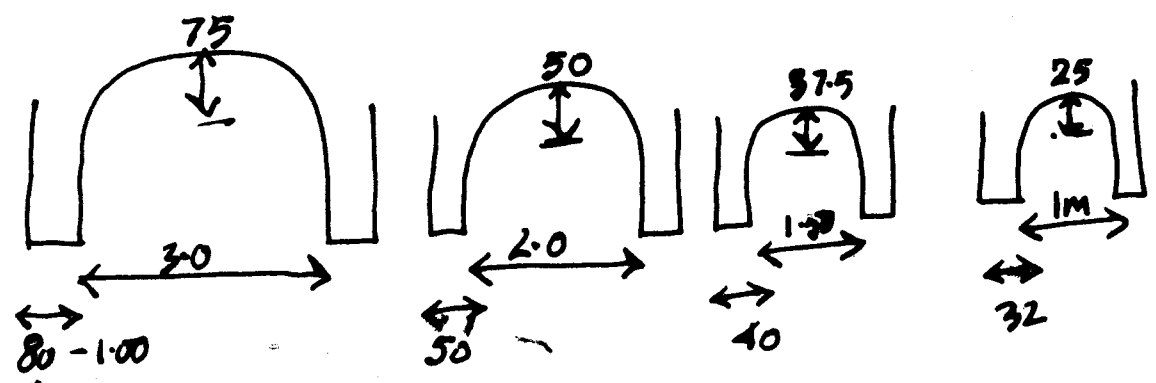


# Tape 20.2

## Makshahah or vaults.


### VAULTS.



One metre width must have at least a minimum of 32 cms thickness of wall. [If the shape of the vault is not regular, a lot of forces are exerted on the walls]. If the shape of the vault is not an exact semicircle and one side is lower than the other, then the distribution of the forces on the walls will be unequal and the ~~low~~ walls will collapse.



That is if there is no vault adjacent. If there is another adjacent vault the thickness can be reduced to 60cms.

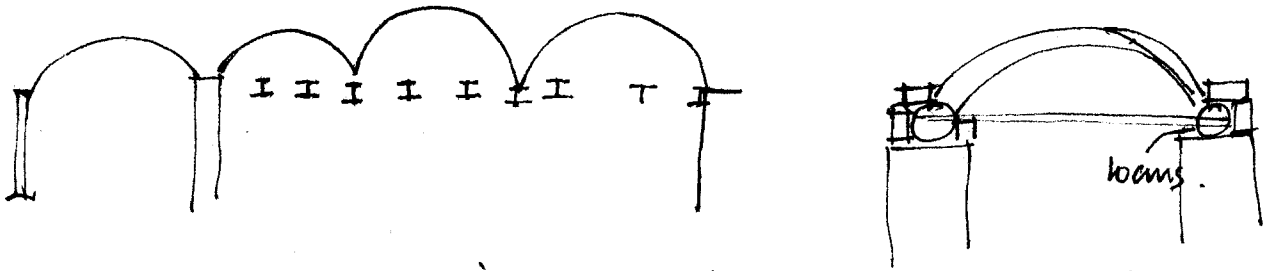
[The course of bricks at the back of the vault has to be tilted 1.5 cms] If it is <sup>built</sup> covered with mud bricks the course of bricks must be tilted at 5cms.

Strong 'guy' ~~spring~~ chips must be put between  sloping course. At the lower part of the vault one brick course must be project out.

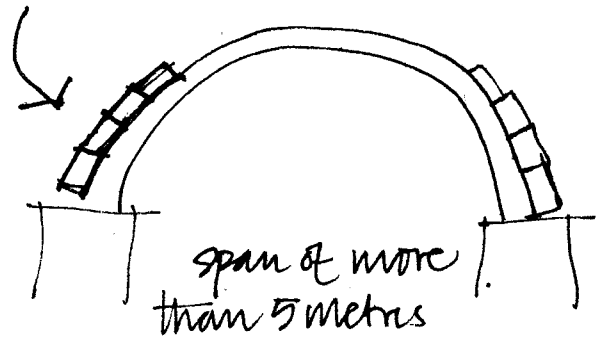
A 3m wide vault with a base made of mud brick and vaults made out of mud brick must have one course of <sup>course</sup> bricks ~~bricks~~ stepped. The sprung  points of vaults wider than 3 metres must have a ledge  <sup>slope</sup> ~~the~~ If one of the base walls is external (ie no counter thrust), then it must be reinforced. Two pieces of wood has to be laid on top of the bases and tied together with a rod

Two pieces of wood has to be laid on top of the bases and tied together with a rod

3. and the rod must be No 12 rod. (12mm) and if they are not tied together and they are not strong enough the walls will move. [Pre-stressed]



If the span is more than 5 metres, then an extra course of bricks has to be laid on top of the vault.

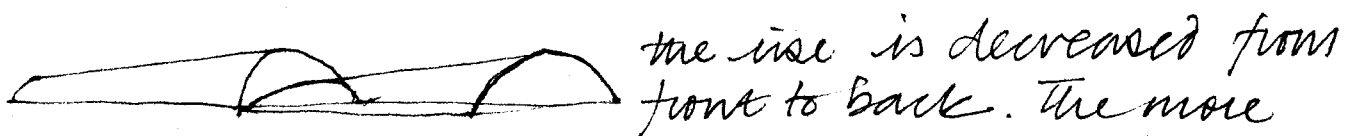


If the span is more than 3 metres the spaces between the bricks must be filled with pieces of chipped brick 'qaz' + chuk. In <sup>between</sup> ~~between them~~ the spaces which the bricks make as they are laid, + put 'qaz' + covered with chuk (liquid) called ~~gach~~ ~~gach~~ - qaz-gach. or <sup>gach bandi.</sup> ~~gach bandi.~~

The first brick or mud brick of the vault must have a ~~cor~~ ledge underneath and it has to be strong.

How many types of vault are there?

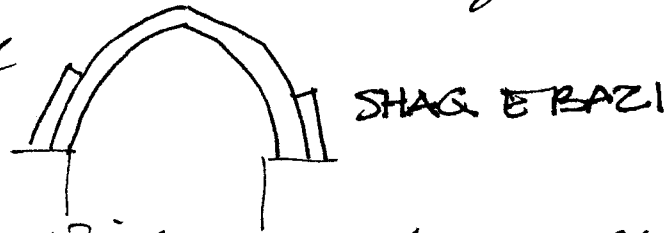
The main one is 25 rise in 1 metre. There are vaults with 3 metre span  $\frac{1}{2}$  metre rise.



4' is decreased / the less the rise the greater the pressure.

~~Around the~~ The whole of the vault has to be covered with a second layer of bricks.

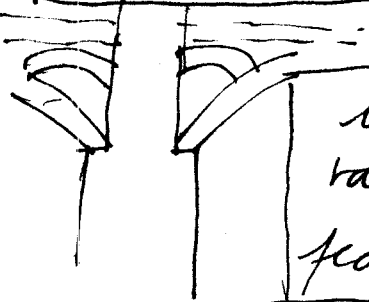
At the lower edges of shag<sup>kh</sup> bazi they must be covered as well



In between the walls which carry the vault shelves or spaces for shelving or openings are possible - takhché. with this process less material is used and more space is produced.

If the the span is 4 of the vault is 4 m, with reinforcement a thickness of 1m is enough but without reinforcement a thickness of 1.25 is required.

In 2 storey buildings the walls on the ground floor must be 10cm thicker than the walls on the first floor.



In between large vaults, little vaults are built in order to have a flat surface for the 1<sup>st</sup> floor.

In Heristan the ground floor is so vaulted and the upper floor is wooden.

In this case the thickness of the vault must not be less than 40cms. Previously,

the floor was directly on top of the vault, but now days it as there is a space in between

The thickness can be 20cms.

5. The maximum ~~number~~<sup>size</sup> of takhche in one row.

The width of the takhche must not be less more than one metre. For the partition walls 30 cms is enough, but external walls must be 1m.



with using less material the walls will have sufficient strength, when pressure is exerted on the sides.

clean?