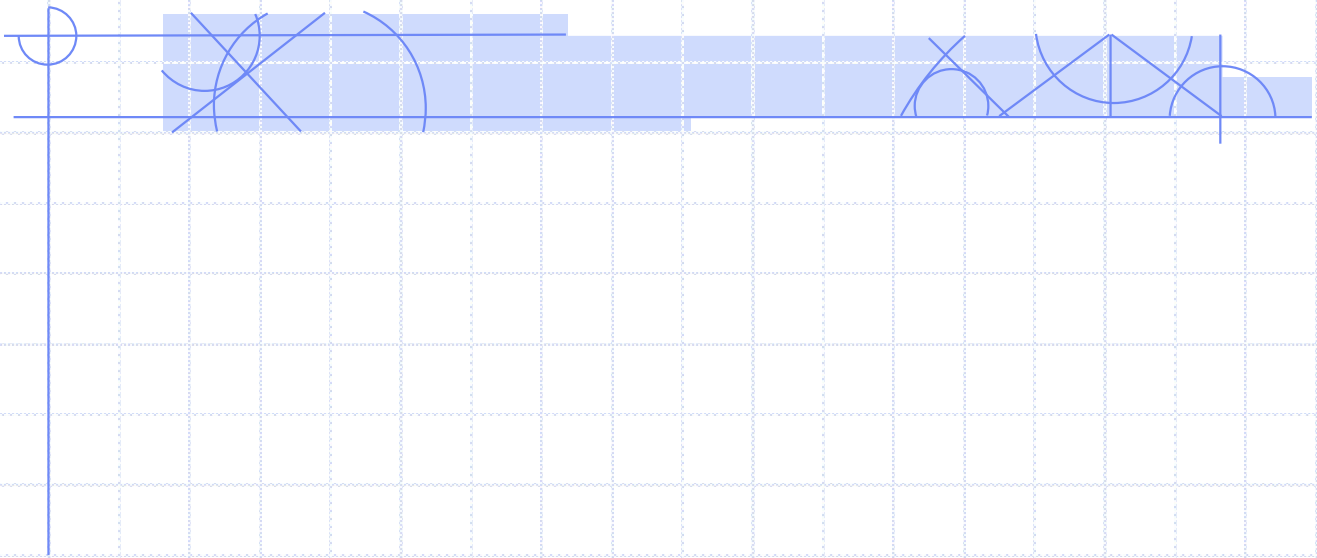
Details of Construction

Arches and Lintel



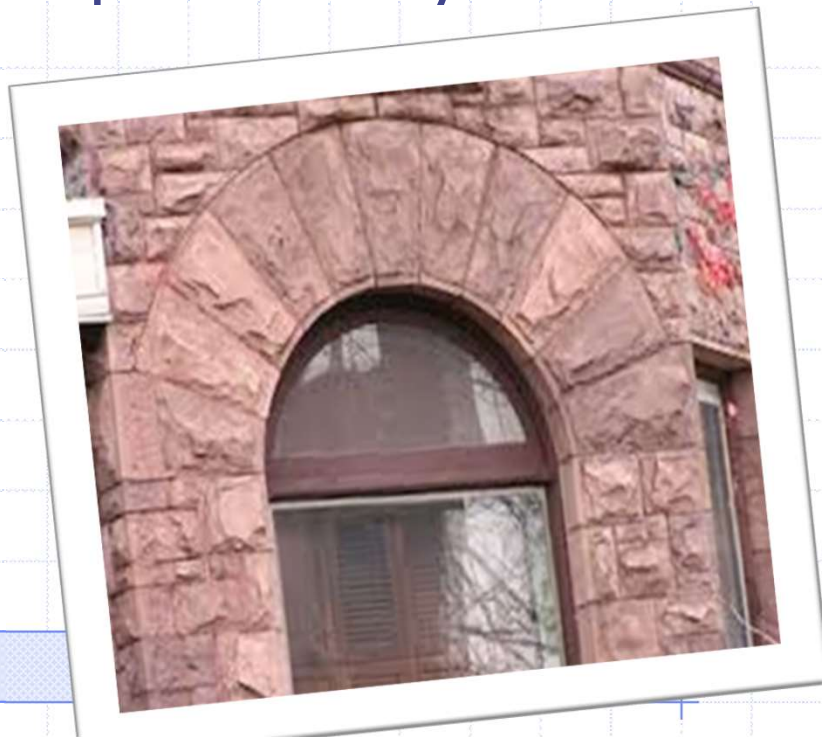
Arch

An arch may be defined as mechanical arrangement of wedge shaped blocks of stone and brick mutually supporting each other and supported at the end by piers on abutment. Because of their shape, the blocks support each other by the natural pressure of their own weight and structures remain in position by the resistance from the support.

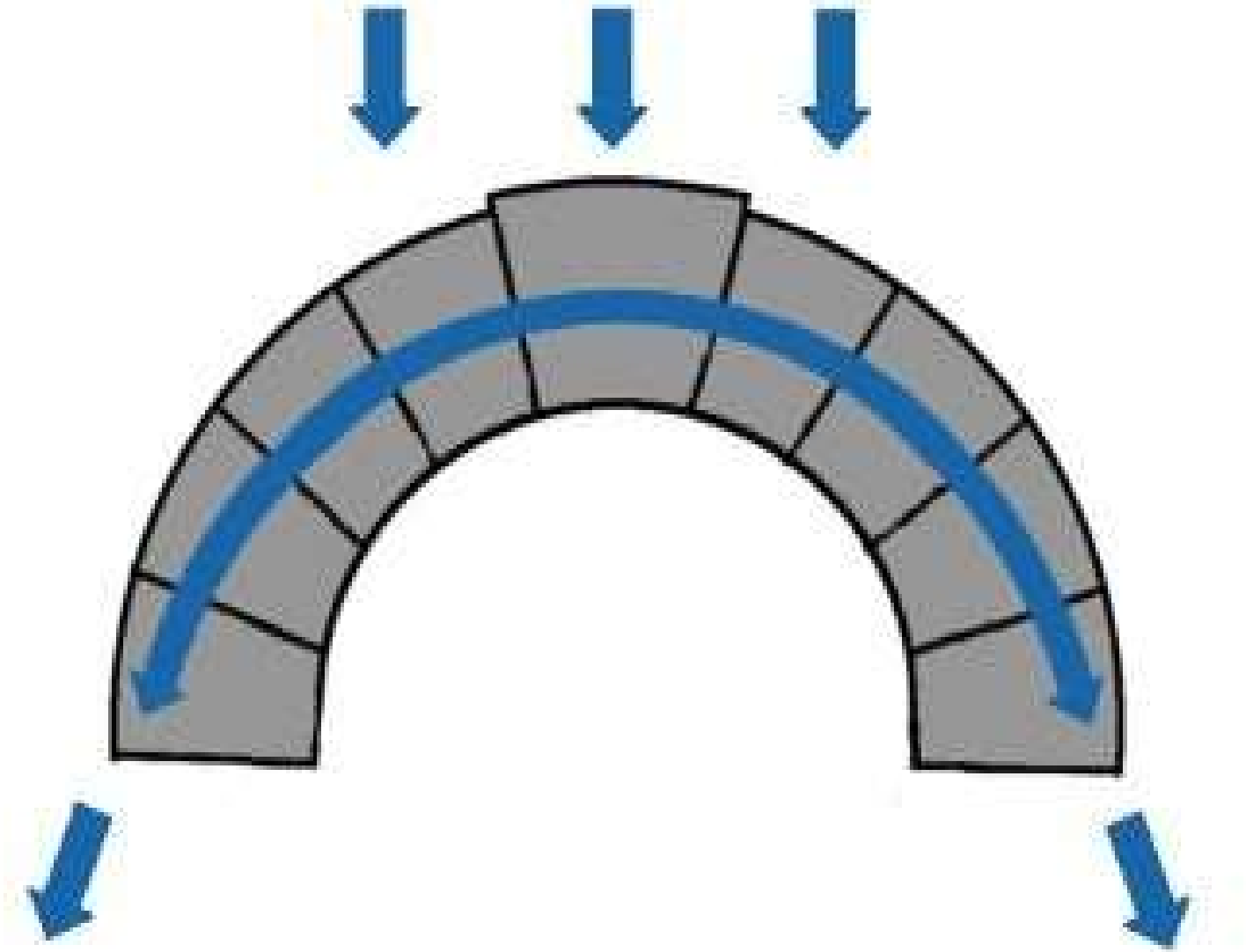
Difference between Lintel and Arch:

Lintel-Load carried by bending

Arch-Load carried by bending and axial force.



Forces acting on the structure





Pont du Gard- Roman Aqueduct in France (1st cent AD)

Elements of a Segmental Arch

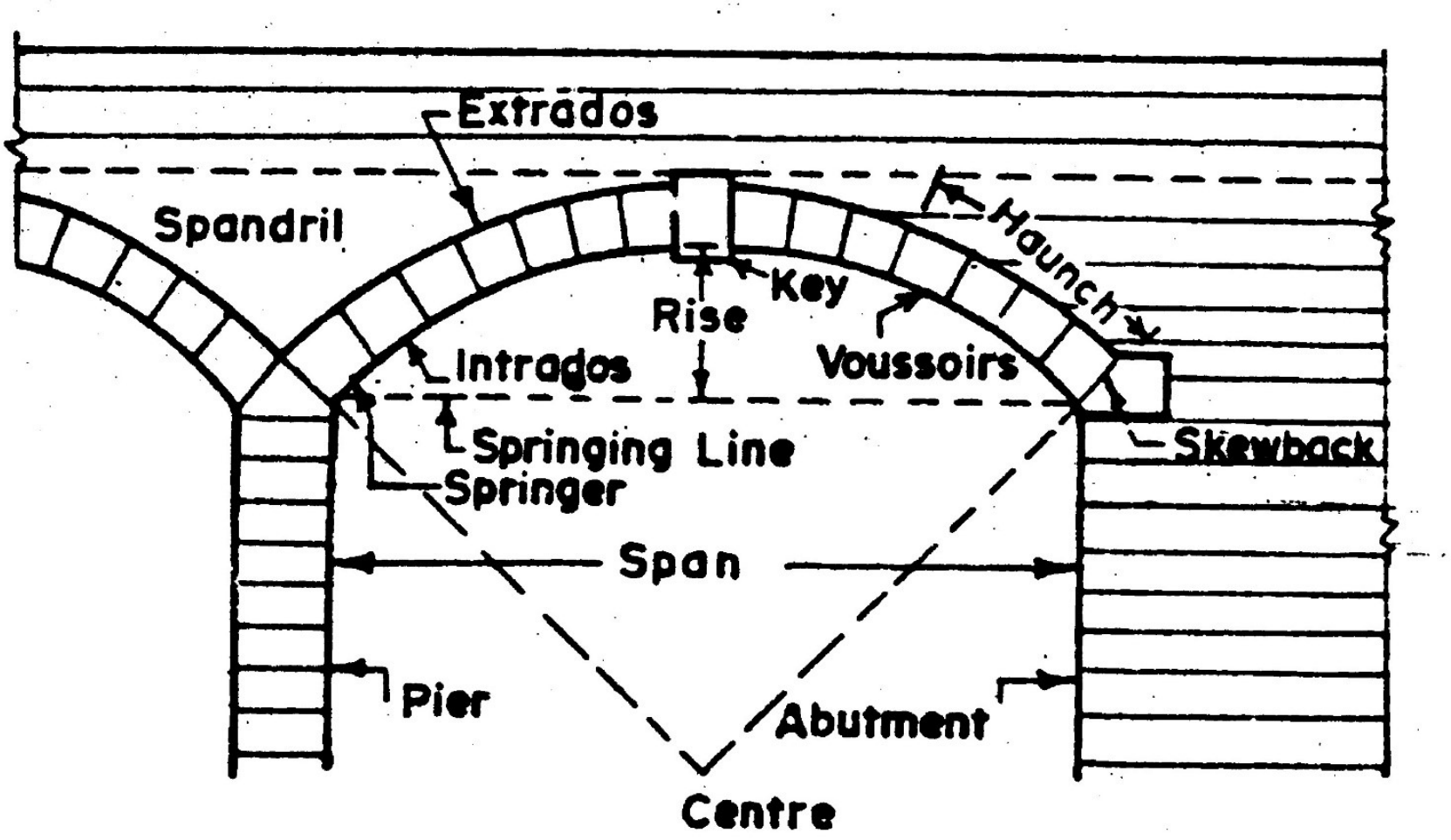


FIG 13.15. ELEMENTS OF A SEGMENTAL ARCH

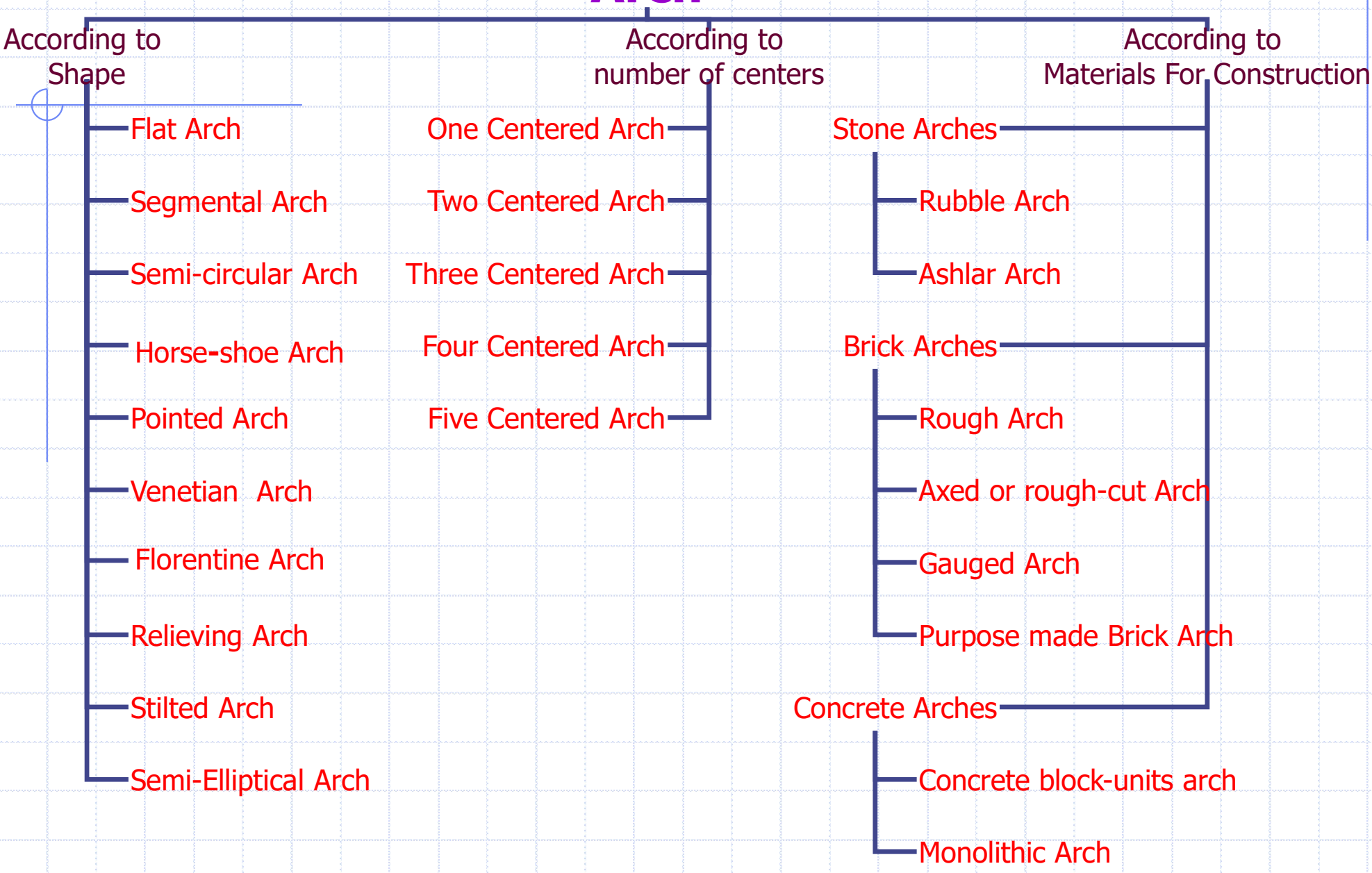
Terms used in Arches

- ✓**Abutment or pier:** It is the part of the wall or pier on which the arch rests.
- ✓**Intrados or soffit:** It is the under-surface of an arch.
- ✓**Extrados:** It is the outer surface of an arch or the outer curve of the arch ring.
- ✓**Voussoirs /Arch block/ Arch stone:** These are the wedge shaped unit forming the arch.
- ✓**Springing points:** Points at the extremities of the intrados
- ✓**Springing stone / Springer:** It is the first voussoir at springing level on either side of the arch.

Terms used in Arches (Continue…)

- ✓Springing line: It is on imaginary line joining the two springing points.
- ✓Key stone : it is the highest central wedge shape block of an arch.
- ✓Span: It is the clear horizontal distance between the supports
- ✓Crown: It is the highest part of extrados.
- ✓Spandrel: Curved triangular space formed between the extrados.
- ✓Rise: It is the vertical distance between the springing line and the highest point on the intrados.

Classification of Arches



Lintels

Lintel is a structural member similar to arches because both are designed to support the loads of the wall situated above the opening and then transmitted the load to the adjacent wall portions over which these are supported.

Definition:

A lintel is a horizontal member which are placed across the opening. A lintel is a sort of beam to the adjacent wall portions over which these beam rest (the width of which is equal to the width of the wall and the ends are built into the wall).

Purpose and Classification of lintel

Purpose of a lintel:

- to support the load above the opening.
- imparts strength by connecting the wall above the opening and the wall adjacent to the opening.
- To aid in placement for doors and windows .
- Provides structural benefit for placement of sunshade/ weather shade.

Classification of lintel:

According to the materials for construction

- Wooden/timber Lintel.
- Stone Lintel.
- Brick Lintel
- Reinforced brick Lintel
- R.C.C Lintel.
- Steel Lintel.

Wooden Lintel

In hilly and village area where timber is easily available, the construction of wooden lintel is suitable.

Disadvantages:

- If not properly ventilated liable to decay
- Wood being combustible, they cannot be recommended for fire proof construction.

Considerations:

- strong wood
- depth is (1/12)th of the span or 8 cm

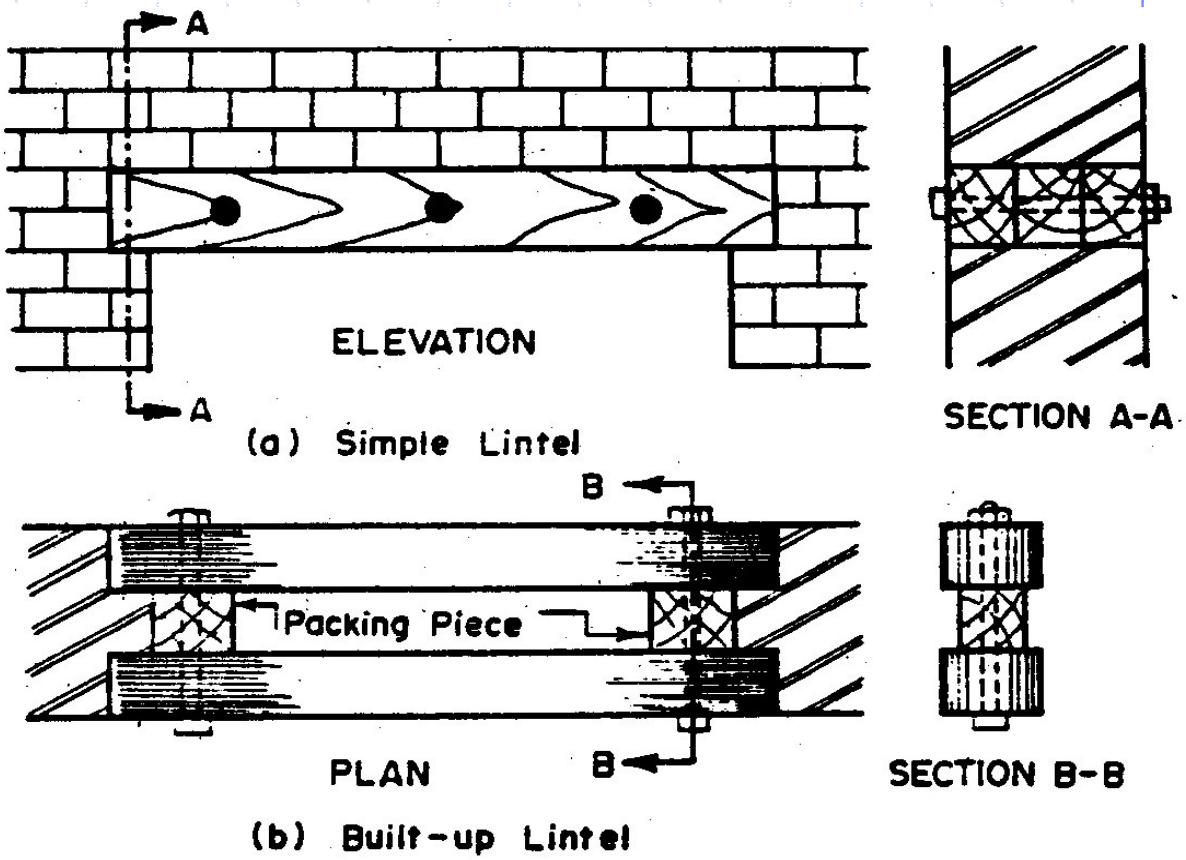


FIG. 13.1. WOODEN LINTEL.

Stone Lintel

The use of stone lintel is very common in hilly areas where stones are easily available.

Disadvantages:

- high cost
- regular sized stone is not always available
- weak in tension.
- it is unable to take excessive transverse load.
- Crack appear under vibratory loads.

Considerations:

- Span 2m
- depth-15 cm or 10 cm/m of span.

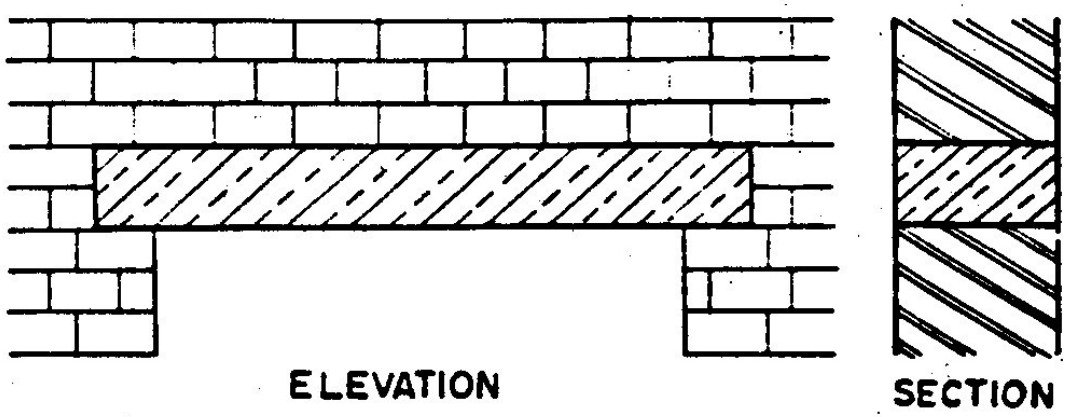


FIG. 13.2. STONE LINTEL.

Brick Lintel

Brick Lintels

Considerations:

- hard, well-burnt,
- 1st class brick
- Mortar ratio 1:3 (cement : sand)

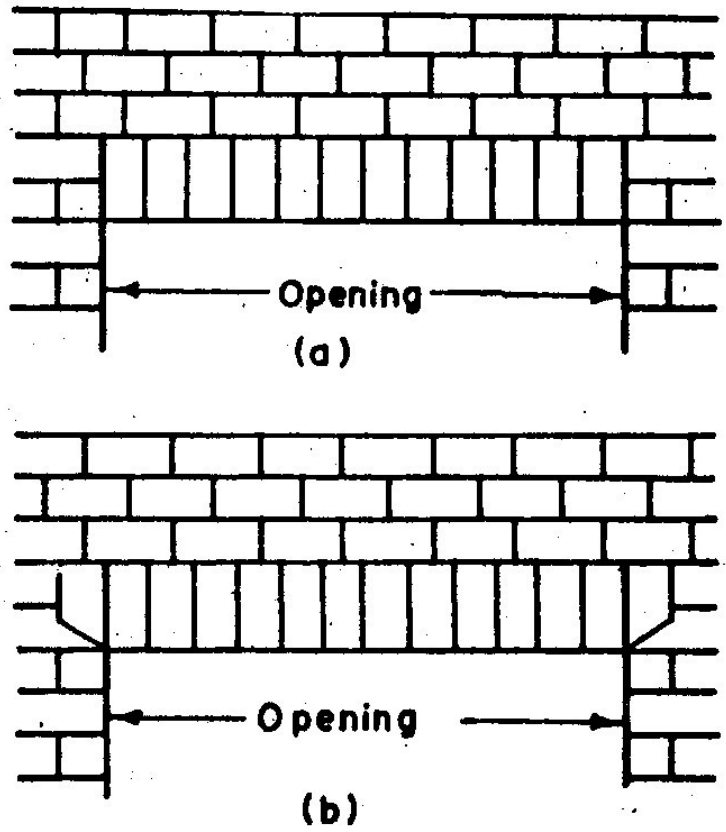


FIG. 13.3. BRICK LINTELS.

Reinforced brick lintels:

-When brick lintels are required to be provided over large spans, they are reinforced with steel reinforcements.

R.C.C. Lintel

Advantages:

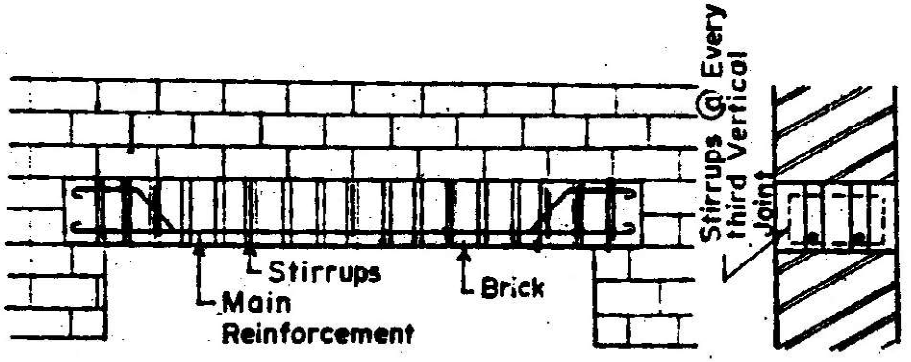
- durable, high strength, having fire proofing properties.
- easy in construction.
- economical.

Types :

1) Pre cast: when the lintel size having very large span of 2 m.

2) cast in-situ

Concrete ratio: 1:2:4



(a) LONGITUDINAL SECTION (b) CROSS SECTION

FIG. 13.4. REINFORCED BRICK LINTEL.

Steel lintels

When a large opening carrying heavy wall load is to be spanned by a lintel then R.C.C. lintel will work out to be very deep and heavy weighted. In that case, steel lintel can be used.

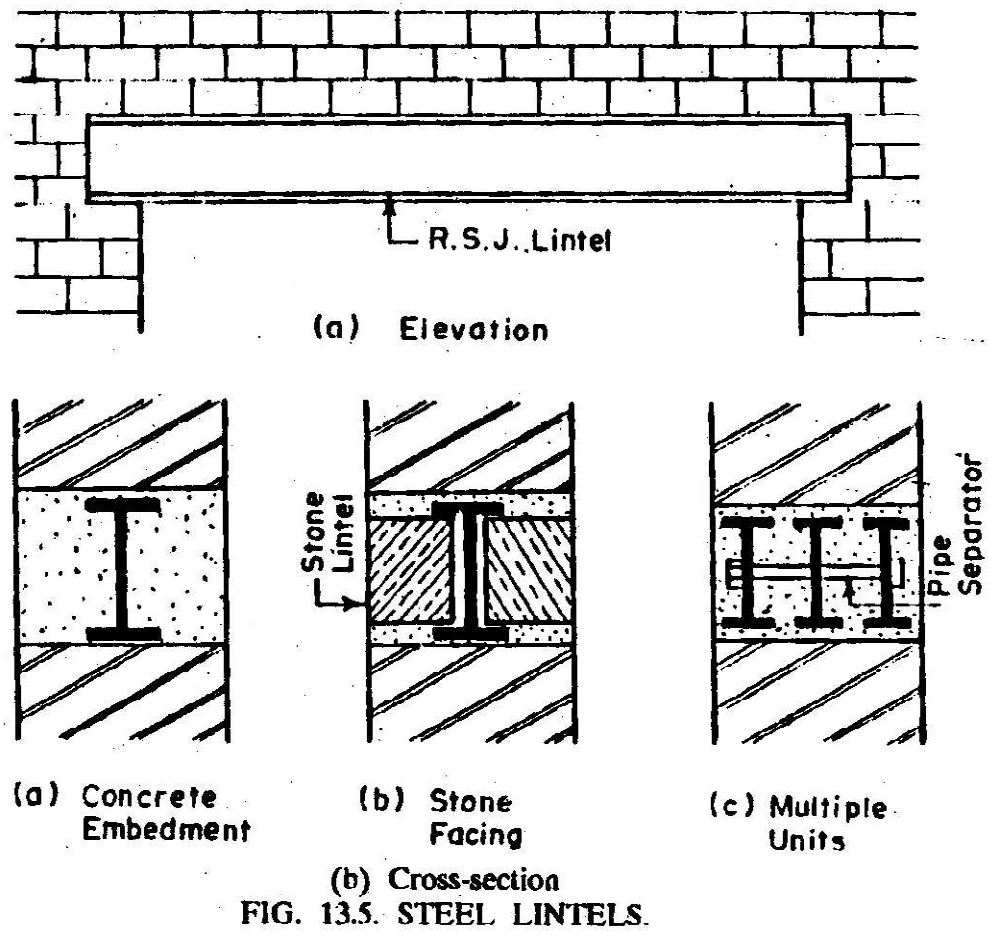


FIG. 13.5. STEEL LINTELS.