Arches Technology

Introduction

Arches are a common feature in houses today. It is a technology which has been in use for hundreds of years and has withstood the test of time as evidenced by the numerous arches seen in ancient buildings and old houses in Sri Lanka. Masons have been trained by Practical Action on the technology and the practical use of several types of arches, some of which were constructed at Practical Action pilot project sites.

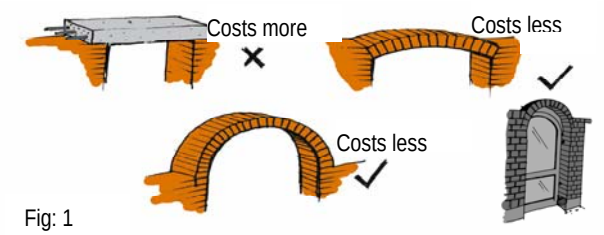
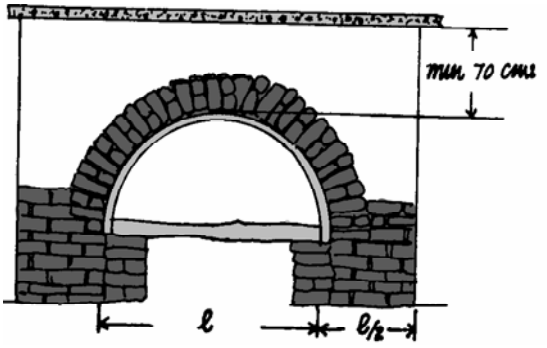


Fig: 1

- Arches can be used not only to beautify buildings but also to minimise costs by reducing the use of steel and concrete.
- Arches can be used to make doors and windows look attractive from the exterior.



- Even masons with limited skills can use this technology after obtaining adequate training.

Limitations of arches

There should be a minimum distance of 70 cm from the top of the arch to the lower beam, while on either side of the arch, there should be a wall with half the width of the arch.

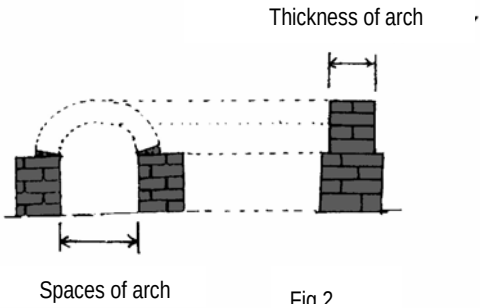


Fig 2

Contact: Resource Desk

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Types of arches

- Semi-circular Arches - Semi circular arches take the shape of half a circle
- Segmental Arches - Segmental arches take the shape of a very large circle.
- Pointed Arches - This method is suitable for tall buildings

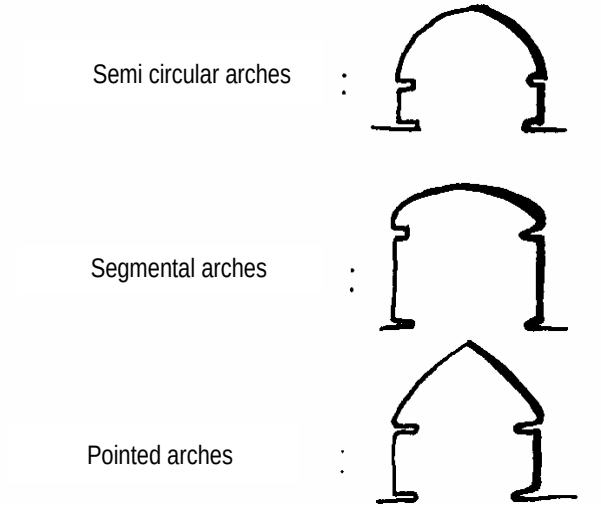


Fig 3

Type of Moulds/Shuttering used

Wooden moulds

Fig 4

These are used for very large arches

Steel moulds

These are used if the need arises to re-use the supports.

Fig 5

Brick and clay moulds

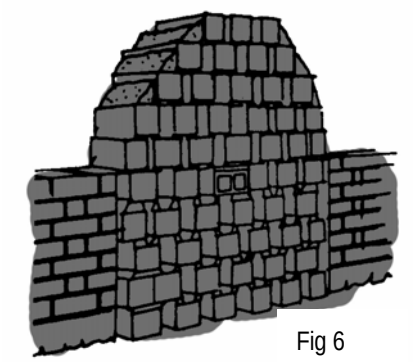


Fig 6

These are also used for constructing large arches. fig.6

Moulds made with steel bars

These are suitable for small arches

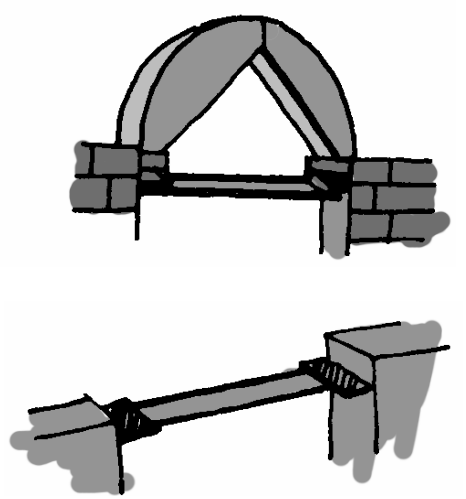


Fig 7

Building Pointed Arches

Mark the middle of the arch as shown in the sketch. Strengthen it with a wooden mould & level it. (The mould should be in two parts). Install the mould before building the arch.

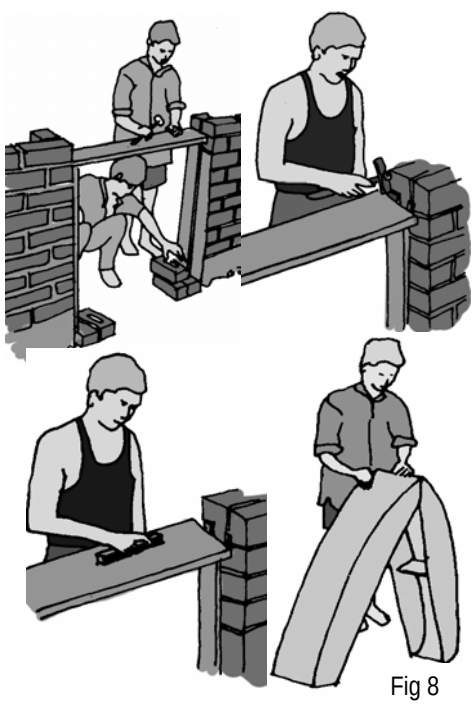


Fig 8

Make the mould precisely vertical. Use a plumb for this purpose

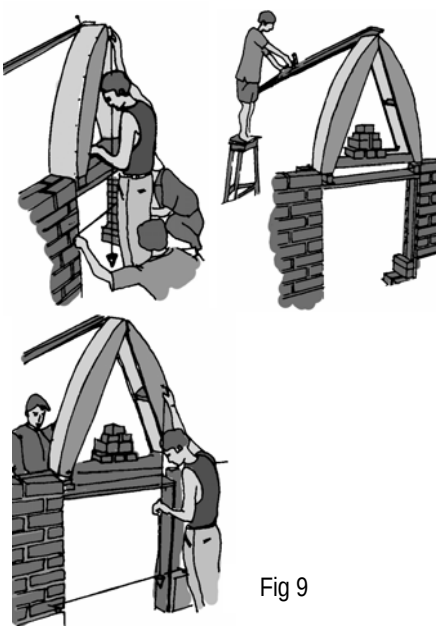


Fig 9

Lay out the bricks as shown in fig.11. If the bricks are not of the same shape, you may lay the bricks as shown in fig.10 so that the appearance of the arch will not be affected. This can be done using bricks of different shapes as below. The bricks should be laid on the mould evenly and there should be uniformity.

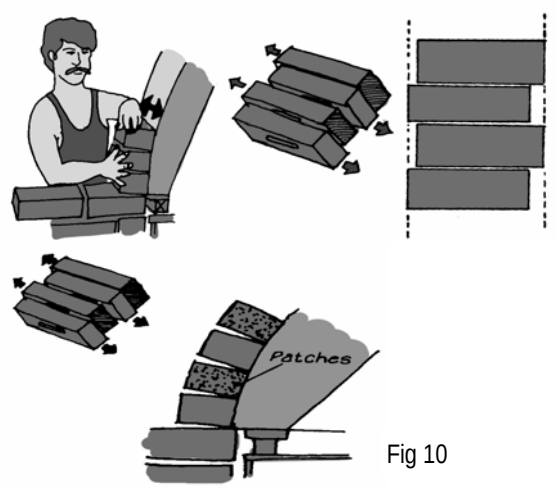
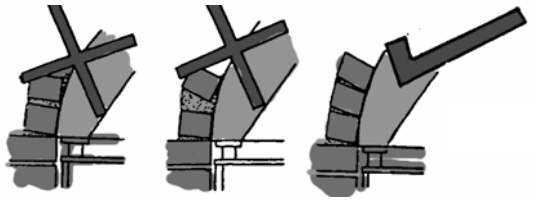


Fig 10



Incorrect correct Fig 11

Every brick should be laid at an angle of 90°degrees on the support. Both sides of the arch should be constructed simultaneously.

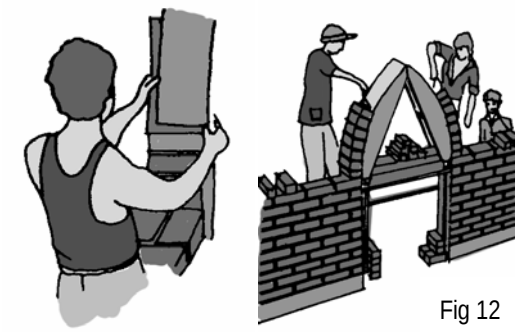


Fig 12

The placement of the keystone too is very important. Make a wooden mould as shown in fig.13. The mould should then be fitted to the top of the arch.

Key stone

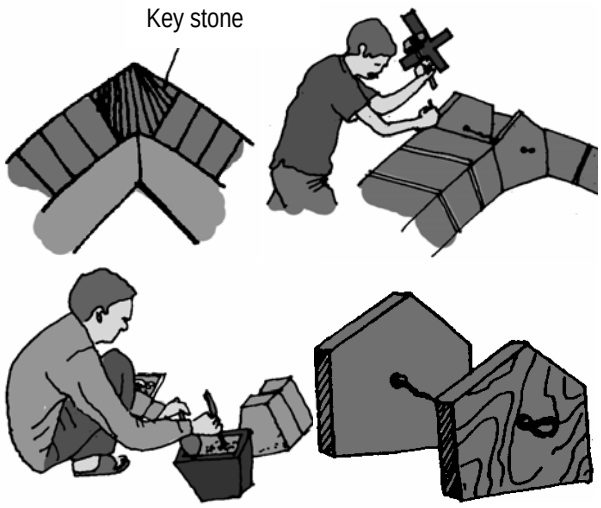
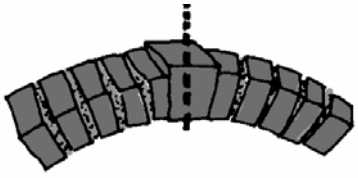


Fig 13

The keystone can also be turned out of rock stone. It will be useful to turnout several key stones by using the wooden mould. fig. 14 show the correct and incorrect ways of fitting the keystone.

Correct fitting of key stone



Incorrect fitting of key stone

Fig 14

Remove the support by tapping on it very slowly. Avoid tapping it across.

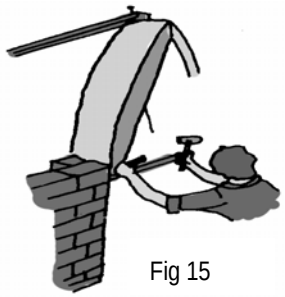


Fig 15

Building Rough Circular Arches

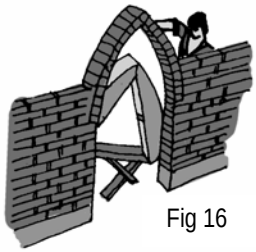


Fig 16

The construction is similar to that of pointed arches. Insert small pieces of stones between the bricks.

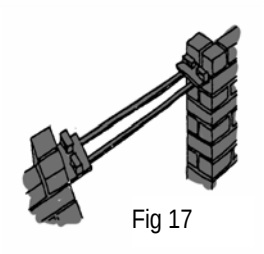


Fig 17

Level it after fixing the wooden mould.

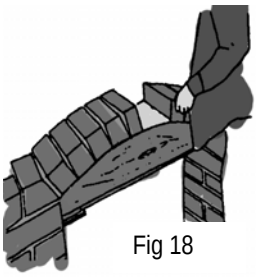


Fig 18

Lay the bricks as shown in fig.18

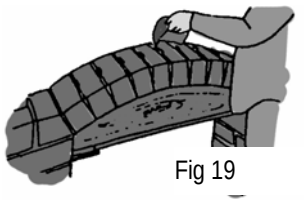


Fig 19

Pour the plaster between the bricks as shown in fig.19.

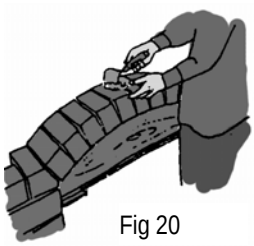


Fig 20

Remove the pieces after a short while and pour the plaster after adding more cement as shown in fig.20. Remove the mould after 24 hours.

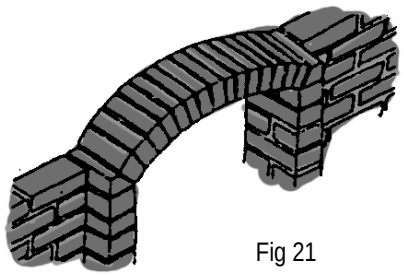


Fig 21

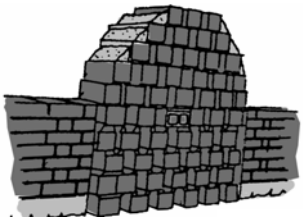
Figure 21 shows the arch after the mould has been removed.

Building Half-Circular Arches

Make the mould as in the earlier type of arches.

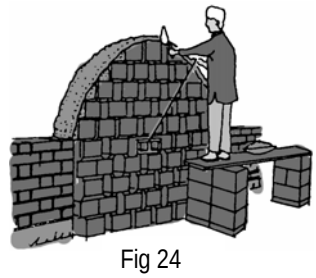
Fig 22

Constructing Giant Arches



Use clay plaster on the bricks until they take the shape of an arch.

Fig 23



The brick mould should be rounded with clay plaster and the circular shape should be measured correctly.

Fig 24

Lay the bricks evenly so that there is uniformity

Fig 25

Corbel Arch

A corbel arch is used in order to eliminate the use of a lintel. When the brick walls adjacent to the opening reach the height where the arch begins, subsequent course of brick should project 2¼ " on each side of the opening. Repeat this process till the apex of the arch is reached. This arch should be constructed very carefully.

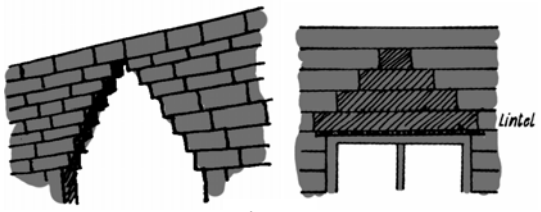


Fig 26

After completing the arch the wall should be done in the normal way.

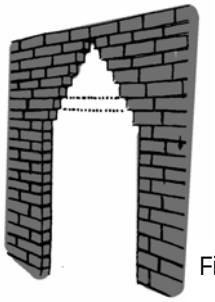


Fig 27

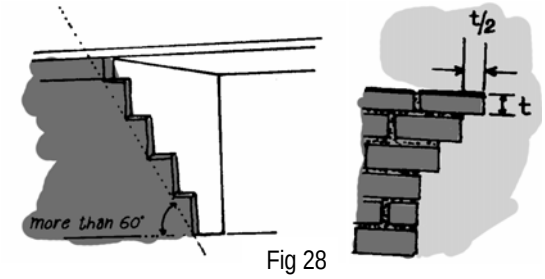


Fig 28

This corbel arch principle can also be used as support for hand-rails at stairways.

Ventilation holes made of bricks

These can be used for ventilation as well as for marking boundaries.

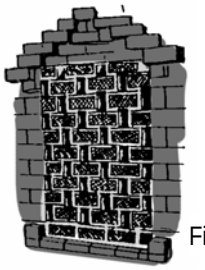


Fig 29

Corbel Sunshades

These can be turned out at a very low cost for covering doors and windows. They can be made to look very attractive and can be made by using only Ferro cement planks and bricks. The bricks that are used for construction should be between 2”- 2 ½” thick.

Brick Jali

These can be used to beautify walls and to provide ventilation and light. Brick jali can be used in the construction of arches made of bricks. Any well-trained mason can easily construct this.