 \right]$$

$$= 120 \left[1 - \frac{1}{3} \left(\frac{254}{22.75 \times 20} \right)^4 \right] = 116.12 \text{ kg/cm}^2$$

$$\text{for earthquake increased by } 33\% \therefore f_c = 116.12 \times 1.33 = 154.4 \text{ kg/cm}^2$$

Case (a) :- maximum tension = 2.2×10^3 kg
 bending = 1.37×10^3 kg cm

$$\text{tension stress} = f_{at} = \frac{2.2 \times 10^3}{15 \times 20} = 7.33 \text{ kg/cm}^2$$

$$\text{bending stress} = f_{ab} = \frac{6 \times 1.37 \times 10^5}{15 \times 20^2} = 137 \text{ kg/cm}^2$$

$$\text{allowable tension \& bending stress} = 182 \times 1.33 = 242.1 \text{ kg/cm}^2$$

$$\therefore \frac{f_{at}}{f_t} + \frac{f_{ab}}{f_b} = \frac{7.33}{242.1} + \frac{137}{242.1} = 0.596 < 1 \text{ so O.K.}$$

Case (b) :- Maximum compression = 1.44×10^3 kg
 Maximum bending = 1.22×10^3 kg cm

$$\text{Compression stress} = f_{ac} = \frac{1.44 \times 10^3}{15 \times 20} = 4.8 \text{ kg/cm}^2$$

$$\text{bending stress} = f_{ab} = \frac{6 \times 1.22 \times 10^5}{15 \times 20^2} = 122 \text{ kg/cm}^2$$

$$\text{allowable compression stress} = 154.4 \text{ kg/cm}^2$$

$$\text{allowable bending stress } f_b = 242.1 \text{ kg/cm}^2$$

$$\therefore \frac{f_{ac}}{f_c} + \frac{f_{ab}}{f_b} = \frac{4.8}{154.4} + \frac{122}{242.1} = 0.535 < 1 \text{ so O.K.}$$

15 cm x 20 cm column size is adequate.


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=====
MICROFEAP-P1          DATE: 09-01-1993          <COMB> P.1
PROJECT : Temple      FILENAME: templ1
AUTHORITY: MAHENDRA RAJ KAYASTHA          ENGINEER: G.M.Joshi
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*****
*                                     *
*   COMBINATION   *
*                                     *
*****

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DISPLACEMENT COMBINATION <2D-FRAME SYSTEM>
LOAD FACTOR : 1

NODE	1-DISP (m)	2-DISP (m)	3-DISP (Rad)
1	0.0000D+00	0.0000D+00	0.0000D+00
2	1.2349D-02	2.2425D-04	-6.0238D-03
3	3.7387D-02	3.7235D-04	-4.8800D-03
4	4.6889D-02	4.0431D-04	-2.0706D-03
5	0.0000D+00	0.0000D+00	0.0000D+00
6	1.2339D-02	-8.0157D-05	-3.8106D-03
7	3.7328D-02	-1.3157D-04	-3.3455D-03
8	4.6829D-02	-1.4153D-04	-1.3332D-03
9	0.0000D+00	0.0000D+00	0.0000D+00
10	1.2330D-02	-1.4409D-04	-6.6365D-03
11	3.7291D-02	-2.4078D-04	-5.2653D-03
12	4.6806D-02	-2.6280D-04	-2.1362D-03

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MICROFEAP-P1                      DATE: 09-01-1993                      <COMB> P.1
PROJECT : Temple                      FILENAME: templ1
AUTHORITY: MAHENDRA RAJ KAYASTHA    ENGINEER: G.M.Joshi
=====

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*****
*                                *
*  COMBINATION                  *
*                                *
*****

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STRESS COMBINATION <2D-FRAME SYSTEM>

LOAD FACTOR : 1

ELEM	MA	HINGE	SECTION (m)	AXIAL F. (Kg)	SHEAR (Kg)	MOMENT (Kg-m)
1	1		0.00	4.1964D+03	1.1493D+03	-1.5365D+03
			2.02	4.1964D+03	1.1493D+03	7.8505D+02
2	1		0.00	2.2040D+03	1.0325D+03	-1.2545D+03
			2.54	2.2040D+03	1.0325D+03	1.3680D+03
3	1		0.00	5.9248D+02	4.2964D+02	-2.6471D+02
			2.04	5.9248D+02	4.2964D+02	6.1176D+02
4	1		0.00	-1.5000D+03	1.5574D+03	-1.8107D+03
			2.02	-1.5000D+03	1.5574D+03	1.3353D+03
5	1		0.00	-7.6506D+02	1.4671D+03	-1.8402D+03
			2.54	-7.6506D+02	1.4671D+03	1.8863D+03
6	1		0.00	-1.8456D+02	8.4226D+02	-7.3482D+02
			2.04	-1.8456D+02	8.4226D+02	9.8340D+02
7	1		0.00	-2.6964D+03	1.0323D+03	-1.4566D+03
			2.02	-2.6964D+03	1.0323D+03	6.2867D+02
8	1		0.00	-1.4389D+03	9.0839D+02	-1.0856D+03
			2.54	-1.4389D+03	9.0839D+02	1.2217D+03
9	1		0.00	-4.0792D+02	3.5010D+02	-1.6383D+02
			2.04	-4.0792D+02	3.5010D+02	5.5037D+02
10	1		0.00	-2.1417D+02	-1.9924D+03	2.0396D+03
			0.47	-2.1417D+02	-1.9924D+03	1.0932D+03
			0.95	-2.1417D+02	-1.9924D+03	1.4677D+02
			1.42	-2.1417D+02	-1.9924D+03	-7.9962D+02
			1.90	-2.1417D+02	-1.9924D+03	-1.7460D+03
11	1		0.00	-1.1831D+03	-1.6115D+03	1.6327D+03
			0.47	-1.1831D+03	-1.6115D+03	8.6722D+02
			0.95	-1.1831D+03	-1.6115D+03	1.0176D+02

```

=====
MICROFEAP-P1                      DATE: 09-01-1993          <COMB> P.2
PROJECT : Temple                      FILENAME: templ1
AUTHORITY: MAHENDRA RAJ KAYASTHA      ENGINEER: G.M.Joshi
=====

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STRESS COMBINATION <2D-FRAME SYSTEM>

LOAD FACTOR : 1

ELEM	MA	HINGE	SECTION (m)	AXIAL F. (Kg)	SHEAR (Kg)	MOMENT (Kg-m)
11	1		1.42	-1.1831D+03	-1.6115D+03	-6.6370D+02
			1.90	-1.1831D+03	-1.6115D+03	-1.4292D+03
12	1		0.00	-1.1923D+03	-5.9248D+02	6.1176D+02
			0.47	-1.1923D+03	-5.9248D+02	3.3033D+02
			0.95	-1.1923D+03	-5.9248D+02	4.8897D+01
			1.42	-1.1923D+03	-5.9248D+02	-2.3253D+02
			1.90	-1.1923D+03	-5.9248D+02	-5.1396D+02
13	1		0.00	-1.2392D+02	-1.2575D+03	1.4294D+03
			0.63	-1.2392D+02	-1.2575D+03	6.4351D+02
			1.25	-1.2392D+02	-1.2575D+03	-1.4243D+02
			1.88	-1.2392D+02	-1.2575D+03	-9.2836D+02
			2.50	-1.2392D+02	-1.2575D+03	-1.7143D+03
14	1		0.00	-5.5831D+02	-1.0310D+03	1.1920D+03
			0.63	-5.5831D+02	-1.0310D+03	5.4762D+02
			1.25	-5.5831D+02	-1.0310D+03	-9.6757D+01
			1.88	-5.5831D+02	-1.0310D+03	-7.4113D+02
			2.50	-5.5831D+02	-1.0310D+03	-1.3855D+03
15	1		0.00	-3.5013D+02	-4.0792D+02	4.6943D+02
			0.63	-3.5013D+02	-4.0792D+02	2.1448D+02
			1.25	-3.5013D+02	-4.0792D+02	-4.0469D+01
			1.88	-3.5013D+02	-4.0792D+02	-2.9542D+02
			2.50	-3.5013D+02	-4.0792D+02	-5.5037D+02

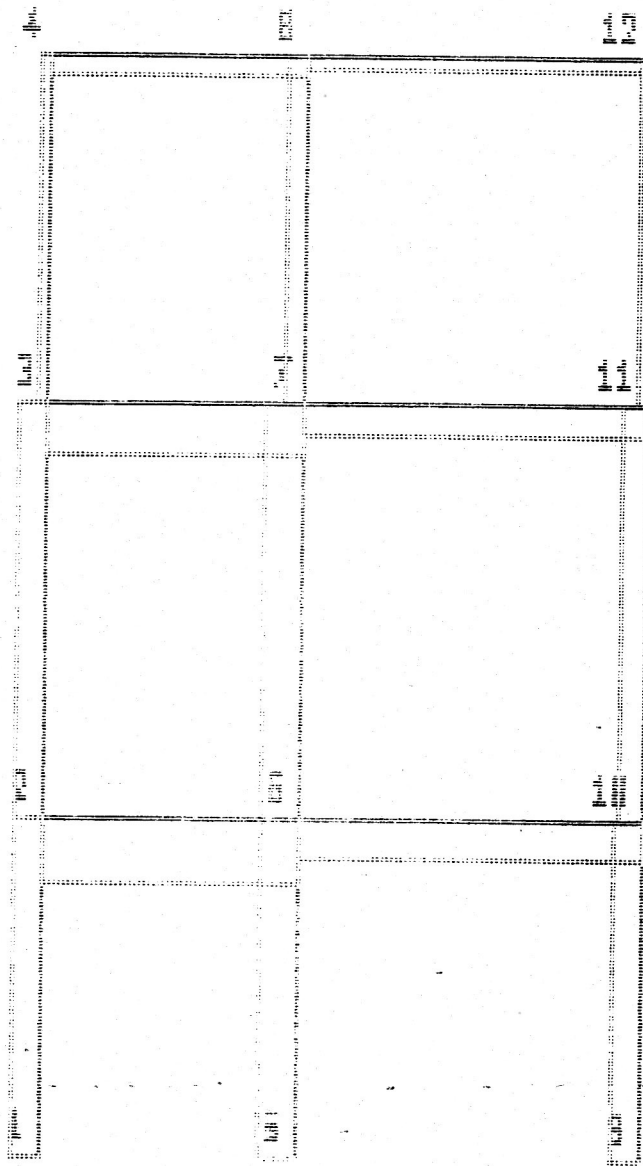
	1-REACTION (Kg)	2-REACTION (Kg)	3-REACTION (Kg-m)
1	-1.1493D+03	-4.1964D+03	1.5365D+03
5	-1.5574D+03	1.5000D+03	1.8107D+03
9	-1.0323D+03	2.6964D+03	1.4566D+03

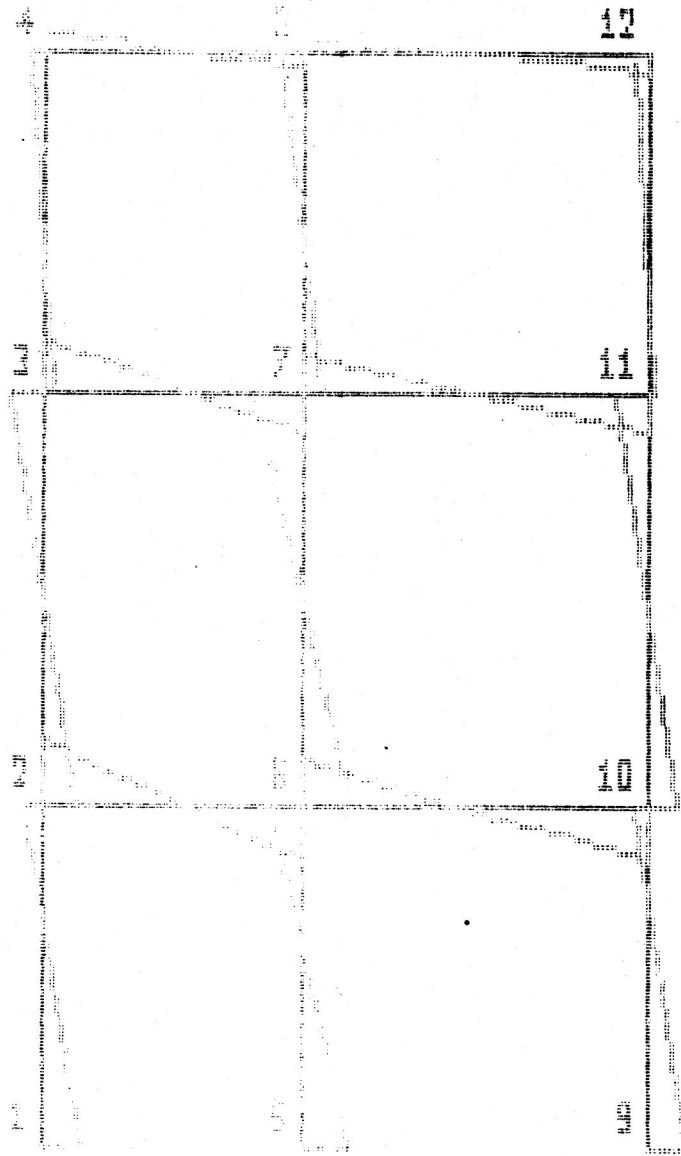
VOLUME OF MATERIALS <2D-FRAME SYSTEM>

SETS VOLUME
 (m³)

1	9.9000D-01
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SHEET FOUR OF TWO 2. 822-032





POINT

CL = 2.97E+03)

MAY, 1994

=====

MICROFEAP-P1

PROJECT : templ1

AUTHORITY: Manik Ratna Tuladhar

=====

DATE: 05-13-1994

<COMB> P.1

FILENAME: templ1

ENGINEER: Prayag Raj Joshi

=====

* COMBINATION *

STRESS COMBINATION <2D-FRAME SYSTEM>

LOAD FACTOR : 1

ELEM	MA	HINGE	SECTION (m)	AXIAL F. (kg)	SHEAR (kg)	MOMENT (kg-m)
1	1		0.00	8.5502D+02	1.0363D+03	-1.0467D+03
			2.02	8.5502D+02	1.0363D+03	1.0467D+03
2	1		0.00	8.9844D+02	9.5407D+02	-1.2117D+03
			2.54	8.9844D+02	9.5407D+02	1.2117D+03
3	1		0.00	9.9979D+02	5.0521D+02	-5.8408D+02
			2.04	9.9979D+02	5.0521D+02	4.4655D+02
4	1		0.00	-5.7624D+02	1.0360D+03	-1.0464D+03
			2.02	-5.7624D+02	1.0360D+03	1.0464D+03
5	1		0.00	-6.2033D+02	9.5344D+02	-1.2109D+03
			2.54	-6.2033D+02	9.5344D+02	1.2109D+03
6	1		0.00	-7.2334D+02	5.9915D+02	-6.4790D+02
			2.04	-7.2334D+02	5.9915D+02	5.7436D+02
7	1		0.00	-2.7878D+02	1.0357D+03	-1.0460D+03
			2.02	-2.7878D+02	1.0357D+03	1.0460D+03
8	1		0.00	-2.7810D+02	9.5249D+02	-1.2097D+03
			2.54	-2.7810D+02	9.5249D+02	1.2097D+03
9	1		0.00	-2.7646D+02	4.0064D+02	-5.1312D+02
			2.04	-2.7646D+02	4.0064D+02	3.0419D+02
10	2		0.00	-1.6575D+02	4.3419D+01	-1.7368D+01
			0.80	-1.6575D+02	4.3419D+01	1.7368D+01
11	2		0.00	-9.0613D+02	1.0135D+02	-4.0542D+01
			0.80	-9.0613D+02	1.0135D+02	4.0542D+01
12	2		0.00	-9.9975D+02	-9.9979D+02 ✓	4.4655D+02 ✓
			0.80	-9.9975D+02	-9.9979D+02	-3.5328D+02

```

=====
MICROFEAP-P1                                DATE: 05-13-1994                                <COMB> P.2
PROJECT : templ1                               FILENAME: templ1
AUTHORITY: Manik Ratna Tuladhar                ENGINEER: Prayag Raj Joshi
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STRESS COMBINATION <2D-FRAME SYSTEM>
LOAD FACTOR : 1

```

ELEM	MA HINGE	SECTION (m)	AXIAL F. (kg)	SHEAR (kg)	MOMENT (kg-m)
13	2	0.00	-8.3203D+01	-6.7361D-01	6.3992D-01
		1.90	-8.3203D+01	-6.7361D-01	-6.3992D-01
14	2	0.00	-5.5181D+02	-1.6481D+00	1.5657D+00
		1.90	-5.5181D+02	-1.6481D+00	-1.5657D+00
15	2	0.00	-4.0069D+02	-2.7646D+02	2.2108D+02
		1.90	-4.0069D+02	-2.7646D+02	-3.0419D+02

1) Beam Design

Sample Calculation

$$M_{\text{max}} = 4.466 \times 10^2 \text{ kg/m}$$

$$F_{\text{max}} = 9.997 \times 10^2 = 1000 \text{ kg m} \quad \checkmark$$

$$d = \sqrt{\frac{6 M}{b \sigma}} = \sqrt{\frac{6 \times 4.466 \times 10^4}{10 \times 1.33 \times 182}} = \underline{10.52} > 10 \text{ cm}$$

Provide 11 cm beam in the upper part or
provide 8 mm thick steel in between timber.

Shear

$$\tau = \frac{3V}{2bd} = \frac{3 \times 1000}{2 \times 10 \times 10} = 15 \text{ kg/cm} \quad \left(\frac{1.33 \times 10}{10} \right) = 16$$

OK.

2) Column

$$l/d = \frac{202}{11.5} = 17.56 > 11 \text{ and } < 18$$

Intermediate column

$$\text{Comp stress} = 120 \left[1 - \frac{1}{3} \left(\frac{254}{22.75 \times 11.5} \right)^2 \right] = 84.46 \text{ kg/cm}^2$$

$$f_{cg} = f_{c_{eq}} = 1.33 \times 84.46 = 112.33$$

$$\text{Max tension} = 8.984 \times 10^2$$

$$\text{Moment} = 1.2117 \times 10^3$$

$$T_s = \frac{8.984 \times 10^2}{11.5 \times 11.5} = 6.793 \text{ kg/cm}^2$$

$$T_b = \frac{6 \times 1.2117 \times 10^3 \times 10^2}{11.5 \times 11.5^2} = 65.76 \text{ kg/cm}^2$$

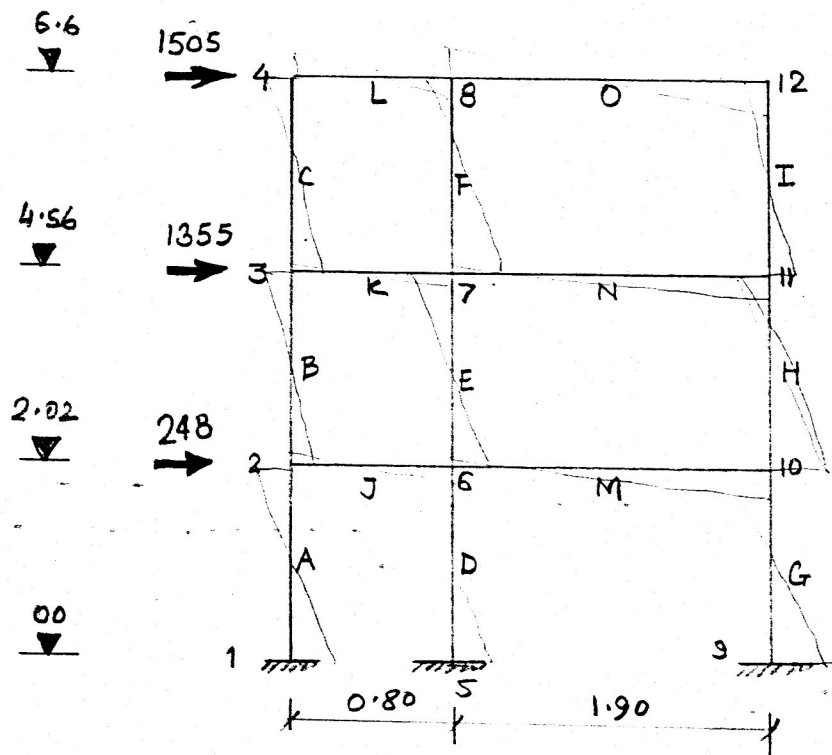
$$\text{Allowable } T \& B_s = 182 \times 1.33 = 242.1 \text{ kg/cm}^2$$

$$\frac{f_{at}}{f_t} + \frac{f_{ab}}{f_b} = \frac{6.793}{242.1} + \frac{65.76}{242.1}$$

$$= 0.03 + 0.27$$

$$= \underline{0.3} < 1 \quad \underline{OK.}$$

Column Size - $4\frac{1}{2} \times 4\frac{1}{2}$



Moment Diagram

=====

MICROFEAP-P1	DATE: 05-05-1994	<COMB> P.1
PROJECT : templ1		FILENAME: templ1
AUTHORITY: Manik Ratna Tuladhar		ENGINEER: Prayag Raj Joshi

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Case 2 with 30% load

Safe

Column Size - $4\frac{1}{2}'' \times 4\frac{1}{2}''$

Beam Size - $4'' \times 4''$

*
* **COMBINATION** *
*

STRESS COMBINATION <2D-FRAME SYSTEM>

LOAD FACTOR : 1

ELEM	MA	HINGE	SECTION (m)	AXIAL F. (kg)	SHEAR (kg)	MOMENT (kg-m)
1	1		0.00	1.7162D+02	1.3057D+01	-8.8509D+00
			2.02	1.7162D+02	1.3057D+01	1.7525D+01
2	1		0.00	1.8033D+02	-4.2413D+01	2.8438D+01
			2.54	1.8033D+02	-4.2413D+01	-7.9291D+01
3	1		0.00	1.2819D+02	1.3327D+02	-1.4562D+02
			2.04	1.2819D+02	1.3327D+02	<u>-1.2626D+02</u>
4	1		0.00	0.0000D+00	0.0000D+00	0.0000D+00
			2.02	0.0000D+00	0.0000D+00	0.0000D+00
5	1		0.00	0.0000D+00	0.0000D+00	0.0000D+00
			2.54	0.0000D+00	0.0000D+00	0.0000D+00
6	1		0.00	-4.8250D+01	2.3660D+02	-2.7109D+02
			2.04	-4.8250D+01	2.3660D+02	2.1157D+02
7	1		0.00	-1.0549D+02	1.4308D+01	-9.5312D+00
			2.02	-1.0549D+02	1.4308D+01	1.9371D+01
8	1		0.00	-1.1105D+02	-4.3305D+01	2.8593D+01
			2.54	-1.1105D+02	-4.3305D+01	-8.1400D+01
9	1		0.00	-7.9941D+01	1.1713D+02	-1.3335D+02
			2.04	-7.9941D+01	1.1713D+02	1.0559D+02
10	2		0.00	-4.3530D+01	8.7131D+00	-1.0914D+01
			1.90	-4.3530D+01	8.7131D+00	5.6414D+00
11	2		0.00	-7.1169D+02	-5.2142D+01	6.6332D+01
			1.90	-7.1169D+02	-5.2142D+01	-3.2738D+01
12	2		0.00	-3.5373D+02	-1.2819D+02	1.2626D+02
			1.90	-3.5373D+02	-1.2819D+02	-1.1731D+02

Max. moment - 1.456×10^2

$$d = \sqrt{\frac{6 M_{max}}{b \sigma}}$$

```

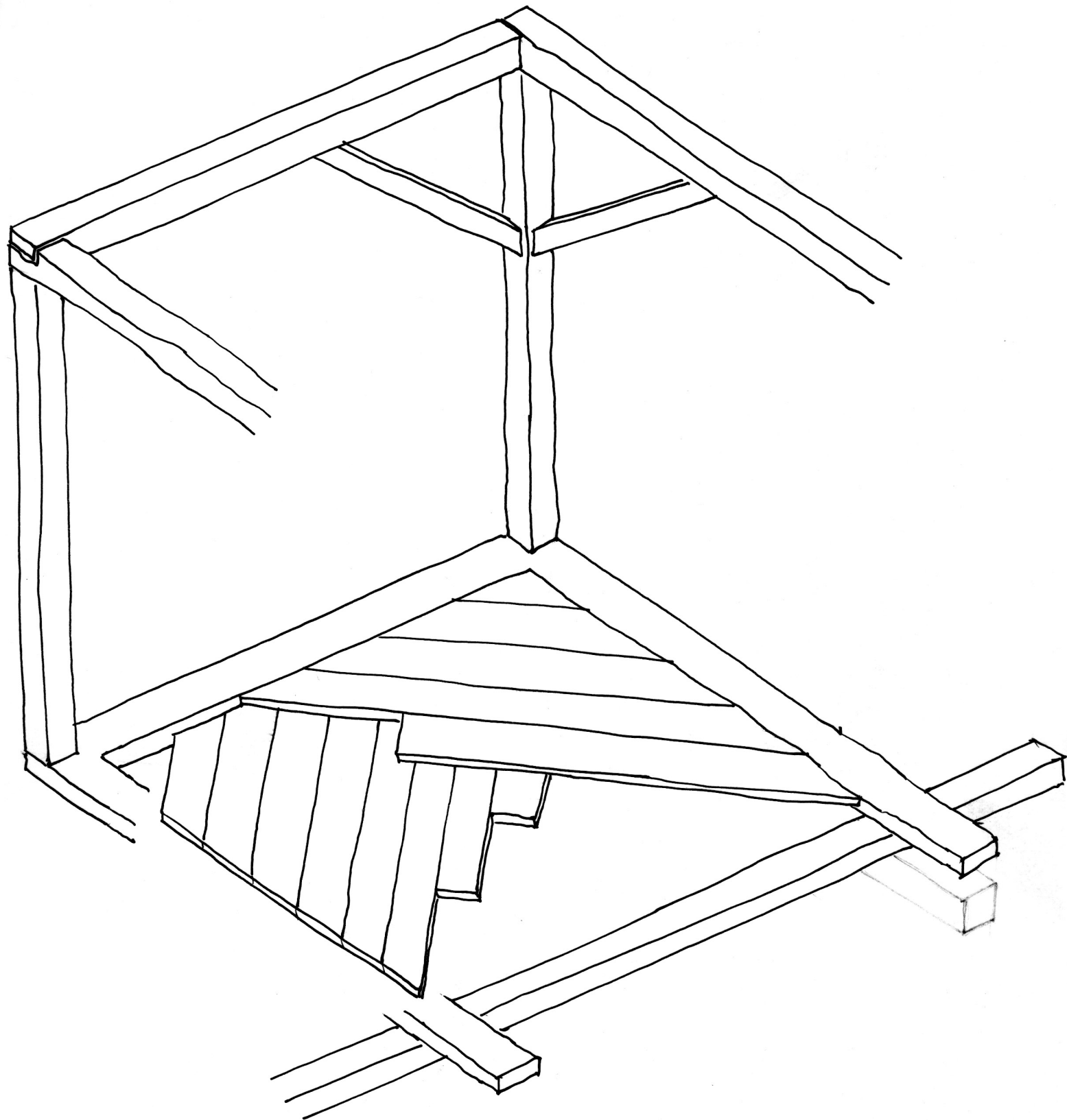
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PROJECT : templ1                                FILENAME: templ1
AUTHORITY: Manik Ratna Tuladhar                ENGINEER: Prayag Raj Joshi
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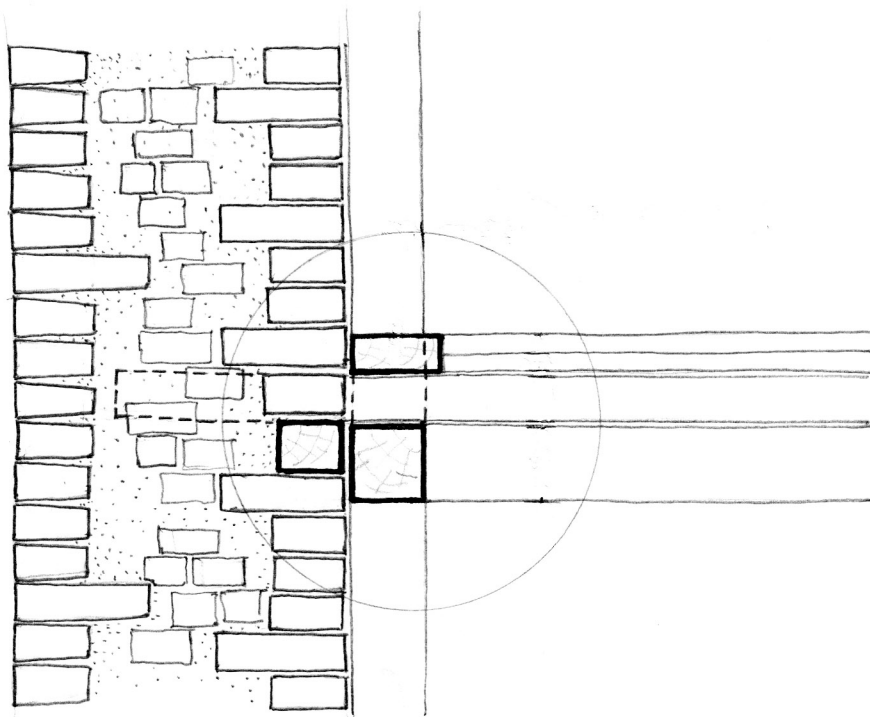
STRESS COMBINATION <2D-FRAME SYSTEM>

LOAD FACTOR : 1

ELEM	MA HINGE	SECTION (m)	AXIAL F. (kg)	SHEAR (kg)	MOMENT (kg-m)
13	2	0.00	-5.7612D+01	5.5595D+00	-4.6766D+00
		2.50	-5.7612D+01	5.5595D+00	9.2221D+00
14	2	0.00	1.6043D+02	-3.1111D+01	2.5824D+01
		2.50	1.6043D+02	-3.1111D+01	-5.1953D+01
15	2	0.00	-1.1713D+02	-7.9941D+01	9.4268D+01
		2.50	-1.1713D+02	-7.9941D+01	-1.0559D+02



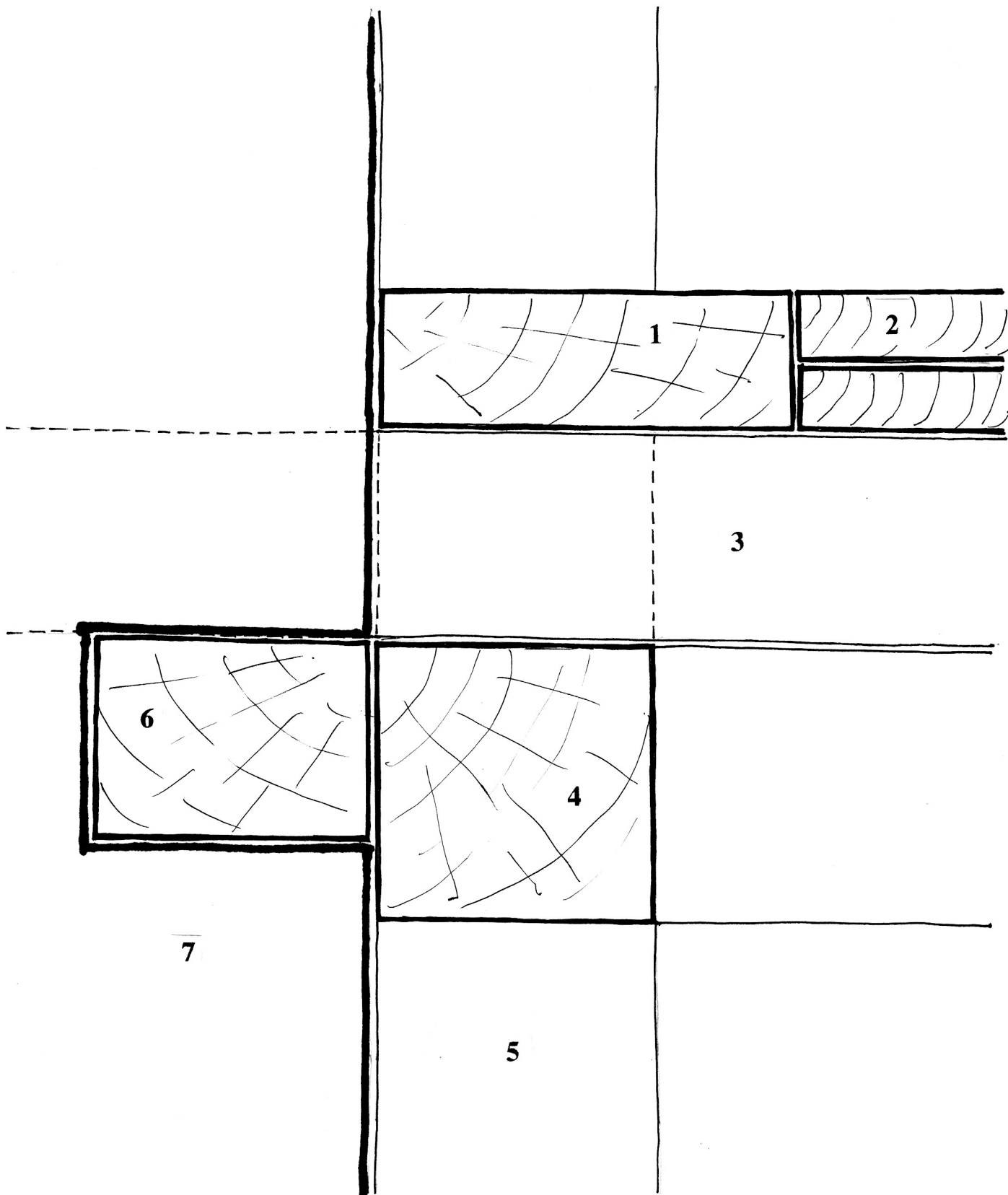
Axon showing new proposed timber structure; beams, posts, two layers of planking above existing joists with 2" X6" boarder around all corners

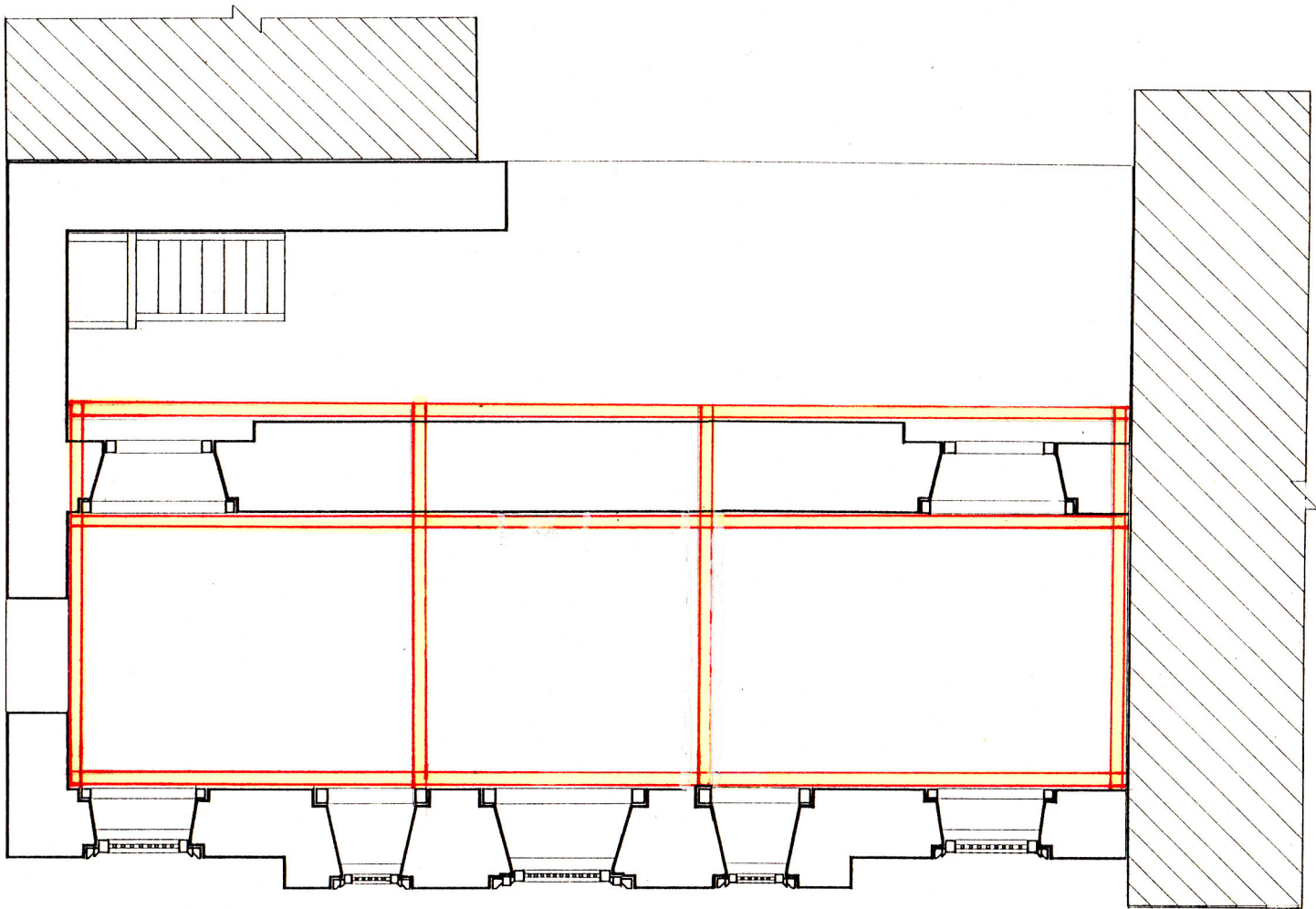


1. Timber boarder 2"X6"
2. Two layers of planking on diagonal (1" thick)
3. Existing joist
4. New sal wooden beam 4.5"X4.5"
5. New sal wooden post 4.5"X4.5"
6. Brick masonry showing inner and outer layers with rubble fill between

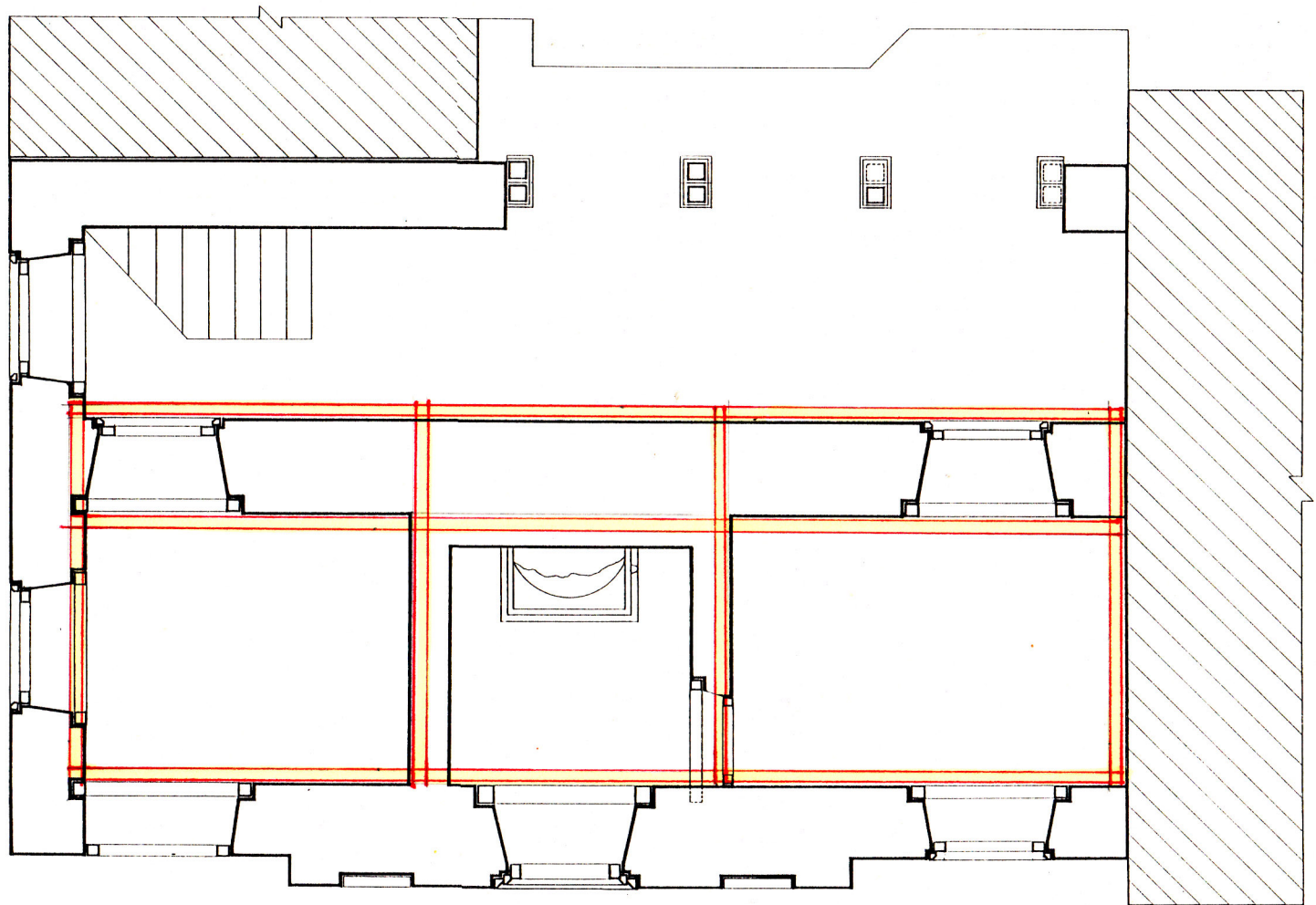
PATUKVA AGACHE :

New timber structure for seismic improvement

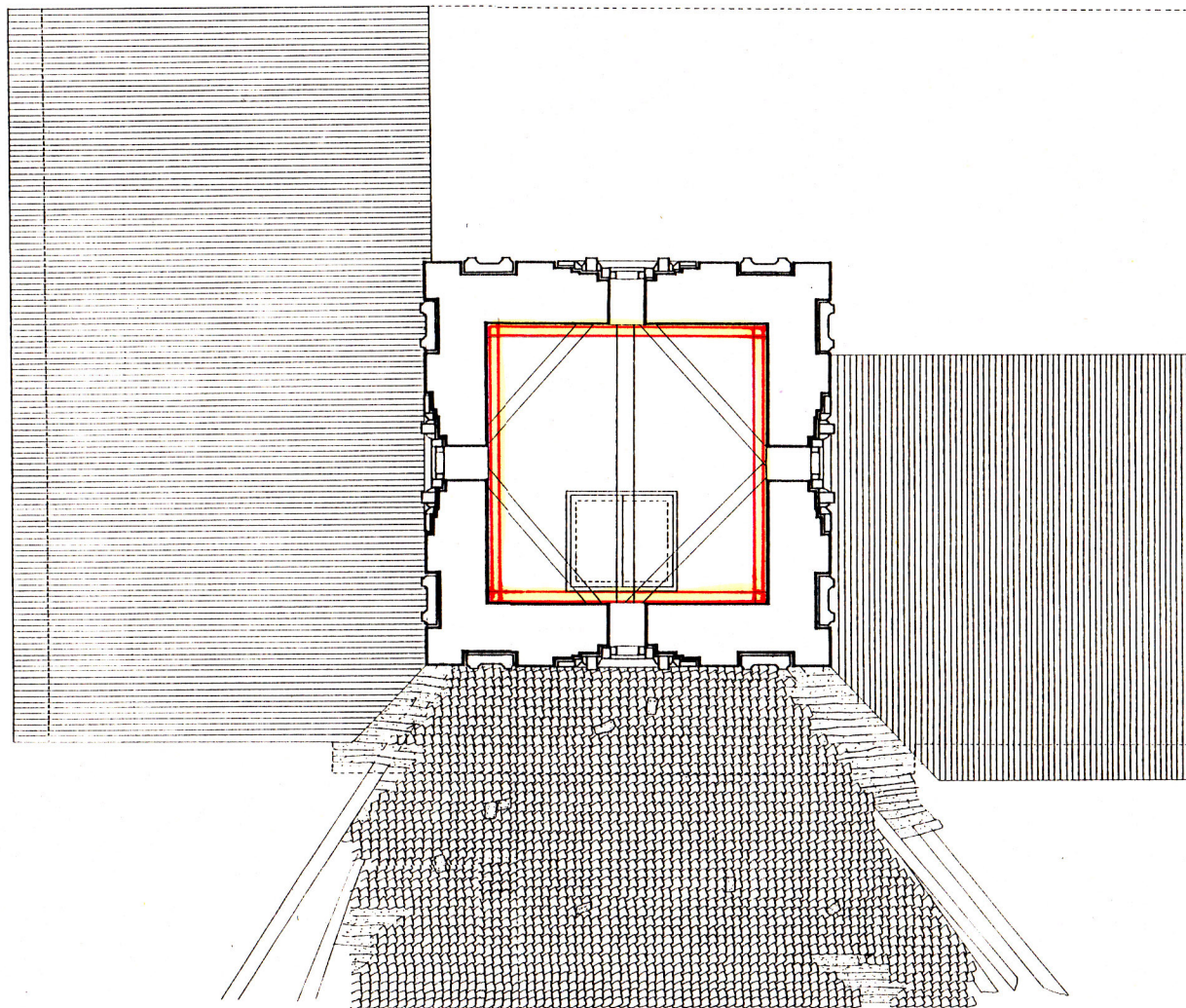




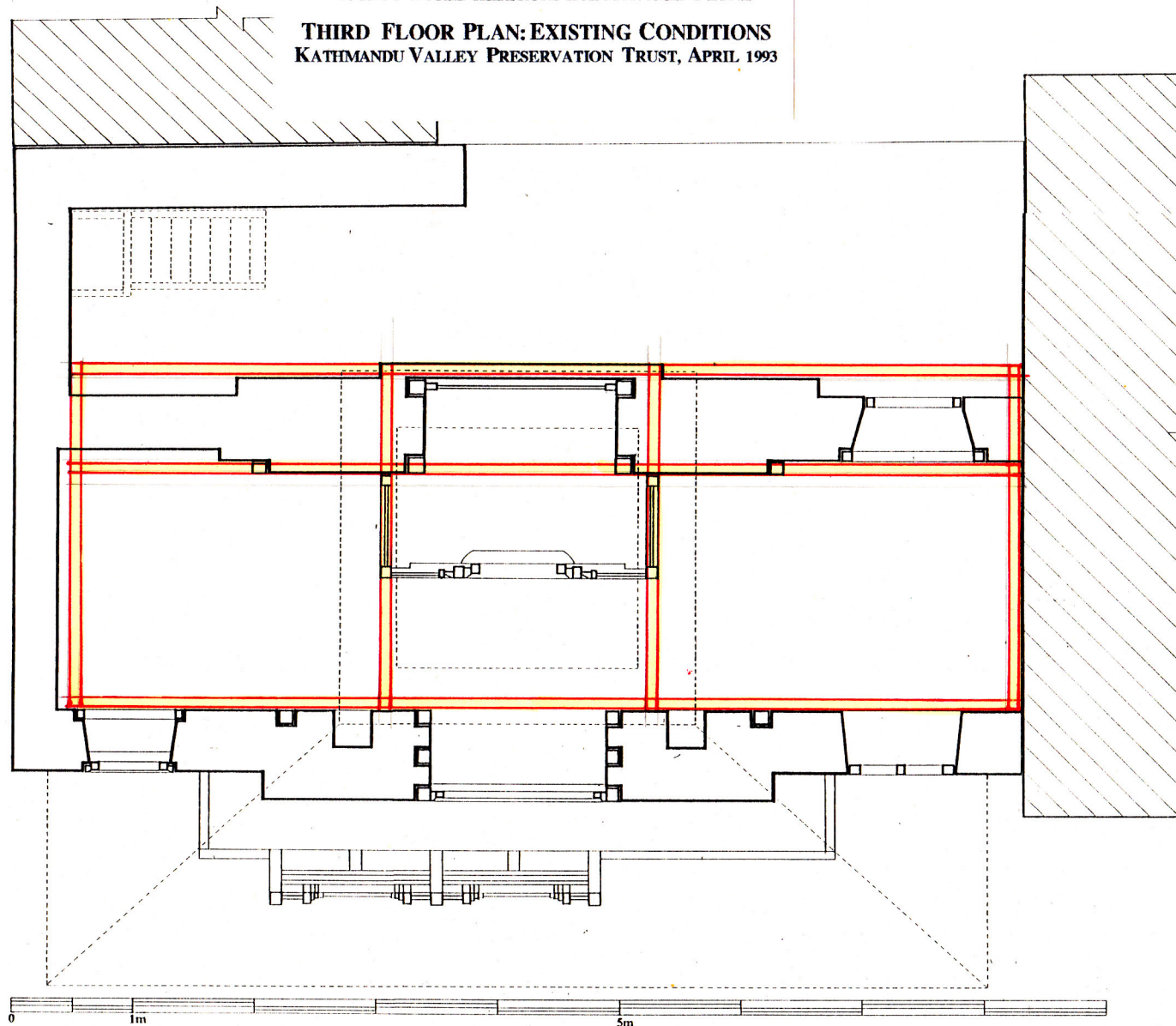
PATUKVA AGAM
 PATUKVA TOL, PATAN
 UNESCO WORLD HERITAGE SITE MONUMENT ZONE
FIRST FLOOR PLAN: EXISTING CONDITIONS
 KATHMANDU VALLEY PRESERVATION TRUST, APRIL 1993



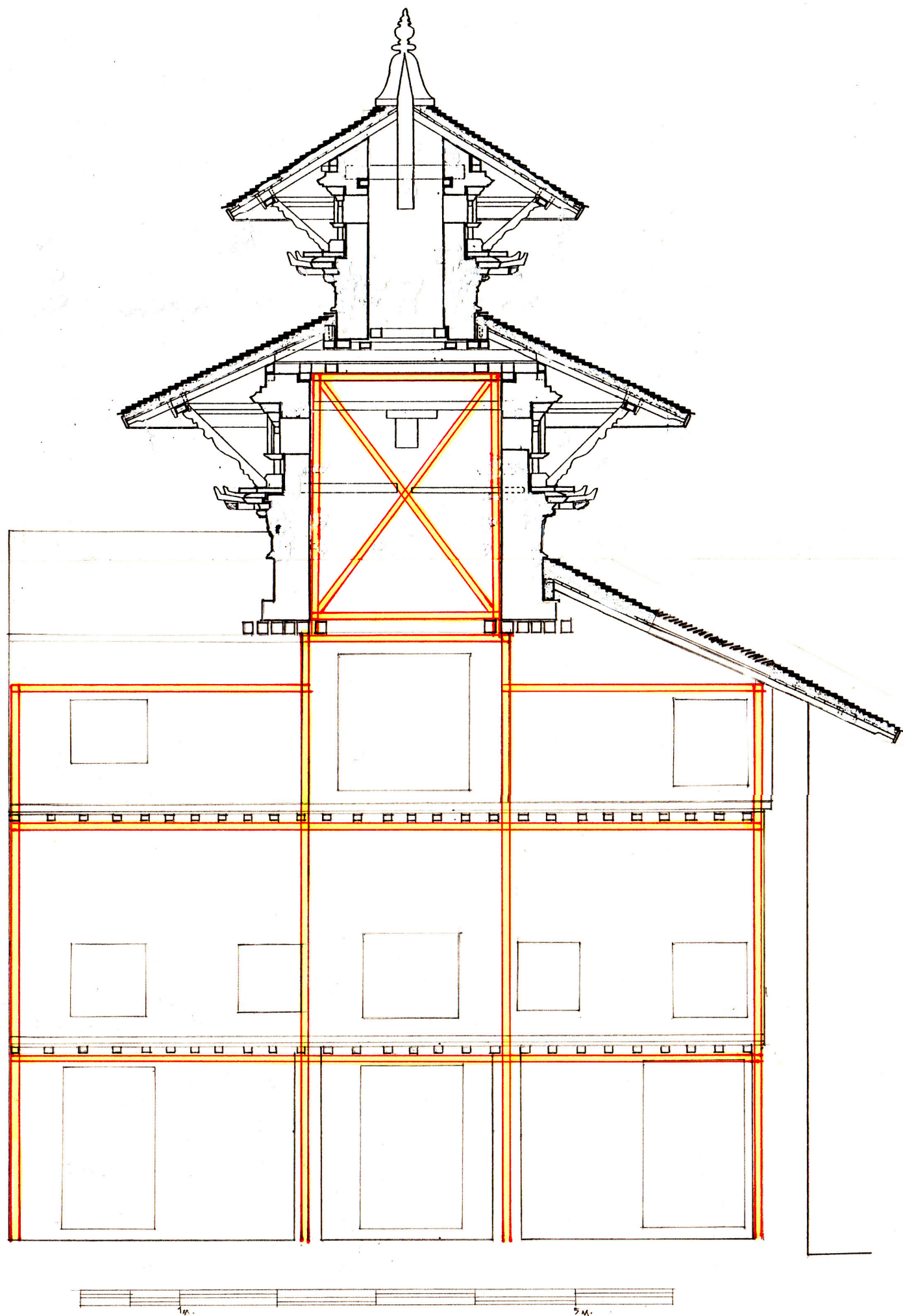
PATUKVA AGAM
 PATUKVA TOL, PATAN
 UNESCO WORLD HERITAGE SITE MONUMENT ZONE
GROUND FLOOR PLAN: EXISTING CONDITIONS
 KATHMANDU VALLEY PRESERVATION TRUST, APRIL 1993



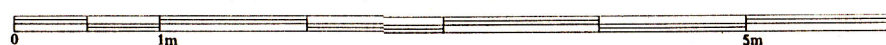
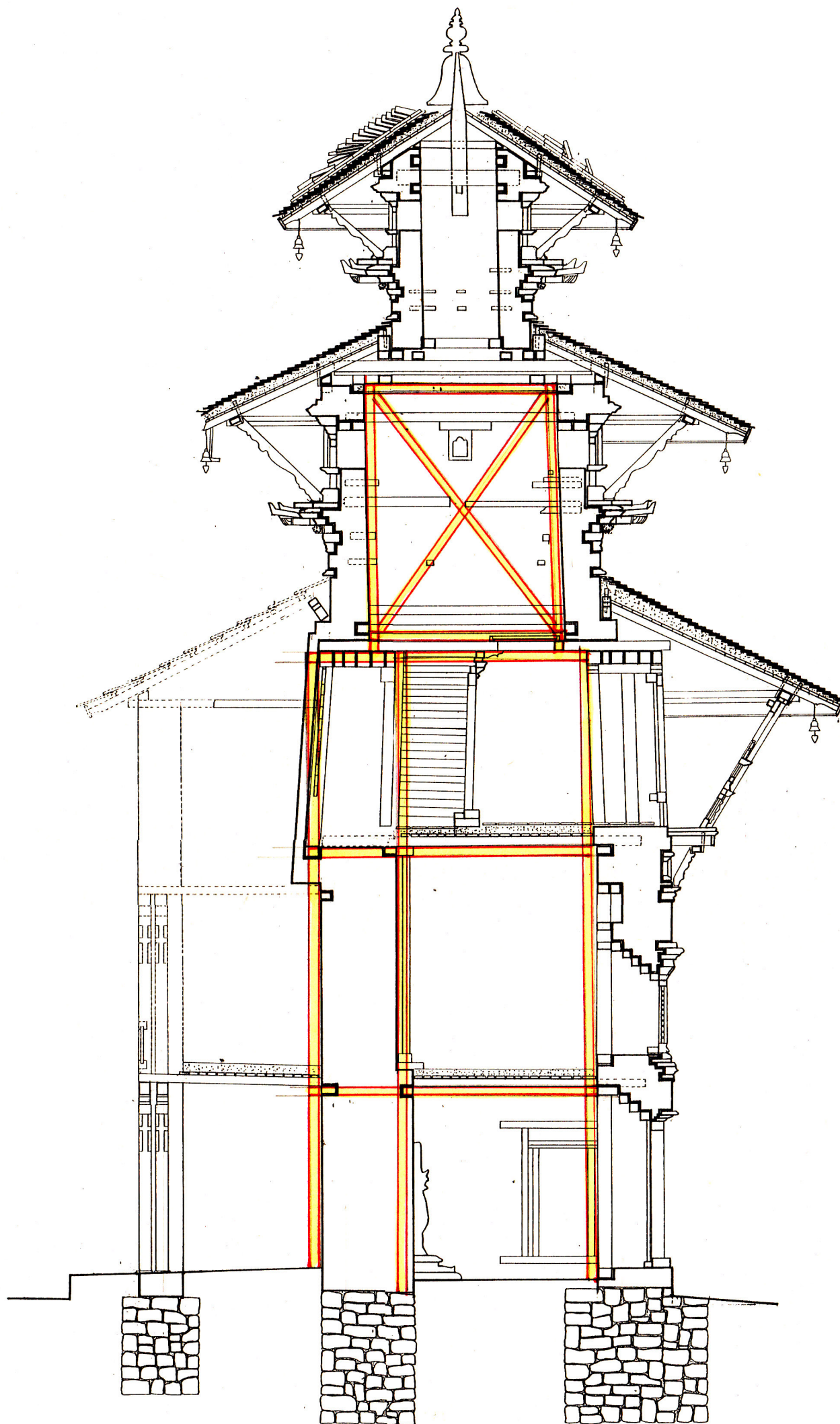
PATUKVA AGAM
 PATUKVA TOL, PATAN
 UNESCO WORLD HERITAGE SITE MONUMENT ZONE
THIRD FLOOR PLAN: EXISTING CONDITIONS
 KATHMANDU VALLEY PRESERVATION TRUST, APRIL 1993



PATUKVA AGAM
 PATUKVA TOL, PATAN
 UNESCO WORLD HERITAGE SITE MONUMENT ZONE
SECOND FLOOR PLAN: EXISTING CONDITIONS
 KATHMANDU VALLEY PRESERVATION TRUST, APRIL 1993



PATUKVA AGAM
 PATUKVA TOL, PATAN
 UNESCO WORLD HERITAGE SITE MONUMENT ZONE
 NORTH-SOUTH SECTION: EXISTING CONDITIONS
 KATHMANDU VALLEY PRESERVATION TRUST, APRIL 1993



PATUKVA AGAM
 PATUKVA TOL, PATAN
 UNESCO WORLD HERITAGE SITE MONUMENT ZONE
 WEST - EAST SECTION: EXISTING CONDITIONS
 KATHMANDU VALLEY PRESERVATION TRUST, APRIL 1993

APPENDIX C

STRUT INVENTORY

BOTTOM ROOF

STRUT: 101

ELEVATION: EAST

AGE: 19th century ?

MAIN FIGURE:

Ganesh (Male): with six hands.

PEDESTAL: Lotus + two rats

MUDRA: Crossed leg standing

CONDITION:

- Structural condition good
- Three hands are lost

BASE SCENE:

- copulating couple



BOTTOM ROOF

STRUT: 102

ELEVATION: EAST

AGE: 19 century ?

MAIN FIGURE:

Varaha (Male): with eight hands

PEDESTAL: Lotus + Unknown animal

MUDRA: Standing

CONDITION:

- Structural condition good
- All hands are lost

BASE SCENE:

- Copulating couple



BOTTOM ROOF
STRUT: 103
ELEVATION: EAST
AGE: 19th century ?

MAIN FIGURE:
Narasimha (Male): with eight hands

PEDESTAL: lotus

MUDRA: Demon killing with two hands

CONDITION:
- structural condition good
- Four hands are lost

BASE SCENE:
- copulating couple



BOTTOM ROOF
STRUT: 104
ELEVATION: EAST
AGE: 19th century

MAIN FIGURE:
Kumara (Male): with eight hands

PEDESTAL: lotus + Unknown animal

MUDRA: standing

CONDITION:
- structural condition good
- All hands are lost

BASE SCENE:
- copulating couple



BOTTOM ROOF

STRUT: 106

ELEVATION: SOUTH

AGE: 19th century ?

MAIN FIGURE:

Female figure with four hands

PEDESTAL: Burning corpse

MUDRA: standing

CONDITION:

- structural condition good
- All hands are lost
- Mildew problems on face, partially on chest and back dripping

BASE SCENE:

- Copulating couple



BOTTOM ROOF

STRUT: 107

ELEVATION: SOUTH

AGE: 19th century ?

MAIN FIGURE:

Female figure with four hands.

PEDESTAL: lotus and deer

MUDRA: standing

CONDITION:

- structural condition good
- All hands are lost

BASE SCENE:

- copulating couple



BOTTOM ROOF

STRUT: 108

ELEVATION: SOUTH

AGE: 19th century ?

MAIN FIGURE:

Female figure with four hands

PEDESTAL: Lotus

MUDRA: crossed leg standing

CONDITION:

- structural condition good
- Mildew problem on face and back dripping
- 1/4 Part of right side of strut damaged by wetrot.



BOTTOM ROOF

STRUT: 109

ELEVATION: SOUTH

AGE: 19th century

MAIN FIGURE:

Female figure with two hands and holding two children in two hands

PEDESTAL: Burning corpse

MUDRA: standing

CONDITION:

- structural condition excellent
- Mildew problem on face
-



BOTTOM ROOF
STRUT: 111
ELEVATION: WEST
AGE: 19th century ?

MAIN FIGURE:

Female figure with two hands,
holding naga and windu in two hands

PEDESTAL: Burning corpse

MUDRA: standing

CONDITION:

- structural condition excellent
- seasoning crack on main body



BOTTOM ROOF
STRUT: 112
ELEVATION: WEST
AGE: 19th century ?

MAIN FIGURE:

Female figure with two hands,
holding kapala and patra in two hands

PEDESTAL: Burning corpse

MUDRA: standing

CONDITION:

- structural condition good
- Moldow problem above head
app. 95. in.



BOTTOM ROOF

STRUT: 113

ELEVATION: WEST

AGE: 19th century ?

MAIN FIGURE:

Female figure with four hands, holding hammer, bajra, pasah and camara.

PEDESTAL: Lotus

MUDRA: standing

CONDITION:

- structural condition good
- wet rot damage on upper part of strut.



BOTTOM ROOF

STRUT: 114

ELEVATION: WEST

AGE: 19th century ?

MAIN FIGURE:

Byaghrini (Female) with four hands holding damaru, trident, vajra and patra (water jar)

PEDESTAL: Human figure, lotus on lion

MUDRA: standing

CONDITION:

- structural condition good



BOTTOM ROOF

STRUT: 116

ELEVATION: NORTH

AGE: 19th century ?

MAIN FIGURE:

Female figure with two hands,
holding vanada and jal (net)

PEDESTAL: Peacock

MUDRA: standing

CONDITION:

- structural condition good.



BOTTOM ROOF

STRUT: 117

ELEVATION: NORTH

AGE: 19th century ?

MAIN FIGURE:

Female figure with four hands,
holding stick and jal (net)

PEDESTAL: Burning corpse

MUDRA: standing

CONDITION:

- structural condition good.



BOTTOM ROOF

STRUT: 118

ELEVATION: NORTH

AGE: 19th century ?

MAIN FIGURE:

Narayana (Male): with four hands holding calra (discus), gada (mace), padma (seed) and Sankha (conch)

PEDESTAL: garuda.

MUDRA: standing

CONDITION:

- structural condition good
- Top 3" and 1/3 part of right side of strut is damaged due to wet rot.



BOTTOM ROOF

STRUT: 119

ELEVATION: NORTH

AGE: 19th century ?

MAIN FIGURE:

Female figure with four hands, holding varanga, trident, abhaya and kamandalu (water jar)

PEDESTAL: lotus and sheep

MUDRA: standing

CONDITION:

- structural condition is o.k.
- Top right side (2" X 6") damaged by wet rot.



BOTTOM ROOF

STRUT: 105, 110, 115, 120

ELEVATION:

AGE: 19th Century.

MAIN FIGURE:

Kusalaha. (corner horse)

PEDESTAL: -

MUDRA: -

CONDITION:

- All four corner horses are in excellent condition.



UPPER ROOF
STRUT: 201
ELEVATION: EAST
AGE:

MAIN FIGURE:
..... ? with four hands.

PEDESTAL: lotus.

MUDRA: standing

CONDITION:



UPPER ROOF
STRUT: 202
ELEVATION: EAST
AGE:

MAIN FIGURE:
..... ? with four hands

PEDESTAL: lotus

MUDRA: standing

CONDITION:

UPPER ROOF
STRUT: 204
ELEVATION: SOUTH
AGE:

MAIN FIGURE:

female figure with four hands
holding sword, mace, vajra
and.....?

PEDESTAL: Tiger

MUDRA:

CONDITION:



UPPER ROOF
STRUT: 205
ELEVATION: SOUTH
AGE:

MAIN FIGURE:

female figure with four hands,
holding mace (?), book, abhaya mudra
and vajra (?)

PEDESTAL:

MUDRA:

CONDITION:



UPPER ROOF
STRUT: 207
ELEVATION: WEST
AGE:

MAIN FIGURE:
*Sarasvati: with two hands
holding vina by both hands*

PEDESTAL: lotus

MUDRA: standing

CONDITION:



UPPER ROOF
STRUT: 208
ELEVATION: WEST
AGE:

MAIN FIGURE:
Female figure with four hands

PEDESTAL: lotus and horse

MUDRA: crossed leg standing

CONDITION:



UPPER ROOF
STRUT: 210
ELEVATION: NORTH
AGE:

MAIN FIGURE:

Female figure with two hands,
holding patra and camara (yak
tail)

PEDESTAL: lotus and kalasa.

MUDRA:

CONDITION:



UPPER ROOF
STRUT: 211
ELEVATION: NORTH
AGE:

MAIN FIGURE:

Female figure with two hands,
holding jewel, flower, stick and
patra.

PEDESTAL: lotus

MUDRA:

CONDITION:



UPPER ROOF

STRUT: 203, 206, 209, 212

ELEVATION:

AGE:

MAIN FIGURE:

Kusalah (Corner horse)

PEDESTAL:

MUDRA:

CONDITION:



APPENDIX D
THE RAJOPADHYA OF PATAN

The Rajopadhyayas of Patan

Notes by Nutan Sharm after field work in March 1993.

The Rajopadhyayas of Patan

All Rajopadhyayas who are originally from Patan have Garga Gotra. The Gotra refers to the great saintly sage from whom the descent is spread over.

According to Mahabharata, Garga was the priest during the naming ceremony of Lord Krsna, when Krsna was born. "Krsna" this name was given by Garga Rshi.

These Rajopadhyayas are divided into six clans and closely associated with Agnimatha at Thabul. During the fire sacrificial ceremony at Agnimatha each representative of the four clans of them have to recite each of the four Vedas, and two have to act as the priest and the client. But as Sundhara clan became legitimately issueless, the ritual participation has slightly changed.

The Patukva Kavah is considered as a branch of Bakanimha clan. Once this Patukva Kavah became issueless. So the issueless Brahmin adopted a boy who has Bharadvaja Gotra (who was originally connected with Bhaktapur). Since Vratibandha initiation of the boy was already made, the Gotra was not possible to change. So Patukva Kavah has Bharadvaja Gotra. The Rajopadhyaya family who is residing near Yanamula is also shifted from Bhaktapur to stay there. They have also Bharadvaja Gotra. (The Gotra of the Rajopadhyaya of Kathmandu is Kausika.)

APPENDIX E
FUNDING PROPOSAL, AUGUST, 1993

Contents

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Training goals	page 5
Implementation schedule.....	page 6
Construction costs.....	page 7
Local project costs.....	page 9
Total project expenses.....	page 10
Existing conditions and proposed restoration works.....	page 11
Documentation drawings.....	page 16

Introduction

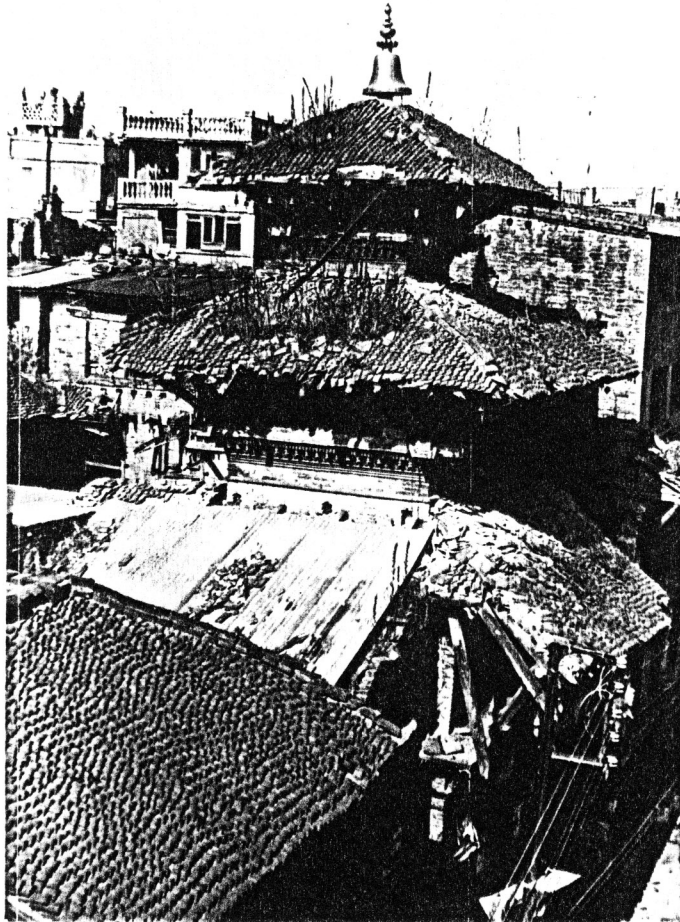
The Kathmandu Valley Preservation Trust, in cooperation with His Majesty's Government Department of Archaeology, proposes to restore the Patukva Agache, a fine 17th century religious structure, in the Patan Darbar World Heritage Site Monument Zone. Following a survey of the monuments in and adjacent to the Patan World Heritage Site, in consultation with the Department of Archaeology and the Patan Conservation and Development Program, the Trust has determined this historical structure to be the most threatened monument of significant historical and artistic value in the area and one whose repair and restoration budget corresponds to the ODA funding limits.

The entire structure of the five storey building is either damaged or endangered: lower portions of the central and rear bearing walls of the structure have deteriorated to make the collapse of the upper stories imminent. The late 17th century religious building is of the highest artistic and historical value: despite structural problems, it retains virtually all of its historical detail and has been little changed over the centuries. It most notably retains all but two of its original woodcarvings--windows, doors and struts--on the principal facade and upper stories, fine examples of the artistic achievements of the Malla period (1400-1780).

This Hindu *agache* (Newari: house *che* of the esoteric shrine *agam*) represents a building type unique to Nepal: a religious building composed of a pagoda type temple, in this case two-tiered, perched atop a three storey base structure, whose form resembles a local residential building. Both Buddhist and Hindu *agache* are found in the Kathmandu Valley, yet it is only among the Hindu *agache* that one finds this intriguing composite structure. The Patkva Agache project will be the first internationally aided restoration of a Hindu *agache* in Nepal and will provide the opportunity to gather long overdue research on this building type. Several such historical structures in Patan alone have disappeared in the last decade.

The *agache* houses shrines and gathering spaces on several levels for use by the religious organization (*guthi*) comprised of some 40 neighboring families. The five storey building, sited on the corner of two small lanes just west of the Darbar Square, defines to its rear one side of a residential courtyard belonging to members of the *guthi*.. Negotiations with the *guthi* have demonstrated their support for the project and willingness to contribute funds and services to the restoration project.

The Kathmandu Valley Preservation Trust has developed expertise and trained local professionals in the restoration of monuments of similar size, age, and construction techniques through work on the nearby Uma Maheswar and Radha Krishna temples in cooperation with the Department of Archaeology. Both of these projects will be completed in the next two months.



Patukva Agache

Spring 1992. View from southeast showing the rebuilt south facade and metal roof over the southern portion of the building.

Project justification

In 1989 the Working Group for the UNESCO Campaign to Safeguard the Cultural Heritage of the Kathmandu Valley identified Patan Darbar as first priority for preservation and restoration efforts among the Valley's seven World Heritage Sites. Patan is a city on the edge, a city whose rich artistic and architectural heritage is threatened daily by the pressures of development and the rapidly deteriorating condition of its monuments. The restoration of Patukva Agam will enhance and be complemented by nearby restoration projects currently in progress including Biswanath Temple, Keshav Narayan Chowk, and Ibaha Bahi implemented in cooperation with UNESCO, the Austrian Government, and the Japanese Nippon Institute of Technology, respectively.

These projects in combination with the ongoing German-aided Patan Conservation and Development Programme and the restoration projects (implemented by the Kathmandu Valley Preservation Trust) of nearby Uma Maheswar and Radha Krishna temples, funded by the British Ambassador's Small Projects Scheme and the Canada Fund, respectively, will focus local and international attention on the urgency of preservation efforts in Patan.

Moreover, as the Patan Conservation and Development Programme has identified, there exists a tremendous gap in the provisions for maintenance, protection, and restoration of monuments which fall under the semi-private ownership of religious trusts (*guthis*). With the degeneration of the historical *guthi* system in the last decades, scores of significant monuments have become threatened as they do not come under the direct jurisdiction of the national agency responsible for conservation of monuments, His Majesty's Government Department of Archaeology. The Department of Archaeology in cooperation with the Patan Conservation and Development Programme, has proposed to designate many of these buildings "National Monuments" and to establish the legal framework to monitor and provide technical and financial support for their maintenance. This proposal naturally includes the fine Patukva Agache. International financial assistance for the restoration of such a monument would therefore establish a critical and necessary precedent for the preservation of the semi-private architectural heritage of Nepal.

Technically, the Patukva Agache lies within the Patan Darbar World Heritage Site Monument Zone, but as the Patan Programme has discovered, the UNESCO delineation of the Monument Zone has been misinterpreted, meriting immediate attention. The gazetted legal boundary, according to His Majesty's Government Ancient Monuments Act, follows the centerlines of streets in the vicinity of the Darbar Square yet includes "all adjacent

buildings". In practice, however, only those buildings closest to the Darbar Square, i.e. on one side of the street, have been monitored. Thus, the restoration of the Patukva Agache, which lies on the side of the street away from the Darbar Square, will help to cement the legal boundary of the World Heritage Site.

Lastly, a monument has been chosen which will allow the Overseas Development Administration funding to mobilize additional contributions. The Trust has recently proven its ability to rally local support for conservation, having raised some U.S. \$10,000 through a local benefit for small-scale emergency repairs to monuments. (From this money protective tarpaulins were supplied to the Patukva Agache in June to prevent additional water damage to the timber structure during monsoon rains.) Moreover, the Trust has raised money internationally to allow completion of the Radha Krishna temple restoration project, whose principal funding by the Canadian government necessitated additional fundraising. The funds necessary to allow project completion of the Patukva Agache, that is, in addition to the O.D.A. contribution, will thus be secured by the Trust from local and international contributors. The Patukva Agache guthi and the Patan Conservation and Development Programme have agreed to contribute in preliminary discussions.

Training goals

The Kathmandu Valley Preservation Trust is committed to the training of local specialists and artisans in both the public and private sectors to preserve Nepal's architectural heritage. Although the Trust works in close cooperation with the Department of Archaeology, in these early years work on small-scale emergency projects has been most effectively executed on a turn-key basis, with training efforts focused on private sector professionals. Such private sector professionals are a frequently overlooked, yet key resource for conservation efforts in a country where government bureaucracy is often inefficient or unpredictable. Thus, while longterm training efforts address the technical and manpower needs of the Department of Archaeology, immediate efforts focus on a team of private sector Nepalese including architects, structural engineers, and draftsmen. This team has been involved at all levels of planning and implementation of projects working closely with the Trust's project officer and conservation architect. Moreover, critical training of and financial support to local traditional artisans--carpenters, woodcarvers, masons, blacksmiths and tile-layers-- is involved in all projects undertaken by the Trust. The Patukva Agache restoration project will continue such efforts.

In addition, during the restoration project on-site training seminars addressing locally relevant technical issues such as the seismic consolidation of historical structures, methods of timber reconsolidation, and restoration project management will be offered to the staff of the Department of Archaeology and local professionals.

Implementation schedule

Fall 1992

Preparation of the historic structures report .

Design and implementation of fund-raising campaign

Spring-Fall 1993

The construction falls logically into two phases: the critical repair, rebuilding, and consolidation of the lower three storeys, executed March 1993-November 1993, will allow construction of upper-level scaffolding for execution of the less urgent work on the pagoda superstructure in a subsequent period .

Fall 1993-Spring 1994

Restoration of pagoda superstructure November 1993 - June 1994.

June 1994

Completion of project. Preparation of project report.

Construction costs

<u>Description</u>	<u>Cost of materials and labor</u>
(Refer attached quantities estimate)	(NRps.)
1. Dismantling of damaged structure and temporary shoring up L.S.	35,000
2. Site clearance (project duration)	55,000
3. Scaffolding	138,000
4. Masonry reconstruction (Quantities item 1) 3,000 cu.ft.@ 55 NRp/cu.ft.	165,000
5. Allowance for structural improvement of foundation	75,000
6. Insertion of dampproofing course in existing walls (Quantities item 5)	61,000
7. Facade veneer brick (Quantities item 4) 180 sq ft @ 90 NRp/sq ft	16,200
8. Plinth stone pavement (Quantities item 2) 20 cu.ft.@ 350 NRp/ cu.ft.	7,000
9. Structural timber reconstruction (Quantities item 8) 413 cu.ft.@ 1300 NRp./cu.ft.	536,900
10. Roof planking (Quantities item 9) 1832 sq.ft.@ 85 NRp./sq.ft.	155,720
11. Roofing tarfelt (Quantities item 9) 1832 sq.ft.@ 45 NRp./sq.ft.	82,440
12. Roof tile, mud, and battens (Quantities item 9) 1832 sq.ft. @ 35 NRp/sq.ft.	64,120
13. Anti-vegetal treatment of roof mud	38,000
14. Roof ridge tile 120 lin.ft.@ 100 NRp./lin.ft.	12,000
15. Aviary roof corner tiles 12 pieces @ 200 NRp.	2,400
16. Exterior doors and windows (Quantities item 12)	173,300
17. Structural consolidation (Quantities items 6,7)	350,000
18. Interior floor planking (Quantities item 11) 955 sq.ft.@ 85 NRp./sq.ft.	81,175
19. Interior telia tile paving (Quantities item 11) 955 sq.ft.@ 30 NRp./sq.ft.	28,650

Construction costs (continued)

<u>Description</u>	<u>Cost of materials and labor</u> (NRps.)
20. Interior doors and fittings (Quantities item 10)	55,000
21. Electrical wiring	30,000
22. Toilet/bath	10,000
23. Replacement of eave bells 85 pieces @ 250 NRp.	21,250
24. Cleaning/repointing of facade	25,000
25. Cleaning/repair of timber facade elements	30,000
26. Preservative/chemical treatment of woodcarvings	<u>50,000</u>
Construction subtotal	2,300,155
15% contingency for restoration work	345,000
12% allowance for inflation	<u>276,000</u>
Total construction costs	2,921,155

Local project costs

<u>Description</u>	<u>Cost (NRps.)</u>
<u>Miscellaneous</u>	
Allowance for temporary relocation/insulation of high tension electrical lines to allow construction	75,000
<u>Local technical support</u>	
Consulting engineer	35,000
Site architects 16 months @ 10,000/mo	160,000
Draftsmen	48,000
Conservation consultant	25,000
<u>Administrative costs</u>	
Bookkeeper 16 months @ 3,000/mo	48,000
Office assistant	24,000
<u>Documentation</u>	
Photographic survey	35,000
Photocopy, blueprints	20,000
<u>Office expenses</u>	
Transportation	12,000
Rent and utilities: site office	32,000
Stationery	10,000
Office equipment	<u>25,000</u>
Total local project expenses	539,000

Total project expenses

Total local project expenses (from previous page)	539,000
Total construction costs (from previous page)	<u>2,921,155</u>
Total local costs	3,460,155 NRp
Coordination by Kathmandu Valley Preservation Trust including provision of international architectural restoration and structural design foreign experts @ 22% of local costs	<u>762,000</u> NRp*
Total	4,222,155 NRp

* payable in convertible currency



Patukva Agache

Rear (west elevation) spring 1992

The photograph shows the courtyard facade several months before its collapse.

Existing conditions and proposal for repair and restoration

1.0 Masonry structure

Existing conditions

The most dramatic damage to the structure consists of the collapse of the middle and rear bearing masonry walls of the lower structure, the bottom three storeys. As is the case with all historical buildings in Nepal, the roof cover proves the Achille's heel of traditional construction technology. It appears the tile and mud roof cover above these walls, the west side of the bottom roof, deteriorated seven years ago, and in this short time, precipitated the deterioration and subsequent collapse of the timber roof structure and masonry walls below. The upper temple-like two floors of the building thus perch on a beam supported by the remnants of these walls.

The masonry construction consists of an interior bearing wall of common brick, an intermediate fill, and an outer veneer brick. The masonry walls of the principal facade and the entire two storey superstructure are in good condition. One diagonal crack in the principal facade is the only visible defect in addition to spalling of the lower courses of brick (approximately 5' high), caused by the traditional lack of dampproofing. Both the principal facade and the superstructure otherwise retain all of the historical veneer brick, *dachi apa*, in excellent condition.

The south facade of the building was rebuilt 14 years ago in common brick laid in mud. No structural defects are visible, but the quality of workmanship is poor.

The foundations of the building are of typical unhewn stone laid in mud: the foundation is visible on the principle facade where the plinth has been removed. There are no signs of major settlement of the building. The building was not damaged in the great earthquake of 1934 according to *guthi* elders.

Repair and restoration

After shoring up of the structure to allow access to the building, complete photographic and measured visual and structural surveys of the building will be undertaken. Review of the structure by an internationally recognized seismic engineer will determine how reconstructed portions of the masonry structure can incorporate appropriate seismic reinforcement as well as how historically intact portions of the building can be strengthened.

The collapse walls will be rebuilt in historical materials and details with concealed seismic and dampproofing provisions. A dampproof course will be inserted in all extant walls.

Further investigation of the structural integrity of the 14 year old south facade will determine if it should be rebuilt.

2.0 Timber roof structure

Existing conditions

The three remaining roofs may perhaps be described as what the collapsed portion of the roof looked like at the beginning of its cycle of deterioration. Many small holes in the tile and mud cover have introduced wet rot to portions of the timber structure below, particularly at the ends of the rafters, many of which have broken off. The timber roof structure consists primarily of a local species of yellow pine which deteriorates very rapidly when unprotected from moisture. Work on similar projects has demonstrated that the extent of damage to the timber roof structure can only be determined when the planking, mud, and tile cover above have been removed. For purposes of cost estimation provision of all new timbers has been calculated as careful reconsolidation of the historical timbers (which will be reused to the greatest possible extent) is comparable in cost to new construction.

Repair and restoration

A survey of each individual timber component will determine which pieces can be re-used and how they must be consolidated and preserved. According to international standards the greatest possible amount of original building materials will be reused. Where new timbers are necessary, historically appropriate and extremely durable sal timber (*shorea robusta*) will be used.

3.0 Interior timber structure

Existing conditions

The interior timber structure cannot be examined at present as the entire building has been sealed off for safety reasons.

Repair and restoration

As the building is still used for the same purpose for which it was built some 300 years ago, the interior configuration and finishes will be maintained.

4.0 Roof cover

Existing conditions

The west portion of the bottom roof has collapsed.

The planking of the roof cover appears to be in very poor condition due to wet rot. The roof tiles are unbroken on the three remaining roofs, although many have been displaced by vegetal growth.

The south side of the bottom roof has been replaced with zinc sheets.

Repair and restoration

The introduction of two layers of tar felt sandwiched between layers of bitumen has proven a successful modification of the traditional construction methods to greatly increase the life of the tile and mud roofs. All intact roofs will be repaired and rebuilt in situ to assure maintenance of the historical form.

5.0 Timber openings

Existing conditions

Principal three storey facade:

One of three bays of the focal bay window (*san jhya*) on the second floor of the principal facade has been dismantled after collapse of the roof structure above. The dismantled components are in storage. 50% of these components were severely damaged by wet rot from water damage before dismantling. All components have been cleaned and stored by the guthi with technical assistance from the Kathmandu Valley Preservation Trust.

One ground floor door frame and one upper storey window have been replaced with inappropriate new elements. Otherwise the historical configuration of timber openings is intact and in fair condition. The northern ground floor door frame has been skewed some five inches from the vertical by wall movement, most likely the result of seismic activity. The latticed panels of the entry door blades have been broken and partly removed.

South facade:

This facade rebuilt fourteen years ago provides only a single door opening of historical appearance in good condition. An additional lintel at door height remains with no opening beneath.

Rear facade:

Only the timber arcade of the rear facade has survived the collapse of this wall, although buried beneath rubble it appears to be in poor condition.

Superstructure:

All of the window and niche openings of the superstructure are intact and in excellent condition.

Repair and restoration

Principal facade:

The openings of the principal facade will be restored to their historical appearance including (a) the repair, reconsolidation, and replacement of missing parts of the carved bay window by local woodcarvers and (b) the replacement of one unoriginal door and one window with elements reproducing historical detail.

South facade:

Further research will determine the historical configuration of the south facade.

Rear facade:

The historical openings will be rebuilt according to their historical appearance incorporating any re-usable components.

6.0 Roof struts

Existing conditions

Principal three storey facade:

The four historical struts have been lost.

South facade:

All struts were lost in this fourteen year old reconstruction.

Rear facade:

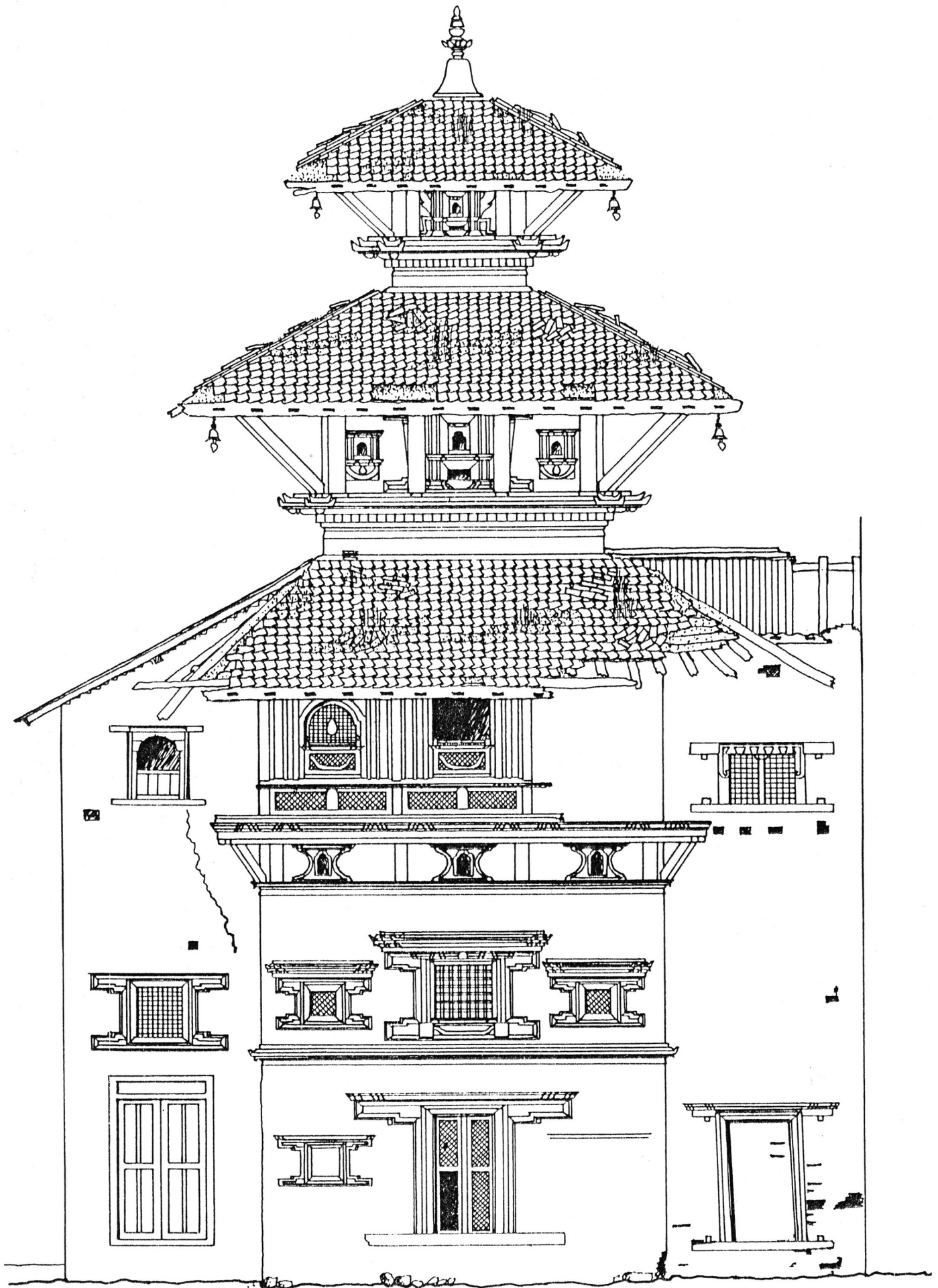
No struts in original configuration.

Superstructure:

All 28 struts are intact and in excellent condition. They depict tantric mothergoddesses (*Astramatrika*). The gilt pinnacle is intact and in excellent condition. About 50% of the historical bronze bells remain hung on the rafter ends.

Repair and restoration

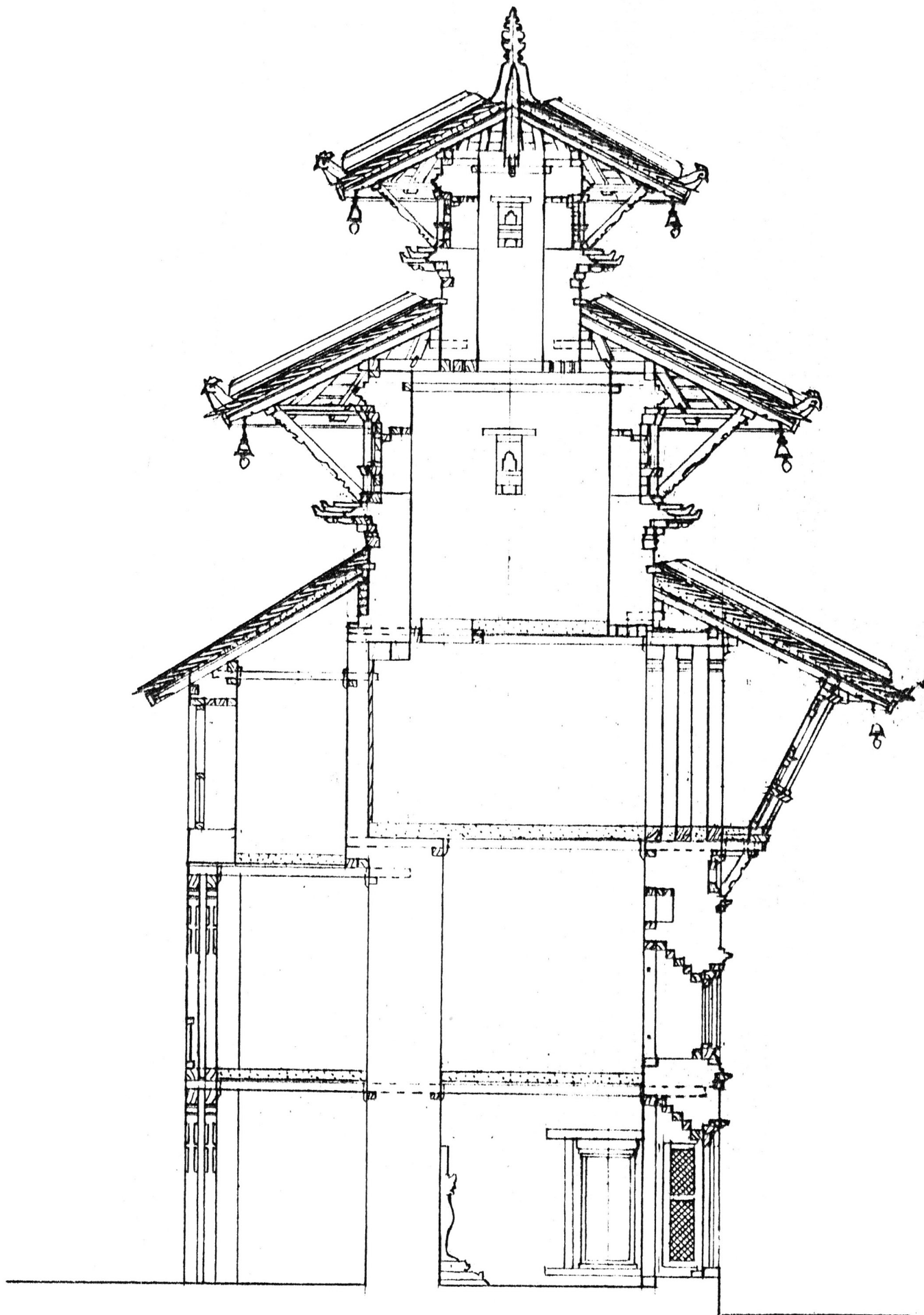
Principal and south facade struts will be replaced with plain timbers as their historical appearance is indeterminate. The struts of the superstructure will be carefully cleaned, and treated with wood preservative.



Patukva Agache (1690)

Principal elevation, existing conditions: scale 1:50

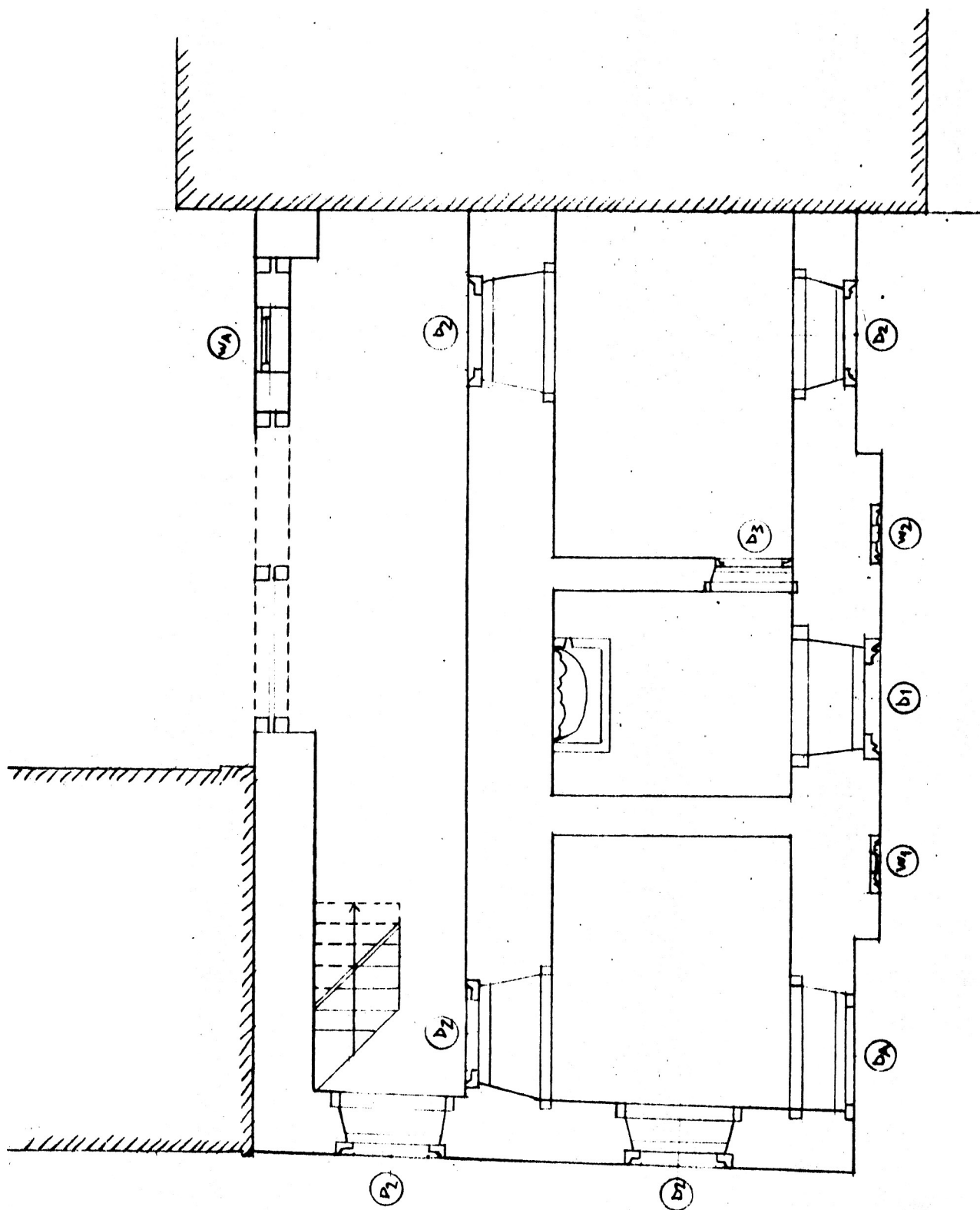
drawing by Gyanendra Joshi, courtesy of Patan Conservation and Development Programme



Patukya Agache (1690)

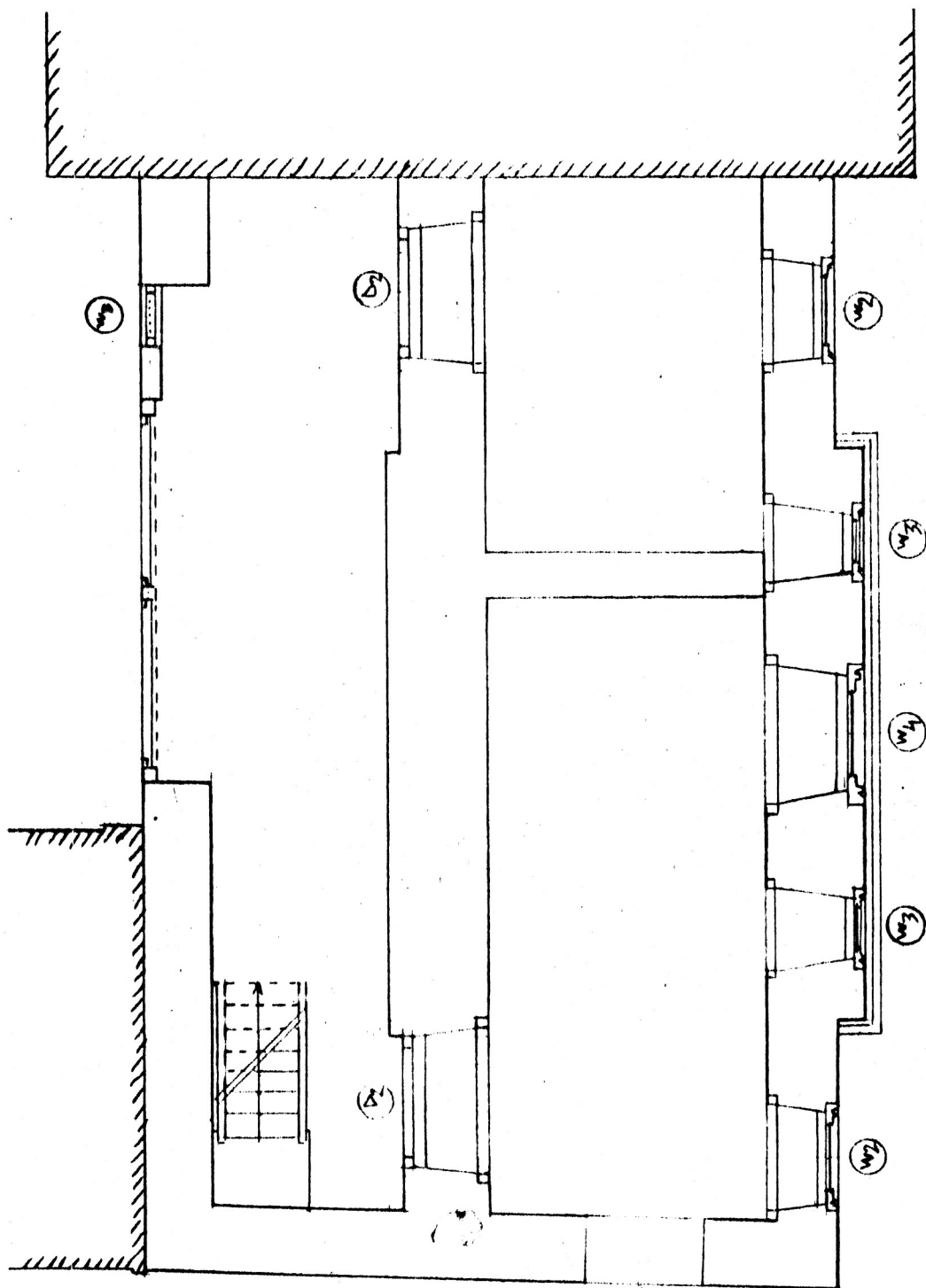
Historical east-west section: scale 1:50

drawing by Gyanendra Joshi, courtesy of Patan Conservation and Development Programme



Patukva Agache (1690)
Ground floor plan: scale 1:50

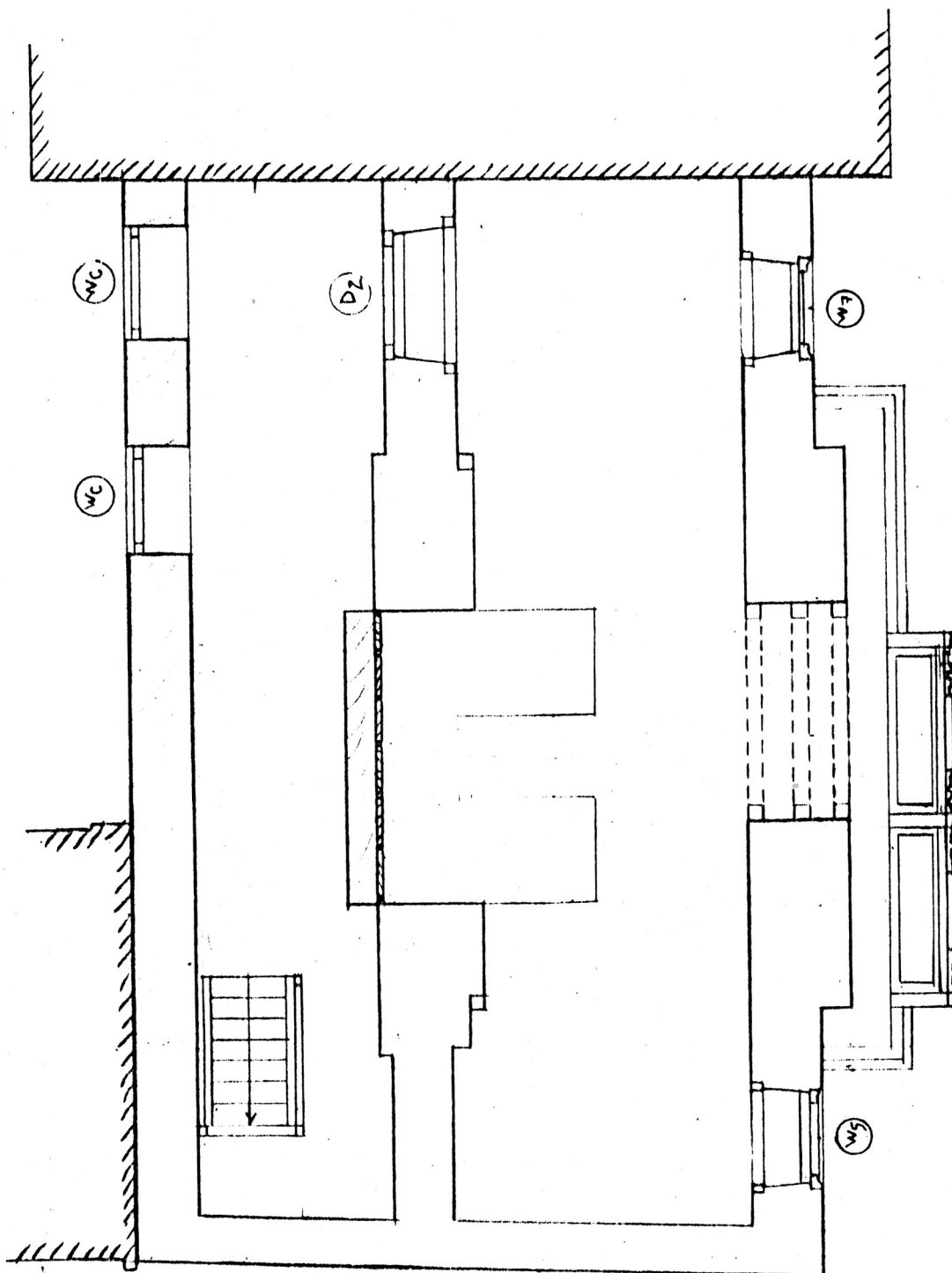
drawing by Gyanendra Joshi, courtesy of Patan Conservation and Development Programme



Patukva Agache (1690)

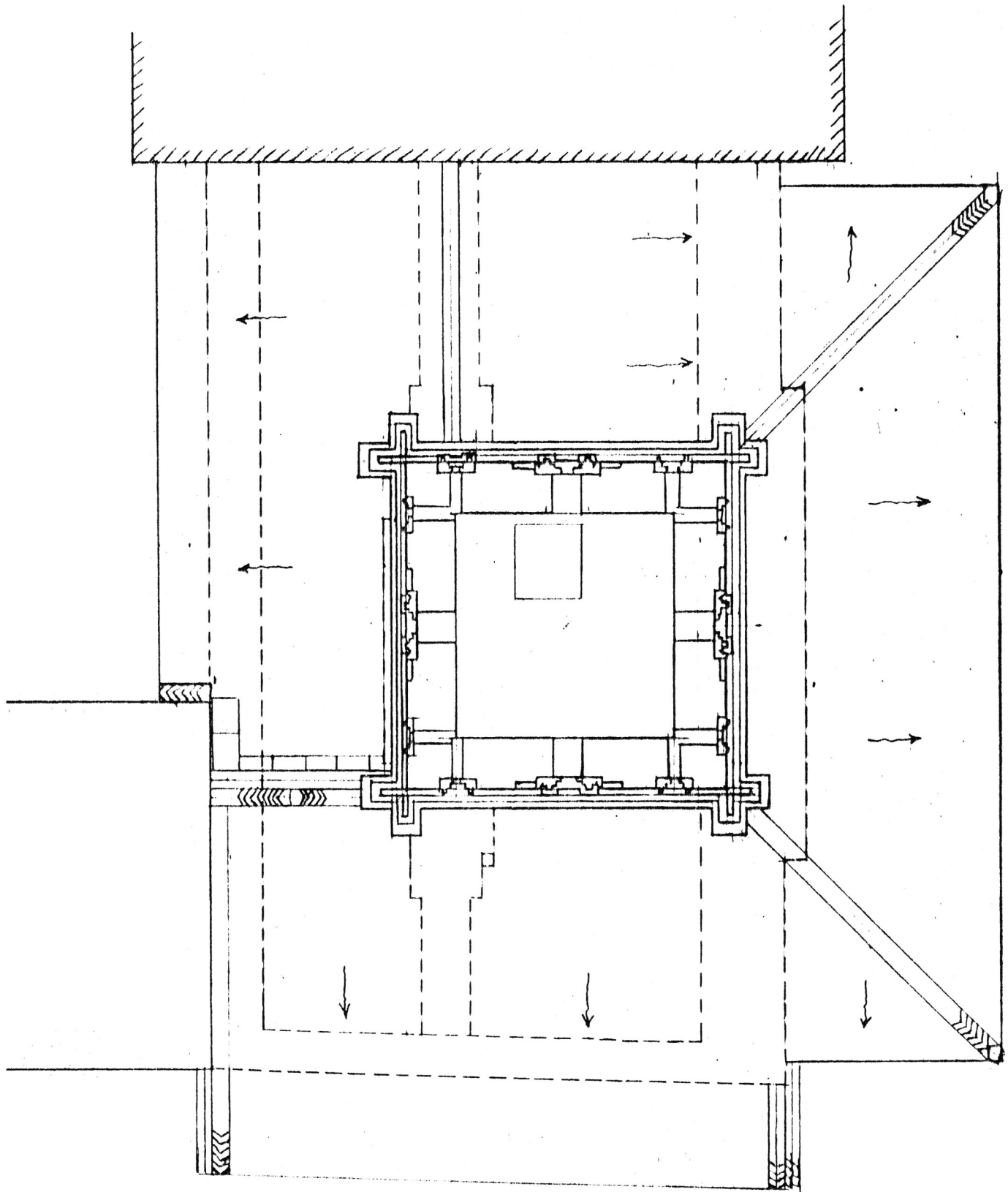
First floor plan: scale 1:50

drawing by Gyanendra Joshi, courtesy of Patan Conservation and Development Programme



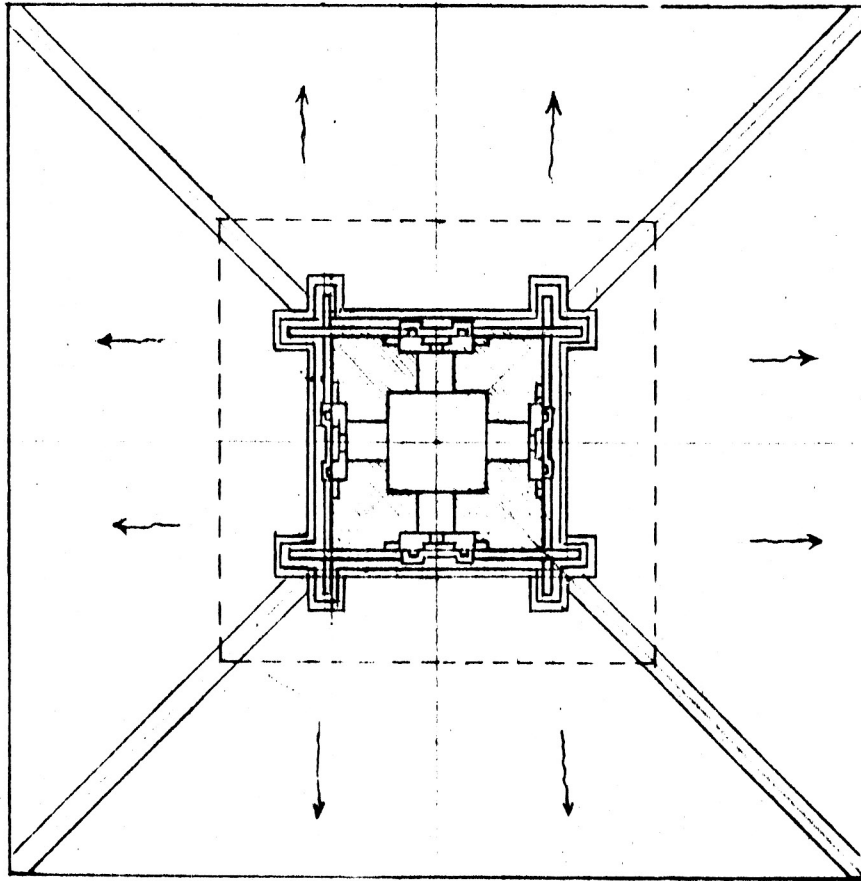
Patukva Agache (1690)
Second floor plan: scale 1:50

drawing by Gyanendra Joshi, courtesy of Patan Conservation and Development Programme



Patukya Agache (1690)

Plan of lower pagoda level showing bottom roof: scale 1:50
drawing by Gyanendra Joshi, courtesy of Patan Conservation and Development Programme



Patukya Agache (1690)

Plan of upper pagoda level showing middle roof: scale 1:50
drawing by Gyanendra Joshi, courtesy of Patan Conservation and Development Programme