

**Assessment of Damage
of
Gorkha Earthquake 2015
on
Kathmandu Valley WHS Monuments**

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EARTHQUAKE DATA

- ON APRIL 25, A MAJOR EARTHQUAKE OF MOMENT MAGNITUDE $M_w = 7.8$ STRUCK NEPAL
- MANY AFTERSHOCKS FOLLOWED - INCLUDING ONE OF MAY 12 OF $M_w = 7.3$
- EXTENSIVE DAMAGE TO BUILDING AND STRUCTURES – OVER 469000 HOUSES DESTROYED, 8786 DEATHS AND 22491 INJURIES – MAKING A MAJOR HUMAN EMERGENCY
- MASSIVE DAMAGE TO HERITAGE MONUMENTS – 133 COLLAPSED, 495 HEAVILY DAMAGED AND 493 PARTIALLY DAMAGED – MAKING A MAJOR HERITAGE EMERGENCY
- KATHMANDU VALLEY WORLD HERITAGE SITE – FIVE OF ITS SEVEN MONUMENTS ZONES SEVERELY DAMAGED

KATHMANDU VALLEY WORLD HERITAGE SITE:
SEVEN MONUMENTS ZONES –
THREE TOWN SQUARES,
TWO STUPAS
AND
TWO TEMPLES

CRITERIA OF LISTING AS WORLD HERITAGE –

(III) LIVING CULTURAL TRADITION /URBANISM

(IV) OUTSTANDING ENSEMBLE OF
ARCHITECTURAL MONUMENTS

(VI) TANGIBLE ASSOCIATION WITH BELIEFS AND
FAITHS



NAUTALE DURBAR , HANUMAN DHOKA DS MZ

HANUMAN DHOKA DS MZ

THE MONUMENTS (BEFORE EQ)



EARTHQUAKE 2015 AND OUR HERITAGE –

WORLD HERITAGE MONUMENTS

HERITAGE OF URBAN RESIDENTIAL BUILDINGS

HERITAGE IN NATURAL SETTINGS

NATURE OF DAMAGE –

(I) TOTAL COLLAPSE

(II) PARTIAL DAMAGE

(III) MINOR EFFECT BUT VULNERABLE

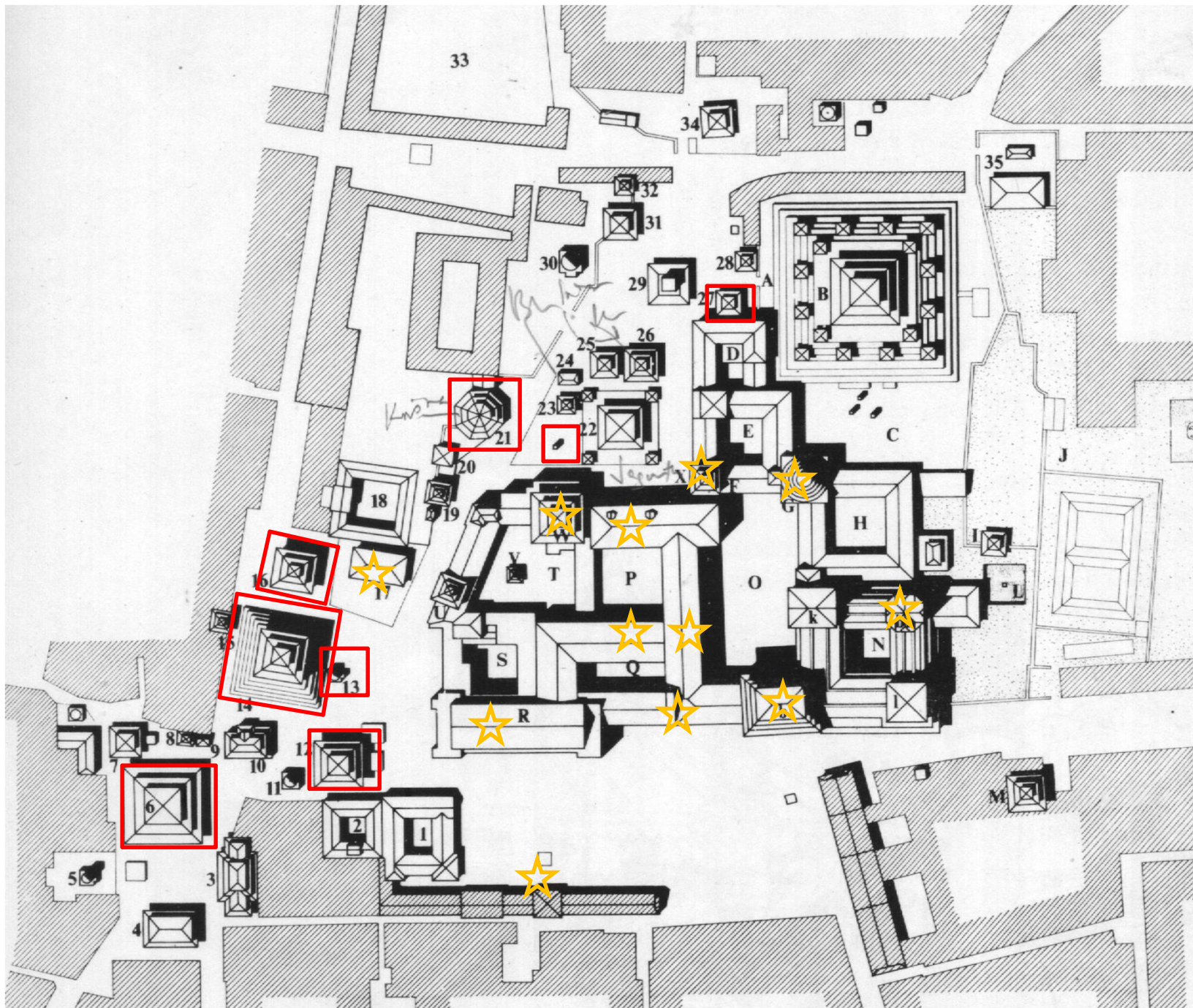
STYLE, TECHNOLOGY, PERIOD

MALLA (TIERED ROOF, BRICK AND WOOD/MUD)

RANA (DESI KAIDA, BRICK AND BAJRA, STUCCO)



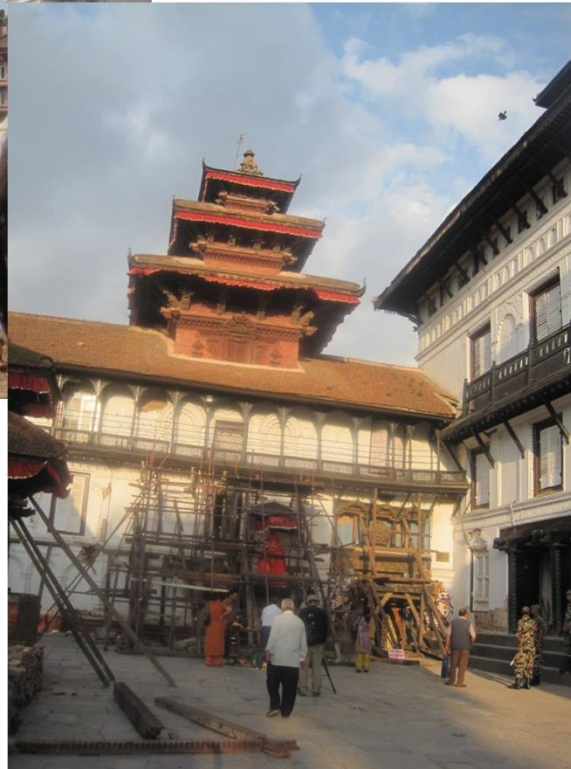
GADDI BAITHAK , DAKH CHOWK, HANUMAN DHOKA DS MZ



KATHMANDU DURBAR SQUARE

HANUMAN DHOKA DS MZ

THE DAMAGE



ASSESSING THE DAMAGE –

MUD AND BRICK?

WEAK STRUCTURE?

POOR TECHNOLOGY?

TECHNOLOGICAL DEVELOPMENT BASED ON
EXPERIENCE

RAIN, EARTHQUAKE, FIRE

* SYMMETRY, BRICK AND WOOD, TIES AND
WEDGES, STEPPED PLINTH, WINDOW AND
DOUBLE FRAMES

ROTTEN JOINTS

MIXED TECHNOLOGIES

POOR OR NO MAINTENANCE

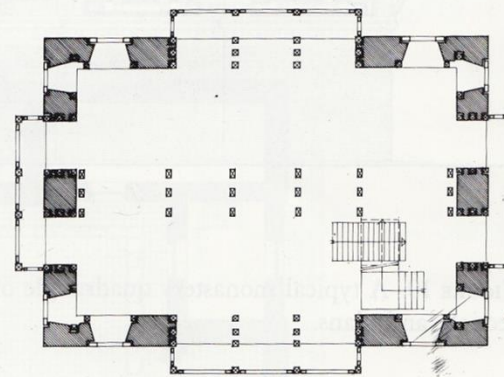
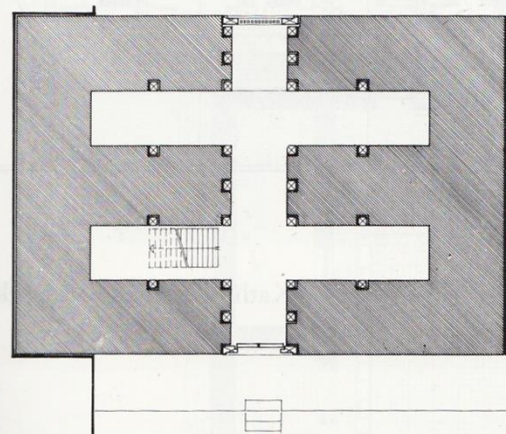
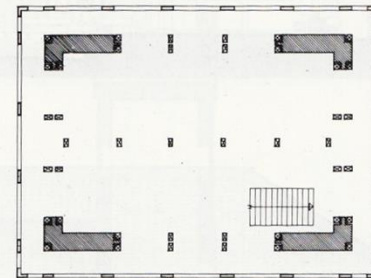
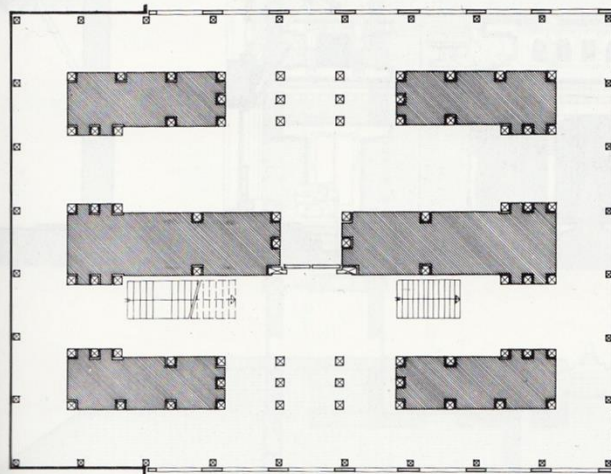
* HEAVY ROOF, PLINTH TIES, RETAINING
FOUNDATIONS



KASTHAMANDAP, HANUMAN DHOKA DS MZ



NAHTALE TOWER



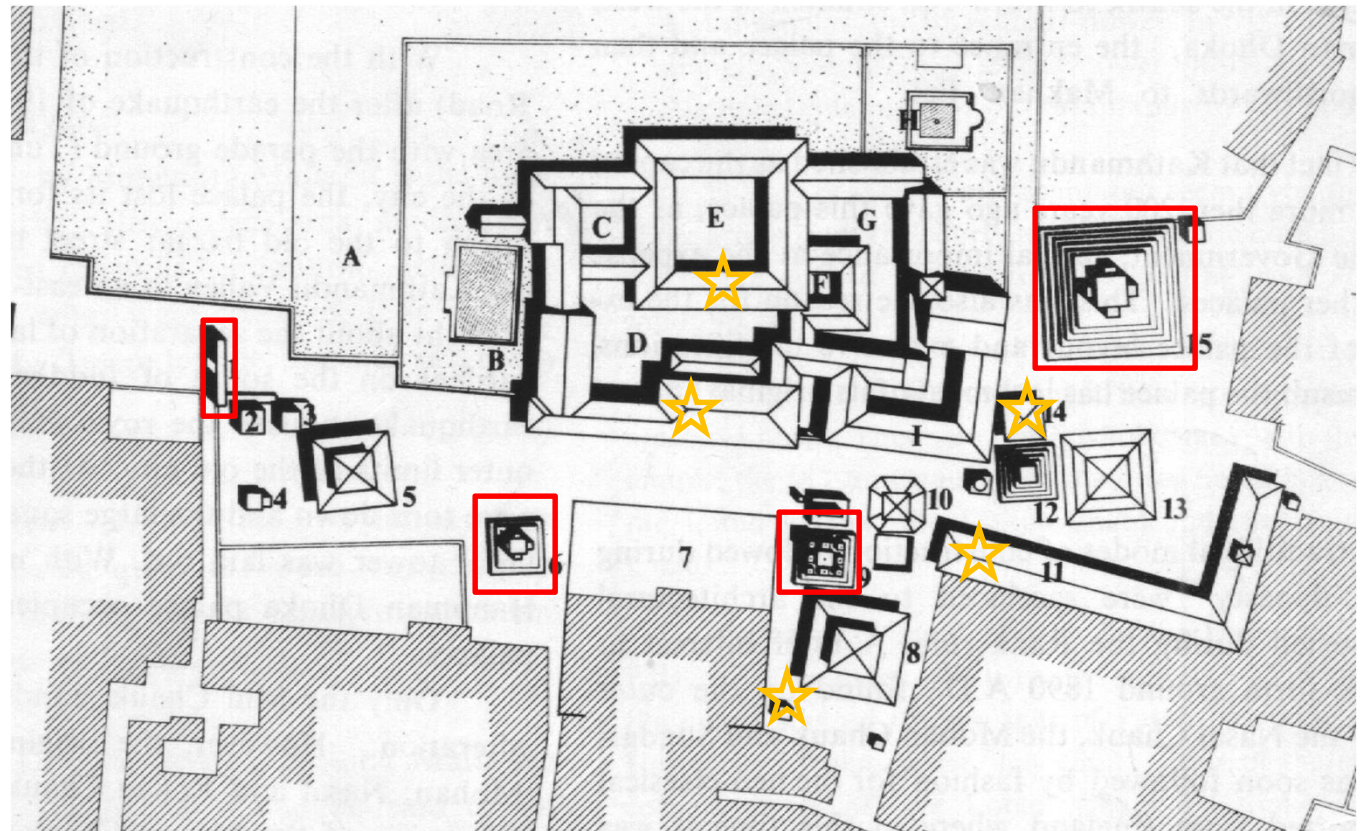
Ground floor

0 1 2 3 4 5

F
M

BHAKTAPUR PALACE SQUARE

- **Vatsala Temple (Sikhara/Stone)**
- **Silu Mahadev Temple (Domical roof/brick)**
- **Kedarnath Temple (Brick Sikhara)**
- **West Gateway of Durbar Square**

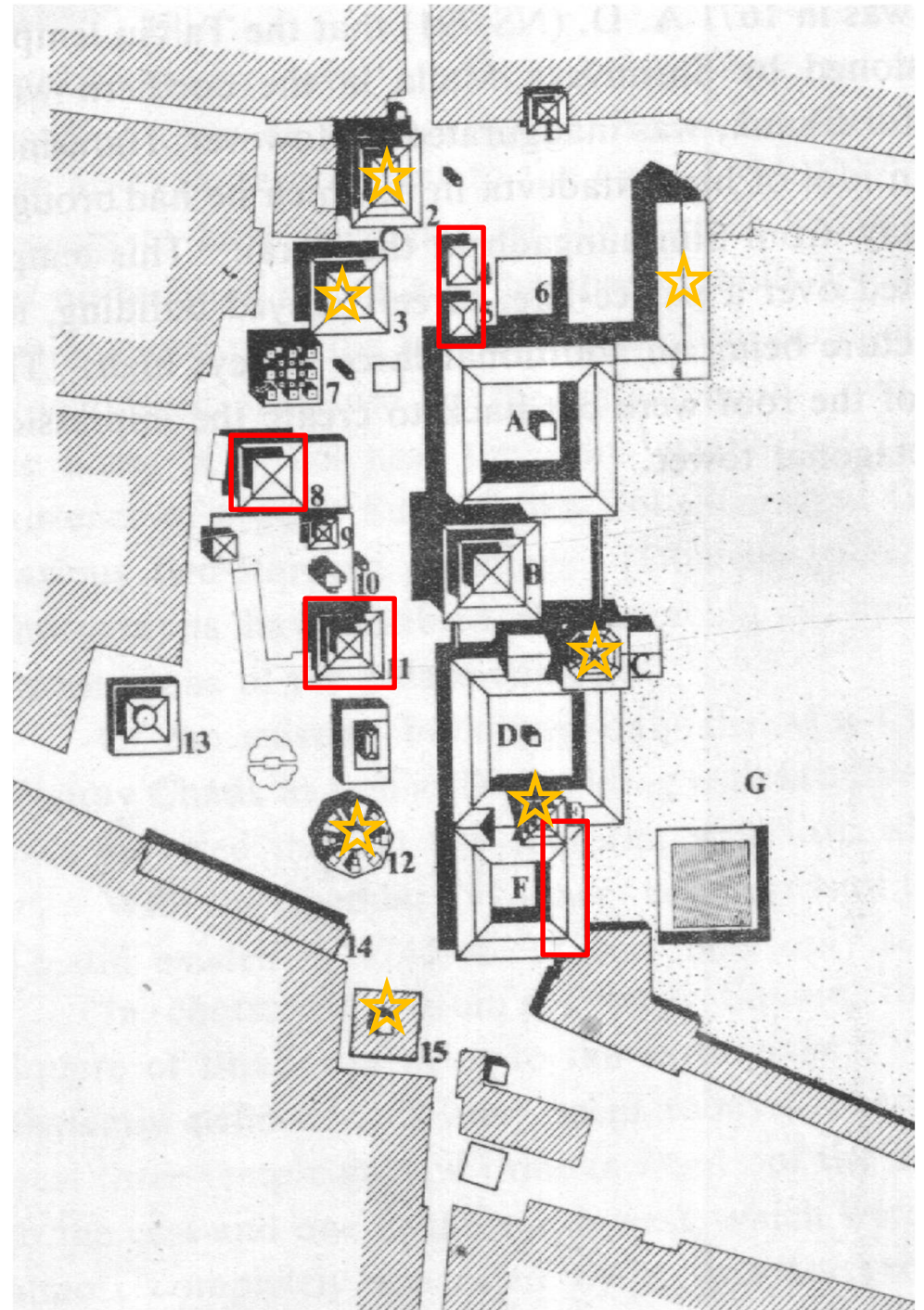


BHAKTAPUR DS MZ

THE DAMAGE



- Charnarayan Temple
- Hari Shankar Temple
- Sankharanarayan Temple
- Mani Mandap
- East Wing of Sundari Chowk



PATAN DS MZ

THE DAMAGE



HARISANKARA PATAN DS MZ

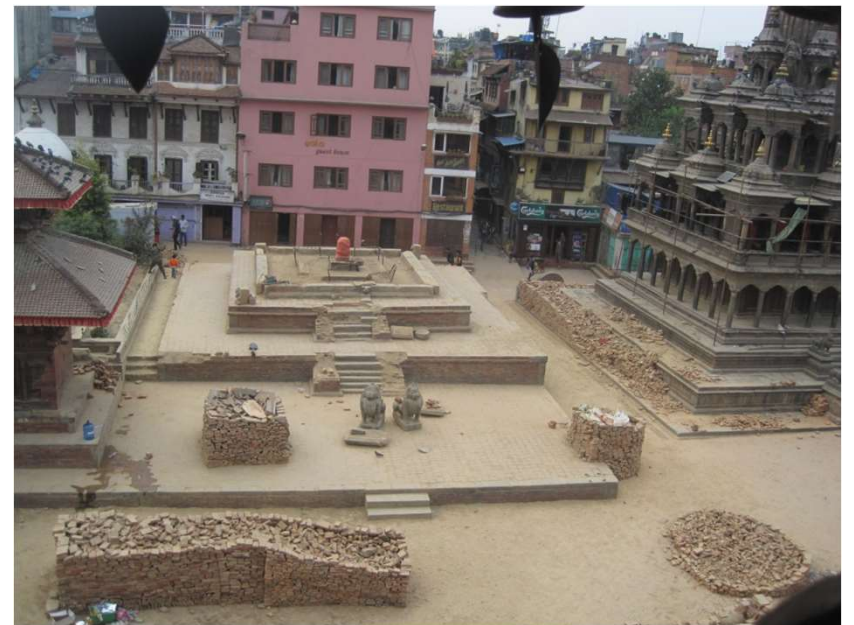


TALEJU PATAN DS MZ



CHARNARAYAN, PATAN DS MZ

THE DAMAGE



BOUDDHA AFTER EARTHQUAKE



BOUDDHA UNDER RECONSTRUCTION



उत्सवसिंह अधिकारी/रासस

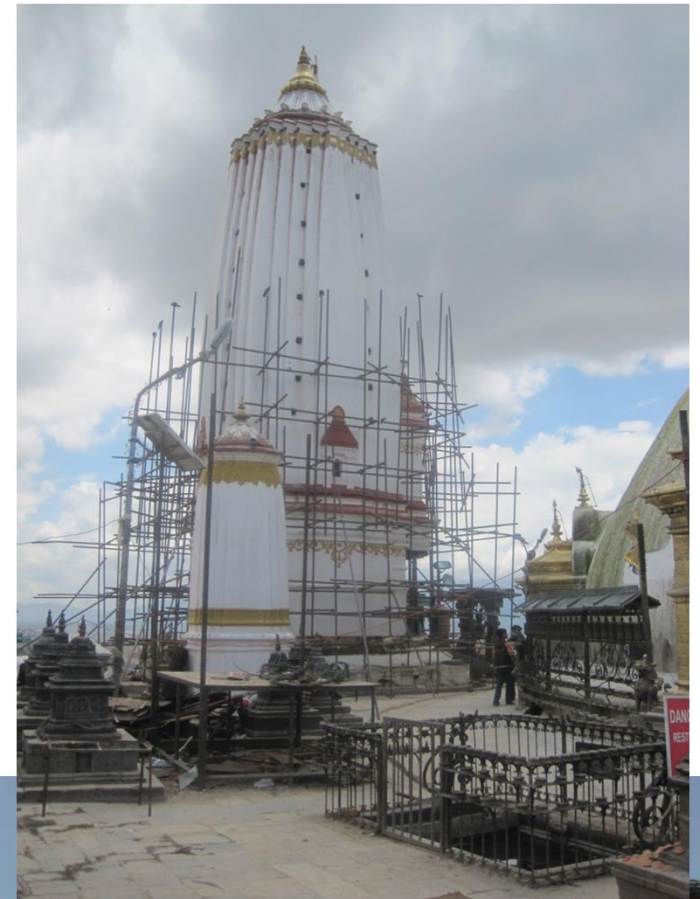
CHANGUNARAYAN MZ

THE DAMAGE



SWOYAMBHU MZ

THE DAMAGE



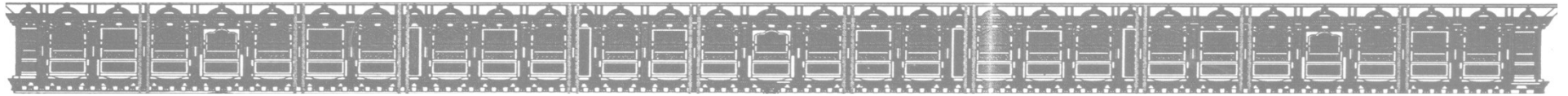
SWOYAMBHU MZ

THE DAMAGE

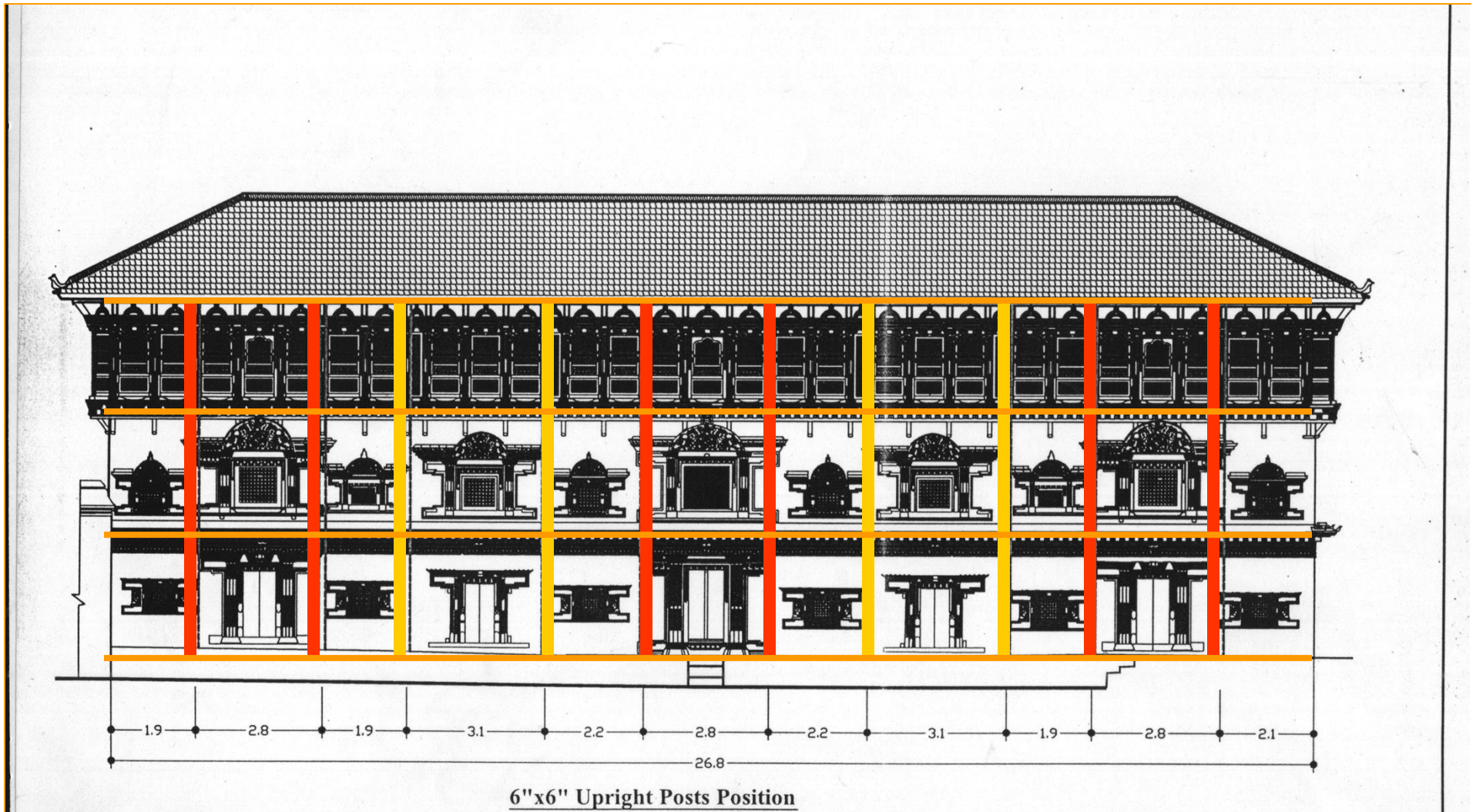


CLOSE LOOK AT RECENT RESTORATIONS DAMAGES AND DETAILS





ELEVATION WITH UPRIGHTS AND HORIZONTALS





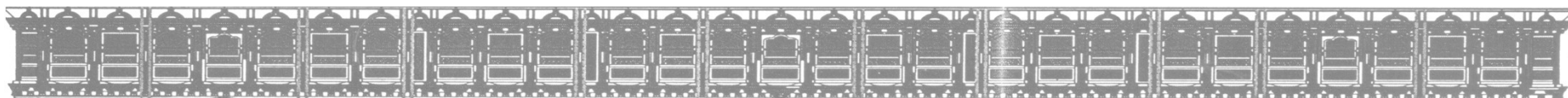
SKINNING, STRENGTHENING AND RECONSTRUCTING



NOTE THE POOR STATE OF BRICKWORK INSIDE (1975 RESTORATION!)

- STRENGTHENING THE BUILDING
- UPRIGHT WITH SLEEPER (*THAMWITH LAKASHI*)







NAUTALE HANUMAN DHOKA DS MZ

THE DAMAGE

- ☆ TECHNOLOGY MODIFICATION
- ☆ TECHNOLOGY INTEGRATION



BATSALA TEMPLE –BHAKTAPUR DS MZ

THE DAMAGE

- * TECHNOLOGY MODIFICATION
- * PARTIAL STRENGTHENING
- * LACK OF MAINTENANCE



RADHAKRISHNA SWOTHA PATAN DS MZ

THE DAMAGE

- * INHERENT PROBLEM?
- * TECHNOLOGY MODIFICATION?
- * LACK OF MAINTENANCE



THE DAMAGE

- * POOR RECONSTRUCTION
- * LACK OF MAINTENANCE



PRATAPPUR SWOYAMBHU MZ



TRILOKYA MOHAN TEMPLE, KATH DS MZ



ISSUES IN FOCUS
TECHNOLOGY, TRADITION AND SOCIETY

STRENGTH
EARTHQUAKE RESISTANCE
STABILITY

AUTHENTICITY

INTEGRITY

VALUE/MEANING (INTANGIBLES AND
COMMUNITY)



KASTHAMANDAP, HANUMAN DHOKA DS MZ

REBUILDING HERITAGE – (TECHNOLOGY, TRADITION AND SOCIETY)

THREE PRINCIPLES

GLORIFICATION OF THE PAST – MAXIMIZING TRADITIONAL TECHNOLOGY AND MATERIALS

AVOIDING MISTAKES OF THE RECENT PAST (MIXING TECHNOLOGY AND LACK OF MAINTENANCE)

FUTURE VISION OF SOCIAL AND CULTURAL CONTINUITY

RESEARCH AND DEVELOPMENT ON CONSERVATION AND DISASTER MITIGATION

RESEARCH ON TRADITIONAL TECHNOLOGY AND MATERIALS AND RETROFITTING/STRENGTHENING

INCLUSION OF MODERN KNOWLEDGE SYSTEM INTO THE TRADITIONAL



NAUTALE DURBAR , HANUMAN DHOKA DS MZ

CHANGUNARAYAN MZ

THE IMMEDIATE REPAIR

