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AB-ANBĀR II. CONSTRUCTION

ĀB-ANBĀR "water reservoir."

ii. Construction

Cisterns are built in towns and villages throughout Iran, as well as at crossroads, caravanseries, and hospices (*rebāṭ*). While town cisterns may be filled with rain water or from *qanāt*s, most *āb-anbār*s along caravan routes are filled from the spring torrents of nearby streams; during the dry season gradient weirs are constructed in the stream bed in order to divert water to the cisterns when the winter snows melt and the streams rise. Use of two or more cisterns becomes necessary when the volume of water is large. As one cistern becomes full, the water collecting behind the weir can be directed into a second cistern by diverting it into a second channel dug alongside the first, as this channel is opened and the other closed off. Should this channeling system fail to draw off a sizable enough volume, the water would built up behind the weir and eventually destroy it.

Mode of construction. Cisterns built inside private dwellings are usually square or rectangular; public cisterns in towns or along the caravan routes are generally round. While the former have a flat roof and are often built into the foundation of the house, the latter have a distinctive hemispherical or almost conical roofing.

Water remains quite cool inside the cistern, since it is generally built beneath ground level and is insulated by very thick walls. In most parts of Iran, but

particularly in the south, one or more ventilation towers (*bādgīr*) is built along the edge of the cistern's roof, directly on the tank wall and connected by a duct to the upper part of the cistern chamber under the domed roof. Fresh air entering through these ducts keeps the air inside the cistern chamber circulating and the water cooled. The six-ventilator cistern to be found in the city of Yazd is probably the most elaborate example of the type equipped with ventilation chambers. In the case of cisterns with domed or conical roofs, the center of the roof is sometimes pierced, and a short ventilation chamber made of brick is built directly over the cistern chamber. A duct inside the ventilation chamber leads from the openings or slats (that catch the breeze on top) directly inside the roof, again circulating air inside the cistern chamber. The height of these ventilation chambers is generally about one meter, though some can occasionally be seen that reach a height of two or even three meters.

Construction. Materials used consist essentially of stone or baked brick with lime-mortar and plaster. After the pit that will house the cistern has been hollowed out, the bottom is covered with slaked lime-mortar. When this floor hardens, the builder erects the tank's walls, made of baked brick or stone. The bricks are generally plunged in water before being laid. The filling between bricks or stones consists of lime-mortar. After the roofing of brick and slaked lime is laid, the tank's floor and walls are finished with a coating of plaster.

A type of cistern called *rīḵtaʾī* ("poured," i.e. made of poured lime-plaster) is considerably cheaper to build. First the perimeter of the tank's walls is marked out, and the earth within the wall area is dug out to the desired depth. Next lime-mortar is poured into the square or rectangular trench until it is filled nearly to the ground level. This is left for a week or two until the mortar settles and is solidified. Then the area of earth bounded by the mortar walls is dug out down to the desired floor level. The floor is built by pouring lime-mortar; and, finally, when the walls and floor are dry, they receive a coat of plaster.

Plaster is an indispensable material in the construction of the Iranian cistern, since the essential function, containment of water, is achieved by the watertightness of the plaster. The type of plaster most commonly used, called *sārūǰ*, is a compound from six parts clay, four parts lime, one part ash, and an amount of *lūʾī* sufficient to keep the compound from cracking; this last consisting of the seeds and pods of an extremely soft and pliable species of reed. The first step in the preparation of this plaster is the mixture of the clay and lime, to which water is added. All of this is made into a relatively hard, clayey substance which is worked for one or two days. Next the ashes and *lūʾī*

are pounded into this mixture until the various components have been thoroughly blended. This pounding is done with wooden sticks about 10 cm in diameter and one meter long, one end of which has been tapered to serve as a handle. This last step is important, because the more the mixture is pounded and kneaded, the more durable it is. When the plaster compound is ready, it is spread on the walls and the floor of the cistern with a trowel. The next step is to score the plaster surface with a lentil-shaped stone that fits in the palm of the hand and is called a *mohra* ("bead"). This scoring goes on for several days until the walls and the floor of the tank begin to perspire, a sign that the components in the plaster are holding together fast. Only then is the cistern filled with water.

Drawing water. Cisterns may be provided with a tap. When the place for the tap is reached in the course of construction, an additional pipe for it is built into the wall; and a plaster compound (half clay and half lime) called "bastard clay" (*gel-e eḥarāmzāda*) is pounded with the feet into the space above the pipe. Water is taken from this type of cistern by means of a separate chamber, containing a staircase, about as deep as the adjoining tank chamber. The stairs are wide enough so that persons going up and down with buckets, gourds, or leather bottles will not get in each other's way. Two, three, or even more taps are sometimes installed. A few cisterns have been observed to have two separate stairs on opposite sides. In the case of the cisterns built alongside roadways, however, the normal procedure is to construct the staircase within the cistern chamber itself, so that the water is drawn directly from the tank.

Capacity. The capacity of the traditional cylindrical cistern varies generally from 300 to 3,000 cu m. This upper limit is dictated by the fact that the maximum diameter allowed by the method of construction is about 20 m. If the depth of the tank is up to 10 m, its capacity would be about 3,000 cu m. In a few localities the cisterns have an even greater capacity, and some exceptional examples have been cited as able to hold up to 100,000 cu m. These are not round tanks, however, but square or rectangular cisterns with columns placed in the middle of the tank chamber in one or two rows. These support a roof consisting of a series of domes or barrel-vaults.

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Data in the article was gathered primarily through personal observation; however, see illus. in *Âthâr-è Irân* 4, 1949, pp. 316-19.

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