

Fig.6.1 : Maharana Sangram Singh II at Prince Jagat Singh's marriage feast at the City Palace, Udaipur, 1730 CE
tempera on paper, 75.7 x 90.2 cm, The City Palace Museum, Udaipur, Acc. No. 2011.18.0040
Photo courtesy: The City Palace Museum, MMCF, Udaipur

Kothar (The Grain Storage) at the City Palace of Udaipur : *a case study in archaeological perspective*

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The City Palace at Udaipur is located on a rocky protuberance roughly oriented north-south. Maharana Udai Singh II (1537-1572 CE) initiated the construction of the City Palace at Udaipur in the year 1553 CE.[1] New buildings or palaces were added by subsequent Maharanas. During 16th to 18th-19th centuries, Maharanas constructed several storerooms and large storage chambers called Kothar in the palace of Udaipur for storing grains and other edible essentials. Though there has been a strong tradition of underground storage, the ancient evidence of very large chamber(s) that too from royal palaces has not been reported so far. Therefore this evidence is unique

The Construction of Kothar

The location of the Kothar in the northwestern part of the City Palace, Fig.6.2, was visualized according to the guidelines of *Vastu-shastra*. The building of Kothar was initially Zenana Rawla, residence of royal ladies, and due to safety reasons, was shifted in Rai Aangan in Mardana Mahal, the oldest construction in The City Palace.[2] Of course, we do not know when exactly the Kothar building was used as storage, but it is likely from the last quarter of the 17th or in the early 18th century, as revealed in the early paintings. Kothar may have been raised to address some issues. Mewar was visited by several draught famines and floods in the 18th and 19th centuries. In the mid-18th century, because of the Maratha and Pindari invasions and weak economy the treaty with the British was realized and a need for the large grain storage was felt necessary to overcome natural calamities or war-like situations.[3] Barter or commodity exchange was prevalent until the pre-modern times in Mewar. Therefore, it is likely that several items were purchased by the Royal Palace in lieu of grains to the merchants. According to the elderly people, attached to the royal household, salary also used to be paid in grains.

The earliest evidence of Kothar is found in a dated painting of 1730 belonging to the reign of Maharana Sangram Singh II (1710-1734 CE). It is a painting of Kunwar Jagat Singh's marriage feast, in which the rooms of older Kothar and heaps of grain are visible on the right side, Fig.6.1. It is perhaps the earliest visual evidence of grain storage in the City Palace that might have been remodelled by the subsequent Ranas. An old map at Maharana Mewar Research Institute (MMRI) shows that the Kothar was composed of very large chambers, Fig.6.2. This addition was made in the reign of Maharana Swarup Singh (1842-1861).

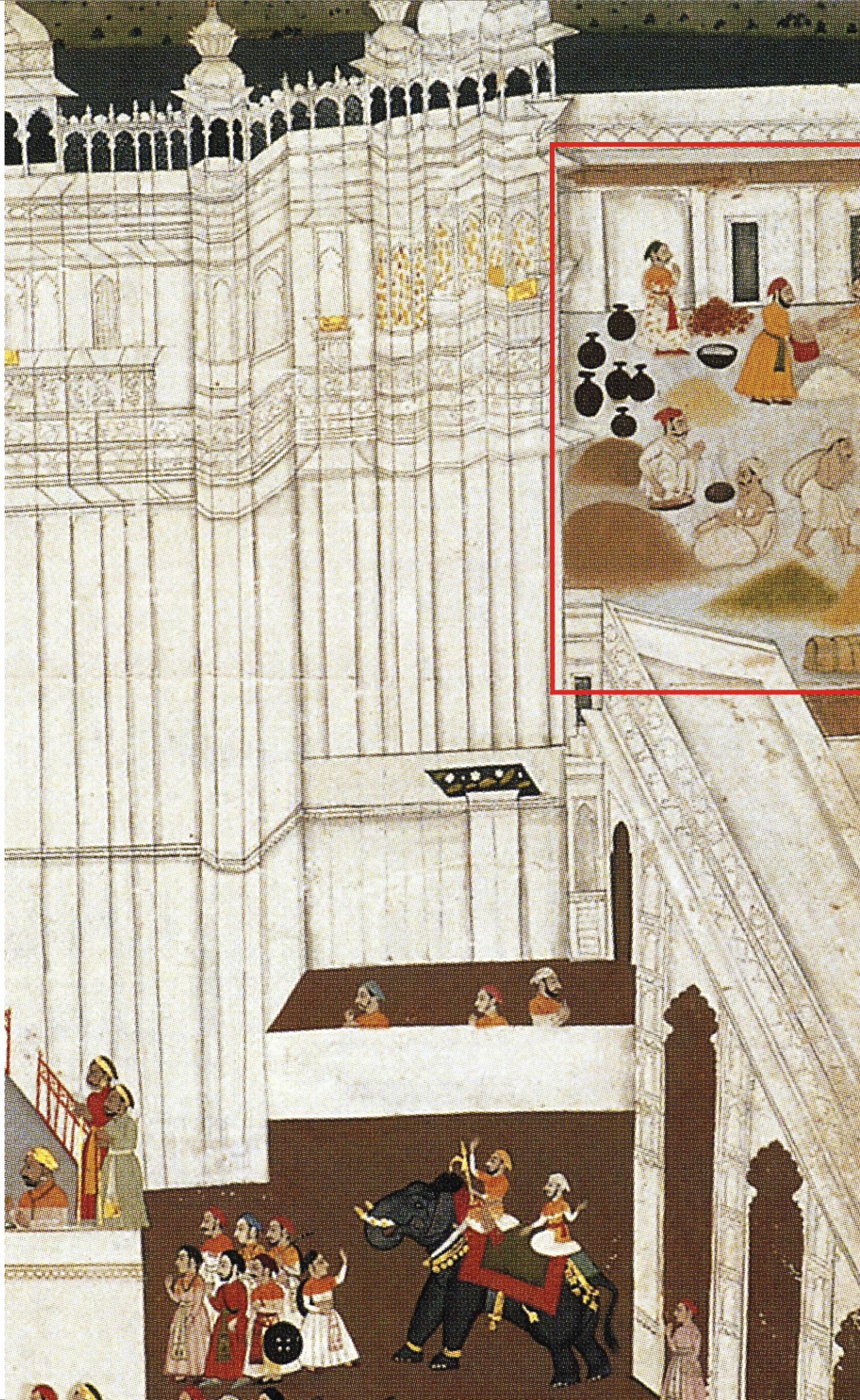
The early residents of Mewar prepared storage-rooms or structures for storing grains. The walls of the storage were plastered with the mixture of clay and cow-dung and grains were preserved in several rectangular or circular clay bins. In the villages of southern Rajasthan, storage bins are generally found close to the kitchen or in a room close to the kitchen. The construction of Kothar at City Palace was

done in two phases. During the reign of Maharana Karan Singh (1620-1628), the distance between the Kothar and the Karan Vilas Rasoda, royal kitchen, was very short. Kothar had several rooms and it is likely that there were storage-bins too as a clay-bin is displayed in a kitchen at the Zenana Mahal, palace for royal women. It can be inferred that possibly the earlier rooms of Kothar were plastered by a mixture of clay and cow-dung and the bins were used for storing grains in these rooms so as to preserve from insects and fungus.

In the second phase, Kothar was enlarged, surely due to the lack of enough space to store the grains, Fig.6.3. It may also indicate better climate, prosperity of the state and well-organized administrative system. According to the map, Fig.6.3, and the oral tradition, as many as four major structures or chambers were constructed for storing grains. These chambers or rooms were added one after another according to the requirement. Dimensions of these chambers appear to be similar. Three chambers were in a row, out of which only one is still intact, Fig.6.4, and the other two, Chambers B and C in Fig.6.3, are now converted into residential apartments for the City Palace staff. Their length and width are 23 x 19 feet and depth is 29 feet, respectively. The fourth, Chamber D in Fig.6.3, was a bit bigger than the other ones. Its length and width were measured 28 x 19 feet and depth 12 feet.

The architectural plan of Kothar also gives an idea of the area of storage. Considering the plan of Kothar, about 337 ton or 3,37,946.67 kg. of grains had been stored in each chamber. It means about 1351 tons (13,51,786.68 kg.) of grains had been stored in all the four chambers. Generally about 100 kg. grains are enough to feed a person for one year. It means about 1351 tons of cereals may have supported about 13000 people round the year. It was obviously one of the largest known grain storage of the late-medieval period, following the famed granary at Harappa.

Kothar chambers are rectangular in shape and are narrow from the base and wider on the middle and top, Fig.6.5. It gives more strength to the walls after the grains are filled and also reduces the force or pressure. Our ancient wells and other water structures had also been made with this structural concept. The chambers were constructed with semi-dressed stone and a mixture of lime and *surkhi*, mortar, as binding material. The *surkhi* is a mixture of lime, powder of bricks, and some organic material. The ratio of these elements may vary as per requirement.[4] Lime dries faster than clay or cement so it helps to avoid moisture in the storage-chambers during the monsoon. Lime also has a special characteristic that as it becomes older, it gets more strength and wards off insects. After cleaning a corner of Chamber A of Kothar, we realized that the floors of these Chambers were made of flat stone-slabs and clay, plastered with cow-dung. A close examination revealed that the walls of these Chambers had considerably thick plaster of clay mixed with cow-dung, straw, and stone pebbles. It appears that such thick plaster was very useful for maintaining the requisite temperature in the Chamber. It was observed that there was less quantity of straw in the lower portion of the wall whereas it was the same in the rest of the upper portion. We do not know if the ash was also mixed in the plaster because people normally used to mix ash to plaster the underground storage walls. Discussion with villagers, farmers, and experts, made it clear that different materials like clay, cow-dung, and straw mixed plaster is very important. Clay should be very fine. Cow dung is sticky so it is mixed with clay to clasp the wall and works as an adhesive. Only clay plaster may develop cracks when it dries. The straw used in the plaster is a good binding material other than being a bad conductor of heat. In Odisha, people are still using rice



Heaps of Grain
in Kothar,
detail, Fig.6.1

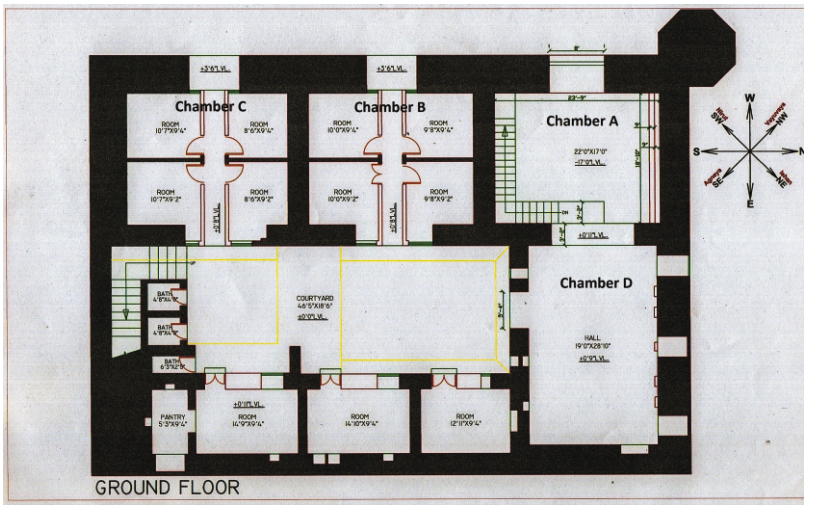


Fig.6.3 : Present structural plan of Kothar area, c. 2014 ,30 x 20 cm, The City Place Museum, MMCF, Udaipur,
Photo courtesy:
The City Palace Museum, MMCF, Udaipur



Fig.6.4 : Internal part of Chamber A, 18th-19th Century, The City Palace, Udaipur
Photo courtesy:
The City Palace Museum, MMCF, Udaipur



Fig.6.5 : Differences in width in Chamber A, 18th-19th Century, The City Palace, Udaipur,
Photo courtesy:
The City Palace Museum, MMCF, Udaipur



Fig.6.6 : White fibrous material on the wall of underground silos from Balathal, South Rajasthan, Chalcolithic Phase
Photo courtesy: Prof. J.S. Kharakwal



Fig.6.7 : White fibrous material on the wall of underground silos from Kanmer, Gujarat, Medieval period
Photo courtesy: Prof. J.S. Kharakwal



Fig.6.8 : Decomposed straw turning white on the wall of Kothar, Chamber A, 18th-19th century, The City Palace, Udaipur
Photo courtesy:
The City Palace Museum, MMCF, Udaipur

straws to preserve their grains in underground storage pits.[5] Because of decomposition, the straw or grass, mixed with plaster in the Kothar, has converted into white.

Grains should be filled in the air-tight storage chambers once the plaster is very well dried. On top of all the four Kothar Chambers, a circular hole was provided perhaps to fill the grain. It seems that people were aware of the fact that they should not open the whole chamber for filling grain, so as to avoid air or moisture in the chamber, which otherwise, later on, help to grow fungus and insects as well. Two bigger squarish holes were made on top, perhaps, for taking out grain.

Various archaeological sites, have evidences of food storage such as bins, jars, pots, storerooms, underground silos, and granaries.[6] Huge granaries have been reported from excavations at Dholavira,[7] Gilund,[8] and Pachhmta[9] and at many other sites. At Balathal and at Loteshwar, a few silos were discovered with a layer of some sort of white fibrous material on the inner surface.[10] Even several Early Historic and medieval silos of clay, plastered with cow-dung and strengthened with a thick layer of decomposed grass or straw, have been reported from the excavation at Kanmer, Kachchh, Gujarat, Figs.6.6 & 6.7.[11] After decomposition, the straw perhaps turns white. Perhaps the plaster in the Kothar of the City Palace having straw may also turned white in course of time. This kind of whitish material is traceable at several parts of the walls of the chamber, Fig.6.8, indicating the use of straw in the plaster. Apart from the archaeological evidence, several ancient Sanskrit and vernacular texts of later period also have information about the traditional storage of cereals and storage making techniques.[12]

Thus traditional techniques of storage appear to be time-tested as the evidences from various archaeological excavations would indicate. Maharanas of Mewar also used the same techniques to preserve large quantities of grains and other food items for centuries. This can be a link between ancient evidences and the techniques of storage used in the later era for a better understanding of the uninterrupted tradition. It also shows that in such huge chambers, hundreds of tons of grain were stored, to have a safe future. The clay and cow-dung plaster was surely the best means to avoid humidity and reduce microbial formation in the chambers. The Kothar can be considered as one of the largest grain storage of the country made by traditional technology in the royal residence of Mewar. Additionally, it is a fine example of the tremendous wisdom of the ancient people of the region.

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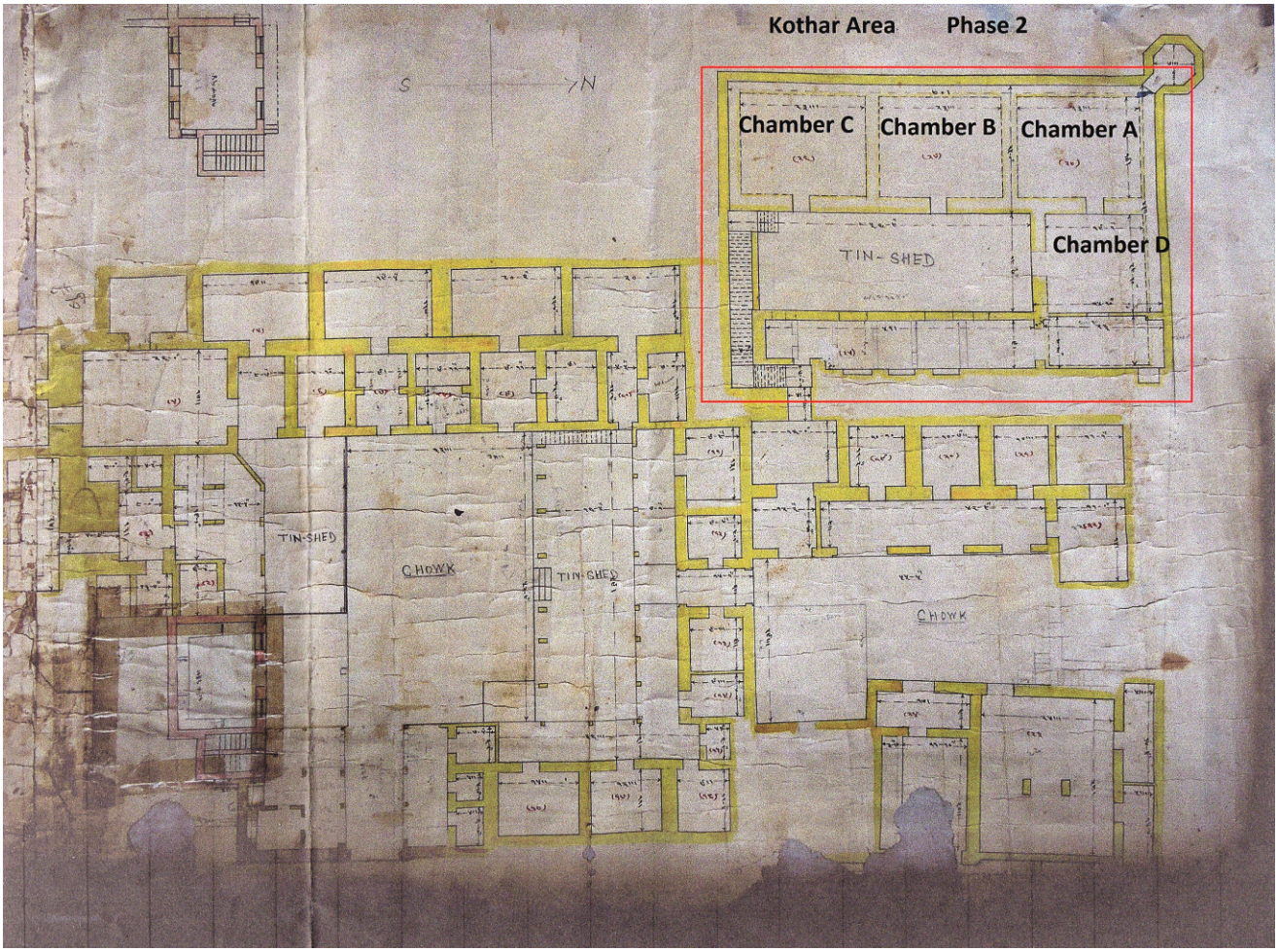


Fig.6.2 : An old map of the second phase of Kothar with 4 huge storage chambers, 19th Century, ink-drawing on paper, 42 x 30 cm Maharana Mewar Research Institute (MMRI), The City Palace, Udaipur, *Photo courtesy:* MMRI