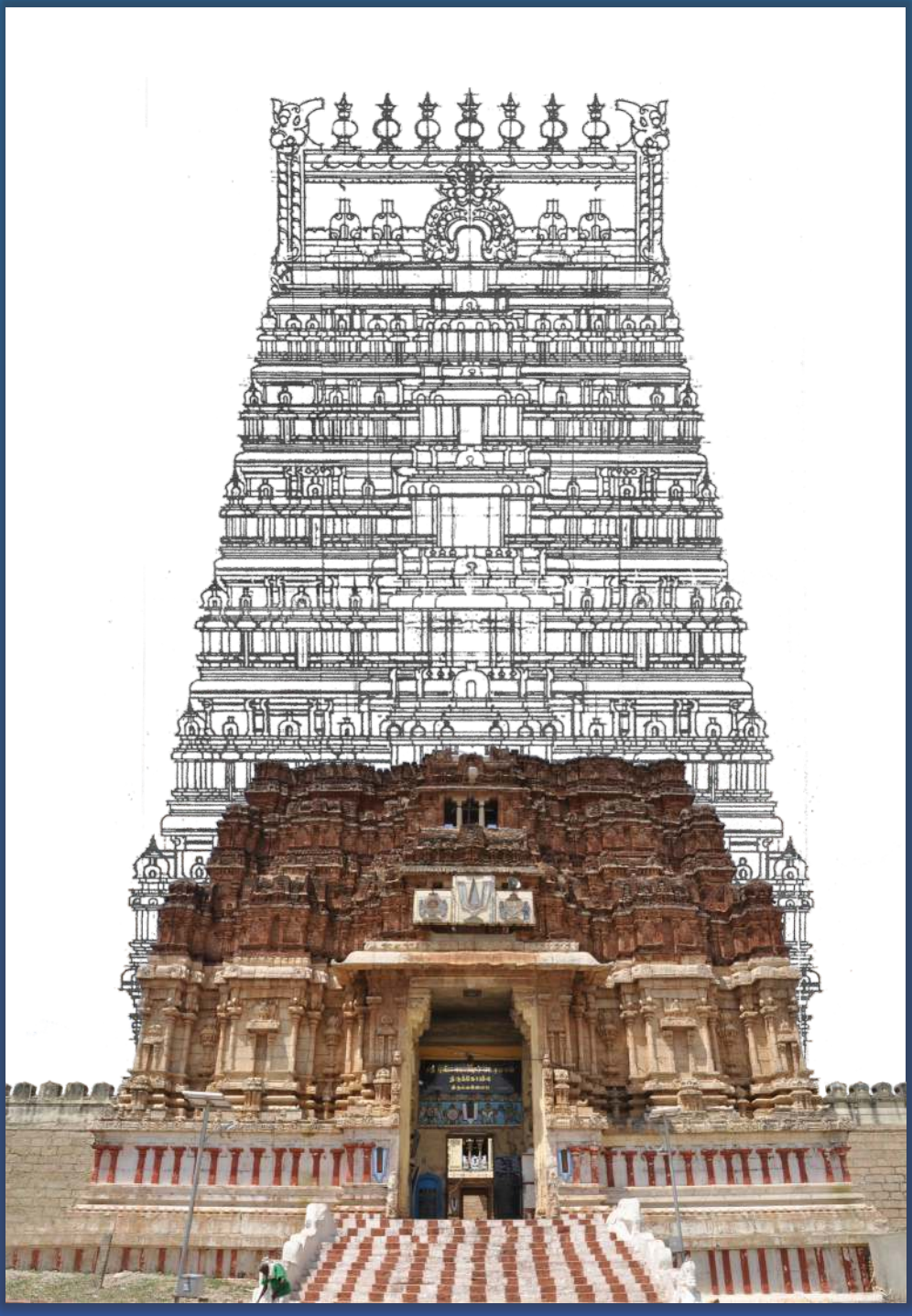
Arulmighu Shree Pundarikatcha Perumal Thirukoil
Rajagopura Thiruppani

22 March 2019

REPORT - 5 (Jan 2018 - 15 Mar 2019)



THIRUPPANI DONORS

Shri V S Jayabal M.Tech **Dr S Velumani M.D**

Computer generated view of the RajaGopuram is shown in comparison with the existing RajaGopuram

Arulmighu Pundarikatcha Perumal Thirukoil
Rajagopura Thiruppani - Thiruvellarai

22 March 2019

REPORT - 5
January 2018 - 15 March 2019

Status report
Since our earlier Report-4 January 2018

Submitted to

The Secretary
Department of Information and Public Relations
Government of Tamilnadu, Chennai

The Commissioner
Department of Hindu Religious and Charitable Endowment
Government of Tamilnadu, Chennai

ADC Thiruppani
Department of Hindu Religious and Charitable Endowment
Government of Tamilnadu, Chennai

The Chief Sthapathi
Government of Tamilnadu, Chennai

The Joint Commissioner
Sri Ranganatha Swamy Thirukoil, Srirangam

The UNESCO, India

BY

Shri V S Jayabal M.Tech

Dr S Velumani M.D

DONORS

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01. Introduction

We conducted an extensive state of the art evaluation of the safety of the kalkaram by an expert team from IIT-Madras. The detailed report covering the findings with special reference to the details of the defective pillars and beams to be replaced are given in annexure, page 132 to 279, in report 4 titled IIT-Madras report, submitted on Sunday 14 January 2018 to the HR&CE Department.

We got permission from the HR&CE Department to carry out kalkaram thiruppani as per order no 1719/1414/D5/ dated 19-01-2017 a copy of which is given under.

This report details the renovation reconstruction thiruppani we have done during 2017 & 2018

அருள்மிகு அரங்கநாதசுவாமி திருக்கோயில், ஸ்ரீரங்கம்

அனுப்புநர்
பொ. ஜெயராமன், பி.எஸ்.சி., பி.எல்.,
இணை ஆணையர் / செயல் அலுவலர்,
அருள்மிகு அரங்கநாதசுவாமி திருக்கோயில்,
ஸ்ரீரங்கம், திருச்சிராப்பள்ளி – 6.

பெறுநர்
திரு.வி.எஸ்.ஜெயபால்,
டாக்டர் எஸ்.வேலுமணி,
நம்பர்136, அப்புசாமி நாயுடு வீதி,
ரெட் பீல்ட்ஸ்,
கோயமுத்தூர் - 641 045

==========

ந.க. எண் 1719 / 1414 / டி5 / நாள் 19.01.2017

அய்யா,

பொருள் : திருப்பணி – உபயப்பணி – ஸ்ரீரங்கம் அருள்மிகு அரங்கநாதசுவாமி திருக்கோயிலின் உபகோயிலான திருவெள்ளறை அருள்மிகு புண்டரீகாட்ச பெருமாள் திருக்கோயில் இராஜகோபுரத் திருப்பணி புனரமைக்கும் பணிக்கு பணி ஆணை வழங்கியதன் தொடர்ச்சியாக வல்லுநர்குழு பரிந்துரையின் அடிப்படையில் இராஜகோபுரத்தினை வலுப்படுத்துதல் மற்றும் பாதுகாத்தல் செய்யும் பணிக்கு பணி ஆணை வழங்குதல் – தொடர்பாக

பார்வை :

1. அரசாணை நிலை எண் 266 / சுற்றுலா பண்பாடு மற்றும் அறநிலையங்கள் (அ.நி.4-2) துறை நாள் 19.11.2015
2. ஆணையர் இந்து சமய அறநிலையத்துறை ந.க.எண் 8246 / 2014 / ஒய்1 நாள் 01.12.2015
3. இவ்வலுவலக ந.க.எண் எண் 1719 / 1414/ டி5 நாள் 15.12.2015
4. மாண்பமை உயர்நீதிமன்ற வல்லுநர் குழு கூட்டமர்வு நாள் 23.11.2016

திருச்சிராப்பள்ளி மாவட்டம், ஸ்ரீரங்கம் வட்டம் ஸ்ரீரங்கம் அருள்மிகு அரங்கநாதசுவாமி திருக்கோயிலின் உபகோயிலான திருவெள்ளறை, அருள்மிகு புண்டரீகாட்சப் பெருமாள் திருக்கோயிலில் இராஜகோபுரம் கட்டுமான புனரமைப்பு பணிக்கு பார்வை (3)ல் காணும் இவ்வலுவலக கடிதத்தின் தொடர்ச்சியாக பார்வை (4)ல் காணும் மாண்பமை உயர்நீதிமன்ற வல்லுநர் குழு கூட்டமர்வில் தெரிவித்த கருத்துறையின்படி முதல் கட்டமாக தற்போதுள்ள இராஜகோபுரத்தினை இருக்கும் நிலையிலேயே பலப்படுத்துவதற்கும் மற்றும் பாதுகாப்பு பணி மேற்கொள்வதற்கும் (Preserving & Strengthening) பணி ஆணை இதன் மூலம் வழங்கப்படுகிறது.

இத்துடன் வல்லுநர் குழு கூட்ட நடவடிக்கைகளின் உத்தரவு நகல் இத்துடன் இணைத்து அனுப்பப்படுகிறது.

(ஒம்) பொ. ஜெயராமன்,
இணை ஆணையர் / செயல் அலுவலர்

உத்தரவுப்படி அனுப்பப்படுகிறது

மேலாளர்.

02. Preliminary work done until December 2018

02.1 Lime-Mortar Development

Conventional way

In the traditional process the granite roller what is seen in the picture is driven by two bullocks traveling in a circular path, enabling the grinding of the lime and sand mixture with the addition of water.

Traditional method

In these modern times, we wanted to bring a little mechanization to replace the bulls by the introduction of the gearbox in the middle of the circle, with the granite rollers on either side to prepare the Lime-Mortar.

After the studies, we have found the different techniques available. Here we have decided to pursue as per the good old technique of utilizing the bulls to traverse in the circular path to grind. During the design of this machine we have estimated that it may take about a minute for the bulls to complete one full circle. That is 1 rpm. Therefore, in consultation with the manufacturer Shri K Kandasamy-B.E., M.Sc- Engineering, Sakthi Drives - Coimbatore, it was decided to design the suitable gearbox to reduce the speed from the regular 1440 rpm to 1 rpm with the suitable other parts. Here the introduction of the two grinding wheels diagonally opposite became mandatory to balance the system. By this process we get an added advantage that the grinding time can be reduced by 50%.

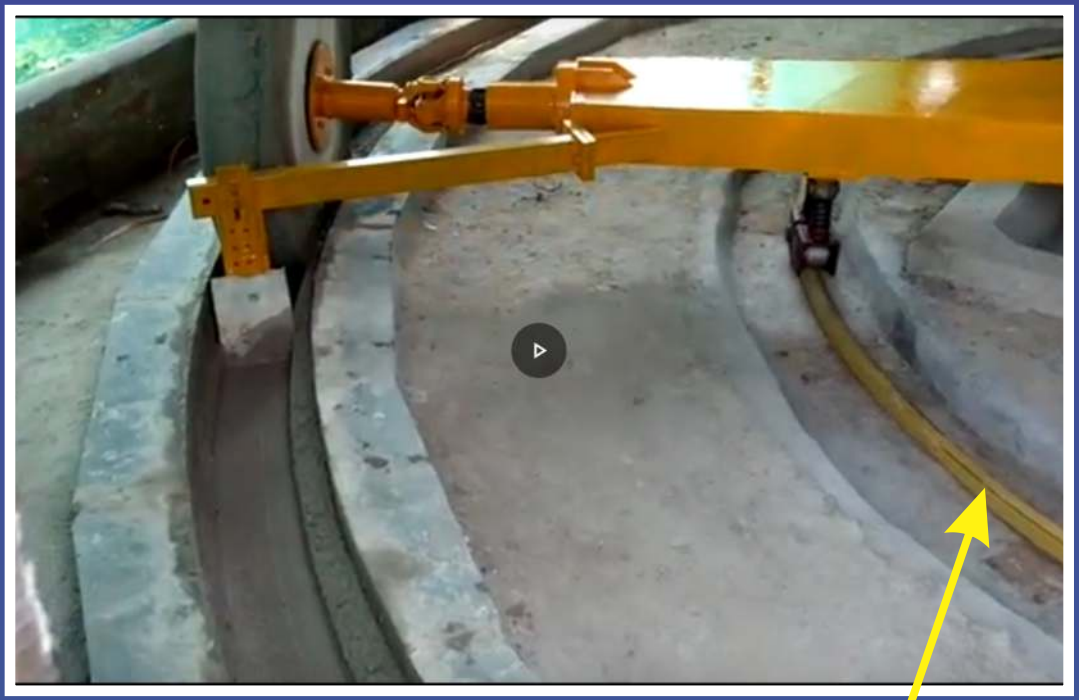
Current method

Traditional Lime-Mortar preparing arrangement in construction phase

Two sets of gear boxes powered by two horse power motors each

Another view of the Lime-Mortar mixer

Dr. Arun Menon - IIT Consultant, Mr. V S Jayabal - Donor and
Mr. Kumaragurubaran - Sthapathi
discussing a Lime-Mortar mixer arrangement



Dynamic balancing rails / drive

Lime-Mortar machine with the support in the middle of the arm to prevent the sagging and for dynamic balancing.

In the end it turned out to be the perfect traditional machine to carry out the job. This project was completed in September 2016.

02.2 Model Gopuram

To confirm the quality of thus prepared **Lime-Mortar** model Gopurams were built in the fourth prakaram adjoining the Raja Gopuram. For this purpose we have chosen the **karnakudu** from the first (5' x 5' x 12' height), second and the third tier to the actual dimensions.

This was completed in January 2017. On the four sides of the karnakudu, we have plastered with the Lime-Mortar on two sides and left the two sides with the original brick structure. This will give an idea about the complications / intricacies of the structure to the common devotee. This can also be time tested.

Bricks

It was equally imperative to utilize the clay bricks possibly of the same existing dimensions for this purpose.

Picture of the bricks with measurements

The conventional bricks is about 3 inches thick. Therefore, the machines were modified to produce the bricks with 2 inches thickness, close to the existing bricks.

These bricks were specially produced in Coimbatore to the dimensions shown and shipped to Thiruvellarai site.

02.3 Sourcing the Granite beams and Pillars

This quarry was located around 90 km north of Bangalore International Airport towards Hyderabad. 5 beams each weighing approx. 30,000 kg, length 30', width 5' and breadth 4'.

Inspection at the quarry - August 2017

Subsequently, these were transported to the temple site on Saturday 30th September 2017 and the sculptors started working on it.

02.4 Sourcing the Illuppai Wood - August 2017

We were scouting for such a heavy, well grown illupai trees atleast 80 to 100 years old and beyond. This was also located near Chikbellapur, 100 kms. north of Bangalore.

The trunks of these trees were about 3 feet diameter and 15 – 20 feet tall, with the total height of the tree being 60-70 feet. To attain this heavy trunk the trees are to be atleast 100 years old. Normally the trees in the highways grow slowly and takes quite a few decades to grow to this size. Slow growth hence more strength.

On the contrary the trees in the rain forest grows faster to this dimensions, which might mis-lead us in regard to the strength. That was the reason we were looking for the trees on the dry belt. Due to widening of this National Highway to Chikbellapur, they need to sacrifice these trees. Subsequently the contractor cut these trees and transported the logs to saw mills at Cuddalore to cut to the required dimensions as stipulated by the Sthapathi.

View of the Illupai wood logs, waiting to cut to the required sizes

Unloading at the temple site
September 2017

These sized beams need to be given a protective coating. This protective coating is prepared from cashew nut oil and herbals as per the Sthapathy's recipe. This coating saves the wood from insects and thermites attack and hence possibly prolong the life of the wood.

Important:

Considering the availability of this illupai wood (இலுப்பை மரம்) and Vengai wood (வேங்கை மரம்), we have planted 30 plants each of these trees in the Shree Pundarikatcha Perumal premises in the first half of February 2015. These trees have grown almost about 10' height in the last four years and looks more healthier.

Possibly in the next 80 years and beyond these trees would have matured enough and probably grown to 70' - 80' tall. May be in the next century this can be used for any renovation in our temple.

03. Capacity Building

The 5th clause in the MOU between Shri V S Jayabal and IITM given below highlight the importance we attach to the capacity building initiative

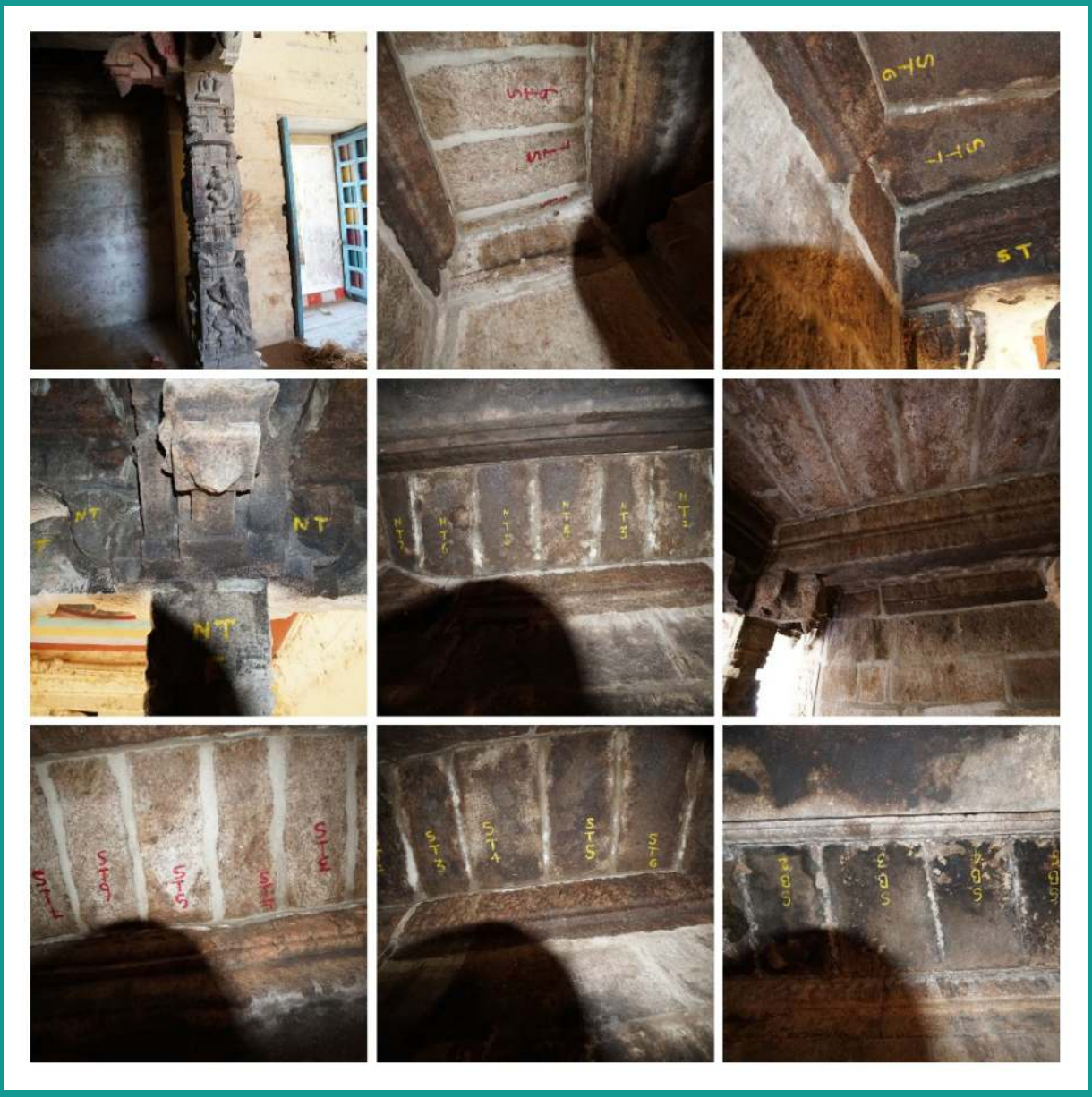
> Shri V.S.Jayabal has understood the magnitude of the project in its various dimensions and would like to go ahead with the construction as per the religious rules, Tamil Nadu Government HR&CE department regulations, repeating the same architectural pattern of the existing two tiers and use this project as an educational tool to the present day archaeology, civil engineering and shilpa shastra students as and when needed.

Already a part time PhD candidate at IITM Mr. Debopam Roy, a faculty member at the National Institute of Construction Management and Research Pune, working on the project management challenges in Heritage Conservation Projects in India under the agesis of the National Center for Safety of Heritage Structures – NCSHS - for his doctoral thesis has visited Thiruvellarai on May 2017 and conducted on-site studies for his thesis to be presented to the University of Pune.

As per the advise from Dr Arun Menon, Asst. Prof. - **IIT-M**, the Executive Engineer - HR&CE Department based in Madurai came to Thiruvellarai on Friday 5 January 2018 in connection with the Thiruchendur prakaram demolishing and reconstruction work, to learn about the ways we have used to cut the 8 inches thick two way RCC slab, 16' x 16' . She also discussed about the tailor made core cutting machinery used for the above job which was partly designed by Mr V S Jayabal the donor.

04. Dismantling the damaged structures Kudavarai (குடவறை)

04.1 Identification and Traceability



The beams and slabs are given an identification number for easy assembling


CBE
CBE
NB

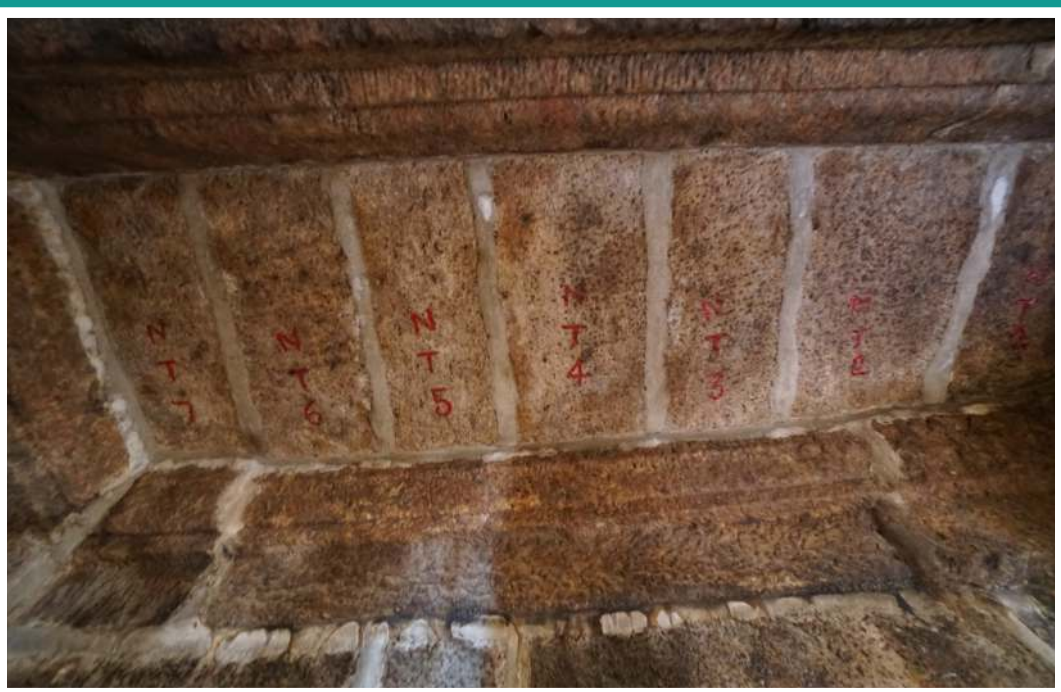

NT7
NT6
NT5
NT4
NT3
NT2
NT1

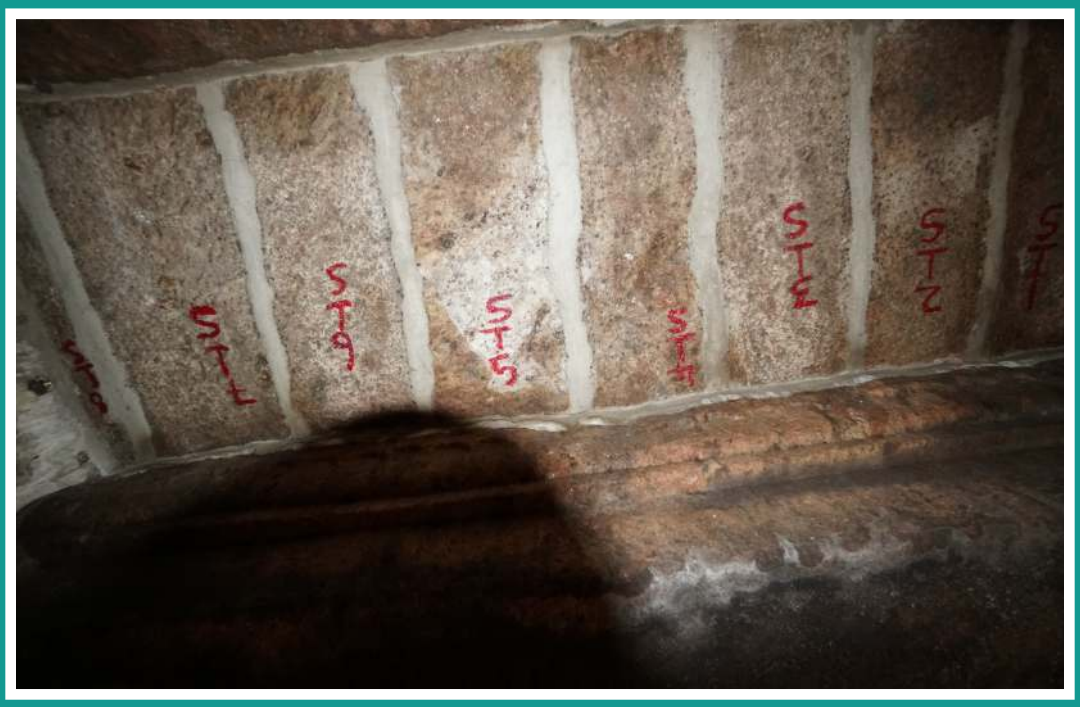

NT7
NT6
NT5
NT4
NT3
NT2
NT1


NT


ST
ST


NB5
NB4
NB3
NB2
NB1


NT7
NT6
NT5
NT4
NT3
NT2


ST7
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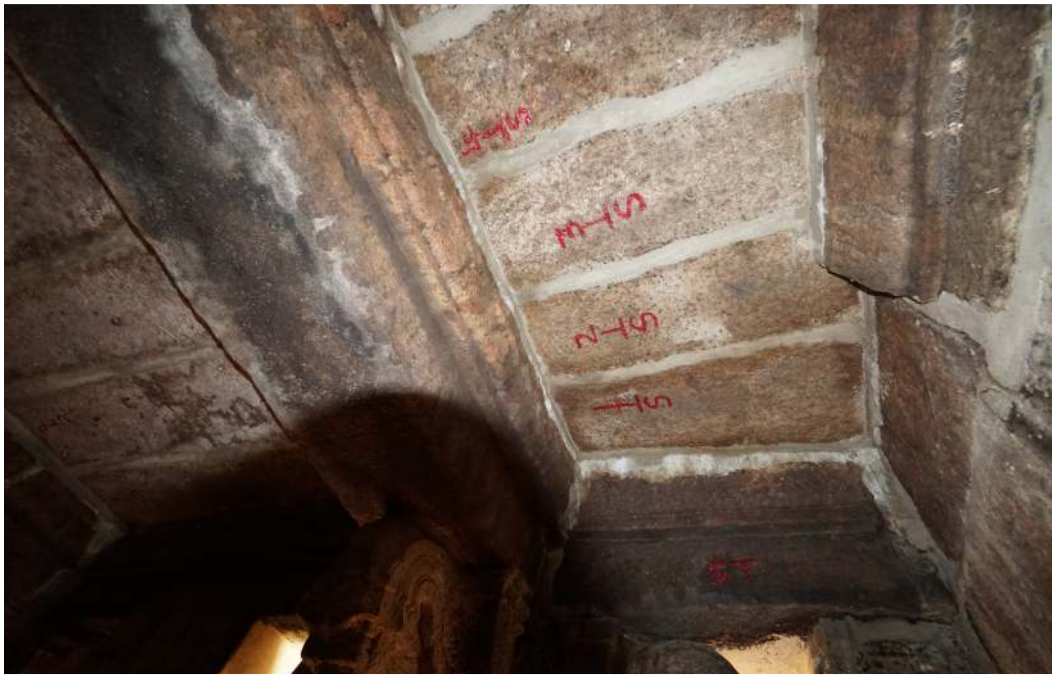
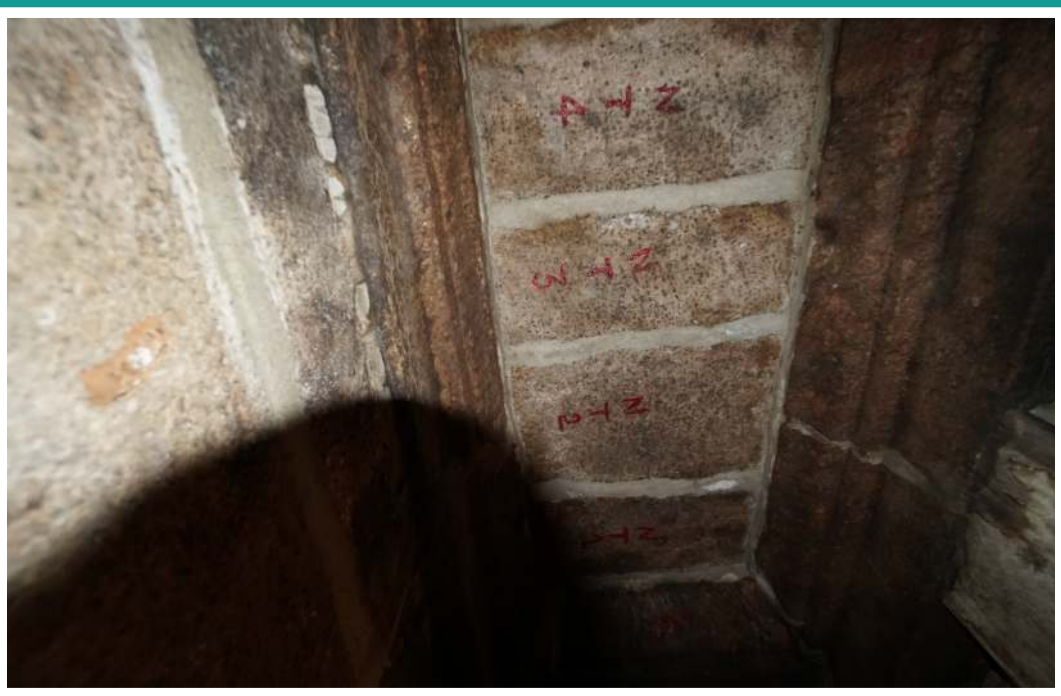
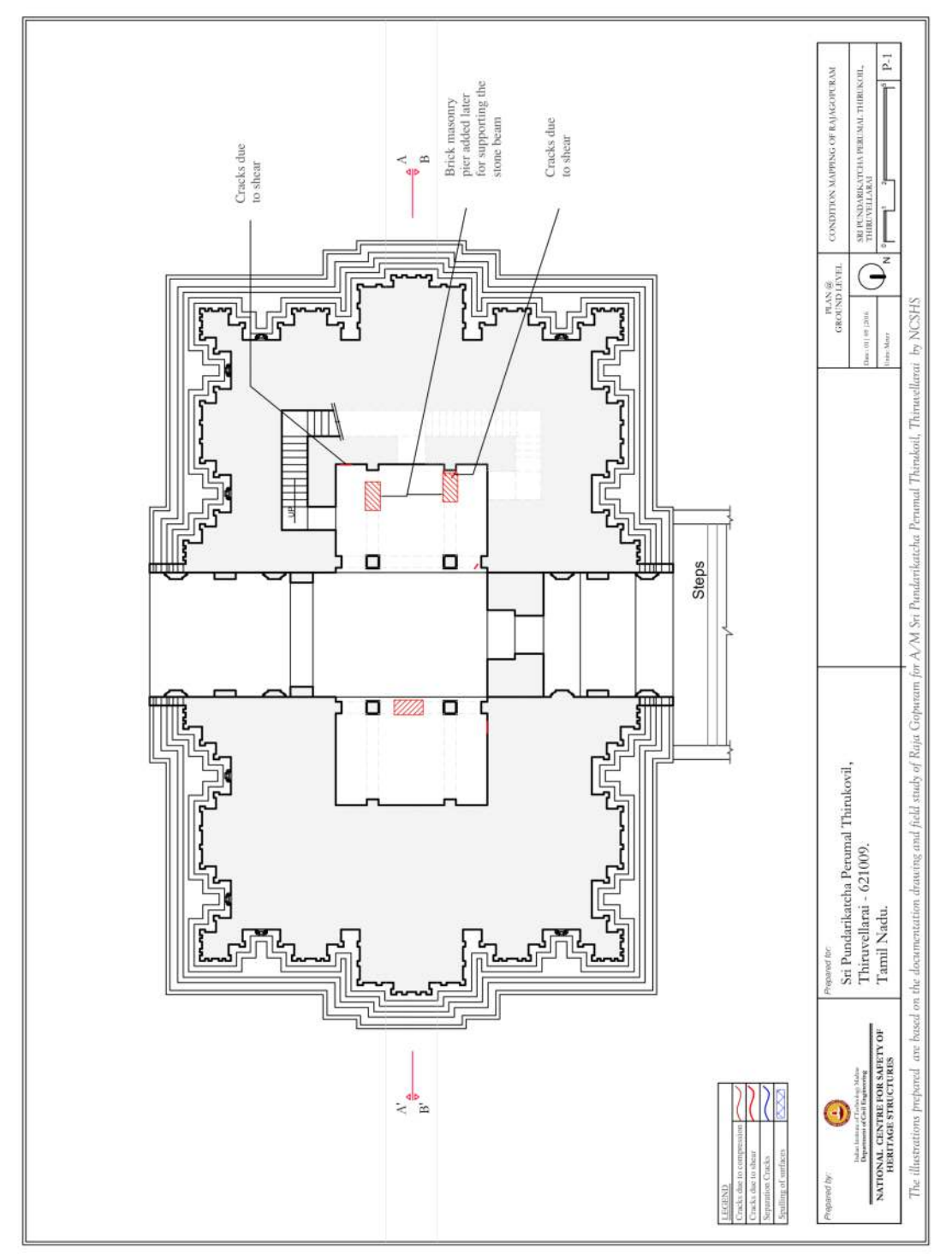
ST2
ST1

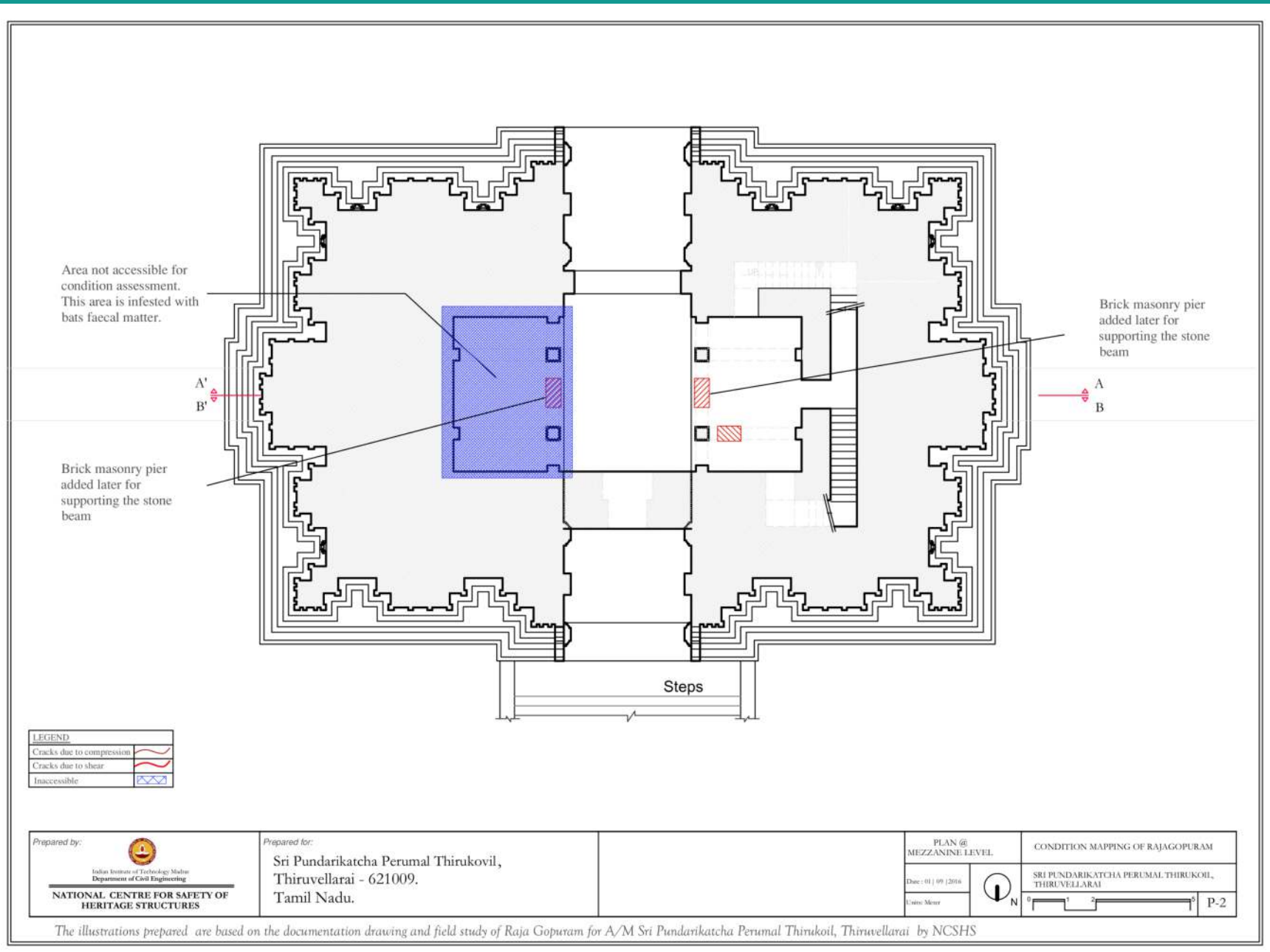


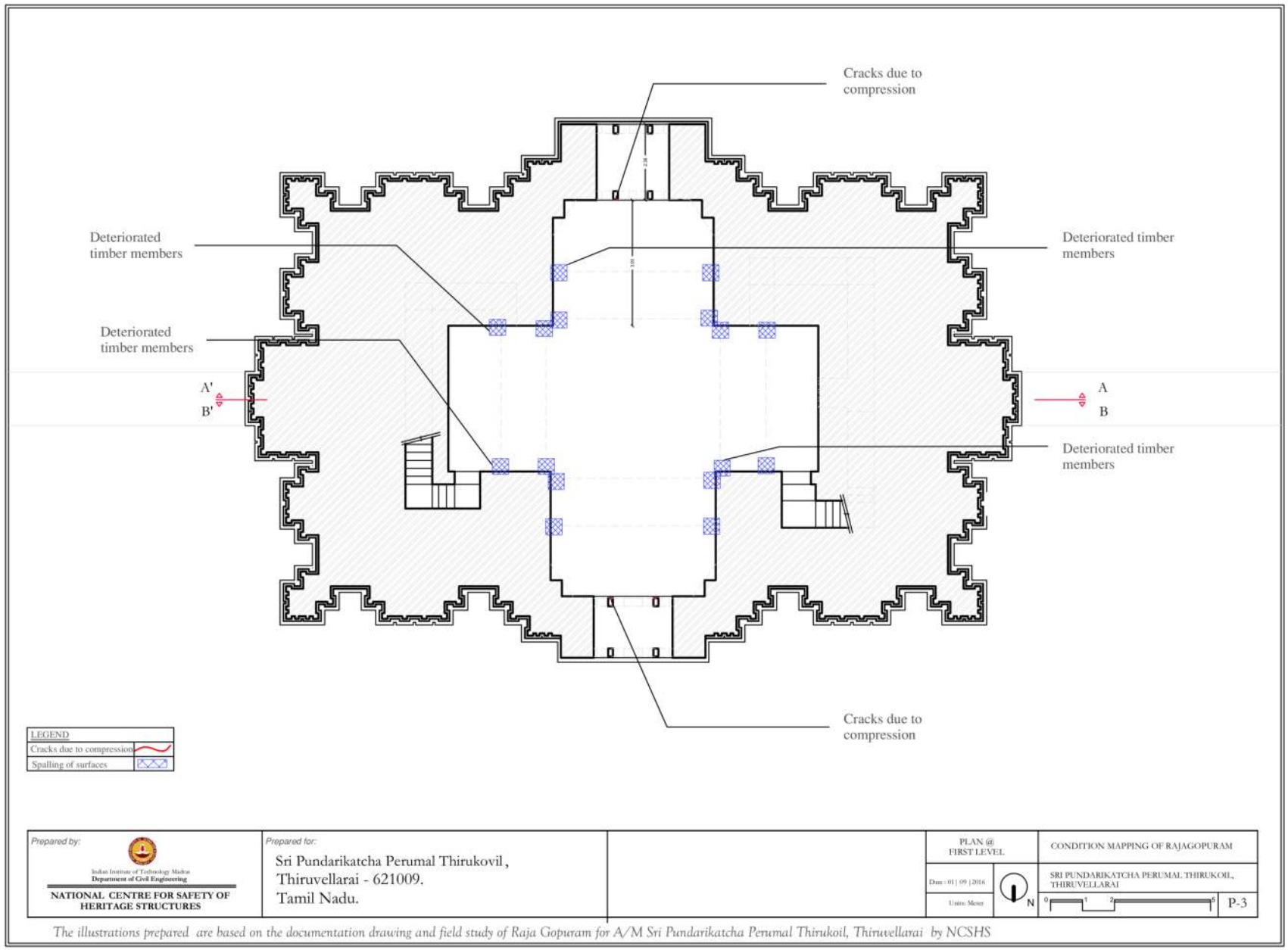


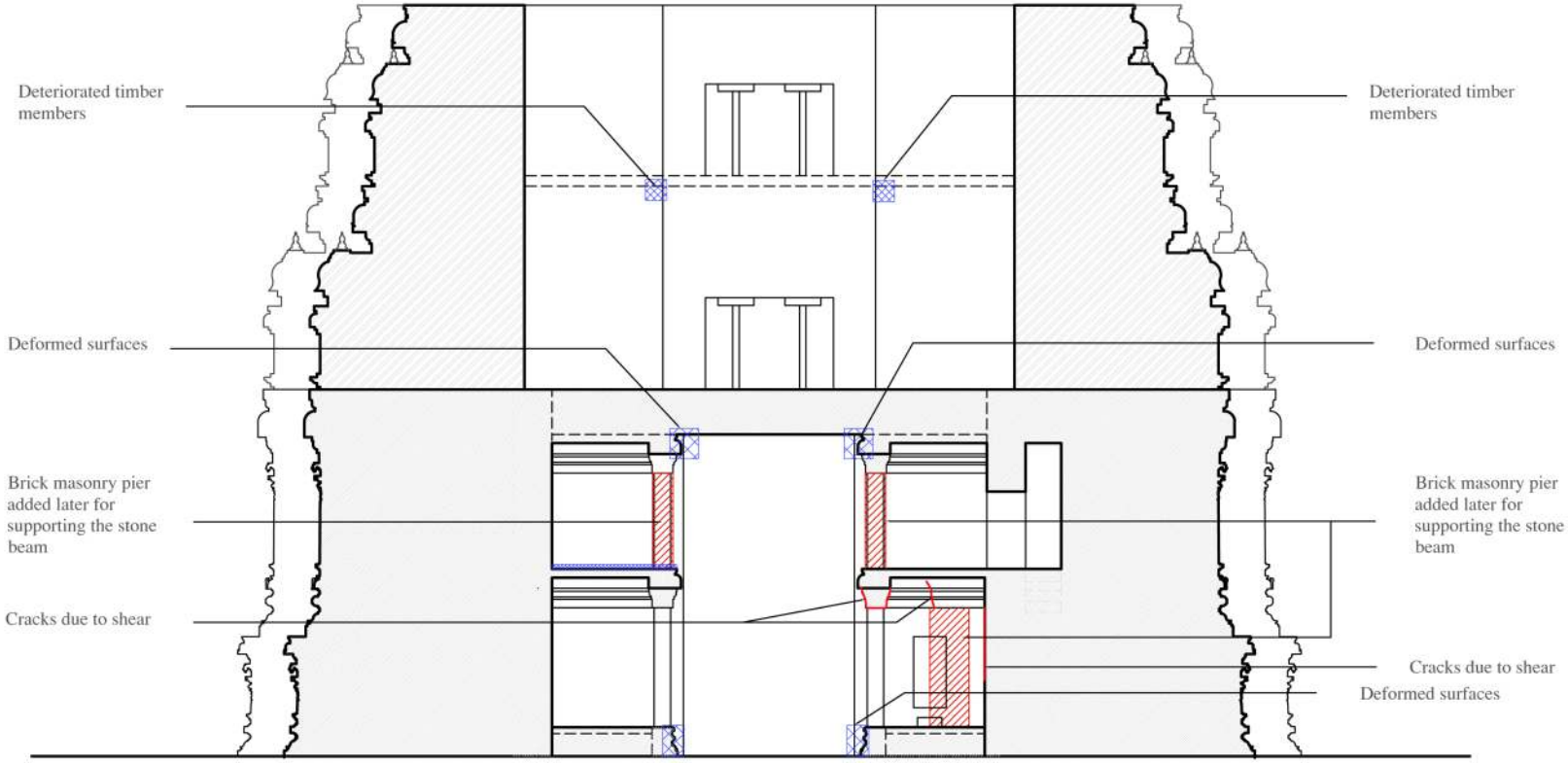
04.2 IIT Report

IIT-Madras in their Inspection report September 2016, have identified the cracked damaged beams and pillars.




Area not accessible for condition assessment. This area is infested with bats faecal matter.
Brick masonry pier added later for supporting the stone beam
Brick masonry pier added later for supporting the stone beam
A'
B'
A
B
Steps
LEGEND
Cracks due to compression
Cracks due to shear
Inaccessible
Prepared by:
Indian Institute of Technology Madras
Department of Civil Engineering
NATIONAL CENTRE FOR SAFETY OF HERITAGE STRUCTURES
Prepared for:
Sri Pundarikatcha Perumal Thirukovil,
Thiruvellarai - 621009.
Tamil Nadu.
PLAN @ MEZZANINE LEVEL
CONDITION MAPPING OF RAJAGOPURAM
Date : 01 | 09 |2016
Units: Meter
N
SRI PUNDARIKATCHA PERUMAL THIRUKOIL, THIRUVELLARAI
P-2
The illustrations prepared are based on the documentation drawing and field study of Raja Gopuram for A/M Sri Pundarikatcha Perumal Thirukoil, Thiruvellarai by NCSHS


Cracks due to compression
Deteriorated timber members
Deteriorated timber members
Deteriorated timber members
Deteriorated timber members
A'
B'
A
B
Cracks due to compression
LEGEND
Cracks due to compression
Spalling of surfaces
Prepared by:
Indian Institute of Technology Madras
Department of Civil Engineering
NATIONAL CENTRE FOR SAFETY OF HERITAGE STRUCTURES
Prepared for:
Sri Pundarikatcha Perumal Thirukovil,
Thiruvellarai - 621009.
Tamil Nadu.
PLAN @ FIRST LEVEL
CONDITION MAPPING OF RAJAGOPURAM
Date : 01 | 09 | 2016
Units: Meter
N
SRI PUNDARIKATCHA PERUMAL THIRUKOIL, THIRUVELLARAI
0 1 2 5
P-3
The illustrations prepared are based on the documentation drawing and field study of Raja Gopuram for A/M Sri Pundarikatcha Perumal Thirukoil, Thiruvellarai by NCSHS



LEGEND	
Cracks due to compression	
Cracks due to shear	
Separation Cracks	
Spalling of surfaces	

Prepared by:

Indian Institute of Technology Madras
Department of Civil Engineering

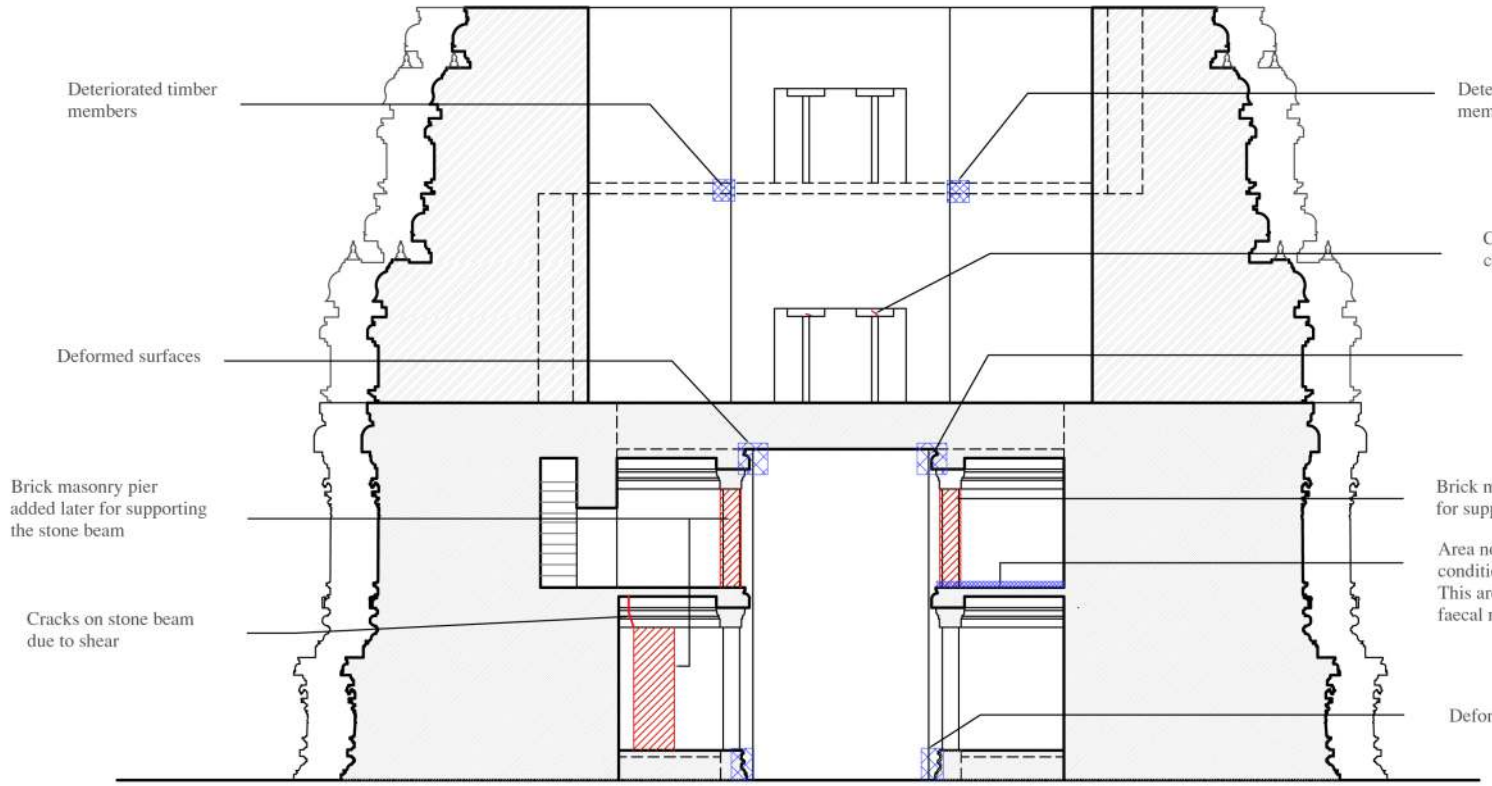
NATIONAL CENTRE FOR SAFETY OF HERITAGE STRUCTURES

Prepared for:

Sri Pundarikatcha Perumal Thirukovil,
Thiruvellarai - 621009.
Tamil Nadu.

SECTION AA'	CONDITION MAPPING OF RAJAGOPURAM
Date : 01 | 09 | 2016	SRI PUNDARIKATCHA PERUMAL THIRUKOIL, THIRUVELLARAI
Units: Meter	0 1 2 5 E-1

The illustrations prepared are based on the documentation drawing and field study of Raja Gopuram for A/M Sri Pundarikatcha Perumal Thirukoil, Thiruvellarai by NCSHS



LEGEND	
Cracks due to compression	
Cracks due to shear	
Separation Cracks	
Spalling of surfaces	

Prepared by:

Indian Institute of Technology Madras
Department of Civil Engineering

NATIONAL CENTRE FOR SAFETY OF HERITAGE STRUCTURES

Prepared for:

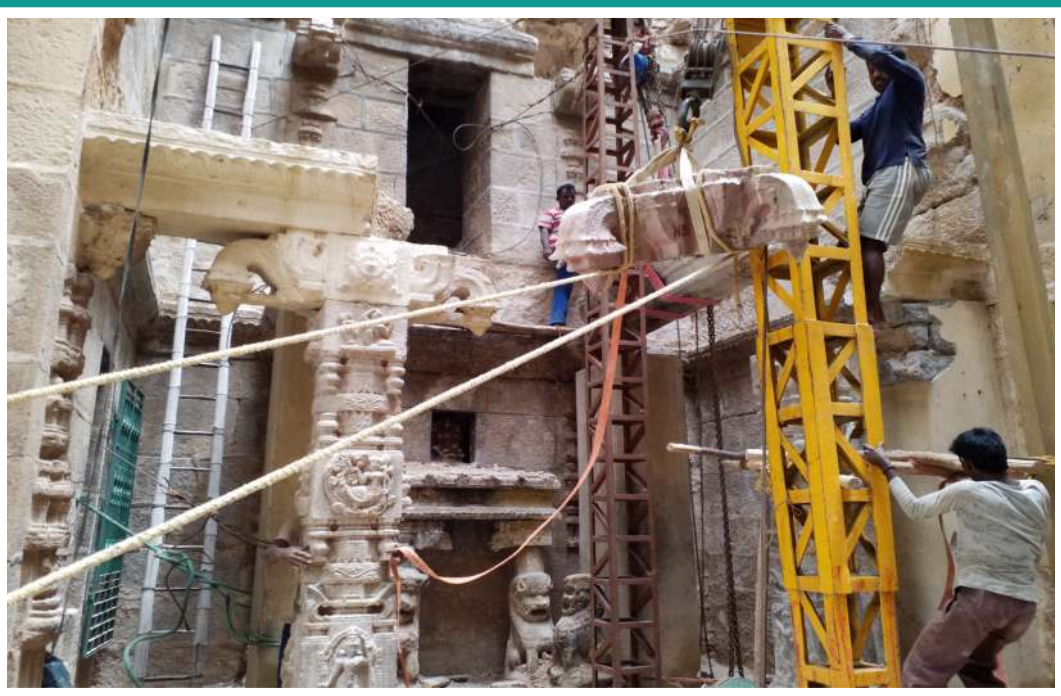
Sri Pundarikatcha Perumal Thirukovil,
Thiruvellarai - 621009.
Tamil Nadu.

SECTION BB'	CONDITION MAPPING OF RAJAGOPURAM
Date : 01| 09 |2016	SRI PUNDARIKATCHA PERUMAL THIRUKOIL, THIRUVELLARAI
Unite: Meter	0 1 2 5 E-2

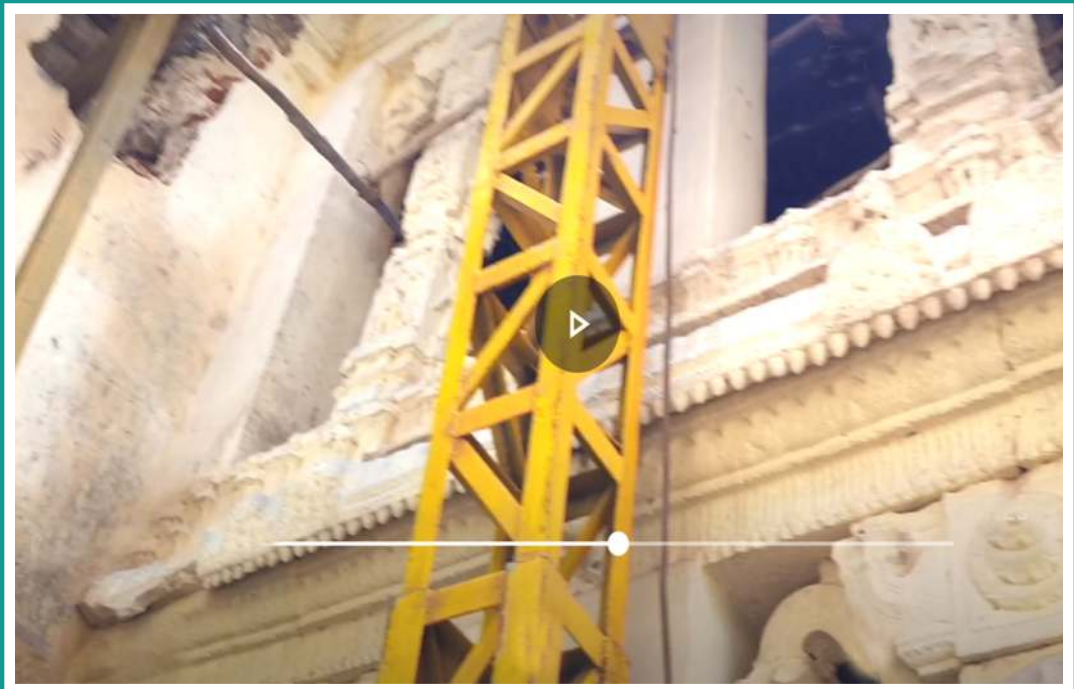
The illustrations prepared are based on the documentation drawing and field study of Raja Gopuram for A/M Sri Pundarikatcha Perumal Thirukoil, Thiruvellarai by NCSHS

04.3 Pictures before dismantling

04.4 Dismantling the kudavarai beams and pillars



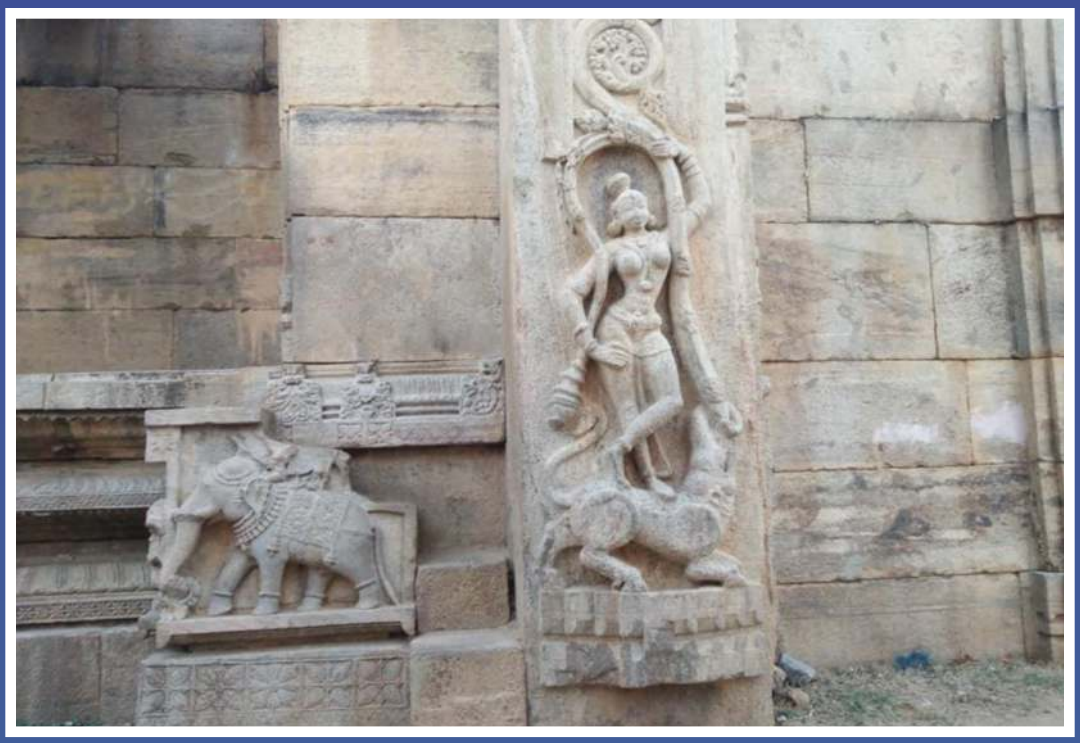
Tuesday 15 May - Sunday 10 June 2018



04.5 Re-assembling the structure - January 2019

05. Scupltures work in progress & the finished ones

The sculptures work on the door frames is very critical, since it represents the **Hoysala Architecture** from Mysore region. This Rajagopuram was built by **the Hoysala kings around 1200AD.** This architecture is similar to Melakote temples near Mandya and Belur temples near Hasan.



Carvings in **Melakote temples** near Mandya, Mysore

Carvings in **Belur temples** (Door frames) near Hasan

05.1 Granite stones as received from the quarry in Bangalore

Granite beams arrived from quarry in north of Bangalore
August 2017

05.2 Sculpturing work in progress

Accordingly, the sculptures were reproduced as per the undamaged ones in Thiruvellarai on the exit door. Here we have noticed the similarity between the door frames in Belur, Melakote and Thiruvellarai.

05.3 Fully finished beams

Fully carved door frames
July 2018
As mined Granite beam weight - 28,500 kg
Finished weight - 17,200 kg

Fully carved top frame
September 2018
As mined weight - 17,200 kg
Finished weight - 11,200 kg

06. UNESCO visit

Monday 29 May 2017

3rd November, 2017

From
Shri V S Jayabal and Dr S Velumani
35 Lalbahadur colony, Peelamedu, Coimbatore.

To
Dr Shikha Jain
Director, DRONAH,
A-258 South City, Gurgaon122001, Haryana, INDIA

Dr Arun Menon
Prof of structural engineering
Indian Institute of Technology
Chennai-600036.

Sir / Madam,

1. We are submitting herewith the compliance report regarding the recommendations given by the UNESCO Fact finding committee in relation to the Rajagopura Thiruppani undertaken at Thiruvellarai.

2. In your fact finding report you have concluded as per structural examination and shilpa shastras the addition of floors to the addition of floors to the north gopuram within the specified parameters is feasible; however as per agama shastras and conservation [recommended by ASI and international norms] it is not recommended.

3. We have already submitted a detailed report with adequate pramanams-evidence- to the effect that a Rajagopuram can be constructed at the north entrance. Apart from this we have also submitted to you our proposals to add five more tiers as per the drawings approved by the chief Sthapathy. Further our third report indicates the advantages by adding further stories with particular reference to the pramanams. Please recall our discussions at Thiruvellarai in regard to the same topic and you have indicated to us that UNESCO is going to conduct a seminar on agama shastras in Chennai around June end/July 2017. You have also requested us to participate and express our views. Please refer our email dt 18th june 2017. In this context we have discussed with vedic pundits and planned for all India Congress on pancharatra agama, with nearly thirty eminent vedic scholars on 11th, 12th and 13th October at Srirangam, an invitation for which is enclosed herewith. We would appreciate your presence or your representative's presence at the above summit for exchange of views.

4. Regarding the conservation aspects, we request you to highlight us about the norms being followed by ASI and international norms.

Thanking you and with regards

Sincerely yours,

V.S.Jayabal Dr S Velumani

Copy

Debashish Nayak, Director, Center for Heritage Management, Asmita Bhavan, Central campus, Navrangpura, Ahmedabad, 3800009, Gujarat, India

Er G Bagavansarathy, Deputy Superintending Archaeological Engineer, Fort St George, Chennai 600009.

The Joint Commissioner , HRCE Department Sri Ranganatha Swamy Temple,Trichy.

23rd November 2017

To
Ms Moe Chiba
Programme Specialist for Culture, UNESCO New Delhi
Ms Shikha Jain, UNESCO New Delhi

Madam,

We attended the workshop on agama shashtra and vedic conservation held on 17th and 18th November 2017 at Chennai organised by UNESCO, New Delhi with the support of HR&CE department, Government of Tamilnadu. It was nicely organised. Thanks for your hospitality in the workshop.

We have a few points for your consideration and introspection.

The following is a quote from part of the writeup / invitation, background part, of the above said workshop

> The present workshop intends to convene the experts of Agama Shastra from Vaikhanasa, Saiva and Sakta schools to seek their knowledge and insight specifically related to **Jeernoddhara** (maintenance) for idols and building fabrics of the temples, with an aim to evolve guidelines for the modern day heritage professionals.

Compared to VAIKHANASA AGAMA, the **PANCHARATRA AGAMA** is followed in almost equal number of the Vaishnava temples. It is highly unfortunate and painful to note that the **PANCHARATRA AGAMA** is omitted from your thought process right from the beginning, probably for reasons well known to you. And naturally the **PANCHARATRA AGAMA** scholars are not included/ grossly under represented in the speakers list and the subsequent discussions and deliberations.

We have further noticed that the speakers list has been changed a couple of times and the **PANCHARATRA AGAMA** scholars who has been earlier included in the programme has been dropped at the last moment sometimes even without the knowledge of the speakers.

We have conducted a national congress titled AKILA BHARATHA SRI PANCHARATRA VIDHVATH SAMMELANAM in Srirangam on 11th 12th 13th October 2017 with nearly thirty vedic scholars organised by **PANCHARATRA AGAMA VIDWAN SHRI Raman Bhattachariar Swamy** for which we have sent an invitation to you sufficiently early to plan your schedule. However you did not choose to attend.

Hence we have reasons to conclude the above workshop conducted by you is not a truly representative workshop and in a way incomplete and unbalanced though unfair with specific reference to the **PANCHARATRA AGAMA** following temples.

Further most of the thiruppani / renovation works are carried out by individual / family / trusts and so it would have been appropriate for you to have sent the workshop details and the invitations to this important group of stake holders to appropriately educate them which we observe is a deficiency in this workshop.

We are certain you can recall your visit to Thiruvellarai as part of the fact finding committee and the explanations given to your team by Mr. V S Jayabal M Tech, one of the undersigned on all the state of the art engineering systems used in renovation. You may recall the appreciation made by your representatives about the quality of renovation being done. In fact one of them wanted a **Lime-Mortar** grinding machine. We further state here that you have expressed your lack of knowledge in agama principles to be followed in renovation, which we understand very well. We sent already sent REPORT 3 dated 18th June 2017 containing all the details explaining as to how and why the renovation of the Rajagopuram can be undertaken with pramanams/evidence from vedic scripts.

At the cost of repetition we rewrite here the following points

We are going to use the **Lime-Mortar** prepared in the traditional way.

We are going to use the bricks with almost the same size, shape, dimensions as used in the existing gopuram.

Well experienced Sthapathy and his group of equally experienced masons in **Lime-Mortar** construction are going to be involved in the renovation. To support this point, a model Gopuram is constructed with the above said materials and the masons for inspection by the appropriately authorised and qualified persons.

Some of the hitherto unused / yet to be used engineering practices in temple Rajagopuram construction like the foundation stability study in multiple dimensions, certification by the reputed institutions like Indian Institute of Technology Madras, signing of **MOU** with **IIT Madras** for expertise and advice as and when needed, use of health monitoring systems, earth quake resistant studies, computer simulation studies for the completed Rajagopuram weight bearing etc are involved in this renovation.

With all our humility we state here that these system practises are over and above the UNESCO New Delhi recommendations from which you can understand the science and dedication involved in this renovation.

We have given pramanams / evidence as to why the Rajagopuram should be constructed. In case you feel otherwise, we would be willing to answer questions if the questions are backed by pramanams.

As part of capacity building component we welcome structural engineering and architecture students to observe the work when it gets started. It may not be out of place to state here that Mr. Deopam Roy a faculty member at the Notational Institute of Construction Management, Pune with Dr Arun Menon, IITM, as his guide has already visited Thiruvellarai and conducted some onsite studies as part his, Ph D, doctorate thesis.

In this scenario we hope to have a mutually beneficial relationship with UNESCO, New Delhi in this renovation, and we sincerely believe UNESCO New Delhi will benefit from the project of this quality and magnitude.

With warm regards

Mr V S Jayabal M. Tech

Dr S Velumani M.D.

After completing the inspection at Thiruvellarai on Monday 29 May 2017, as per the Madras High Court instructions, UNESCO conducted the Agama Sastras workshop in Madras, November 2017, to clarify the Agama experts view towards the existence / construction of the Rajagopuram at the northern entrance. Our team gave a presentation and submitted the pramanams in support of the Rajagopuram at the northern side.
Subsequently since till now we didn't receive any adverse comments, so obviously we presumed all in order.

Agama congress
November 2017, Madras

07. Scaffolding - 250mm I Beam

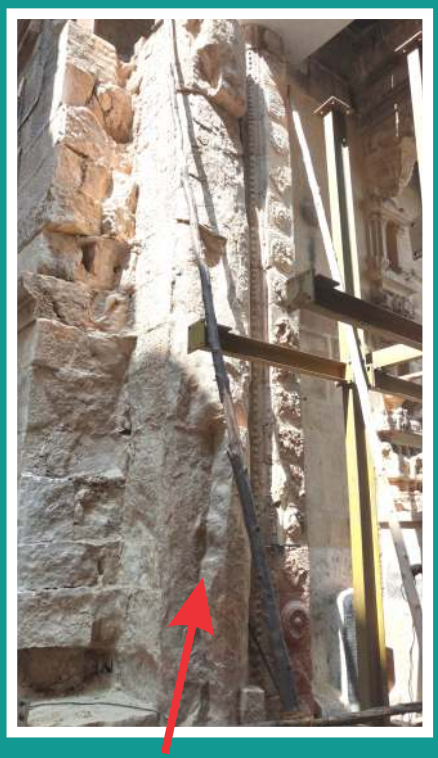
To enable removal of the damaged granite beams, approximately 20,000 kg each, we need to erect the heavy scaffolding utilising 250 mm steel beams 16 nos. each 20' height, weighing totally 10,000 Kgs. This was completed in December 2017.

We understand around 1960s some renovation work was going on to refurbish the ceiling, the beams & pillars.

During the process of removal of the ceiling because of the problems faced, they constructed a RCC concrete ceiling and the front entrance was reduced from 20' height to 10' height, erected a 6' width wall on east and west & extended it to the ceiling and installed a temporary door 6' width and 10' height.

This we could visualize for the possible damage on the front door granite nilai kadhavu.

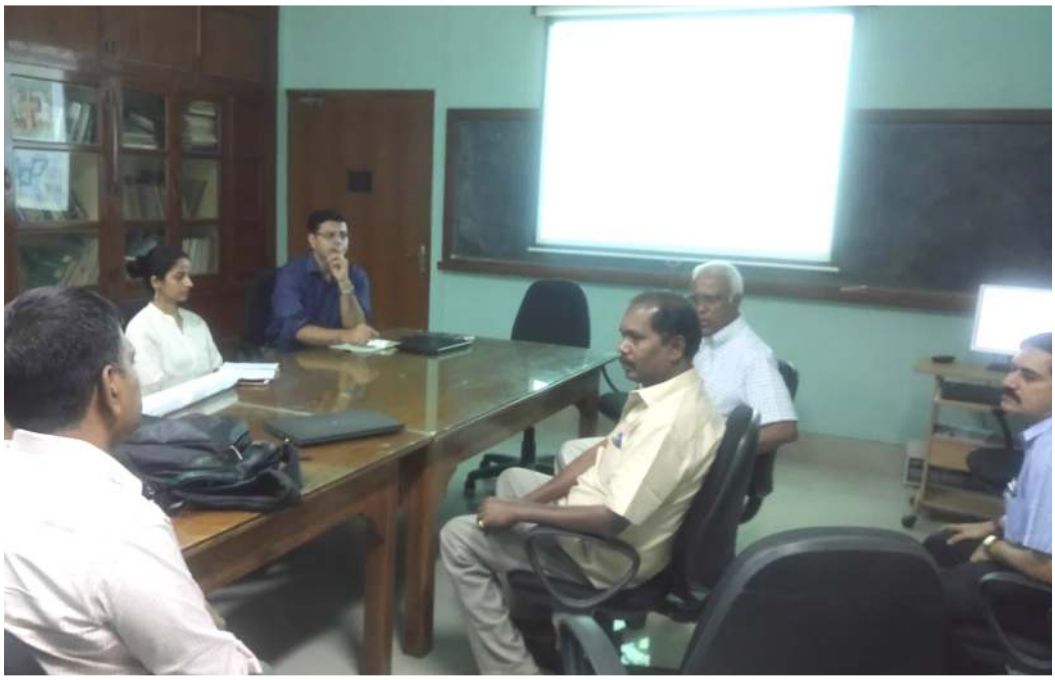
After dismantling being completed, we started working on the front door removal and replacement



View of the damaged door frame

08. Strategy planning - Execution Handling 25,000kg single piece

Our execution team consisting of IIT - Madras & couple of Structural Engineers from Madras who were experts in handling such kind of heavy structures in less accessible areas were involved for a strategic decisions.



March 2018

Here the working space inside the Rajagopuram at the height of 12' from the ground level is too small to install the cranes capable of handling 25' long granite beams weighing 21,000 kg to a further height of 25'. This was one of the biggest concern and it took almost a year to evolve the different options, subject to the availability of handling machines (cranes) in Madras area.

Subsequently after couple of meetings at IIT-Madras and at the temple site for a period of six months, in November 2018 we arrived at a conclusion to hire a crane from Madras with a 300 Metric tonnes capacity, capable of lifting 30 metric tonnes to a height of 150'.

This crane from Germany can handle 300 tonnes
at ground level & 30 tonnes at 150' height
arrived at the temple site on Tuesday 25 December 2018

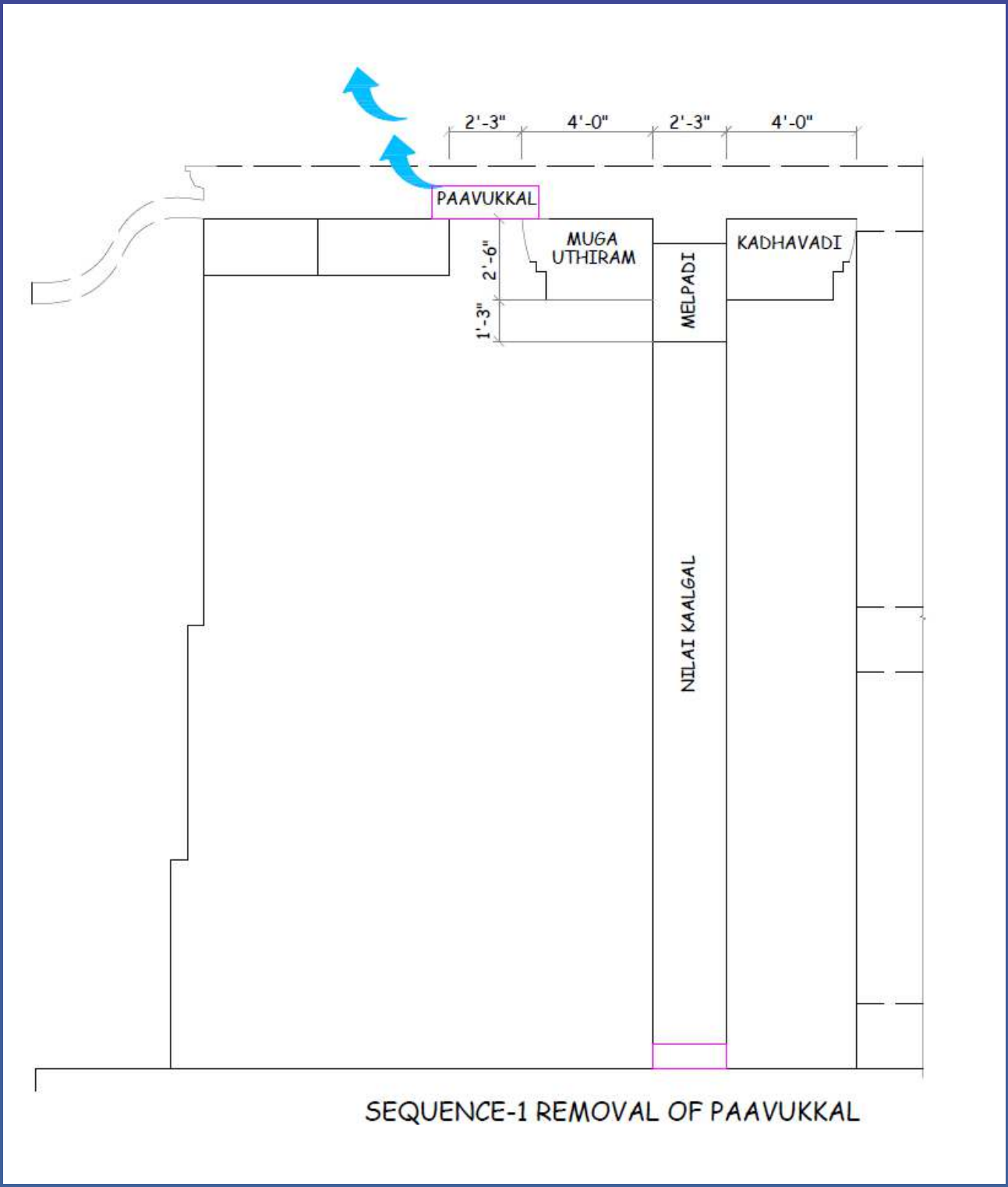

INDO POWER ER-12 AV

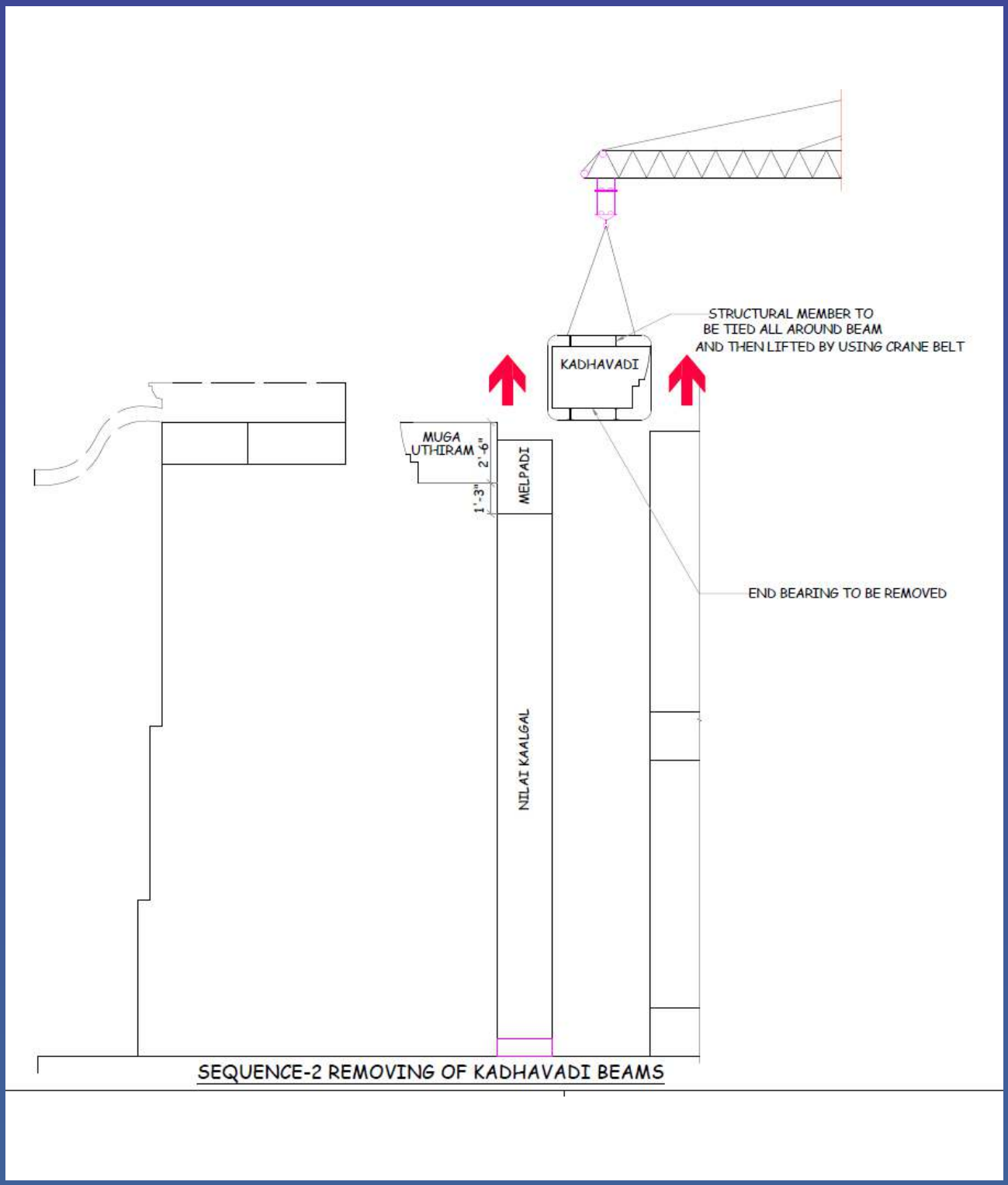

INDO POWER ER-15
INDO POWER ER-12 AV

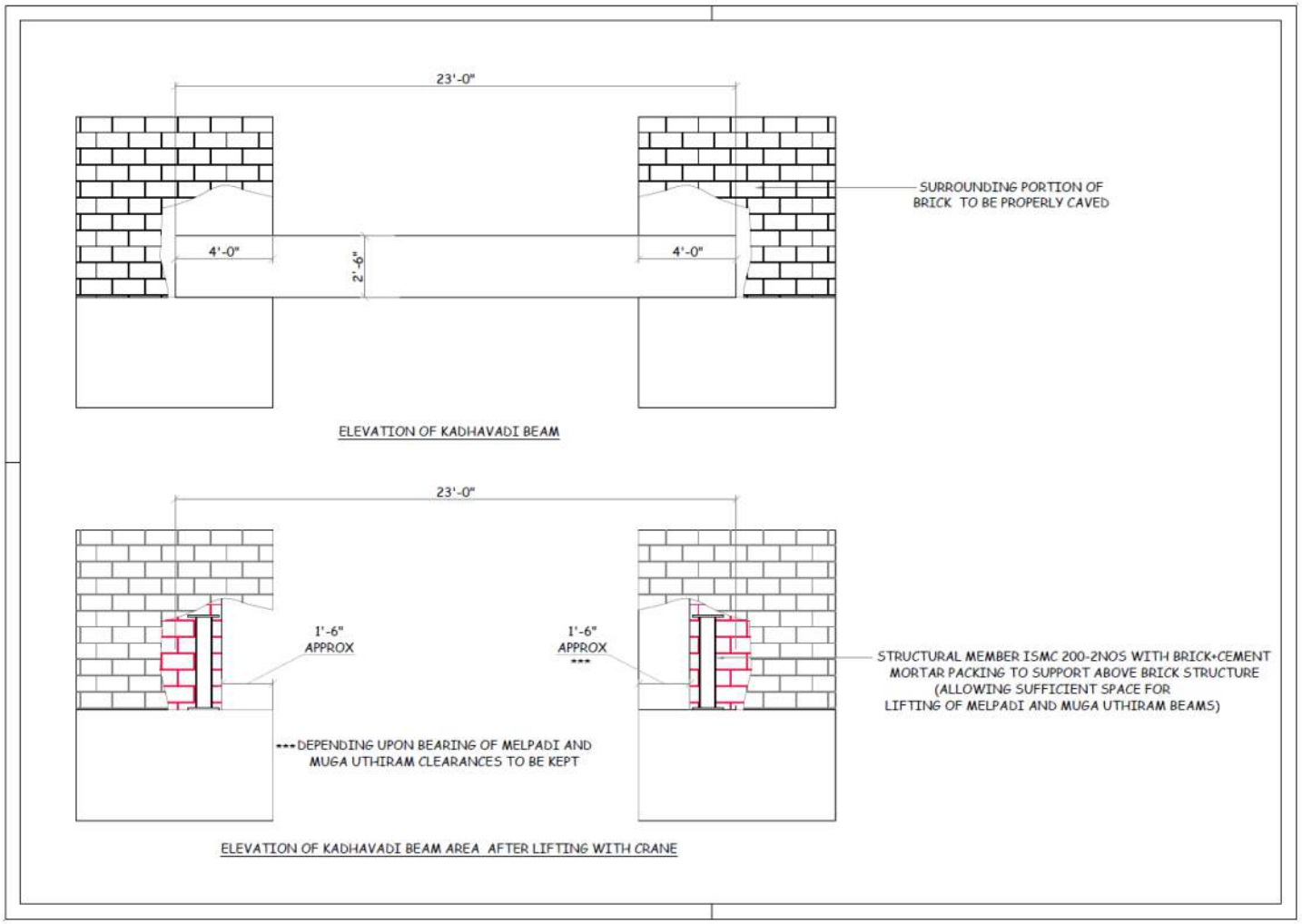
This was necessary to handle the highly delicate sculptures carved and a 25' long granite beams and pillars.

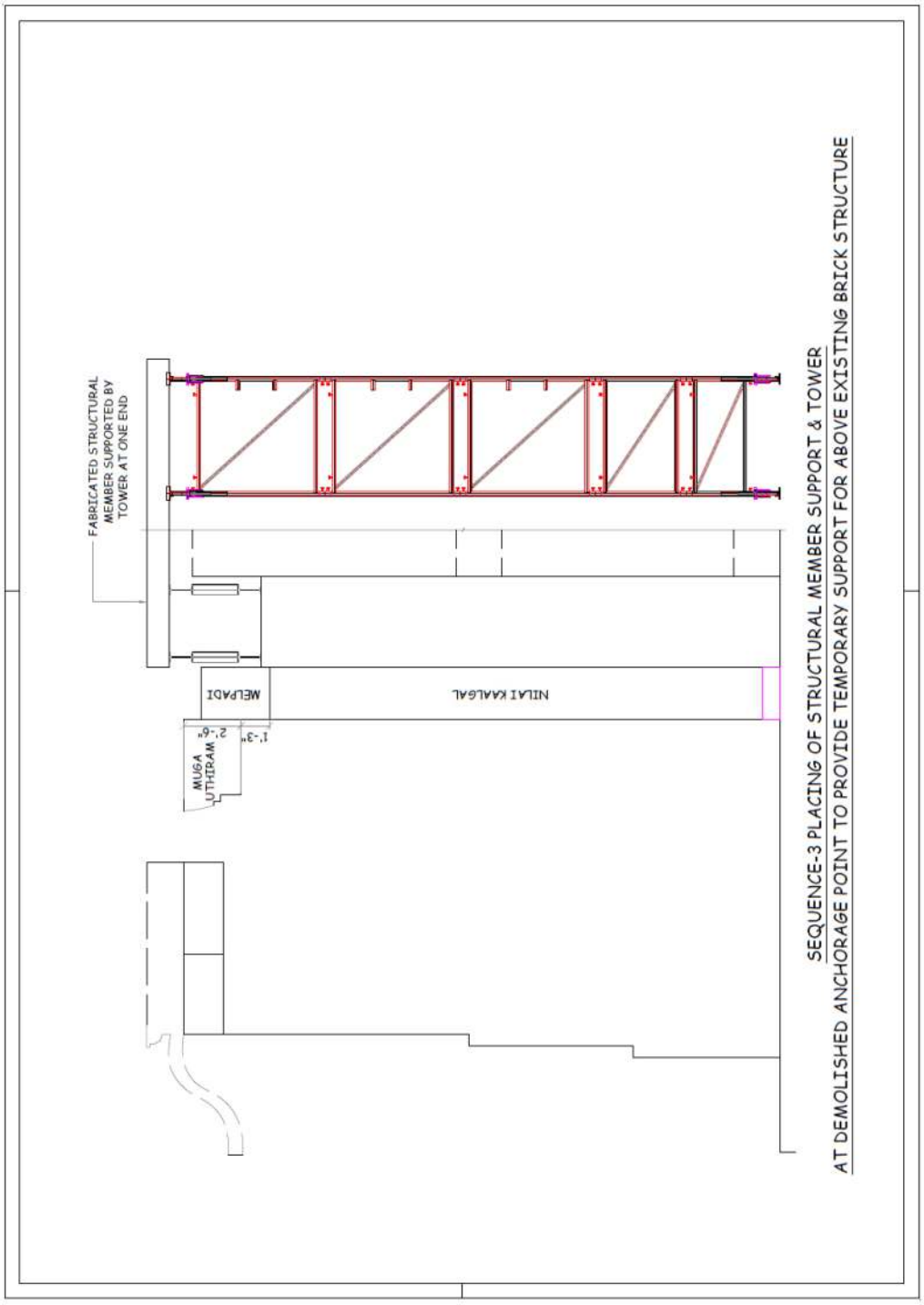
These beams and pillars were to be lifted to about 100' over and above the existing Rajagopuram and to be lowered into the Rajagopuram from the opening in the roof, at obviously higher cost. Anyway, the cost was not a consideration here. The issue is safe dismantling and placement to its final position of the completed beams and pillars taking adequate precautions of the safety of the existing structures and the workman.

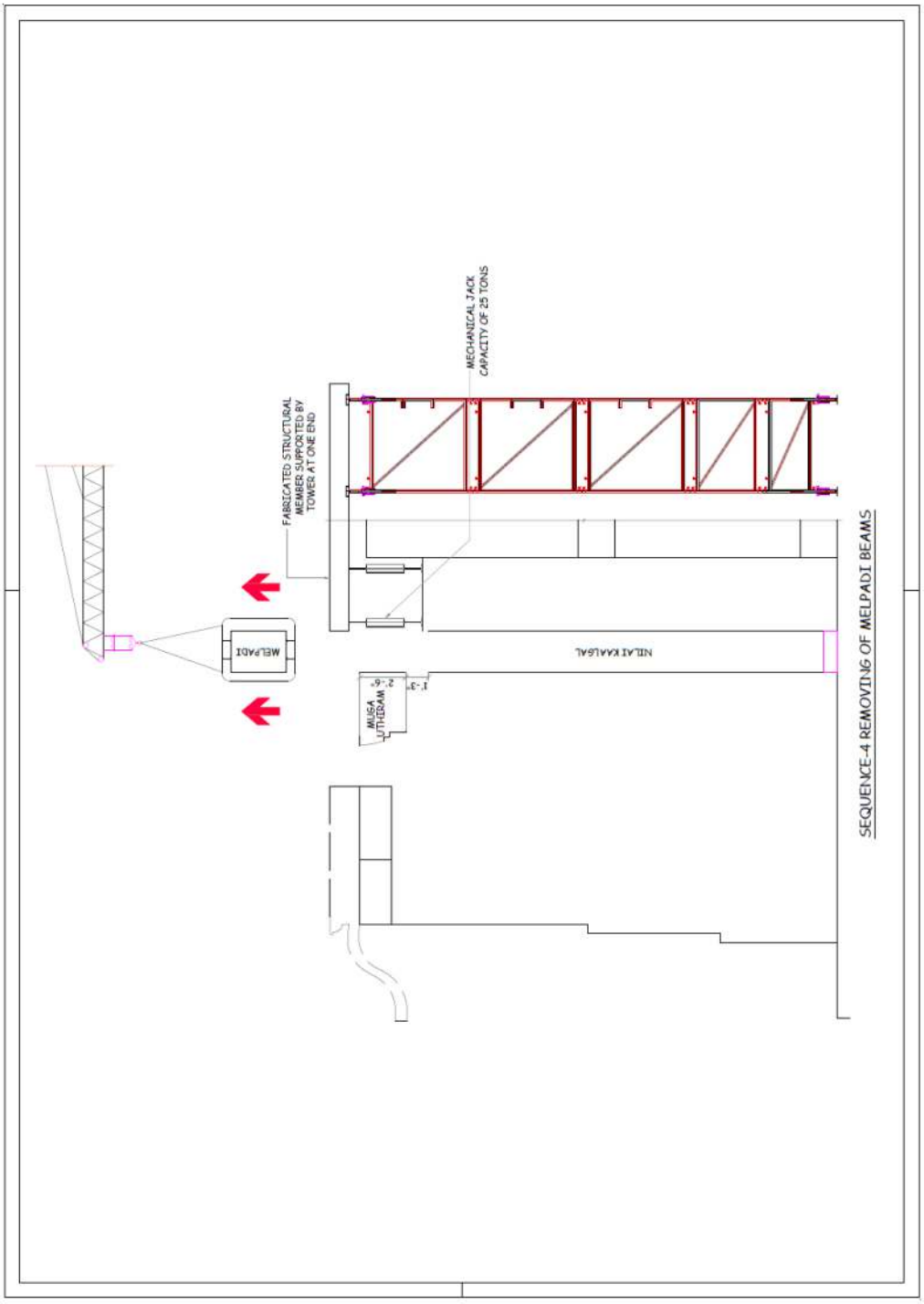
One of our team members, **Strutural Engineer Mr.Srikanth** from Madras has prepared the sequence plan for the execution of the project.

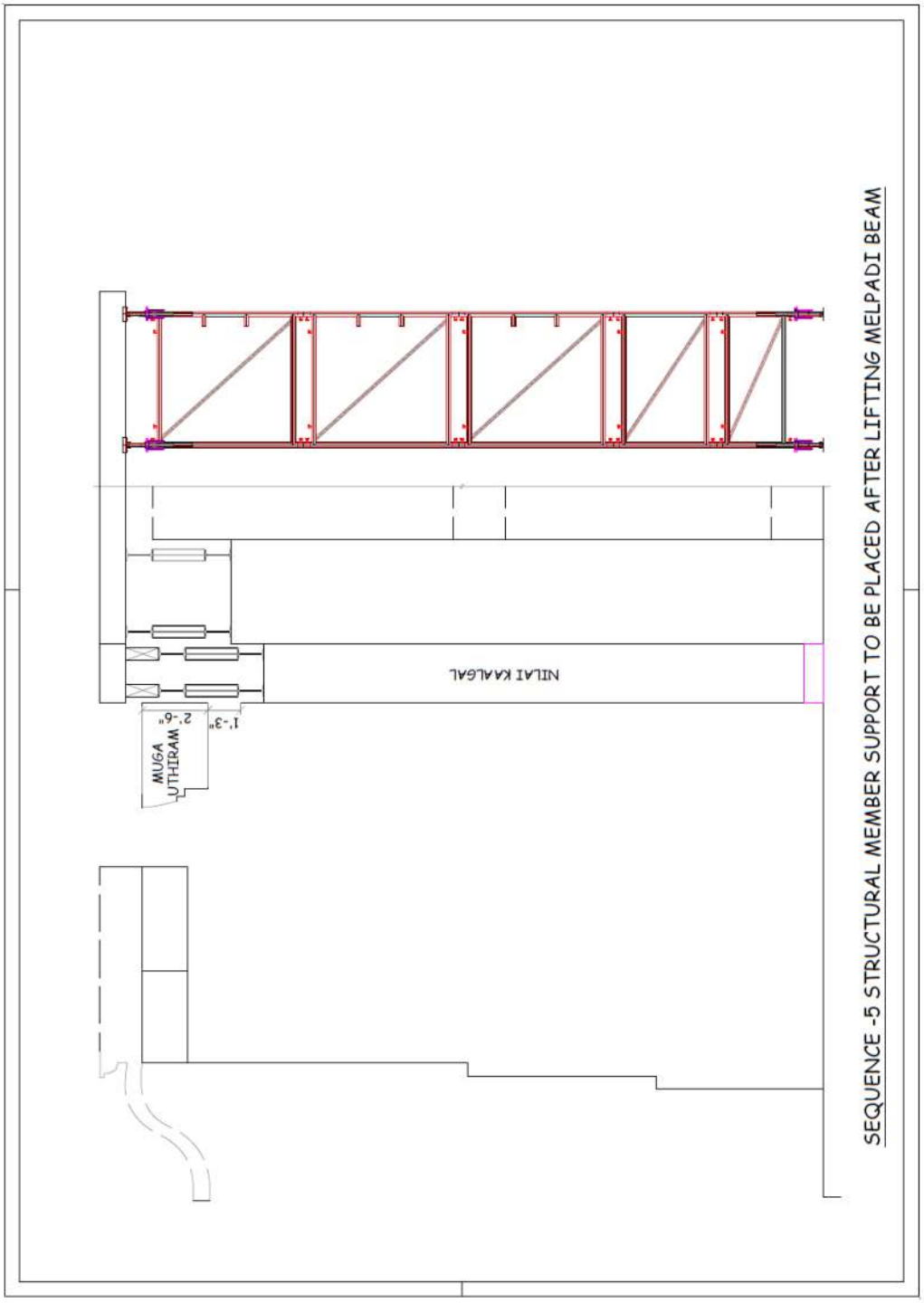


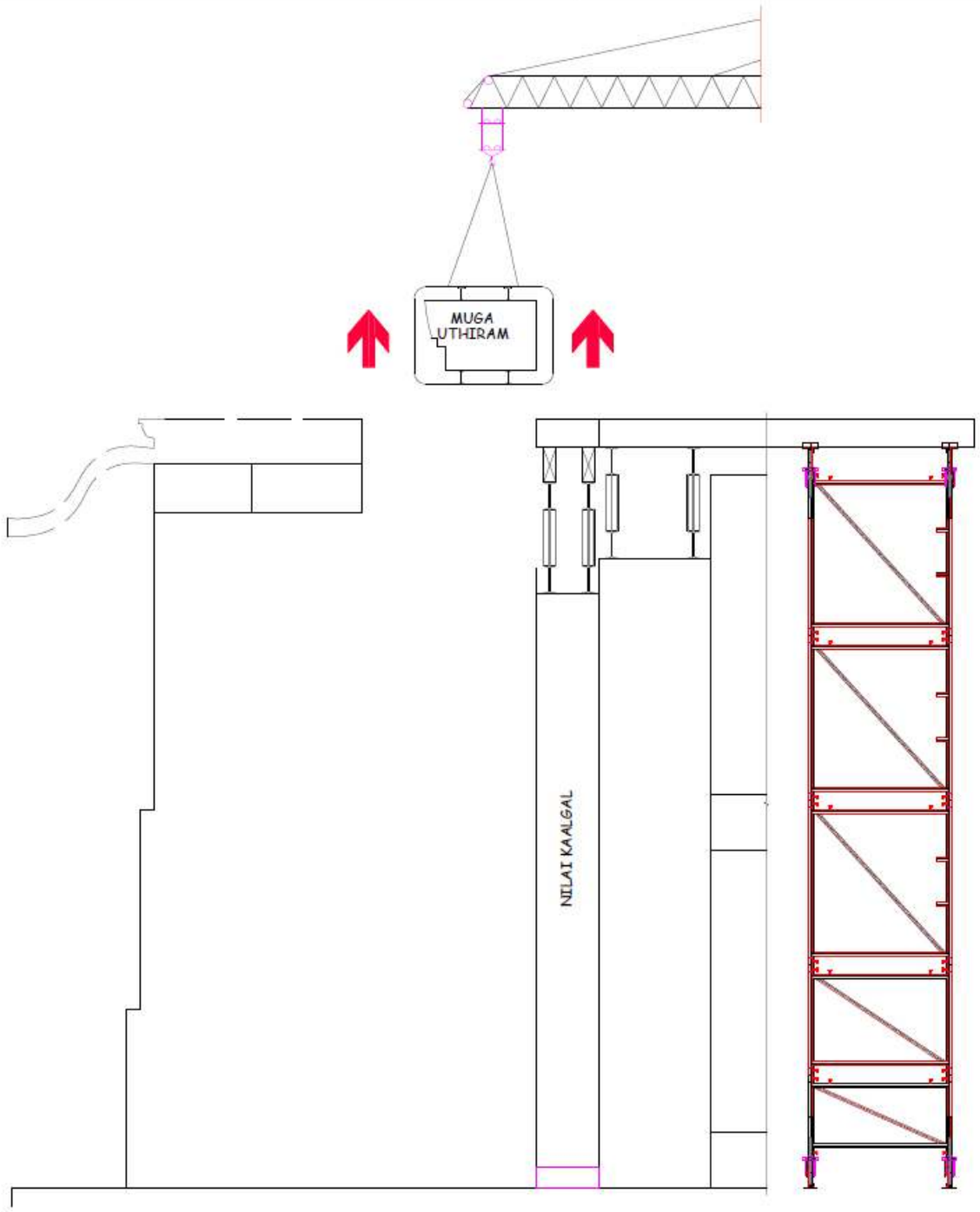

STRUCTURAL MEMBER TO
BE TIED ALL AROUND BEAM
AND THEN LIFTED BY USING CRANE BELT
KADHAVADI
MUGA
UTHIRAM
2'-6"
1'-3"
MELPADI
NILAI KAALGAL
END BEARING TO BE REMOVED
SEQUENCE-2 REMOVING OF KADHAVADI BEAMS


23'-0"
SURROUNDING PORTION OF
BRICK TO BE PROPERLY CAVED
4'-0"
2'-6"
4'-0"
ELEVATION OF KADHAVADI BEAM
23'-0"
1'-6"
APPROX
1'-6"
APPROX
***
STRUCTURAL MEMBER ISMC 200-2NOS WITH BRICK+CEMENT
MORTAR PACKING TO SUPPORT ABOVE BRICK STRUCTURE
(ALLOWING SUFFICIENT SPACE FOR
LIFTING OF MELPADI AND MUGA UTHIRAM BEAMS)
***DEPENDING UPON BEARING OF MELPADI AND
MUGA UTHIRAM CLEARANCES TO BE KEPT
ELEVATION OF KADHAVADI BEAM AREA AFTER LIFTING WITH CRANE

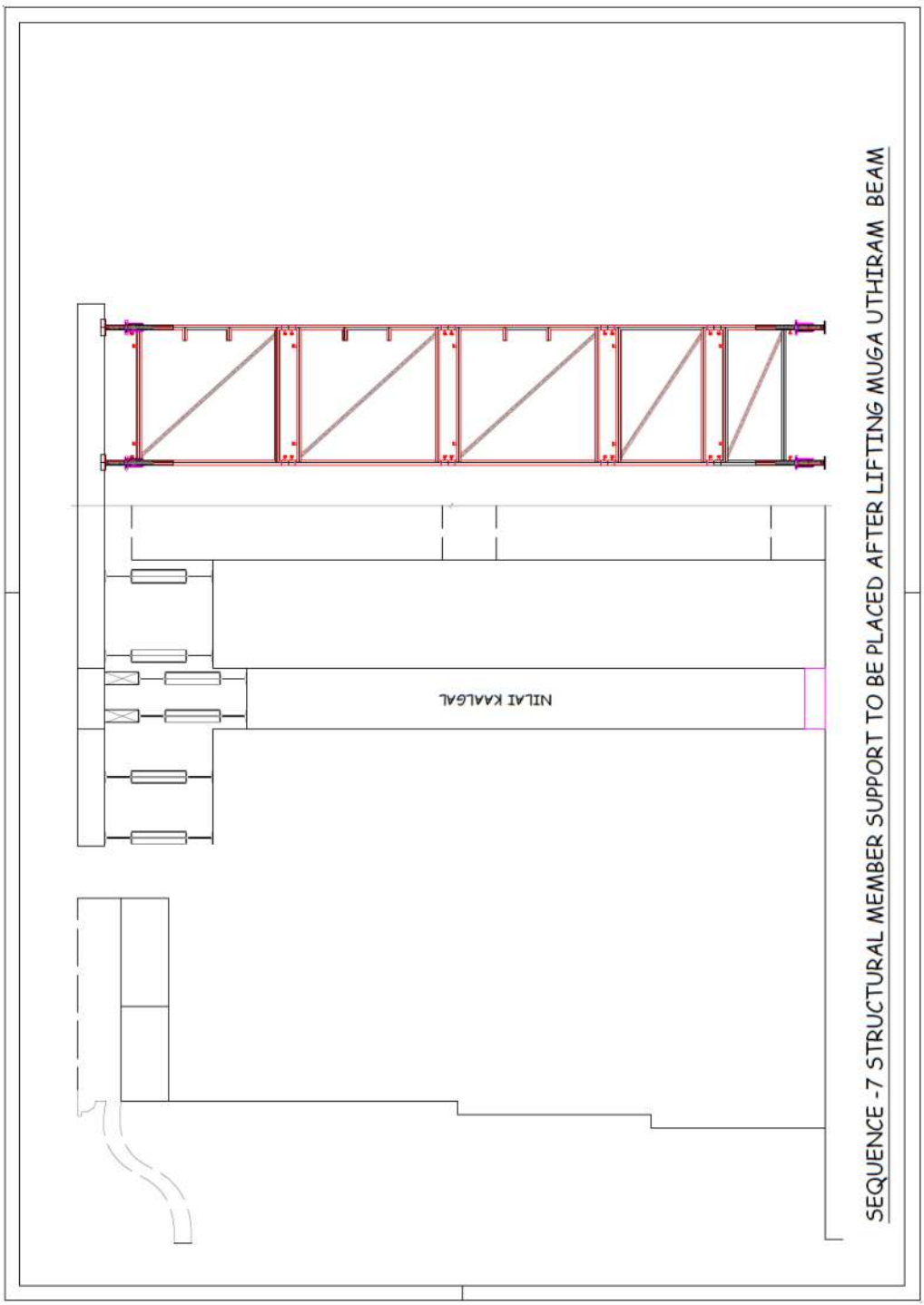

SEQUENCE-3 PLACING OF STRUCTURAL MEMBER SUPPORT & TOWER
AT DEMOLISHED ANCHORAGE POINT TO PROVIDE TEMPORARY SUPPORT FOR ABOVE EXISTING BRICK STRUCTURE
FABRICATED STRUCTURAL MEMBER SUPPORTED BY TOWER AT ONE END
NILAI KAALGAL
MELPADI
MUGA UTHIRAM
2'-6"
1'-3"

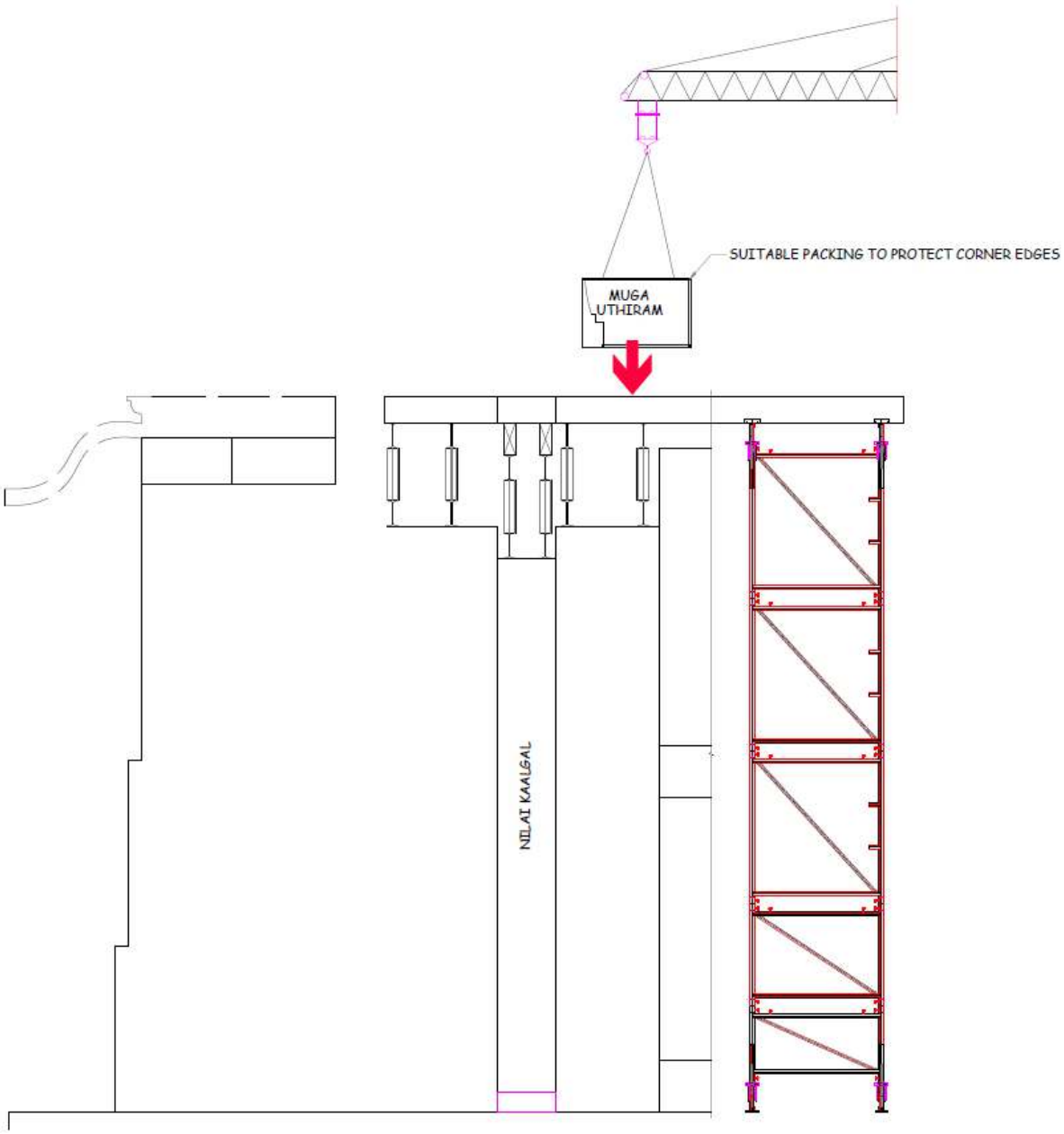

MECHANICAL JACK
CAPACITY OF 25 TONS
FABRICATED STRUCTURAL
MEMBER SUPPORTED BY
TOWER AT ONE END
MELPADI
NILAI KHALGAL
MUGA
UTHIRAM
SEQUENCE-4 REMOVING OF MELPADI BEAMS


SEQUENCE -5 STRUCTURAL MEMBER SUPPORT TO BE PLACED AFTER LIFTING MELPADI BEAM
NILAI KAALGAL
MUGA UTHIRAM
2'-6"
1'-3"

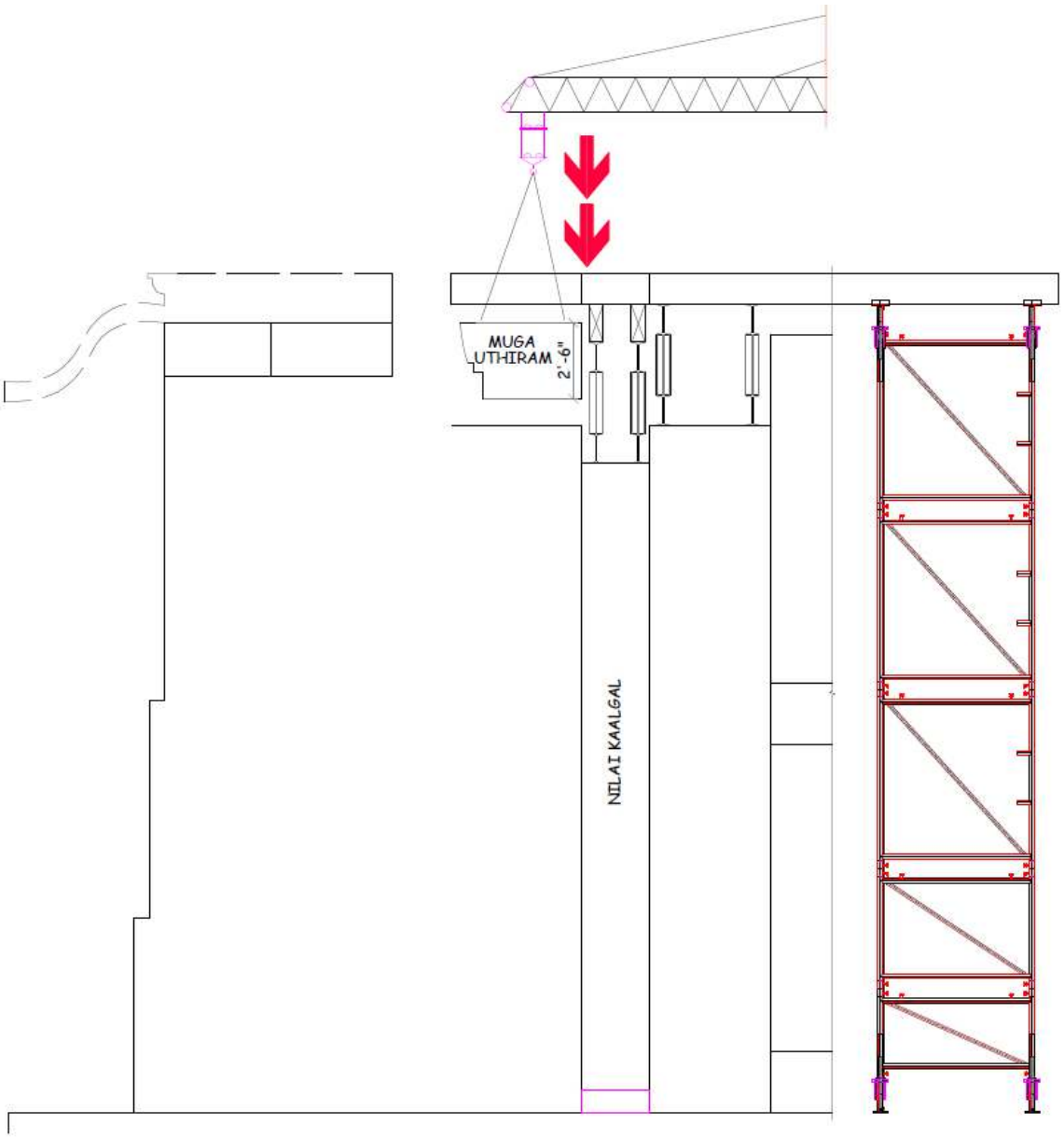


SEQUENCE -6 LIFTING OF MUGA UTHIRAM BEAMS

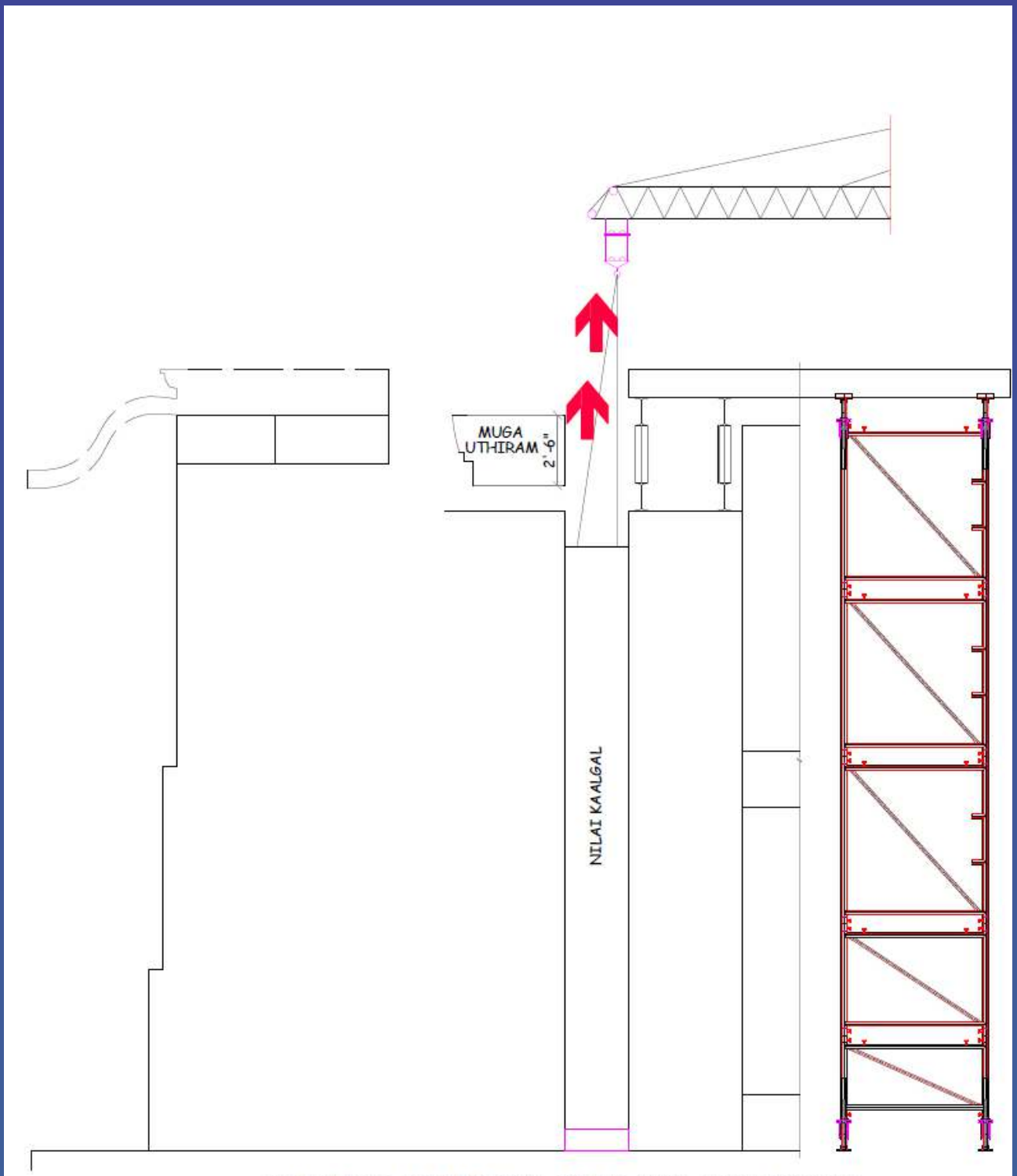

NILAI KAALGAL
SEQUENCE -7 STRUCTURAL MEMBER SUPPORT TO BE PLACED AFTER LIFTING MUGA UTHIRAM BEAM



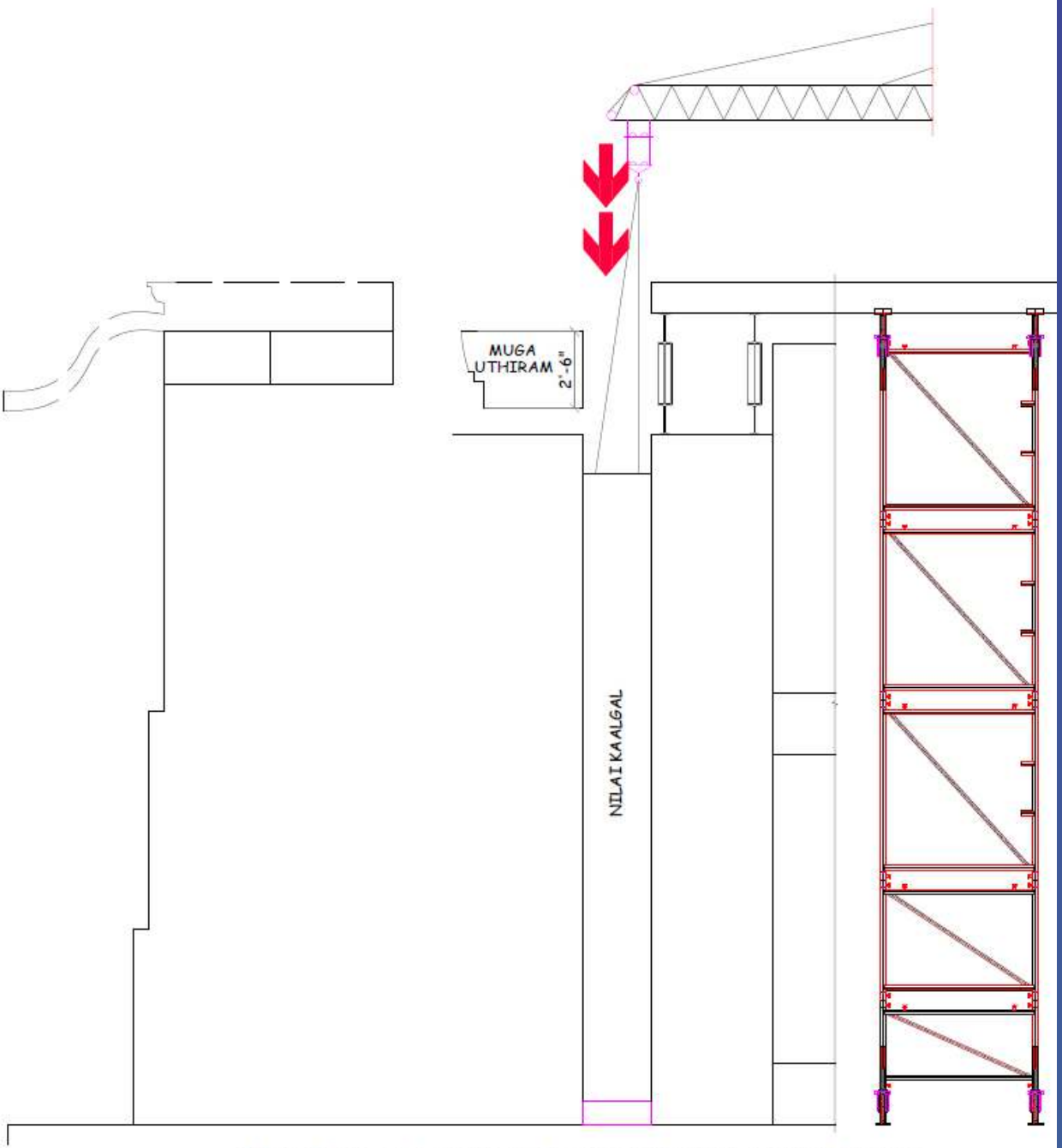
SEQUENCE -8 LIFTING OF NEW MUGA UTHIRAM BEAM BY CRANE



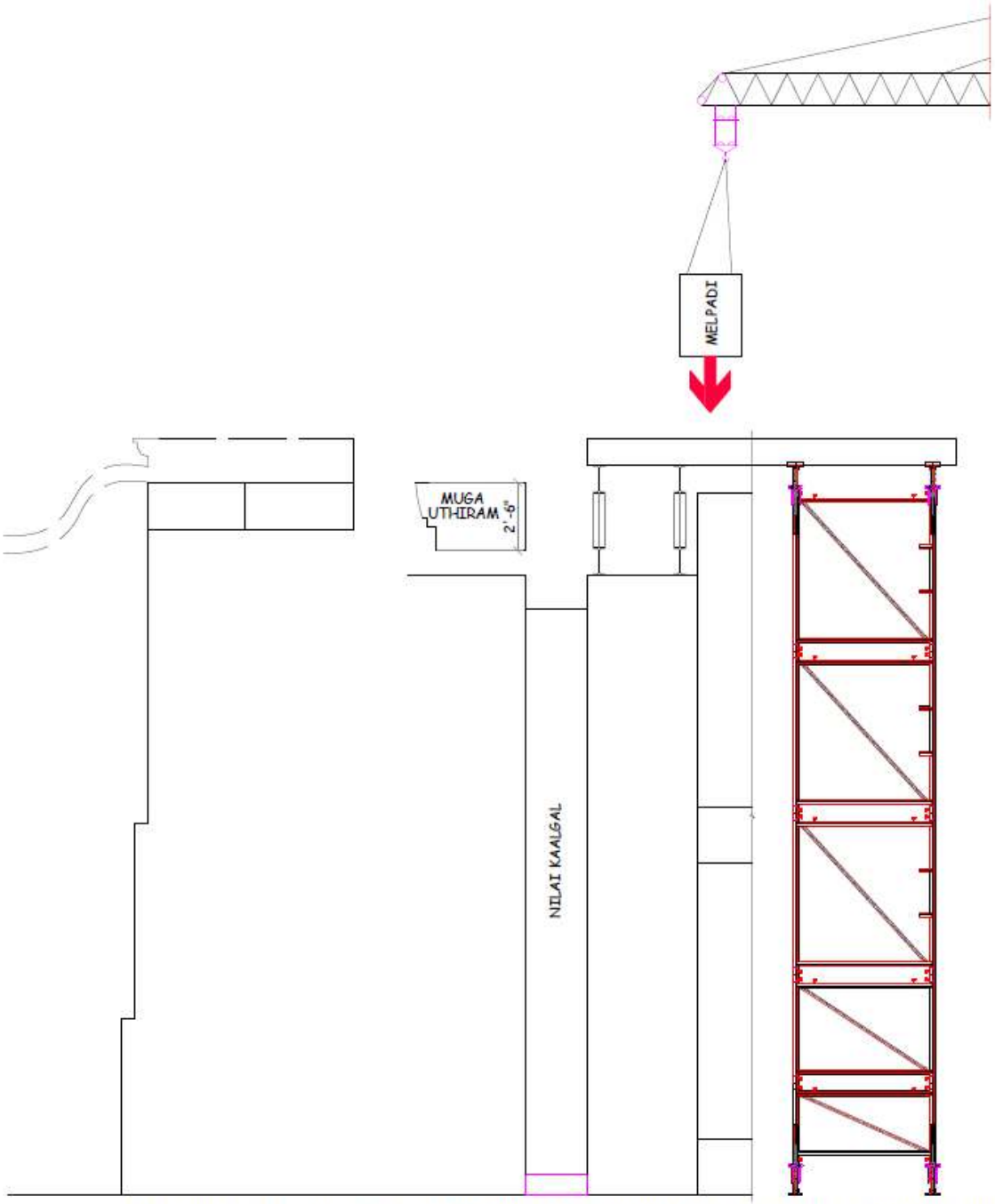
SEQUENCE -9 PLACING OF NEW MUGA UTHIRAM BEAM AND PERMANENT PACKING



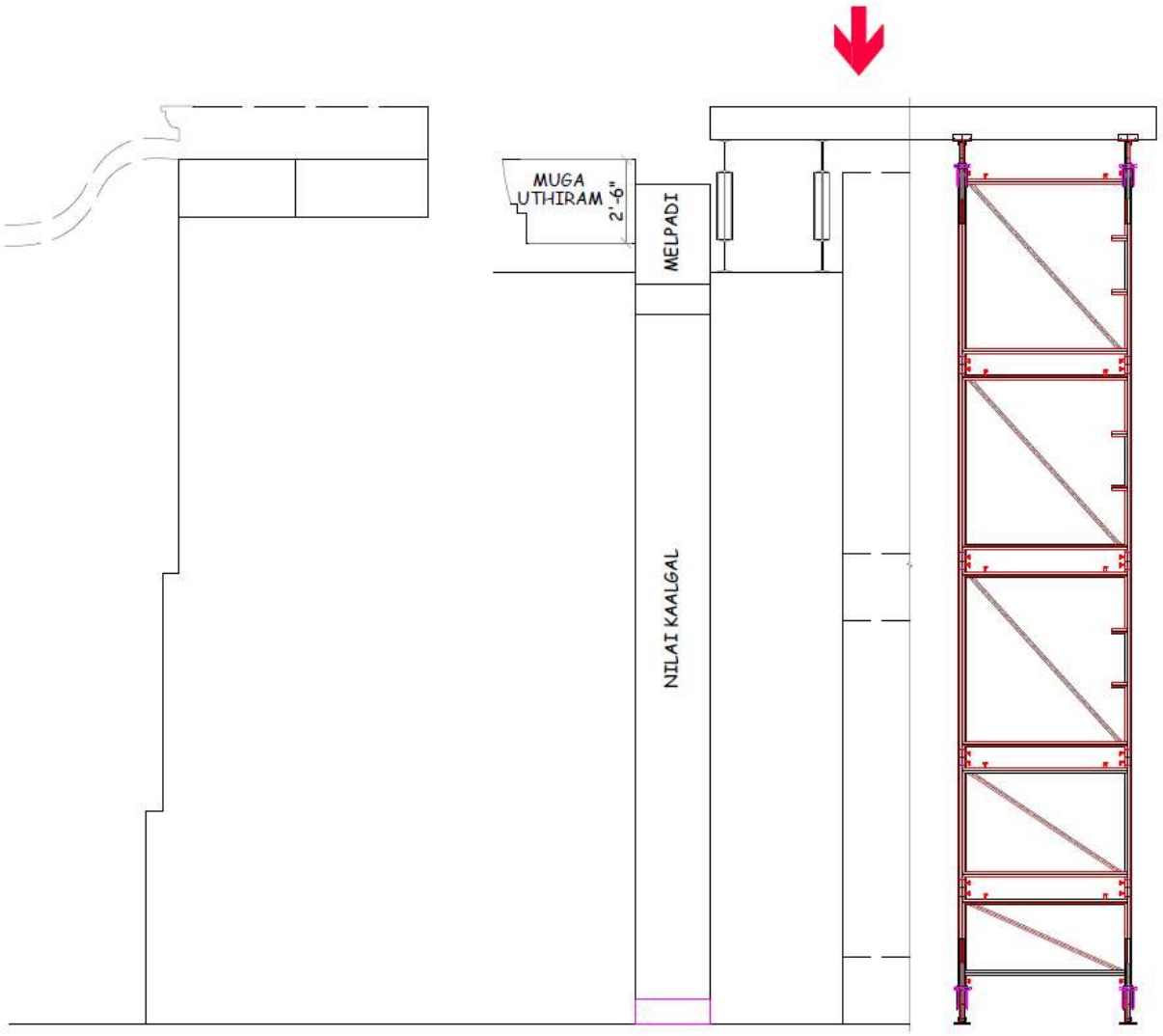
SEQUENCE -10 REMOVAL OF NILAKAL USING CRANE
AND SUBSEQUENTLY REMOVING JACK SUPPORT ONE BY ONE



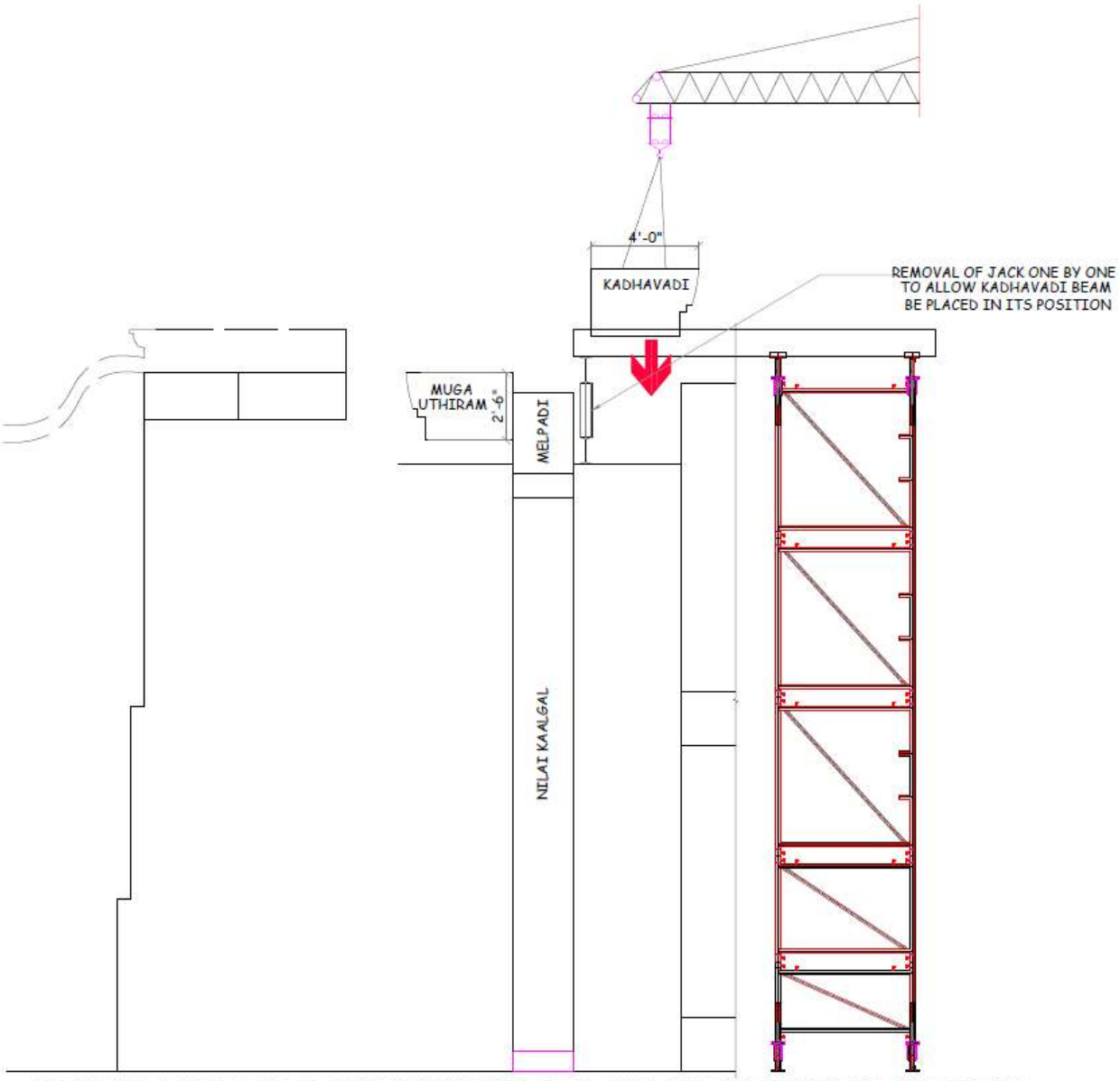
SEQUENCE -11 PLACING OF NEW NILAKAL USING CRANE
AND SUBSEQUENTLY REMOVING JACK SUPPORT ONE BY ONE
AND PERMANENT PACKING TO BE DONE



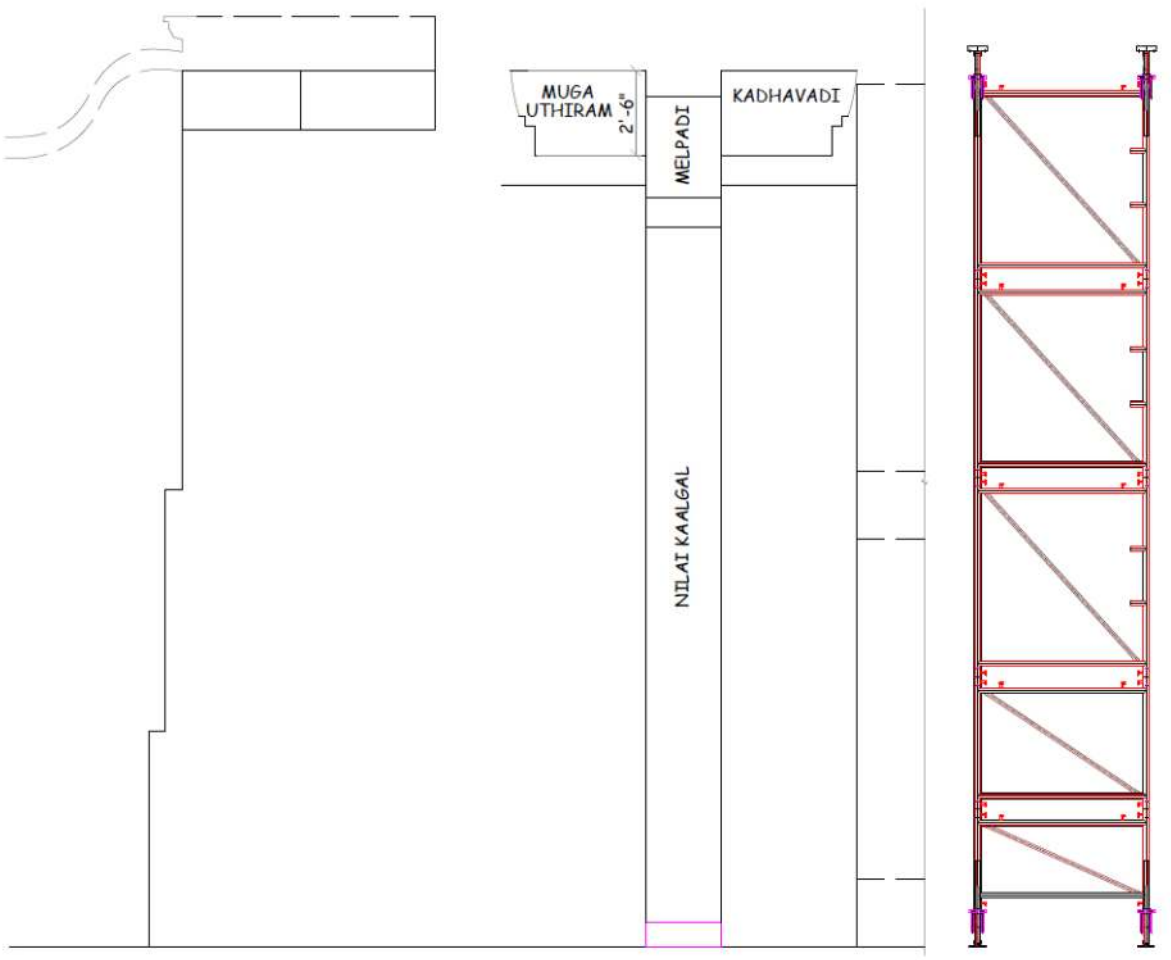
SEQUENCE -12 LIFTING OF NEW MELPADI BEAM BY CRANE AND REMOVING SUPPORTING JACK ONE BY ONE SO THAT STRUCTURE GET SUPPORTED AND AT SAME TIME MELPADI BEAM TO BE SHIFTED TO ITS POSITION



SEQUENCE -13 PLACING OF NEW MELPADI BEAM AND PERMANENT PACKING



SEQUENCE -14 LIFTING OF NEW KADHAVADI BEAM BY CRANE AND REMOVING SUPPORTING JACK ONE BY ONE SO THAT STRUCTURE GET SUPPORTED AND AT SAME TIME KADHAVADI BEAM TO BE SHIFTED TO ITS POSITION



SEQUENCE -15 PLACING OF NEW KADHAVADI BEAM AND PERMANENT PACKING

09. Safety of the Operating Personnel

Safety of the operating personnel is the prime criteria. They have been adequately covered by insurance and in critical areas they are advised to wear helmets towards their safety.

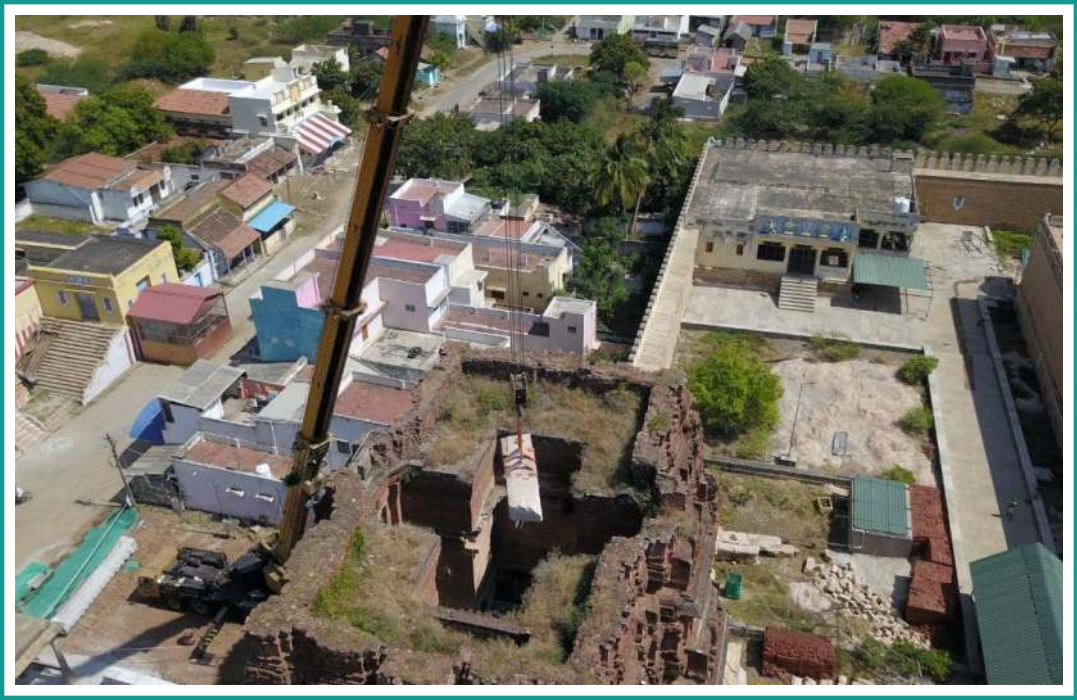
Other sculptors working in a open yard, were of the opinion that the helmets are not necessary due to the weather conditions. Perhaps we agree with them.

However, they have been provided with a thatched roof shelters to escape the heat from the sun. Sculptors worked in an open space so that the stone dust generated while sculpturing will be washed away by the wind, reducing the dust pollution.

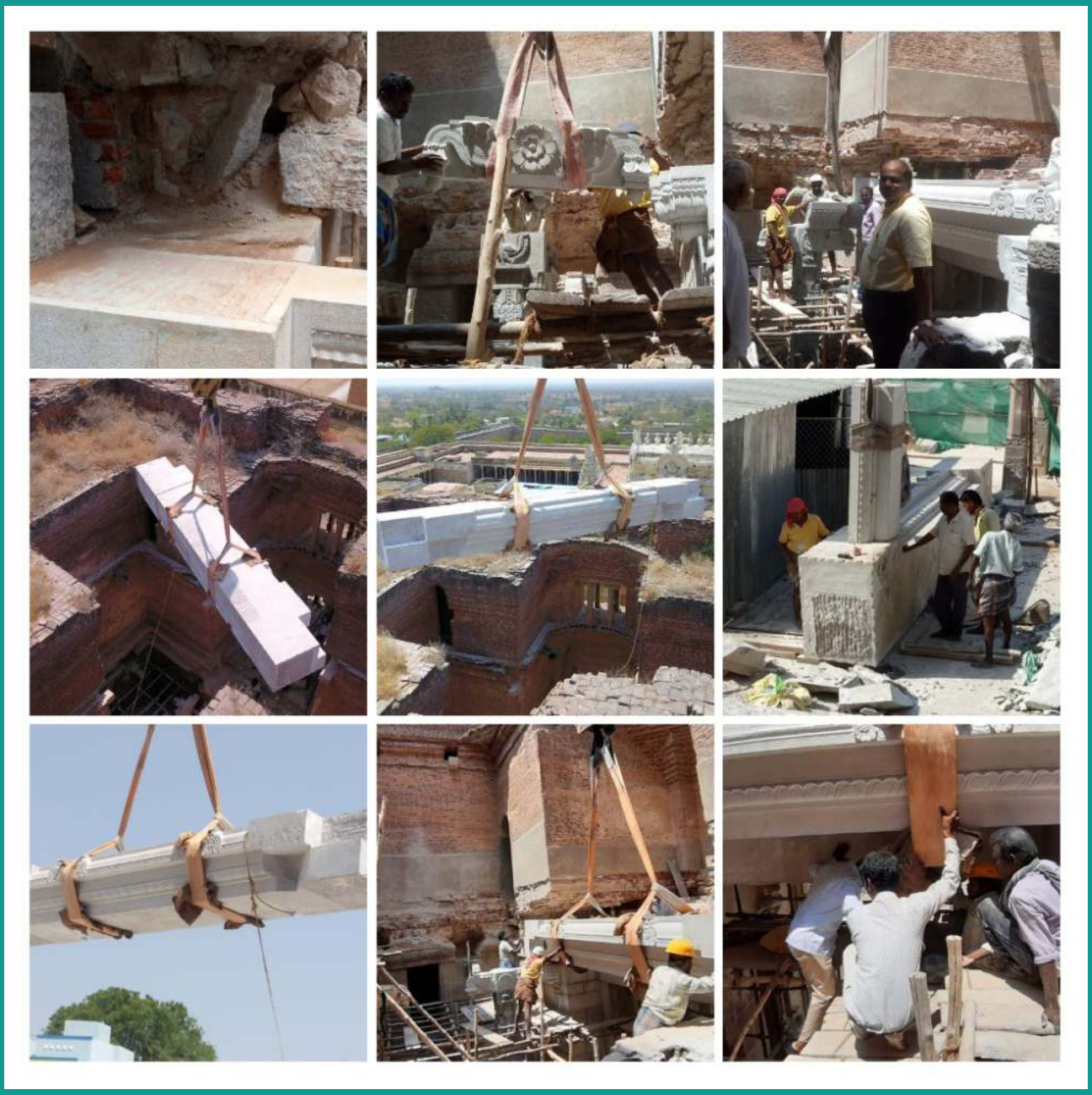
10. Kathavadi beam 23,000 kg

10.1 Dismantling

Friday 4 January 2019



10.2 Installation



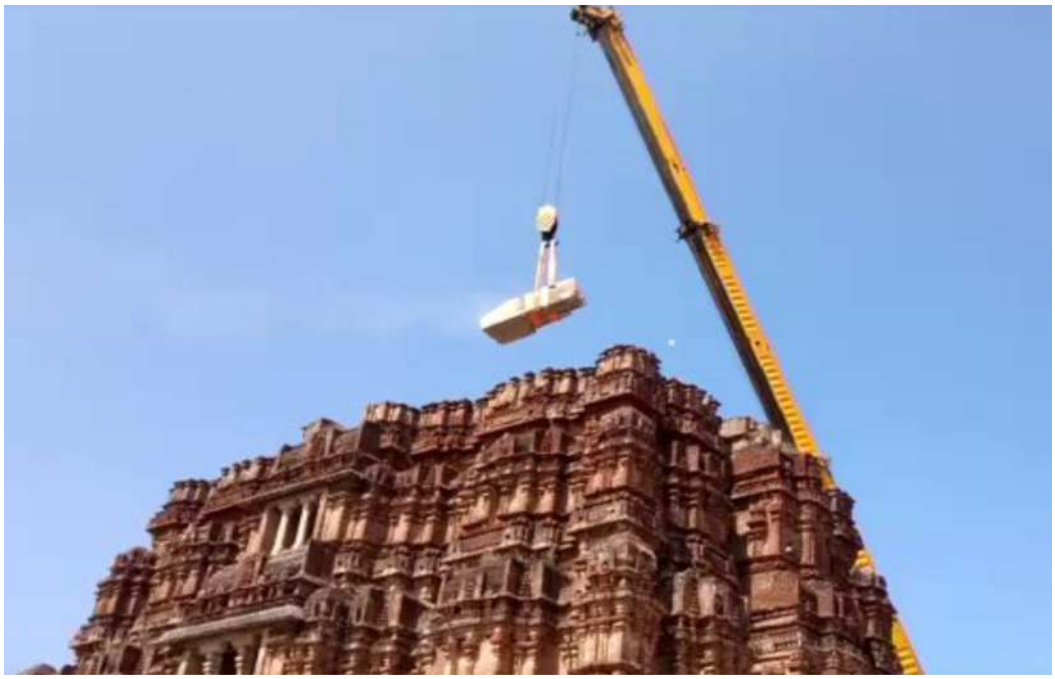
Wednesday 6 March 2019

11. Muga uthiram (முகஉத்திரம்)
22,500 kg

11.1 Dismantling

Friday 4 January 2019


photos



11.2 Installation

Poojas were performed for Muga uthiram, 23' long - 17,100kg finished weight, on Saturday 12 January 2019 in the presence of the Joint Commissioner Shri Pon Jayaram & the Archagars .


KRUPP
KMK 6300


KMK 6300

After the installation of the Muga uthiram
in a relaxing mood, after a month long anxiety

12. Thala vaasakaal
- Nilai kadhavu (நிலைக் கதவு)

12.1 Dismantling

Damaged door frames - Eastern & western side

Friday 11 January 2019

12.2 Installation

This is one of the historical incidence of Installation of the door frame for the existing Rajagopuram, built around 1200 AD.

Having done this, we started working on the installation of the door frame, one on each side, east and west.

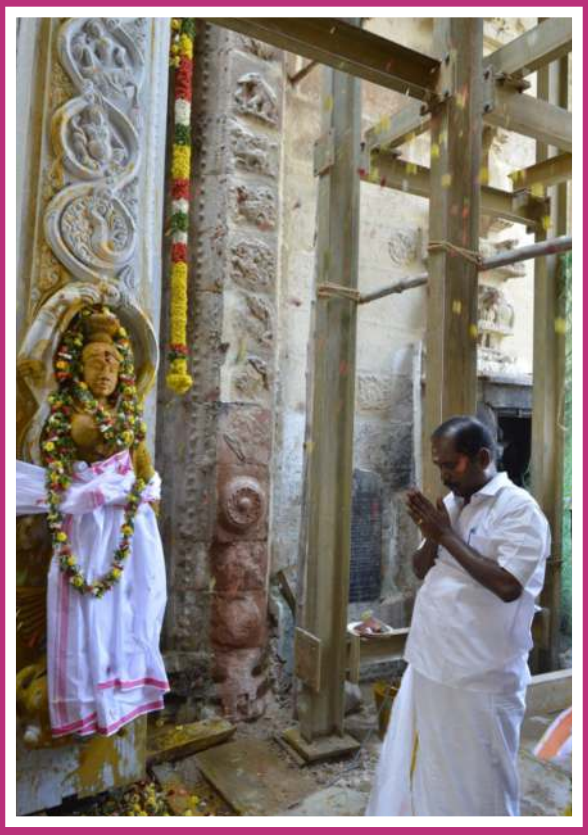
On the auspicious day 23 January 2019 Wednesday, the door frames one each on the east and west (with highly complicated carvings) each weighing 17,500 kg was lifted to its final position, in the midst of the **Brahma sthuthi parayanam,** chanted by about 30 people arrived from Coimbatore.

These door frames in the East & Western sides were heavily damaged. Hence a temporary wall was built and the main door installed with width 6' & height 10'.

The 2 of the doorframes, right side and left side were completed, with all the sculptures, by July 2018.

Simultaneously, we were discussing with the Structural Engineers from Madras , in the IIT Madras.

Finished weight 17,200 kg



Having located it, the southern side supporting wall on east and west was built with 15 carved granite stones each weighing around 500 kg. All this was executed with the Lime-Mortar, ground the specially errected machine.

13. Door top frame melpadi
(நிலைக் கதவு மேல்படி)

13.1 Dismantling

After the settlement of the door frames, the top beam, with lot of carvings, comprising the full frame was lifted to about 110' ht and placed on top of the door frames.

Saturday 16 February 2019

13.2 Installation

Monday 28 January 2019

The team who are responsible for the successful erection of all the beams

14. Packing above the Granite beams

Now we started packing the Muga uthiram on east and west and constructed the final wall above this beam.

Wednesday 16 January - Friday 15 March 2019

15. Closing the ceiling

ஸ்ரீ.

திருவெள்ளறை, அருள்மிகு புண்டரீகாட்சப்பெருமாள் திருக்கோயில்.

வடக்கு இராஜகோபுரம் உறுதிபடுத்துதல் மற்றும் மேம்படுத்துதல் திருப்பணி.

திருக்கோயில் நிர்மாணம் - திருப்பணி

ஆலயம் தொழுவது சாலவும் நன்று - ஔவையார்- நூல் கொன்றைவேந்தன்

மானுட ஜெனமம் எடுத்ததின் பயன் ஆன்மா ஞான பாதத்தை அடையவேண்டியதாகும். ஞான பாதத்தையடைய ஆன்மா லயிக்க வேண்டும். அதற்கு ஆலயம் (திருக்கோயில்) மிக மிக முக்கியமானதாகும். ஆலயத்தை புதிதாக சிற்ப சாஸ்த்திரத்தை பூர்ணமாக கொண்டு கட்டுவித்தலுக்கு நிர்மாணம் என கூறப்படுகிறது. ஆலயத்தின் கருவறை கட்டுமானம் நிறைவடையும் பகுதி கண்டமாகிய விகத்திக்கு மேல் முச்சந்தி வீதியாகிய லல்லாட ஸ்தானமான **ஆக்னேயமாகுடம்**. அதாவது லல்லாடம் எனப்படும் உச்சி ஸ்தானமாகும்.

"இதிகோபுரரூபந்து நேத்ரஞ்சகிரதாகிஷ்" - என்ற வாக்ய ப்ரகாரம் கோபுர தரிசனத்தினாலே சகல பாக்யத்தையும் அடையமுடியும். தரிசனங்களில் கோபுர தரிசனமே சிகரமானதாகும்.

திருவெள்ளறை, அருள்மிகு புண்டரீகாட்சப்பெருமாள் திருக்கோயில் வடக்கு இராஜகோபுரம்.

நெடுங்காலத்திற்கு முன் இந்த இராஜகோபுரம் கட்ட ஆரம்பிக்கப்பட்டு காலத்தின் சூழலால் நிறைவடையாமல் நின்று விட்டது. நாளடைவில் இதன் கல்கார பகுதியில் முக உத்திரம், மேல்படி மற்றும் உள் உத்திரங்களில் விரிசல்கள் ஏற்பட்டுவிட்டது. உச்சி ஸ்தானமாகிய ஆக்னேயத்தின் பாவுகற்களும் விரிசலடைந்து விழுந்து விட்டது. எதிர் நிலைக்கால்களும் உடைந்து கீலகமாகிவிட்டது. ஆலயத்தின் ஏதாவது ஒரு பாகம் பின்னமடைந்தால் அவற்றை புதுப்பித்தலுக்கு அந்தரீதக பிரதிஷ்டை என கூறப்படுகிறது. தற்போது இக்கோபுரத்தின் மேற்கூறிய உடைந்த உத்திரங்களை அகற்றி புதிய உத்திரங்கள் பொருத்தப்பட்டுள்ளது. பொதுவாக புதிய நிலைக்கால்கள் பிரதிஷ்டை என்பது புதியதாக அமைக்கும் ஆலயங்களுக்கே உரியதாகும். ஆனால் இத்திருக்கோயிலில் ஏற்கனவே உள்ள கீலகமடைந்த நிலைக்கால்களை அகற்றி அதே இடத்தில் புதிய நிலைக்கால்கள் நிறுத்தப்பட்டுள்ளது. இந்த இராஜகோபுரத்தின் கல்கார பணிகள் துவங்கி நிலைக்கால் முதல் விதானம் வரை புதிதாக செய்யப்பட்டுள்ளதால் இக்கோபுரம் நூதன (புதிய) இராஜகோபுரமாகவே கருதப்படவேண்டும்.

கல்கார பணிகளின் நிறைவு பணியாக விதானத்தின் மீது பாவுகற்கள் பரப்புவதாகும். கல்கார கட்டுமானம் நிறைவடையும் பகுதியான லல்லாட ஸ்தானமான ஆக்னேயமாகும். நுழைவு வாயிலின் கல்காரஅங்கம் பூர்த்தியாகும் சமயம் திருப்பணியை மேற்கொண்ட கர்த்தாக்கள் மேன் மேலும் பல திருப்பணிகள் செய்ய இறையருளால் சகல வளமும் பெற்று சூரிய, சந்திரர்கள் உள்ள வரை நலமுடன் வாழ வேண்டியும், திருப்பணி செவ்வனே நிறைவடைந்ததற்கு இறைவனுக்கு நன்றி செலுத்தி வழிபாடு செய்தும், உச்சி ஸ்தானத்திலிருந்து தனம், தான்யம், புஷ்பம் ஆகியவற்றை கொண்டு வாழ்த்தி பாவுகற்களை மூடுவது சம்பிரதாயமாகும்.

1/2

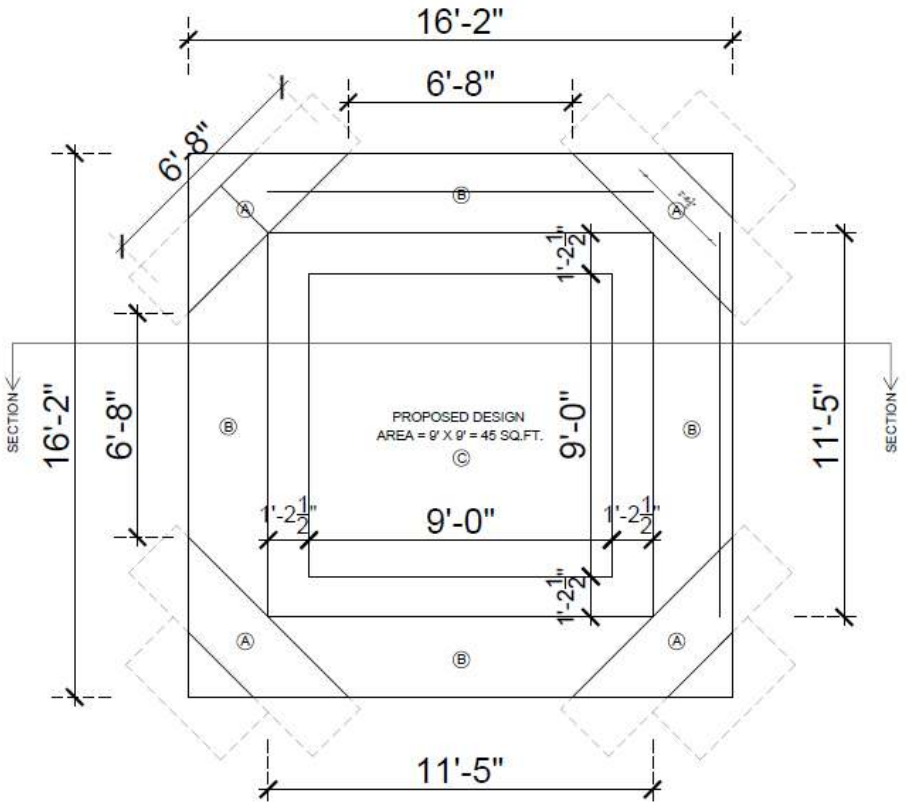
மேற்கண்ட சம்பிரதாயப்படி வழிபாடு செய்து வாழ்த்தி இக்கோபுரத்தின் உச்சி ஸ்தானம் பாவுகற்களை வேய்ந்து கடந்த பங்குனி மாதம் 3 ம் நாள் 17 .03 .2019 ஞாயிற்றுகிழமை அன்று பணி ஸ்ரீ புண்டரீகாட்ச பெருமாள் திருவருளால் செவ்வனே நிறைவுற்றது.

ஆலய திருப்பணி செய்பவர்களின் பலன் - ஆலய விக்கிரக நிர்மாண ஆயாதி சிற்ப இரகசியம் எனும் நூலில் கீழ்கண்ட பாடல் மூலம் தெரிந்துக்கொள்ளலாம்.

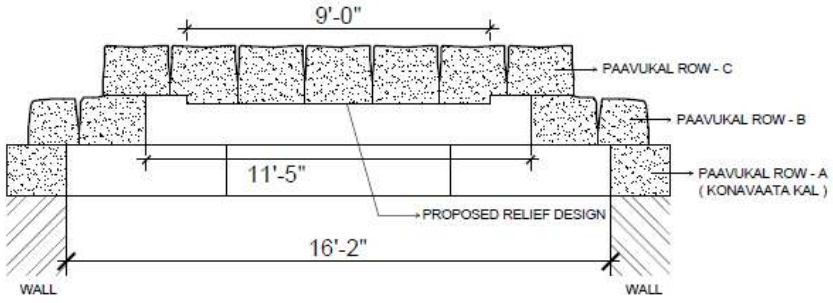
புல்லினால் வருடம் கோடி புது மண்ணால் நூறுகோடி
துல்லிய செங்கல்லாலேயே தூய முன்னூறுகோடி
அல்லியங் கோதே கேளாய் அருத்தரும் ஆலயங்கள்
கல்லினால் அமைத்தபேர்கள் கையிலைவைகுந்தம் மீந்தார்.

சுபம்.

Date : 22.02.2019



CEILING PLAN WITH DIMENSIONS



CONCEPTUAL SECTION - AA'

NORTH RAJAGOPURAM - KALKARAM - CEILING DESIGN

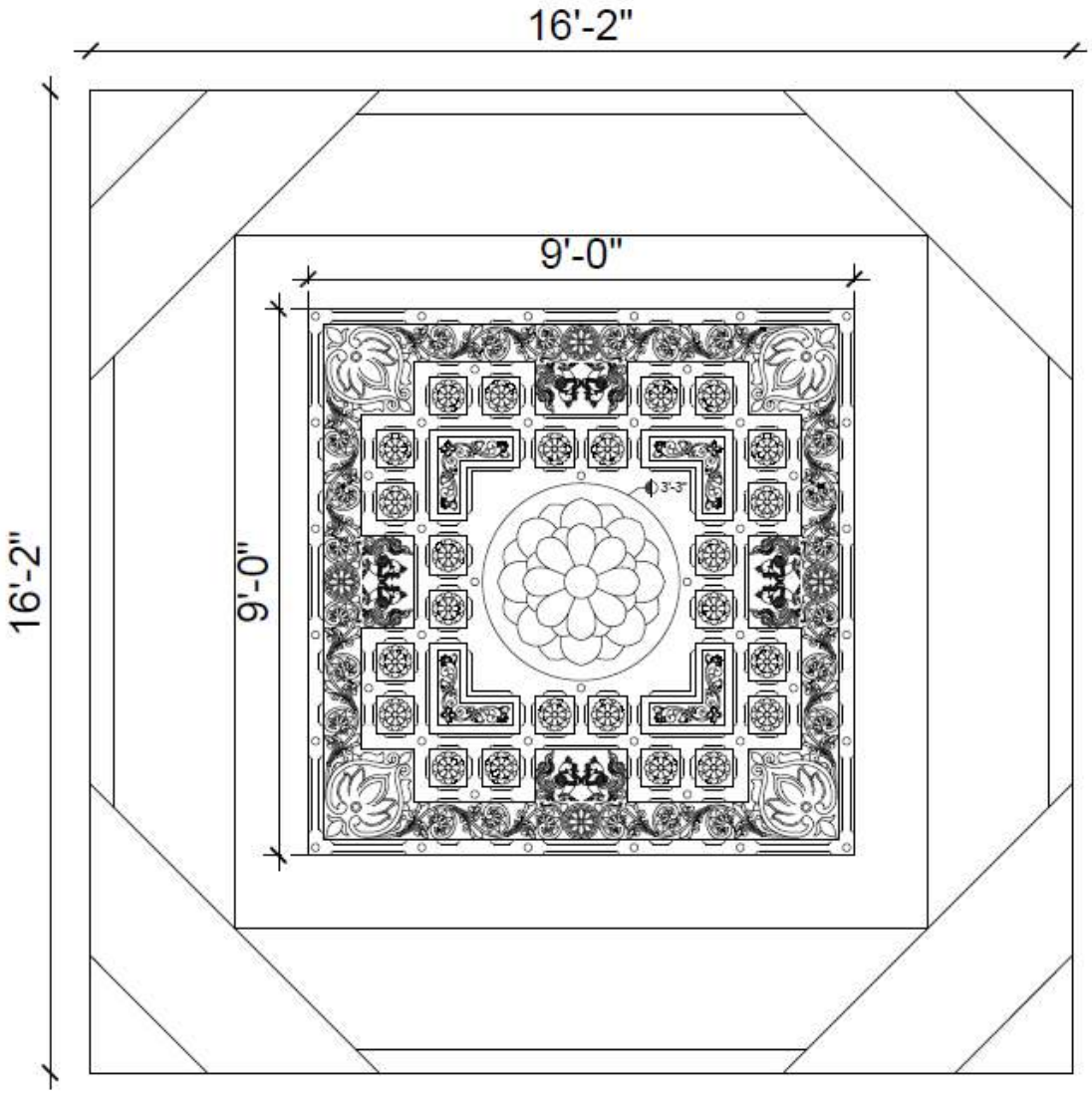
SRI PUNDARIKAKSHA PERUMAL THIRUKOYIL, THIRUVELLARAI

pg - 1 / 3

PREPARED BY - STHAPATHI S. KUMARAGURUBARAN

Print not to Scale

Date : 22.02.2019



Ceiling Plan with Proposed Design

North Rajagopuram - Kalkaram - Ceiling Design

SRI PUNDARIKAKSHA PERUMAL THIRUKOYIL, THIRUVELLARAI

PREPARED BY - STHAPATHI S. KUMARAGURUBARAN

Print not to Scale

15.1 Konakkal - Octagon shape






The opening in the ceiling - between the kathavadis (North-south) - is about 15' x 15' square. This is to be reduced to 11' x 11' square to enable easy assembling and to reduce the dead weight on the ceiling as much as possible. Therefore, we have to introduce an Octagonal shape on top of the kadhavadis. This picture explains the assembly of the octagonal shape. The drawings also explain the same concept.

15.2 Square shape

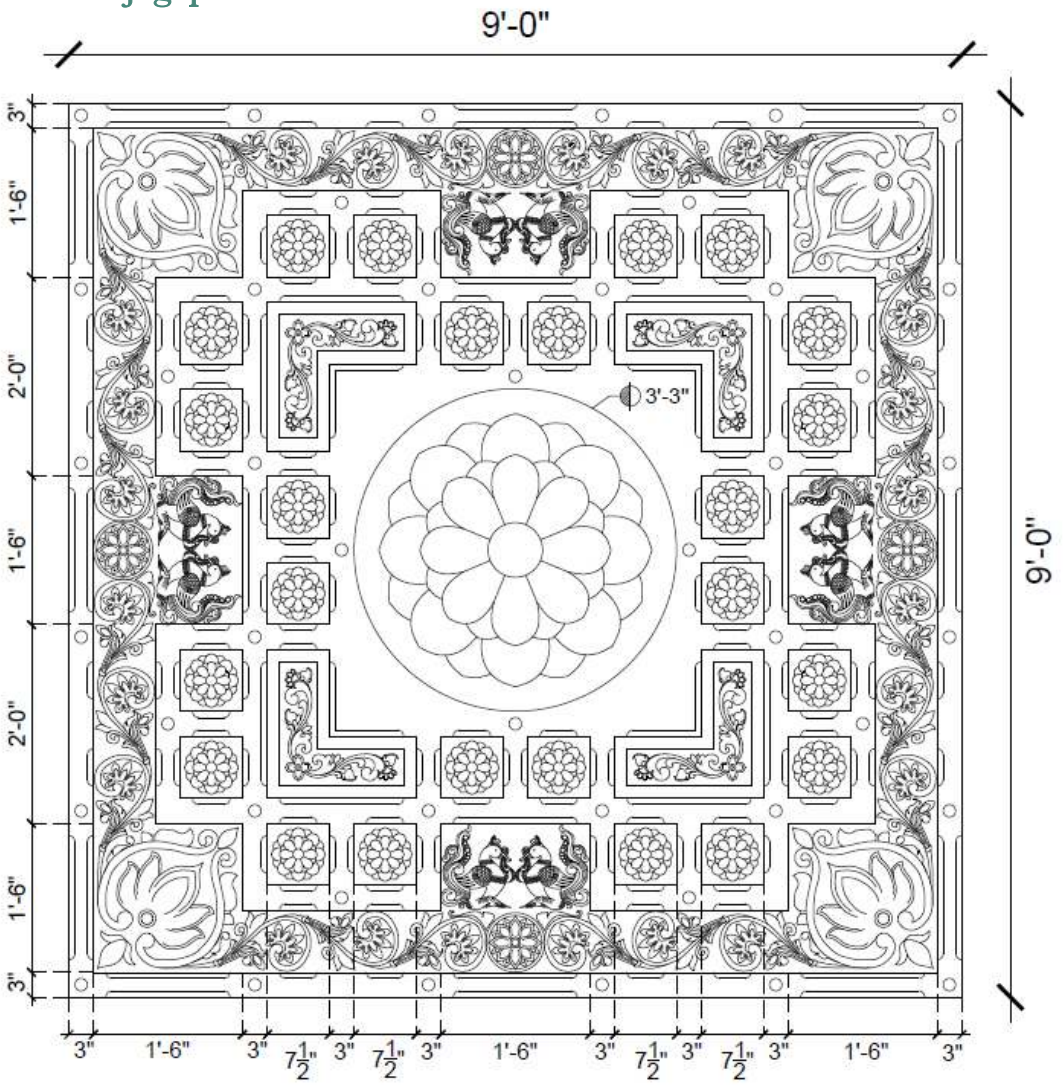
Over and above this square shape pavakkal - granite slabs with the carvings will be placed.

Thus completing the assembly of the ceiling.

15.3 Paavakkal - with carvings

Date : 22.02.2019

In accordance with the Hoysala Architecture, we have designed the suitable carvings for the ceiling inside the Rajagopuram.



Revised Detailed Design

North Rajagopuram - Kalkaram - Ceiling Design

SRI PUNDARIKAKSHA PERUMAL THIRUKOYIL, THIRUVELLARAI

pg - 3 / 3 PREPARED BY - STHAPATHI S. KUMARAGURUBARAN Print not to Scale

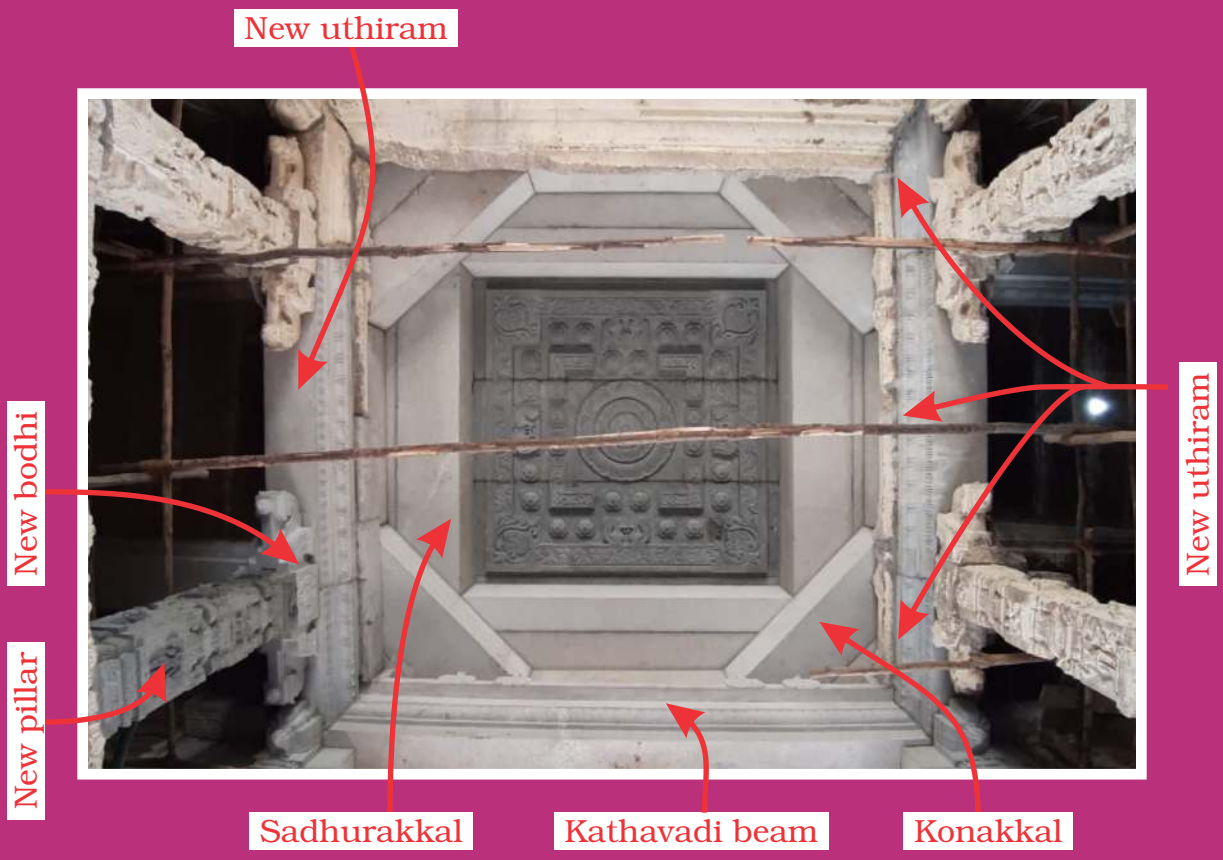
15.4 Carvings in the ceiling

15.5 Ceiling Installation


KRUPP
KMK 6300

Team of sculptors, crane drivers and Sthapathi

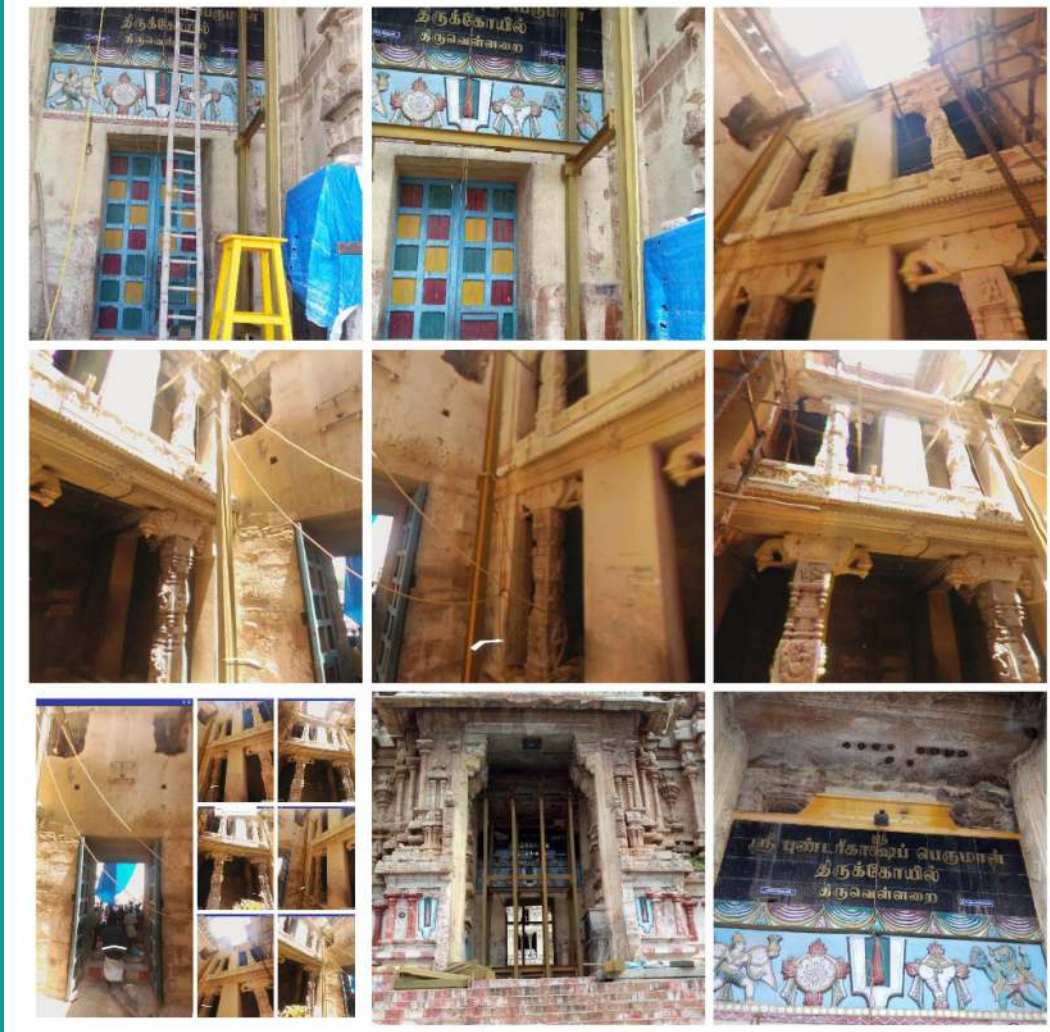
15.6 Ceiling - Completed view



கல்கார கட்டுமானம் நிறைவடையும் பகுதியான லல்லாட ஸ்தானமான ஆக்னேயமாகும். நுழைவு வாயிலின் கல்காரஅங்கம் பூர்த்தியாகும் சமயம் திருப்பணியை மேற்கொண்ட கர்த்தாக்கள் மேன் மேலும் பல திருப்பணிகள் செய்ய இறையருளால் சகல வளமும் பெற்று சூரிய, சந்திரர்கள் உள்ள வரை நலமுடன் வாழ வேண்டியும், திருப்பணி செவ்வனே நிறைவடைந்ததற்கு இறைவனுக்கு நன்றி செலுத்தி வழிபாடு செய்தும், உச்சி ஸ்தானத்திலிருந்து தனம், தான்யம், புஷ்பம் ஆகியவற்றை கொண்டு வாழ்த்தி பாவுகற்களை மூடுவது சம்பிரதாயமாகும்.

16. Completed view

16.1 Before thiruppani - Kudavarai



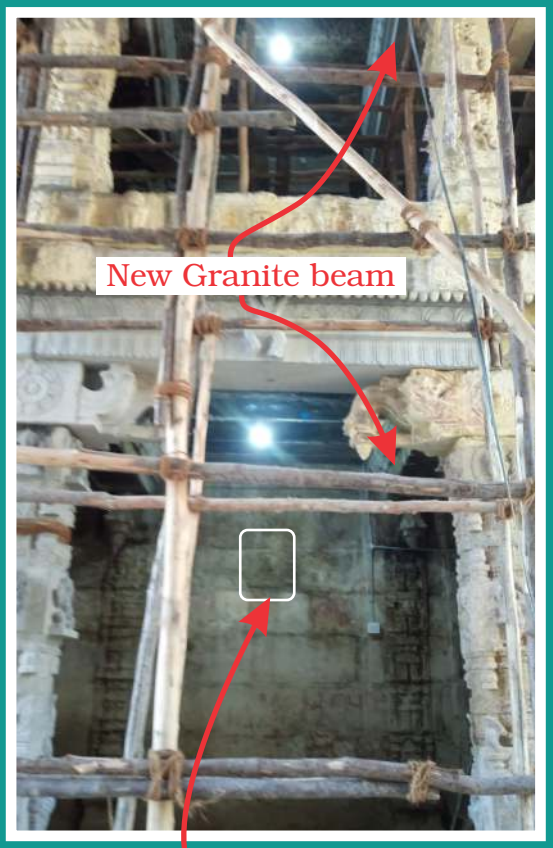
The above 9 pictures display the entrance views before commencement of the work - January 2015.

The entrance door height was limited to 10', the temporary wall was built to about 6' thickness over and above the door frames, blocking the front door frame; the temple's name displayed over that.

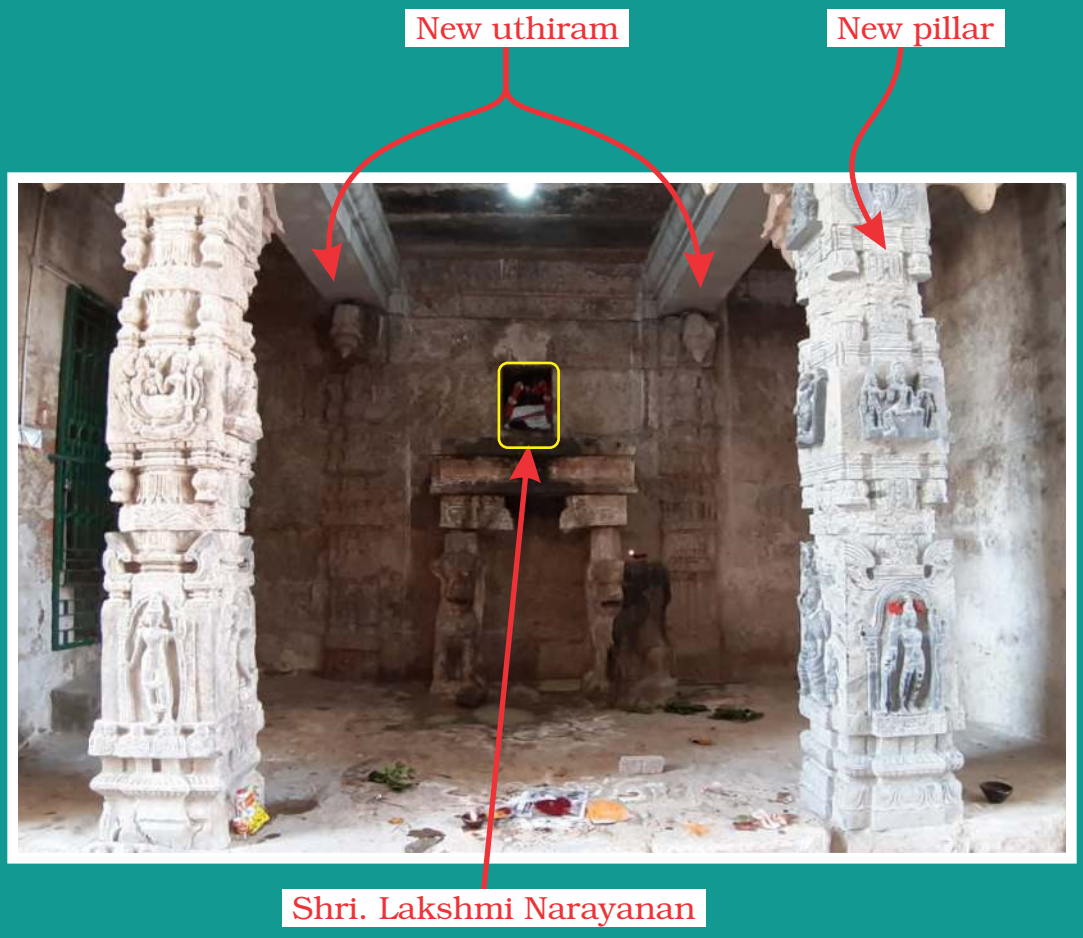
This also reveals the temporary brick pillars, supporting the cracked beams. In this process, the western side Shri Lakshmi Narayanan was unable to view Shri Ramanujar on the eastern side, both placed at about 8' height in view of the wall built in between to support the cracked granite beams.

As per Agama Sastras this is unacceptable, not a good practice.

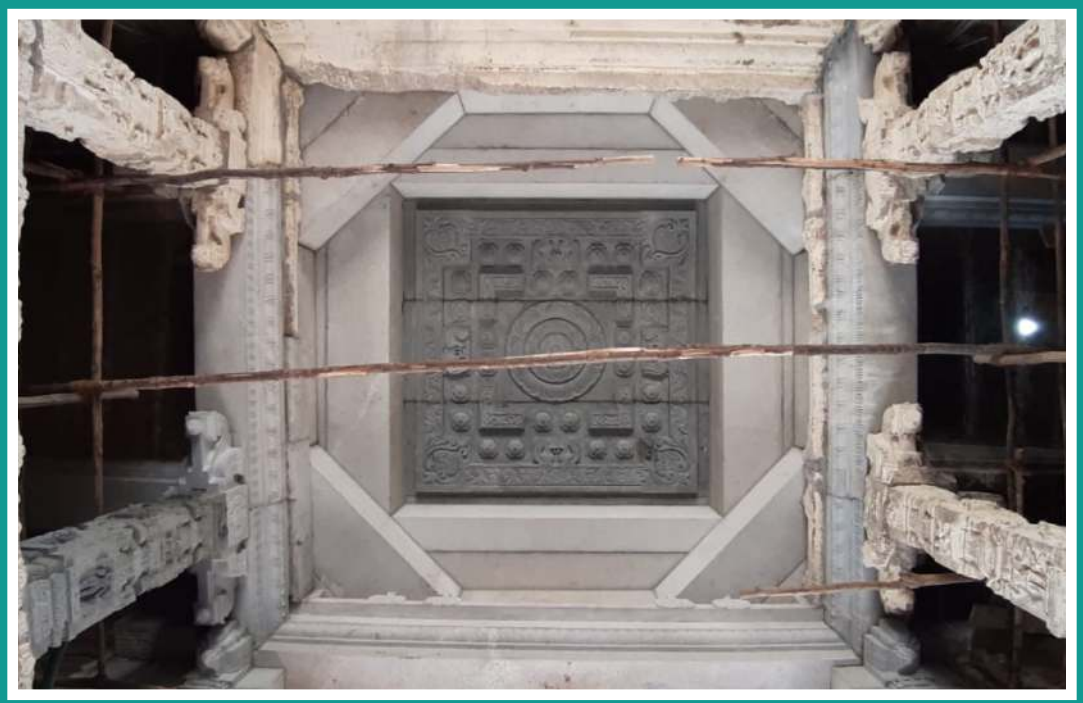
16.2 After thiruppani - Kudavarai



Eastern side



Western side

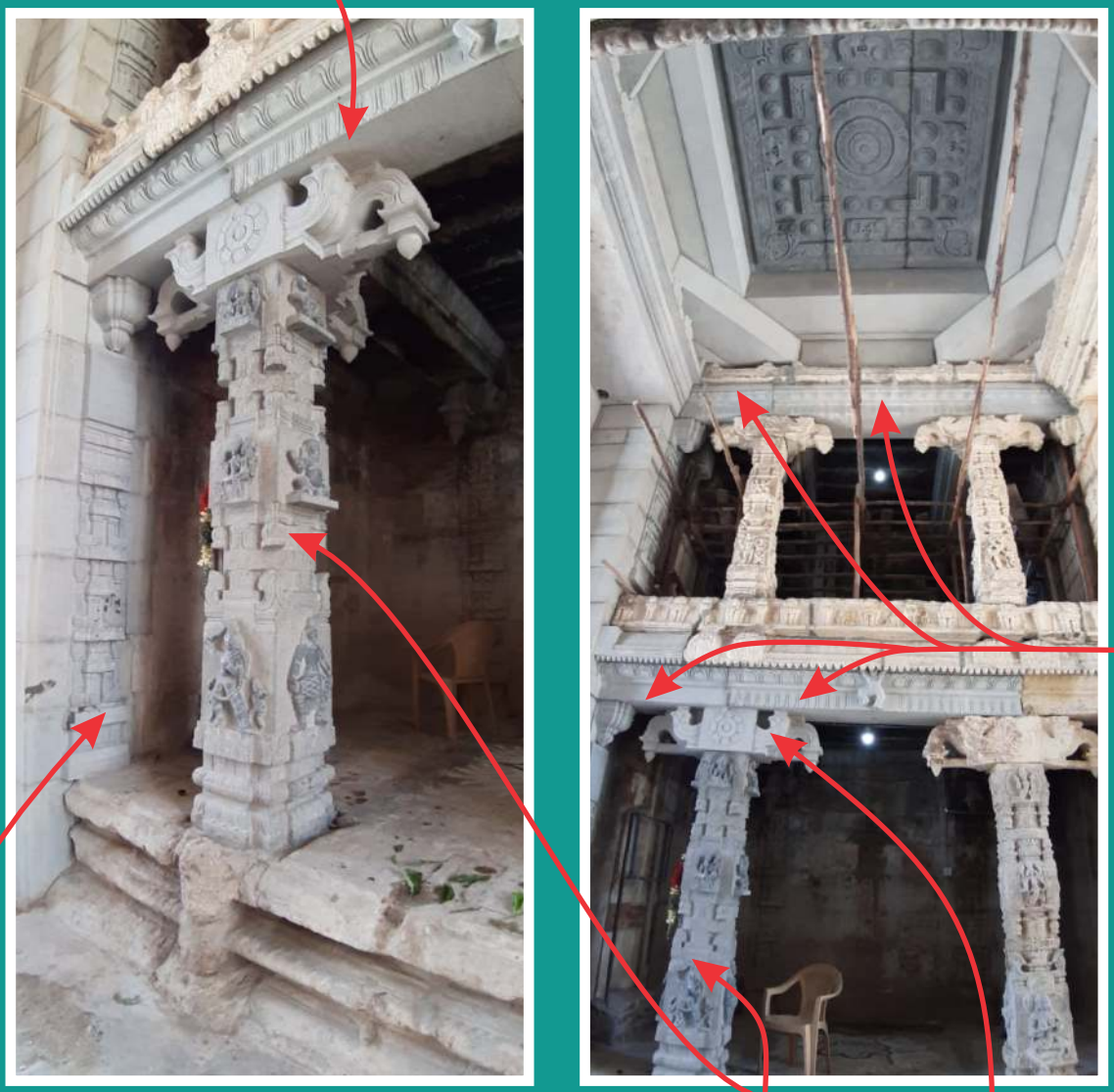


Shri Lakshmi Narayanan

Views towards north and south from the center of the Rajagopuram

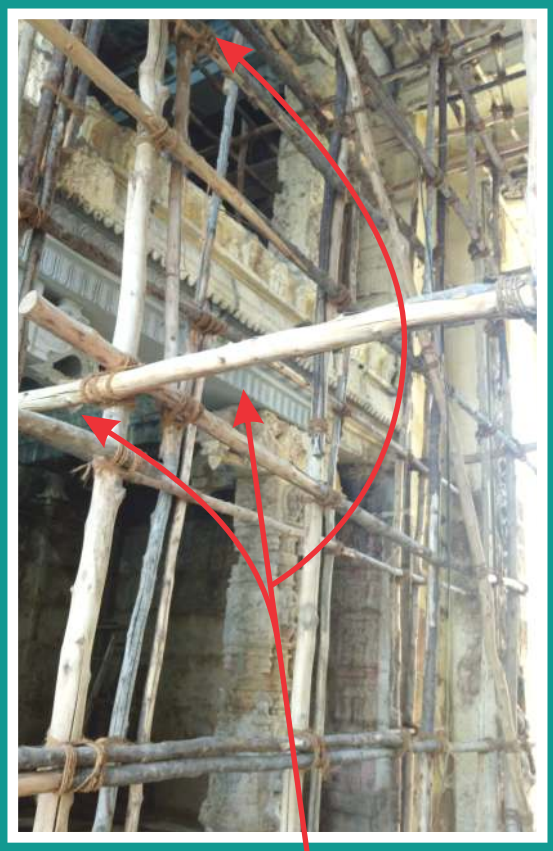
Northern main entrance view


Muga uthiram
New door frame


New uthiram
New uthirams
New pillar
New bodhi
Door frame supporting carved stones
14nos. each on east and west

New pillar

New door frame



New uthiram

New door frame

New uthiram

After Thiruppani - Rajagopuram Main Entrance

After installation of the new door frame, the original Grandeur of the Rajagopuram entrance is restored.

Shri Ramanujar

Shri Navaneetha Krishnan

17. Pushkarani (புஷ்கரணி) - Theppakulam

We have identified the North-east corner Easaniya moolai (ஈசாணிய மூலை) to build the pushkarani, 42' long and 30' wide, with 8 steps, in view of the space considerations. The rain water from the third prakaram (2 acres) is collected and 70% is channeled towards east for discharge into the pushkarani.

The remaining 30% rain water will be channeled to the western side for possible discharge into the Poonginaru (பூங்கிணறு).

The boomi pooja was conducted on Wednesday 17 January 2018.

18. Open air Museum

We thought it is more appropriate to preseve all the damaged beams, pillars, bodhis and some of the carved stones supporting the door frame. For the information of the future renovations because these carvings were almost 800 years old.

From this we can understand the Engineering capability of our ancestors in the absence of the modern day computers. They have been identified and stored in the open yard, being a granite there will be a very very minimal wear due to the weather conditions.

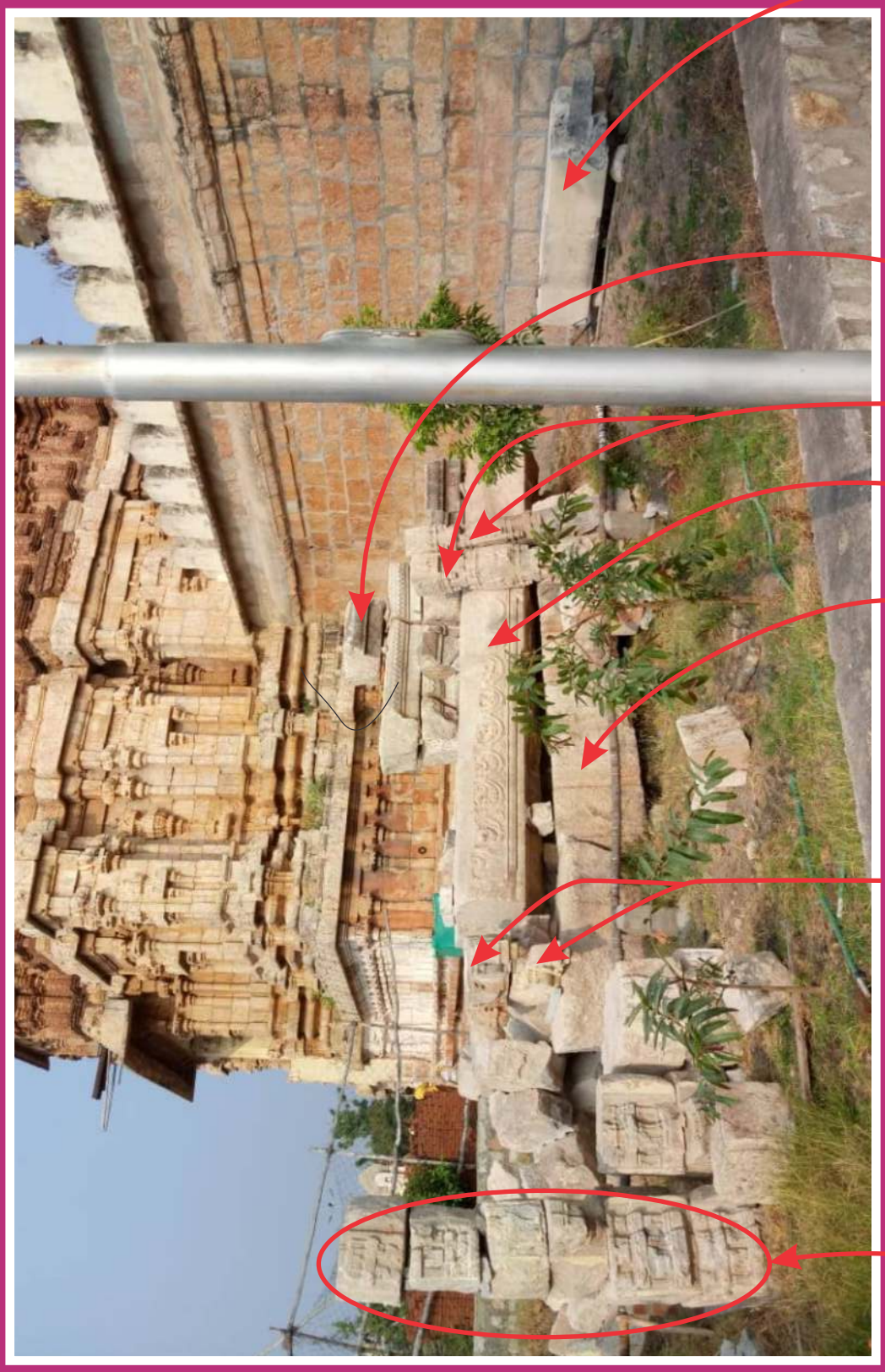
1. Granite beams - weighs from 1000 kg to 3000kg
2. Pillars - 700 to 1000kg
3. Bodhis (junction members) - approximately 1000kg
4. Kathavadi beam - 23' long, 4' wide, 2.5' height, approximate weight 18,000kg
5. Door frames - 2Nos. - 24' long, 2' wide', 2' thickness, each weighing 16,000kg
6. Top frame - 1No - 15' long, 2' wide, 2' thickness, weighing approximately 11,000kg
7. Muga uthiram - 23' long, 4' wide, 2.5' thickness, weighing approximately 18,000kg
8. 28Nos. of the sculptured stones supporting the door frames, 14Nos. on each side; each approximately weighing 300 to 400kg

Since some of the beams are already cracked, came out in 2 to 3 pieces while dismantling. This is assembled to enable the sevarthis to visualize the ancient engineering capabilities.

They are all properly cordoned and the proper displays are organized.

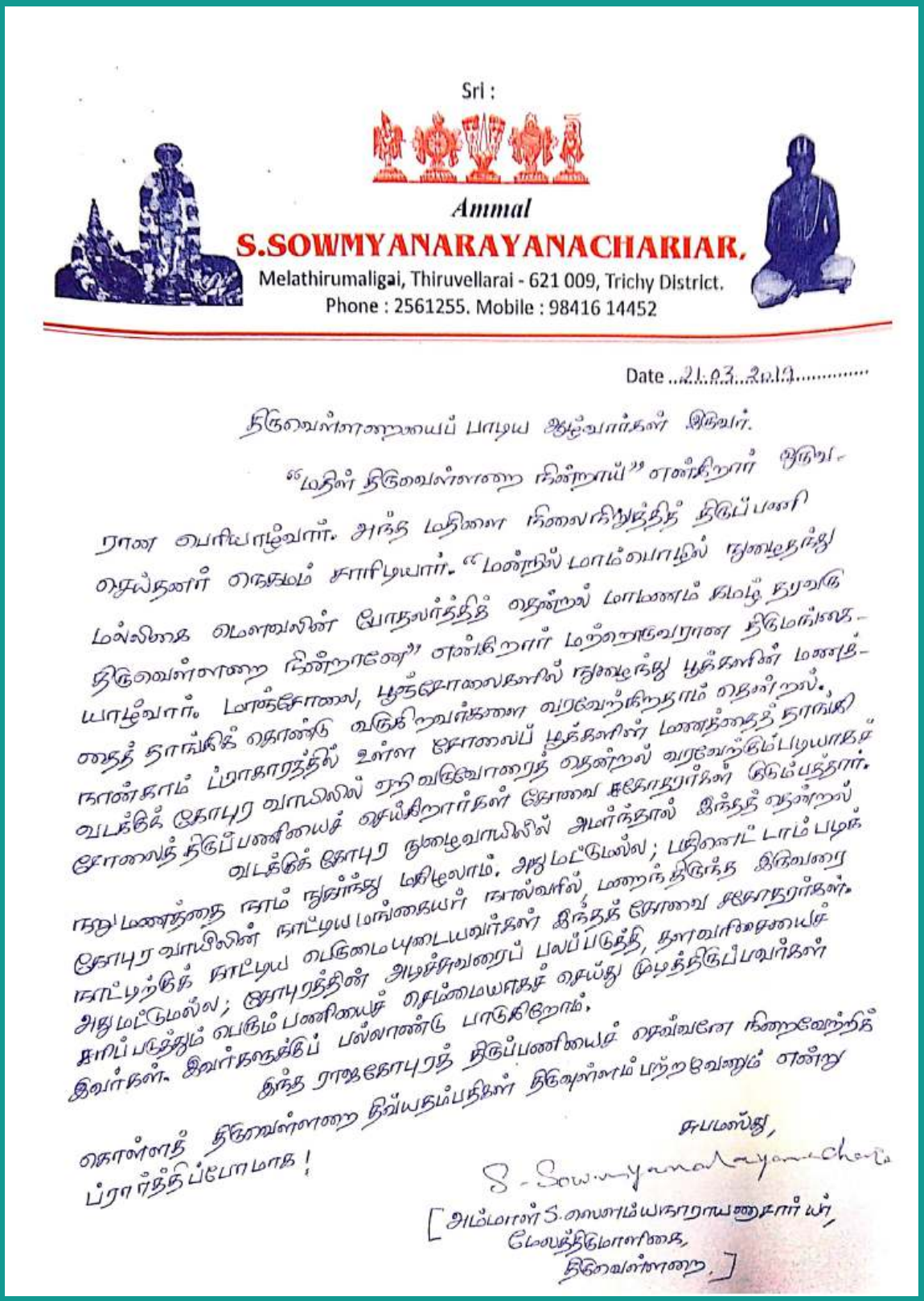
All the dismantled (defective) beams and pillars and the paavakaal as well as bodhi were arranged systematically inside the temple, eastern side next to the Rajagopuram.

In addition whatever stones are removed is also exhibited and cordoned off, with the write-up.



Totally we have replaced 14 Granite uthirams, 2 bodhis and 2 pillars.

19. Sthalathar's opinion about Kalkaram Thiruppani



Sri :

Ammal

S.SOWMYANARAYANACHARIAR,

Melathirumaligai, Thiruvellarai - 621 009, Trichy District.
Phone : 2561255. Mobile : 98416 14452

Date ..21.03.2013.....

திருவெள்ளறையைப் பாடிய ஆழ்வார்கள் இருவர்.

"மதிள் திருவெள்ளறை நின்றாய்" எனுமாறு ஒருவர் -
ராண பெரியாழ்வார். அந்த மதிளை நிலைநிறுத்தித் திருப்பணி
செய்தனர் நெகமம் சாரிடையார். "மன்றில் மாம்பொழில் நுழைதரும்
மல்லிகை மௌவலின் போதலர்த்தித் தென்றல் மாணமும் கமழ் நறுவிரை
திருவெள்ளறை நின்றானே" எனுமாறு மற்றொருவரான திருமங்கை -
யாழ்வார். மாஞ்சோலை, பூந்தோலைகளில் நுழைந்து பூக்களின் மணத்-
தைத் தாங்கித் தொண்டு விருகிறவர்களை வரவேற்கிறதாம் தென்றல்.
நான்காம் ப்ராகாரத்தில் உள்ள சோலைப் பூக்களின் மணத்தைத் தாங்கி
வடக்குக் கோபுர வாயிலில் ஏறி விருப்போரைத் தென்றல் வரவேற்கும்படியாகச்
சோலைத் திருப்பணியைச் செய்கிறார்கள் சோலை சகோதரர்கள் திருமபதார்.
வடக்குக் கோபுர நுழைவாயிலில் அமர்ந்தால் இந்தத் தென்றல்
நறுமணத்தை நாம் நுகர்ந்து மகிழலாம். அது மட்டுமல்ல; பதினாட் டாம் பழங்
கோபுர வாயிலின் நாட்டிய மருங்கையர் கால்வரில் மறைந்திருந்த திருவரை
நாட்டற்குக் நாட்டிய பெருமை புடையவர்கள் இந்தச் சோலை சகோதரர்கள்.
அது மட்டுமல்ல; கோபுரத்தின் அழகுவரைப் பலப் படுத்தி, தளவரிசையைச்
சரிப் படுத்தும் பெரும் பணியைச் செம்மையாகச் செய்து முடித்திருப்பவர்கள்
இவர்கள். இவர்களைத்திப் பல்லாண்டு பாடுகிறோம்.

திருந்த ராஜகோபுரத் திருப்பணியைச் செவ்வனே நிறைவேற்றித்
கொள்ளத் திருவெள்ளறை திவ்யதம்பதிகள் திருவுள்ளம் பற்ற வேண்டும் என்று
ப்ரார்த்திப்போமாக!

சுபமஸ்து,

S. Sowmyanarayanachariar

[அம்மாள் S. ஸௌம்யநாராயணாசார்யர்,
மேலத்திருமாளிகை,
திருவெள்ளறை.]

20. Conclusions

The kalkaram repair/ reconstruction thiruppani is infrequently done in the recent past decades.

Study of the structural weakness, cracks in the hundreds of years old granite pillars and beams are routinely not done as part of the maintenance thiruppani in temple Gopurams compared to the other engineering works, perhaps of the proximity to these structures.

A state of the art evaluation regarding the structural stability of the existing kalkaram at SRI PUNDARIKATCHA PERUMAL TEMPLE in Thiruvellarai was done by a team from IIT - M headed by Dr Arun Menon and the HR&CE approved Sthapthy organised by the donor Shri V S Jayabal.

A total of 3 pillars, 14 beams and 2 bodhis were identified as unsafe.
Adequate number of stone pillars and beams were brought to Thiruvellarai and nearly a dozen qualified and trained sculptors worked for nearly an year to replicate the carvings in the new pillars, beams as in the damaged beams and pillars.

A team of material handling experts, sthapathis, civil engineers discussed and debated nearly six months and decided to utilise a heavy duty crane capable of lifting thirty to forty ton weight to a height of one hundred and fifty feet to handle the stone pillars in the Rajagopura Thiruppani.

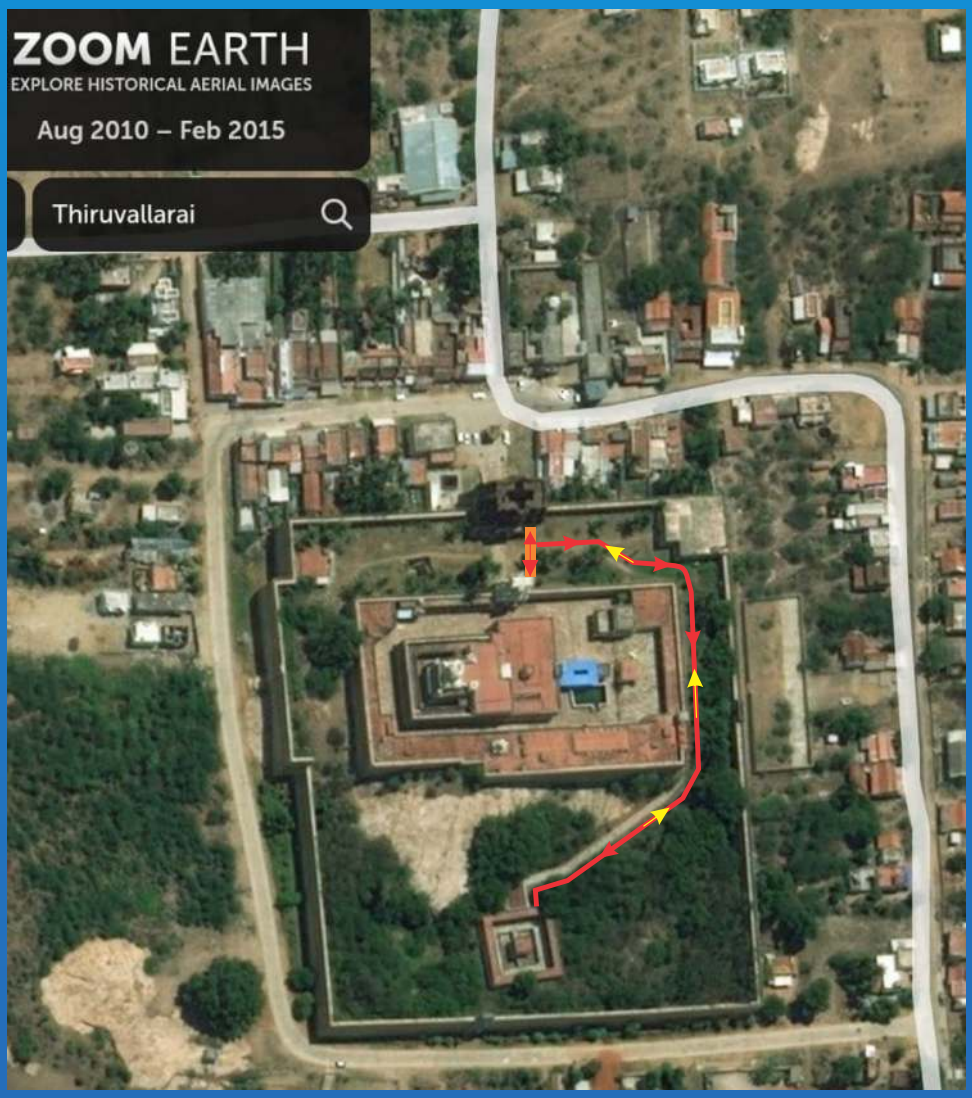
After months of deliberations a scheme was designed to remove the damaged/cracked structures with the safety of the existing structure in mind and the same executed.

Great care was taken to lift heavy pillars weighing as much as eighteen tons and to insert them into the existing Rajagopuram without damaging the existing structures.

The scale and magnitude of the work has to be seen to be believed.
This was a great learning experience for the team.

With humility and a sense of disappointment we are compelled to state here that such a once a way experience of this magnitude was missed to a large extent by the HR&CE technical staff resulting in a lost opportunity for the capacity building initiative. We did speak to some of them and they were of the opinion because of the work load and inadequate staff, they expressed their inability to concentrate more particularly in this Rajagopuram renovation.

We are of the opinion that the modus operandi of this kalkaram Thiruppani may be considered for inclusion in the HR&CE manual as this migh help the future kalkaram related thiruppani in all the temples, particularly in Tamilnadu where there are enough and more Rajagopurams compared to rest of the state.



4th Prakaram

Before renovation, the red line shows the existing pilgrimage path in an incomplete circle. Only upto Vasantha mandapam & back not enabling the Vasantha mandapam Perumal purapaadu (normally in May) to come in a full circle.

The renovation works started in **August 2014 and completed in May 2015,** enabling Vasantha mandapam Perumal purapaadu to come in a full circle.

The renovation works further continued until 2019 to pave the 16 feet Granite pilgrimage path to about 1600 feet.

The arrow mark in red color shows the clockwise direction and the yellow color shows the anti-clockwise direction.