

Introduction:

The Restoration Project of the HAR RAJ JI KA MAHAL, Jaisalmer Fort, Rajasthan, India, has been under progress for over the past three years. After a systematic preparation of Tender Documents, and subsequent award of the contract, on-site work formally commenced in January 2003.

The project has progressed step-wise through different stages. On-site excavations & dismantling of defective parts has revealed the complex layers of time through which the building had been constructed. Interesting finds in the form of dated stone inscriptions have led to a revision of the earlier estimated date of construction of this Palace. Though the Palace as it is now known, has been named after *Har Raj Ji*, the Maharawal of Jaisalmer (1561-1577 AD), its history dates back to the fourteenth century. This can be acknowledged very emphatically after studying the excavated basement which was hitherto filled up by debris. The construction technology and also various stone inscriptions found at site gives clear indication of age of the building.

On-site developments and the discovery of severely damaged structure of the basement floor necessitated a periodical revision & updation of earlier assumptions and estimates to incorporate the fresh developments. Based on the results of the Soil Testing Analysis Report (Phase I & II), requisite arrangements for the stabilization of the foundations were made to ensure the future stability of the building.

The present Report is an endeavor to summarize the entire description of works that has been undertaken till date on the Har Raj Ji ka Mahal site under the purview of the Restoration Project in Phase II.

PHASE - 2

Area covered under Phase Two are Section A , Part of Section B, Payaga Wall, Gateway To Payaga and staircase connecting Har Raj Ji ka Mahal and Hawa Prol.

Following works have been undertaken in this phase:

- a. Repositioning of out of plumb columns and beam structure with perfect verticality.
- b. Reconstruction of wall in case of structural damage
- c. Consolidation of Masonry not dismantled.
- d. Removal and replacement of decayed wooden beams from roof.
- e. Consolidation of Vertical Cracks.
- f. Clamping of Façade with Main structure.
- g. Replacement of broken Chajjas and jhrokhas.

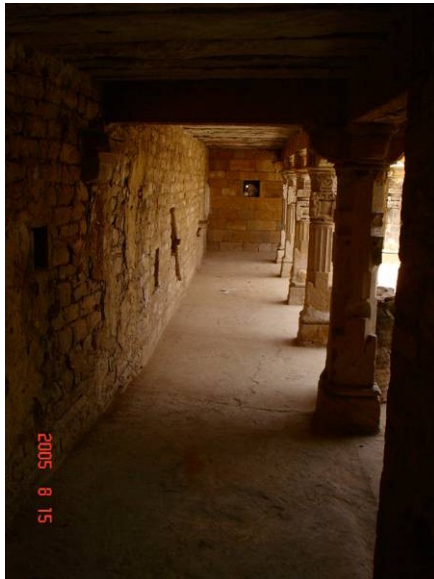
- h. Redesign and erection of freestanding wall towards Payaga.
- i.. Retrofitting of structure in light with recent increase in earthquake in the area.
- j. Restoration of Gateway to Payaga
- k. Restoration of Staircase connecting Har raj ji ka Mahal to Hawa Prol.

1. SECTION A:

The L-shaped section which is main part of section A has been completed. Part second, Third and Fourth floor have been restored in phase II. Lower floors were already restored in phase One. The columns and arches have been completed and the roof slab has been laid. The broken columns have been replaced with new columns which are replicas of the old ones. Floor wise description of work is given below.

First and Second Floor

Ornamented columns in pillared courtyard on second floor have also been erected at original positions. The L-section in Second floor has been completed with floor finishing and stone slab roofing.



Completed Portion of L section –
Section A - Second Floor



View of pillared court showing
second & third floor



Completed Portion of L section – Section A
Jharokha has been restored in the wall facing Chogan para street.



Jharokha facing Chogan Para Street



View of restored Jharokha from inside



View of pillared court showing first floor below



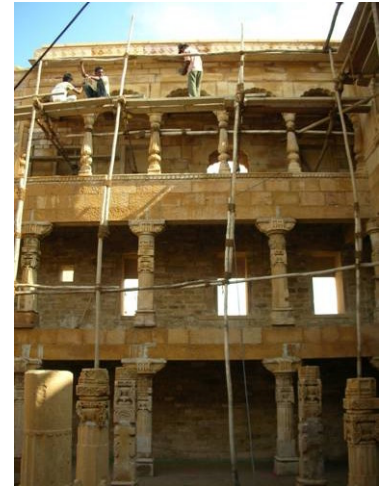
Stone slabs in Roof – Second floor

Third Floor

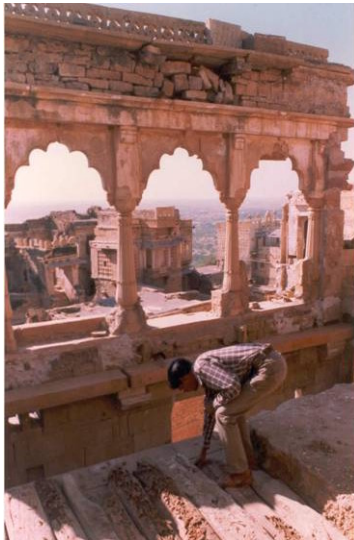
The L - section of third floor has been completed with the erection of ornamented columns in line with the columns below on second floor. Finishing of floor and reconstruction of roof with stone slabs has been completed.

Fourth Floor

The L-shaped fourth floor section has been completed. The arched walls were dismantled, and reconstructed piece by piece. The columns and arches have been completed and roof laid over it. Elevation of wall on the fourth floor has been erected such that the elevation from Dusshera Chowk gives a complete look. This floor was very intricate in design having decorative elements like cusped arches, jharohas and stone panel wall. Every element has been carefully restored to its original position.



Elevation of Wall G1 – G4 (From Pillared Court)



Columns and Arches on fourth floor before dismantling



Columns and Arches after restoration

The copper clamps have been inserted in the wall to make it stable against lateral thrust. Clamping was done as per fig attached. Grooves have been created in the stone for the metal clamp to fit in, thus giving it a better grip on the stone. This is a neat and safe method to clamp the stones, and give their joints stability.



The stone arch wall on this floor has been tied to the main wall running parallel to it, as it is currently a freestanding structure and needs support. The tie beam as shown in photograph has been used at regular intervals

The RCC beams below the arches have been provided for retro-fitting.





Wooden members were sagging under the load, and were badly damaged



Wooden members were replaced with local Jaisalmer stone

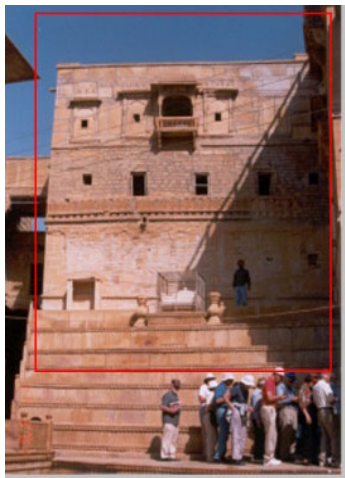
Throne Wall

The design of the external face of the throne wall on the fourth floor has been made changed slightly from original wall design. The original wall had jharokhas on the fourth floor level, with a central window flanked by 2 smaller windows at close intervals.

On the restored wall, the windows on both floors have been placed symmetrically below one another, with larger spacing in between. As suggested by Maharawal of Jaisalmer new jharokhas have also been added on the third floor windows.

BEFORE

AFTER



3. SECTION B:

The first and second floors have been completed in Section B. However, the third, fourth and fifth floors have not been completed yet. This part is being proposed in Phase III.

Second Floor

The walls of the rooms in Section B on second floor have been constructed and have been plastered with lime.



Inspection of quality of Lime paste by the Architect

Plastered walls – second floor

The Gokhda wall has been redesigned symmetrically and restored. All cracks have been repaired. Column on the surface of the wall with “gokhda” has been moved to a position next to the window, so as to form a symmetrical design on the wall.

BEFORE

AFTER



Reconstruction of Wall next to staircase

RESTORATION PROJECT

Wooden roof members

All roof members in *chiyad* wood were replaced with local Jaisalmer stone slabs as wood was not easily available and also it requires more maintenance than stone slabs. The existing roof material was damaged and had rotted; therefore we used the more stable and long lasting Jaisalmer stone to provide support to the slab.

BEFORE



Wooden members were sagging under the load, and were badly damaged

AFTER



Wooden members were replaced with local Jaisalmer stone

Elevation of wall facing Tamboo Khana chowk has been restored till third floor.



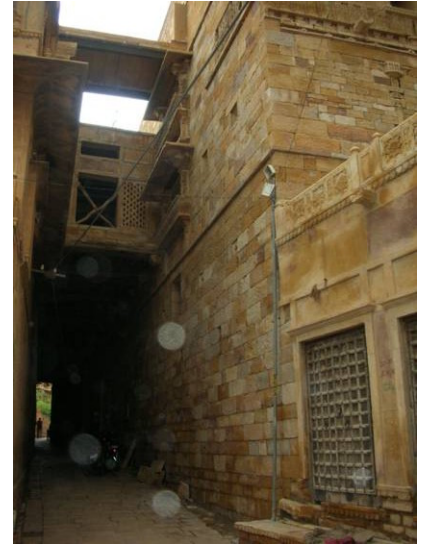
Decorative Jali work on the third floor over the Tambu Khana Chowk is being reconstructed, although the room has not been constructed as yet.



3. BRIDGE

Bridge connecting Section A and Sabha Mahal has been restored with stone slabs as per instructions. Bridge was strengthened by using iron girders. Top level connection form fourth floor to Sabha Niwas has also been restored.

Lower and Upper bridge over Chogan Para Restored

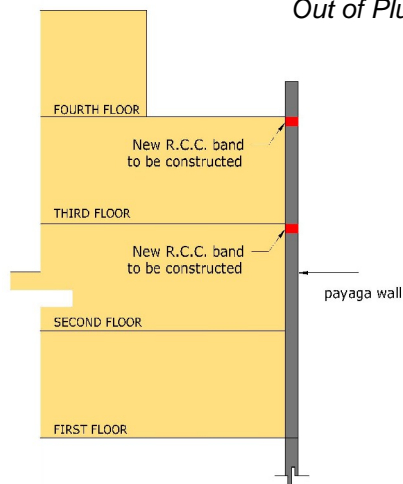


4. PAYAGA WALL

Payaga wall has been completed till fourth floor. Parapet over wall is still left and will be taken up in phase III. Retrofitting has also been done in this wall as this was a free standing wall and vulnerable to lateral forces like wind pressure and earth quakes. Rcc band has been incorporated in the wall. A “chaap” at an interval of 1 mt from RCC band has been placed.



Out of Plumb Payaga wall restored with proper verticality.



Schematic Section of Payaga wall

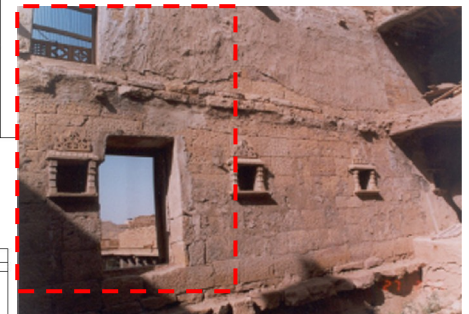
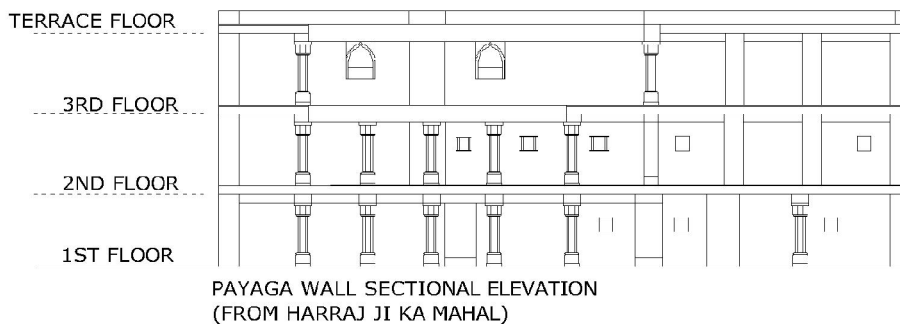
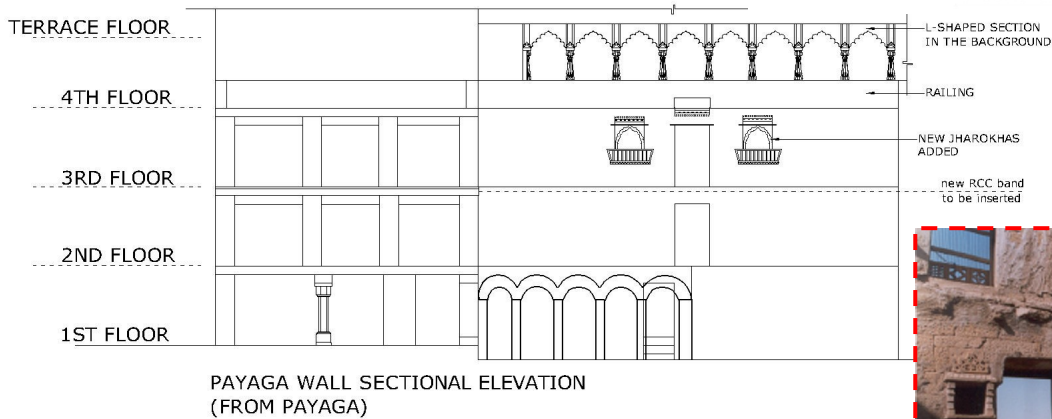
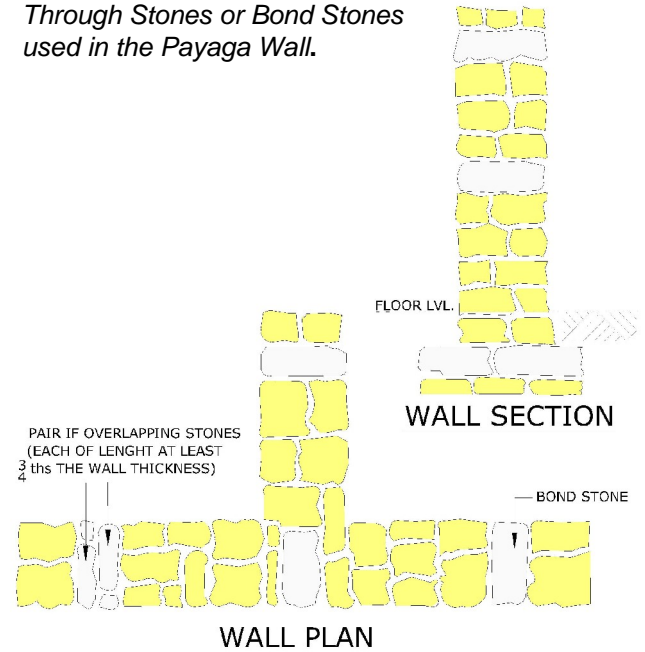


View of Payaga Wall Restored

The “through stones” or “bond stones” have been placed more frequently to strengthen the structure. This has been staggered to give earthquake resistance to the entire structure. (Refer wall plan and wall section attached)

The elevations drawings (below) of the Payaga wall show the stone arch wall on the fourth floor as it has been constructed. Few square openings have been added on the third floor. These will help the free standing Payaga wall to withstand wind pressure. The staggered doors on third and fourth floors have been straightened in the new wall.

Through Stones or Bond Stones used in the Payaga Wall.



The staggered doors in the existing wall were made in one line as per drawing attached

3. GATEWAY TO PAYAGA

The gateway has been restored and rebuilt from scratch, with neat joints and level surfaces, with corrected defects and faults. The existing stone slabs were broken and sagging due to the tremendous load, which has now been rectified by replacing them with new stones and inserting girders which will take the load away from the existing stone lintel.

BEFORE



The stone slabs were broken and disjointed under the tremendous load

AFTER



The stone slabs have been restored and neatly joined to form the gateway



The stone slabs have been restored and neatly joined to form the gateway



The damaged stone has been restored to reconstruct the gateway

BEFORE

Sagging lintel and frame in the interior

AFTER

Load has been transferred by placing a new girder over the existing lintel

Internal Wall over Gateway

The internal wall over the gateway has also been restored and rebuilt. The original stones have been retained in almost all cases, and original stone carvings have been placed in their original positions.

BEFORE

Sagging lintel and frame

AFTER

Wooden doorframe and stone lintel have been retained but reassembled, to remove faults

BEFORE



Historic carving over gateway has been replicated and placed in it's earlier location

AFTER



Detail of Historic carving over gateway which has been restored and retained in its original position

External Wall over gateway

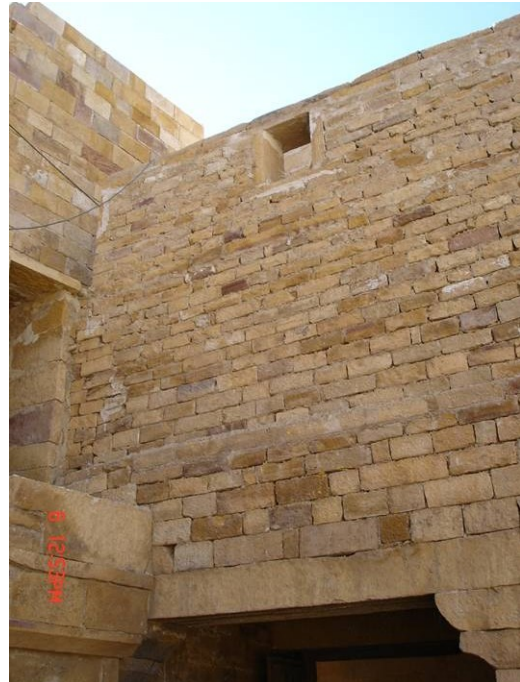
Structural interventions have been made externally, providing girders to take the load off the lintels. Also, the entire external wall was dismantled piece by piece and reconstructed taking extreme caution to achieve perfect joinery and a neat wall.

BEFORE



Wall over the gateway was in a dilapidated condition

AFTER



Wall over Gateway has been reconstructed after complete dismantling

BEFORE



Wall over Gateway has been reconstructed after complete dismantling

AFTER



Edging of Parapet on First Floor has been done by chamfering the stone

4. STAIRCASE connecting Har Raj ji Ka Mahal with Hawa Prol:

STAIRCASE:

The staircase connecting the Har Raj Ji Ka Mahal and the Hawa Prol has been dismantled, restored and is functional. The load bearing wall supporting the staircase was weak and had to be reconstructed. This part was not in the scope of the project but was taken by Girdhar Smark trust as it was affecting the reopened portion of Harraj Ji ka Mahal.



Wall above gateway to staircase



Fig.18: Gateway to staircase

Project Expenditure, Phase II:

Amounts spend on Phase two has been **Rs. 43.50** Lac. While the expenses occurred on Staircase next to Har Ji Ka Mahal has been born by Girdhar Smarak Trust. The amount spend on it is approximately **Rs. 10.00** Lac.

Phase II	Proposed	Spend
A. Emergency Repair Upper Floors	Rs. 30.00 Lac	Rs. 31.00 Lac
B. <u>Payaga Gate, Emergency Repair</u>	Rs. 9.80 Lac	Rs. 12.50 Lac
Total Expenses		RS. 43.50 Lac

CONCLUSION:

The construction work of phase II has been successfully done in Har Raj Ji ka Mahal project, Jaisalmer. The Payaga Gate is restored. All the floors of Section A are complete including its terrace. However Section B is partially completed. Major work left and proposed in phase III are:

- 1: Restoration of Third Floor, Forth Floor and Fifth floor in Section B
2. Parapet wall over Payaga Wall.
3. Installation of basic electrical conduits.
4. Alternative Drainage disposal system of Inner Courtyard in case corridor located in L section is closed.
5. Finishing work of all the areas including pointing on inner surface and installing of doors and windows of required.

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