

BUILDING TECHNOLOGY |

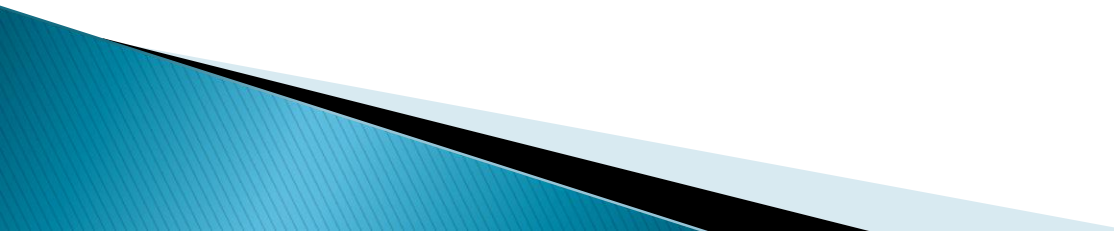
BUILDING Construction |

الإنشاء المعماري

Dr. Ayman A.EL Hamid

**7 Stone Masonry
Arches & Lintel**

Lecture Contents

- 1) Introduction** (Definition, uses, general principles,....)
 - 2) Stone Masonry Types** (Rubber masonry, ashlar masonry,...)
 - 3) Rubber Masonry** (Introduction, types,...)
 - 4) Ashlar Masonry** (Introduction, types,...)
 - 5) Arches** (Introduction, Function, types,...)
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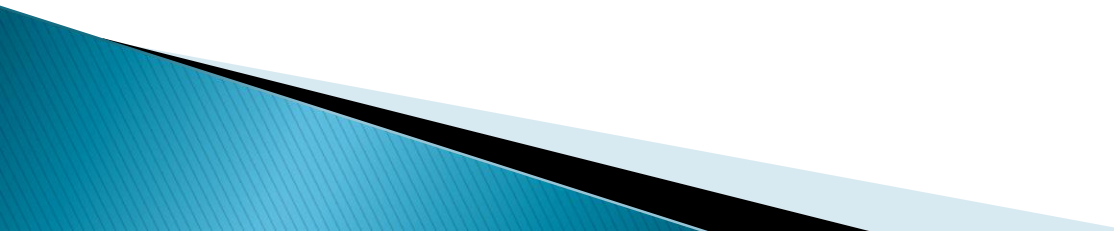
Stone Masonry Introduction

Stone masonry is used for the construction of walls, columns, lintels, arches, beams, etc., of a building. Stones are available in nature and when cut and dressed to proper shapes, they provide an economical material for the construction of various parts of building



Stone Masonry Introduction

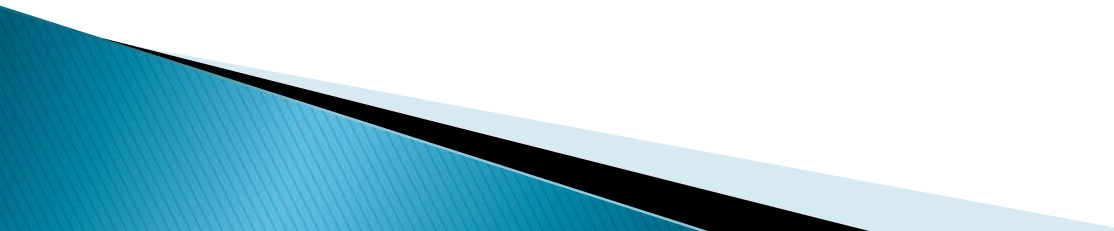
Uses :

- 1) Lintels, Beams, beams Arches, domes etc.,
 - 2) Roofs and Roof coverings.
 - 3) Building foundations, walls, piers, pillars, and architectural works.
 - 4) Cladding Works
 - 5) Dams, light houses, monumental structures.
 - 6) Paving jobs
- 

Stone Masonry Introduction

Stone selection:

The selection of stone for a particular use is a function of several factors.

1. Budget.
 2. Aesthetics (color, pattern and surface appearance) are the two most important factors to be considered for stone used in building interiors.
 3. For exterior use: durability is obviously another important factor.
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Stone Masonry Introduction

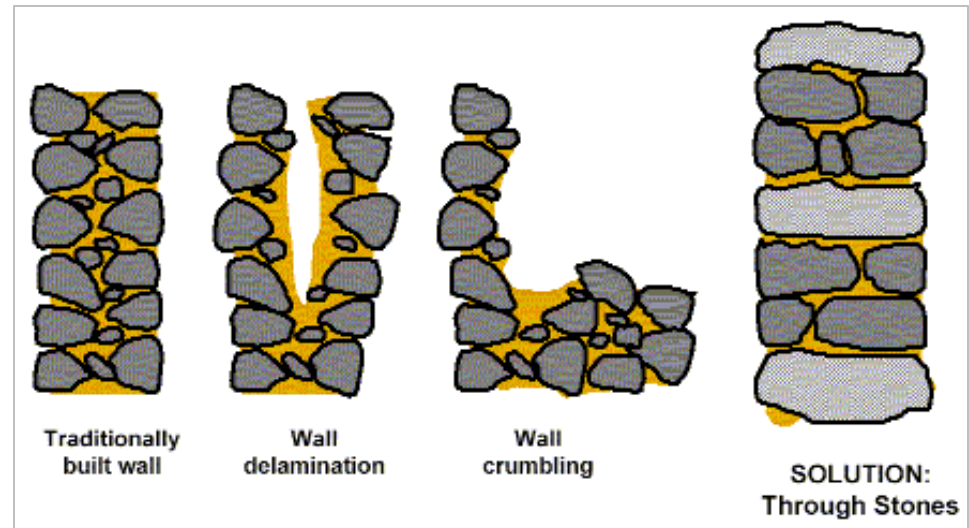
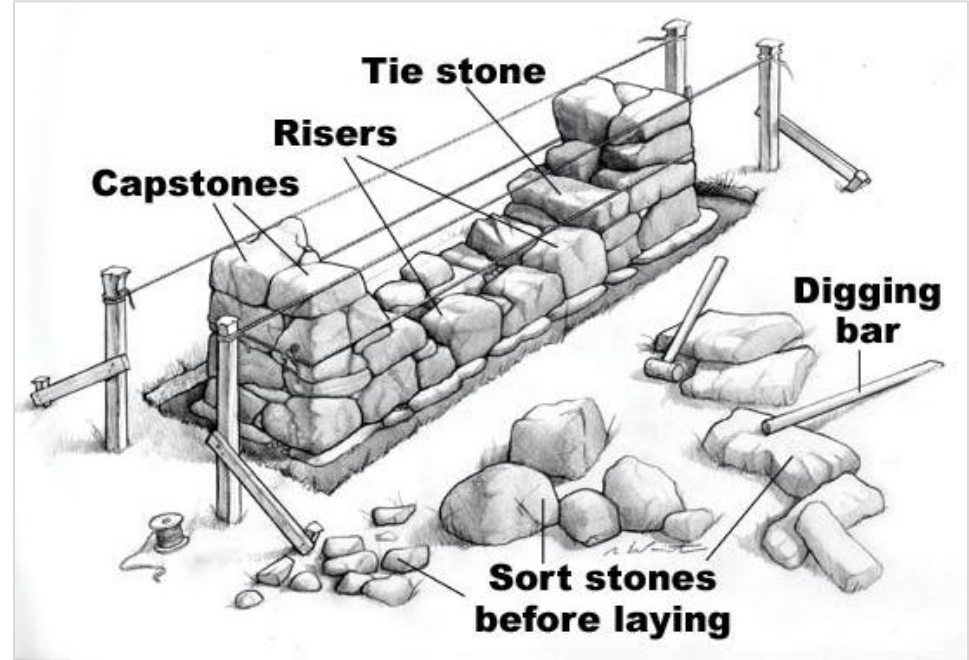
General Principles to be followed in the construction of stone masonry:

- 1) The stones to be used for stone masonry should be hard and durable.
- 2) The pressure acting on stones should be vertical.(compression stress)
- 3) In order to obtain uniform distribution of load, under the ends of girders, roof trusses etc. large flat stones should be used.
- 4) The heads and bond stones should not be of a dumbbell shape.
- 5) The mortar to be used should be good quality and in the specified faces.
- 6) The masonry work should be properly cured after the completion of work, for a period of 2 to 3 weeks.

Stone Masonry Introduction

General Principles:

- 8) As far as possible broken stones or small stones chips should not be used.
- 9) The masonry hearting should be properly packed with mortar and chips if necessary to avoid hallows.
- 10) All the surfaces should be kept wet while the work is in progress and also till the mortar has set.



Stone Masonry Types

Based on the arrangement of the stone in the construction and degree of refinement in the surface finish.

Stone masonry may be broadly classified into the following two types:

Stone Masonry Types

Rubble masonry

الحوائط الدبش



Ashlar masonry

الحجر المنحوت (الدستور)



Stone Masonry Rubble Masonry

The stone masonry in which either undressed or roughly dressed stone are laid in a suitable mortar is called **rubble masonry**. In this masonry the joints are not of uniform thickness.

Rubble masonry Types

Random rubble masonry



Squared rubble masonry



Polygonal rubble masonry

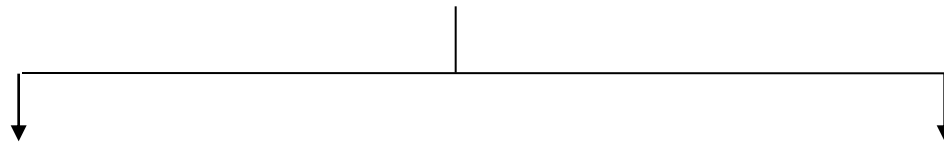


Stone Masonry Rubber Masonry

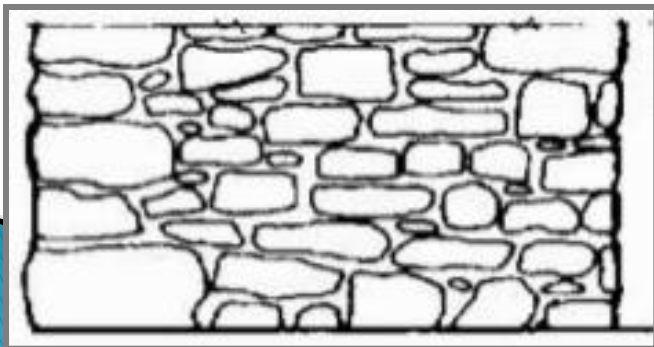
1) The rubble masonry in which either undressed or hammer dressed stones are used is called random rubble masonry.

Further random rubble masonry is also divided into the following types:

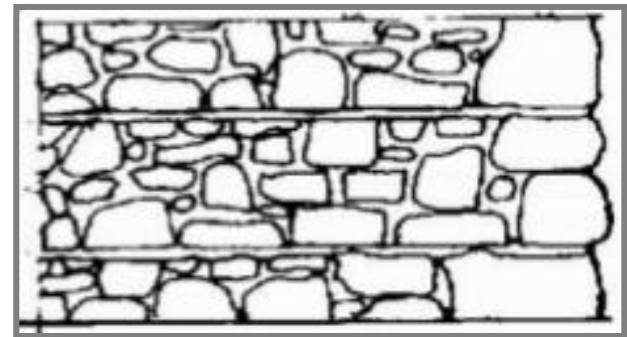
Random masonry Types



**Un coursed
random rubble masonry**

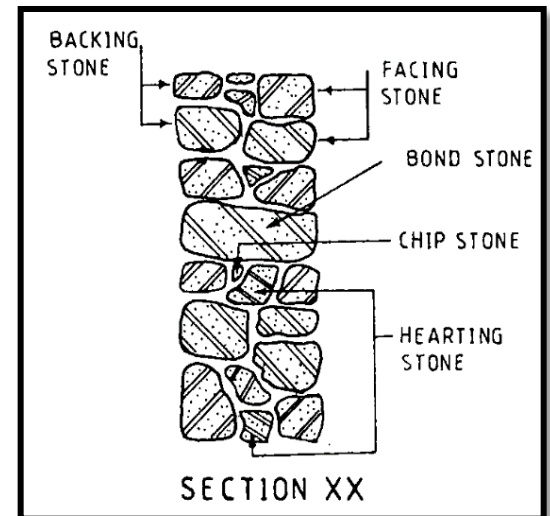
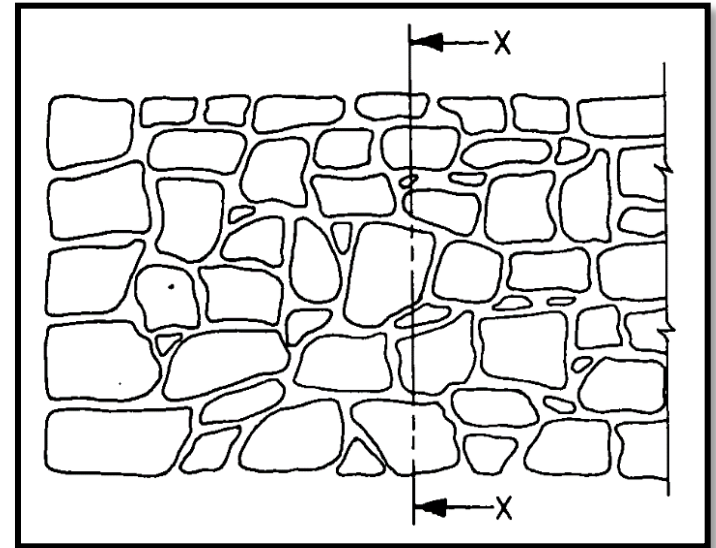


**Coursed
random rubble masonry**



Stone Masonry Rubber Masonry

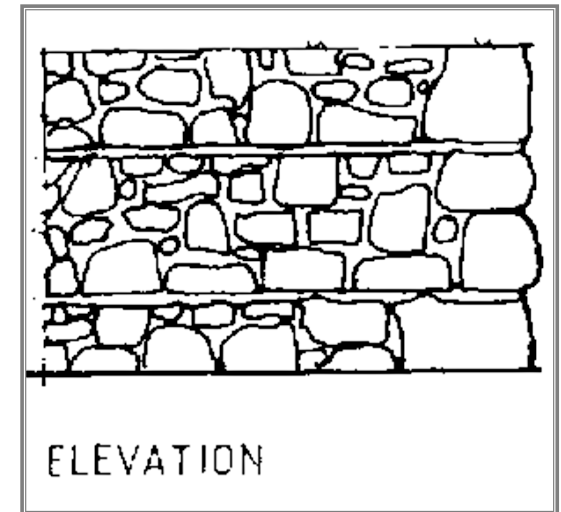
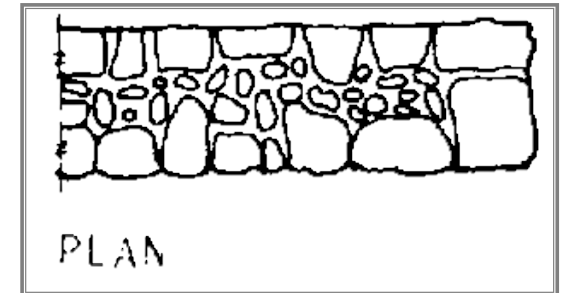
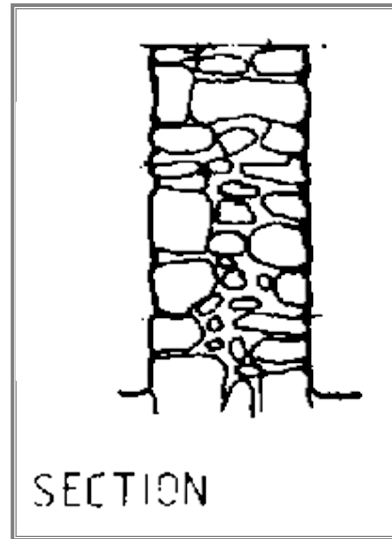
- The random rubble masonry in which stones are laid without forming courses is known as **un coursed random rubble masonry**.
- This is the roughest and cheapest type of masonry and is of varying appearance.
- They are of different sizes and shapes.
- Large stones are used at corners and at jambs to increase their strength.



Suitability: Used for construction of walls of low height in case of ordinary buildings.

Stone Masonry Rubber Masonry

- The random rubble masonry in which stones are laid in layers of equal height is called **coursed random rubble masonry**.
- In this masonry, the stones are laid in somewhat level courses.
- The stones are hammer dressed.



Suitability: Used for construction of residential buildings, boundary walls etc.

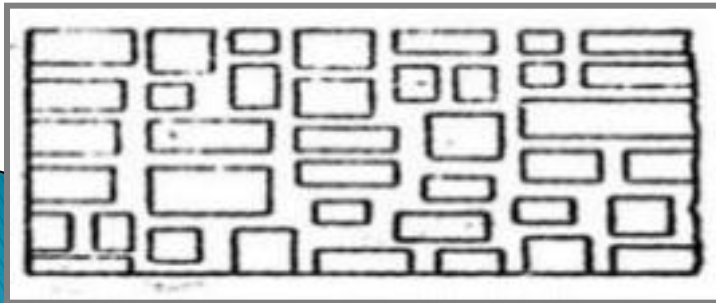
Stone Masonry Rubble Masonry

2) **Squared rubble masonry**: In which the face stones are squared on all joints and beds by hammer dressing or chisel dressing before their actual laying.

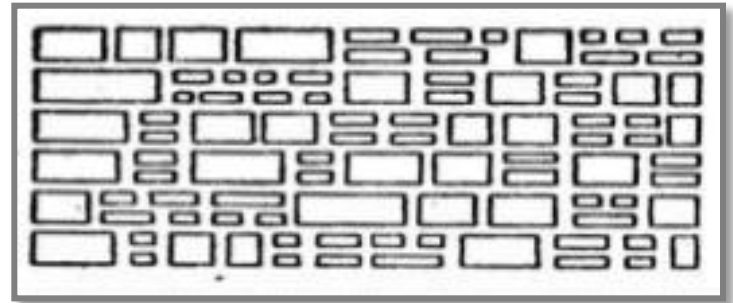
Further random rubble masonry is also divided into the following types:

Square rubble masonry Types

**Un coursed
square rubble masonry**

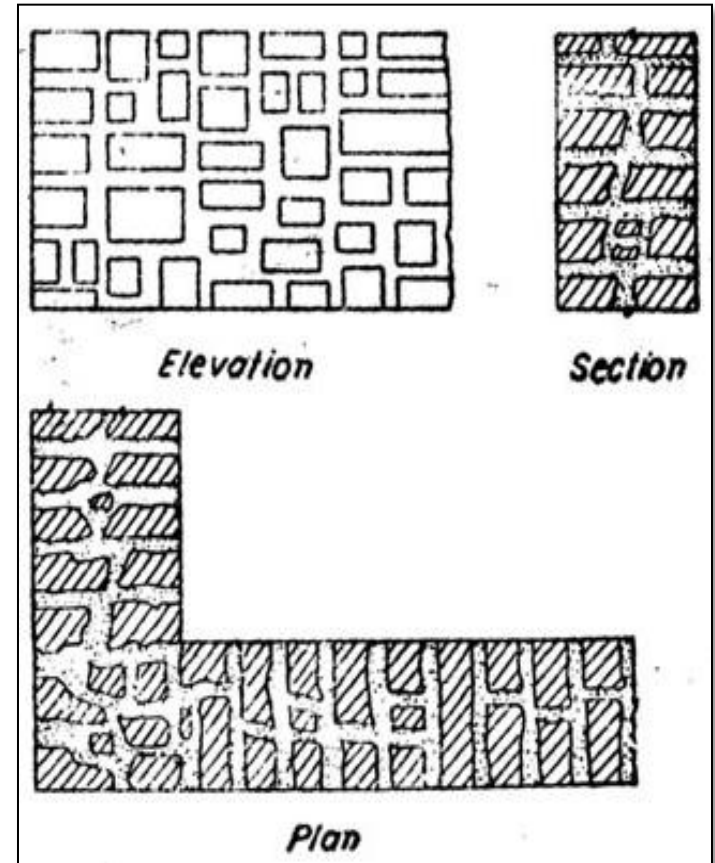


**Coursed
square rubble masonry**



Stone Masonry Rubber Masonry

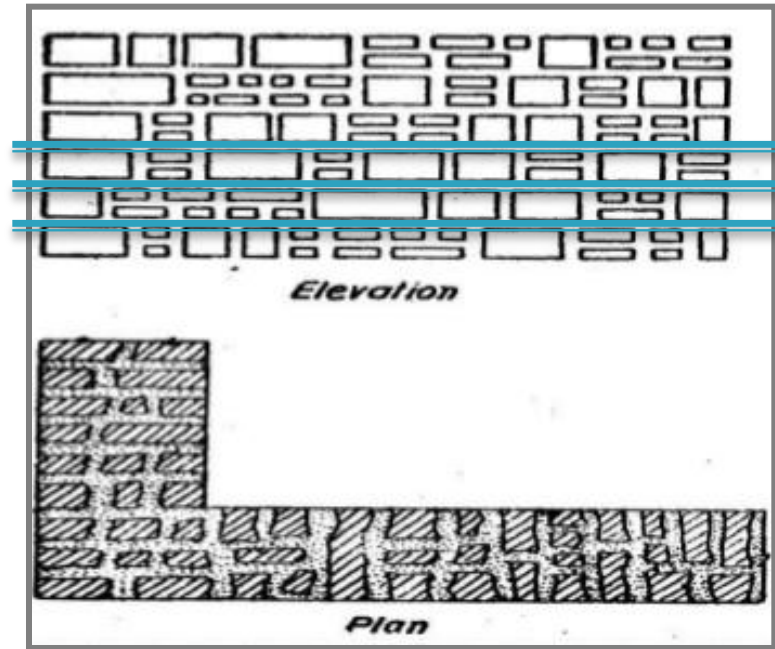
- The squared rubble in masonry which hammer dressed stones are laid without making courses is called **un coursed square rubble masonry.**
- It consists of stones which are squared on all joints and beds by hammer dressing.
- All the stones to be laid are of different sizes.



Suitability: Used for construction of ordinary buildings in hilly areas where a good variety of stones are cheaply available.

Stone Masonry Rubber Masonry

- The square rubble masonry in which chisel dressed stones laid in courses is called **coursed square rubble masonry.**
- It consists of stones, which are squared on all joints and laid in courses.
- The stones are to be laid in courses of equal layers. and the joints should also be uniform.



Suitability: Used for construction of public buildings, hospitals, schools, markets, modern residential buildings etc. and in hilly areas where good quality of stone is easily available.

Stone Masonry Rubber Masonry

3) Polygonal rubble masonry:

- The stones are roughly dressed to an irregular polygonal shape.
- They should be arranged as to avoid long vertical joints in face work.
Small stone chips should not be used to support the stones on the facing as shown in the figure below.

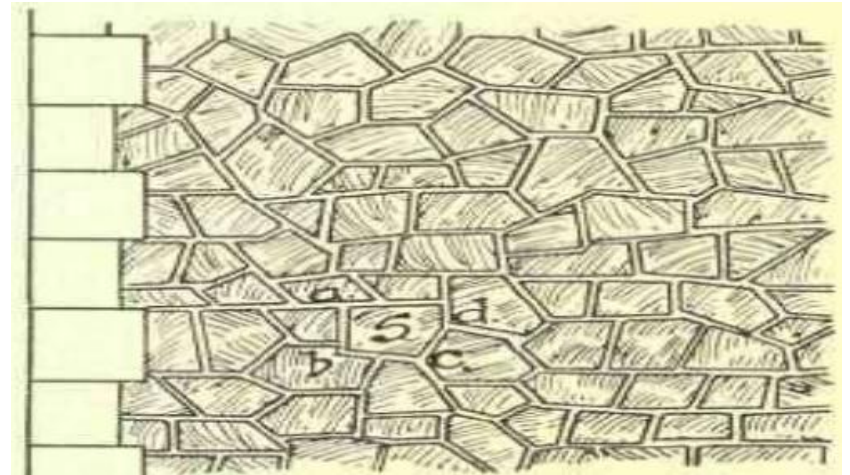
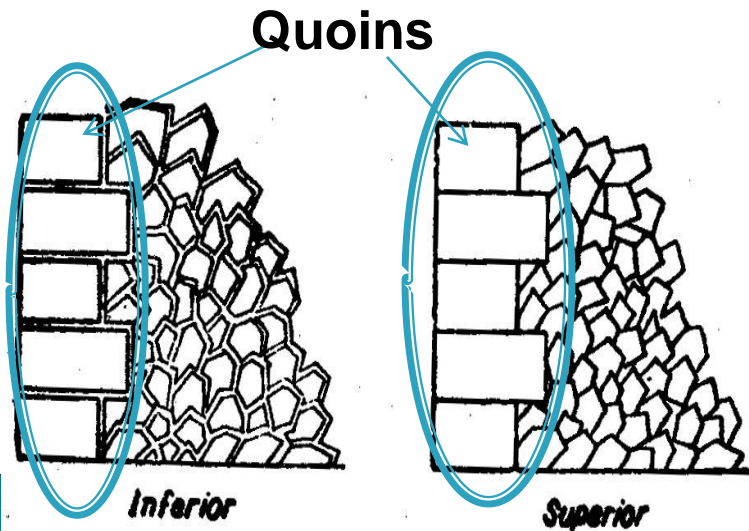


Stone Masonry Rubber Masonry

Polygonal rubble masonry Types

**Un coursed
Polygonal rubble masonry**

**Coursed
Polygonal rubble masonry**



Stone Masonry Ashlar Masonry

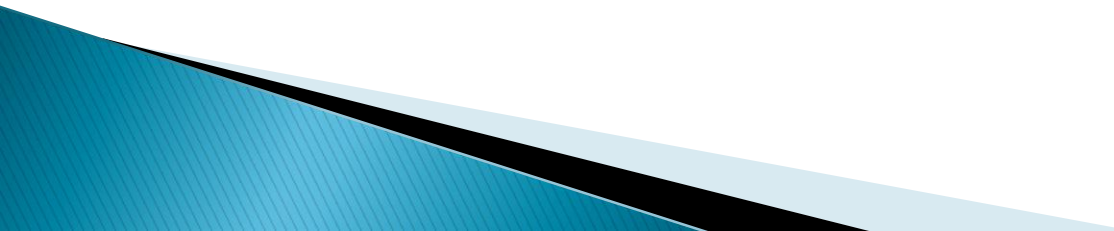
- Is the stone masonry in which finely dressed stones are laid in cement or lime mortar.
- In this masonry the courses are of uniform height.
- All the joints are regular, thin and have uniform thickness.
- This type of masonry is much costly as it requires dressing of stones.

Suitability: This masonry is used for heavy structures, architectural buildings, high piers and abutments of bridges.



Stone Masonry Ashlar Masonry

Ashlars masonry is further sub divided into the following types:

- Ashlars fine or coarse ashlar masonry
 - Random coarse ashlars masonry
 - Rough tooled ashlar masonry
 - Rock or quarry faced ashlars masonry
 - Chamfered ashlars masonry
 - Block in coarse masonry
 - Ashlar facing
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Stone Masonry Ashlar Masonry

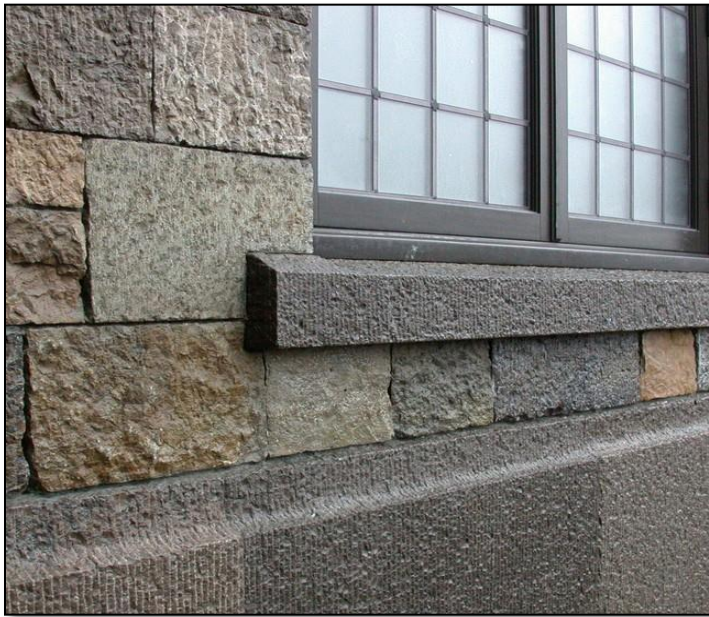


Ashlar fine

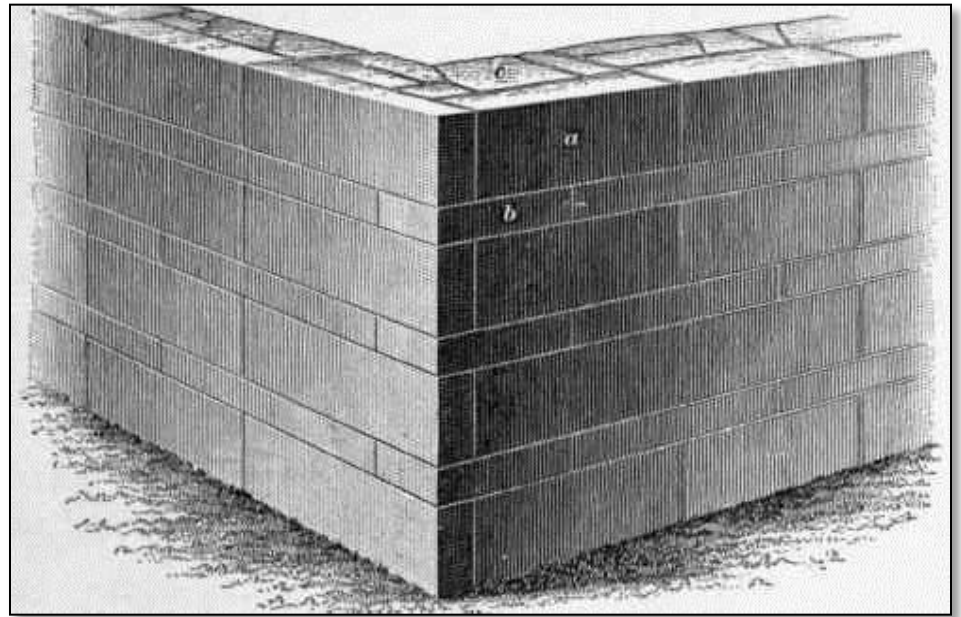


Ashlar rough

Stone Masonry Ashlar Masonry

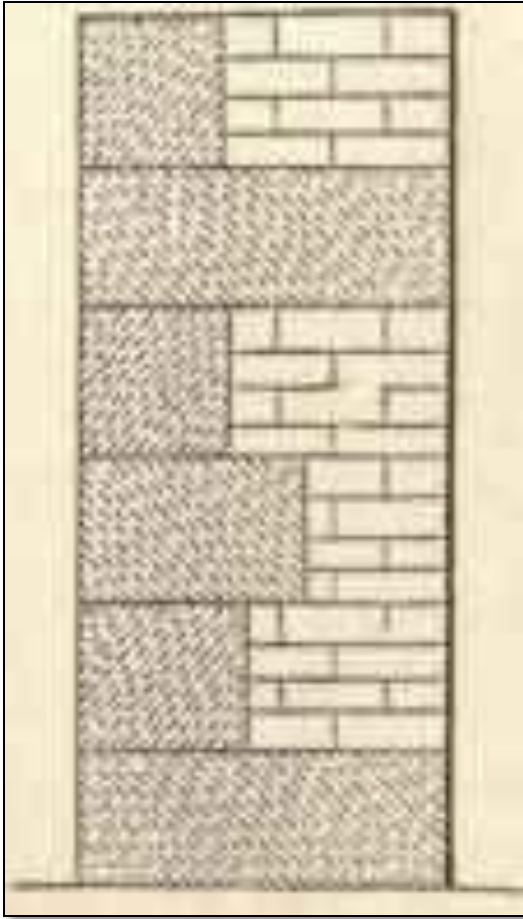


Ashlar rock or quarry faced



Ashlar block in course

Stone Masonry Ashlar Masonry



Ashlar facing



Ashlar chamfered

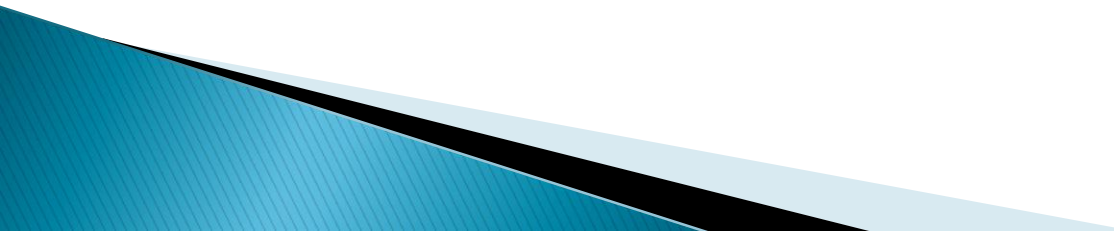
Arches Introduction

An arch may be defined as mechanical arrangement of wedge shaped blocks of stones or bricks supporting each other and supported at the end by piers.



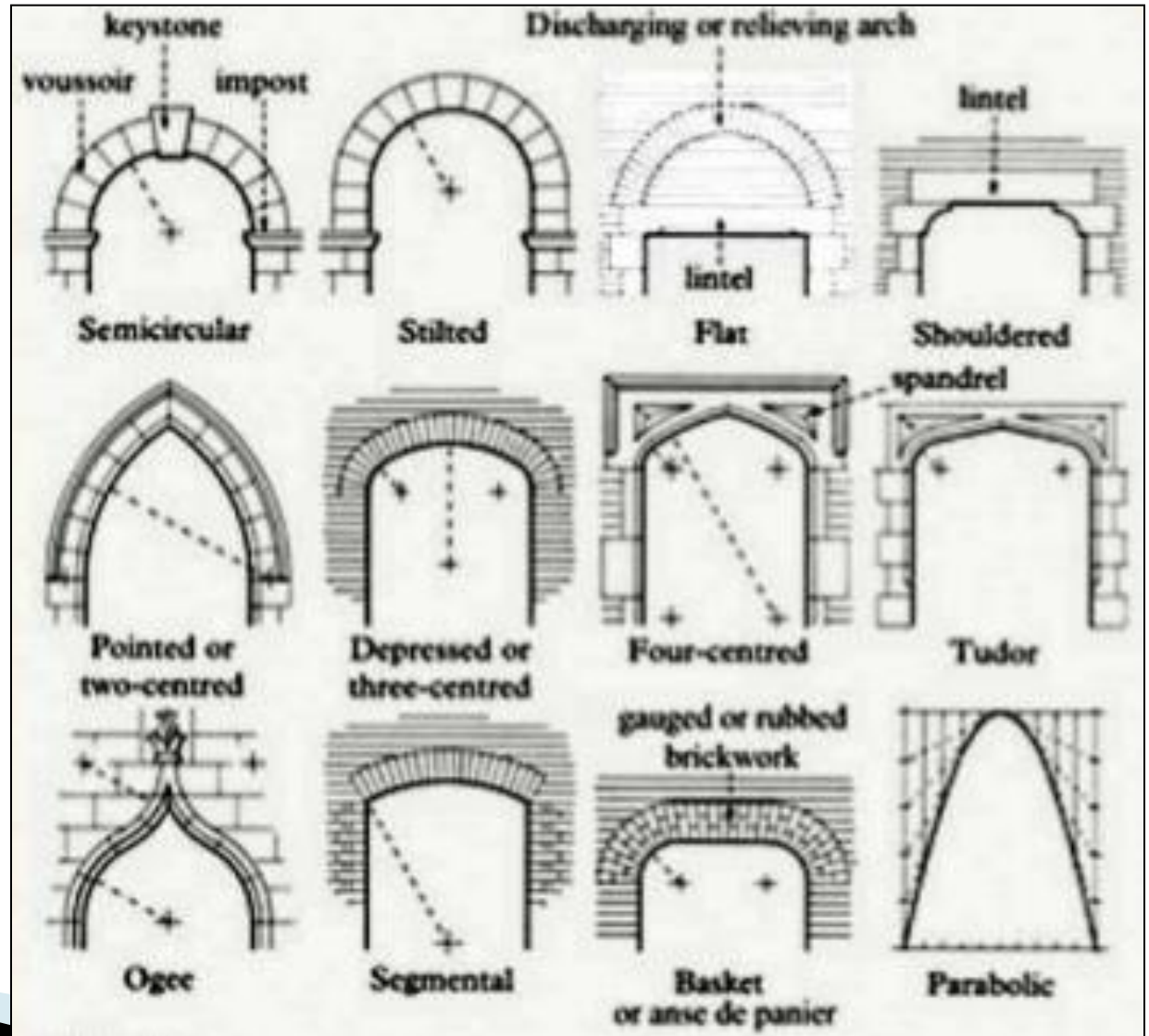
Arches Introduction

Function of an arch:

1. Is to carry weight of the structure above the opening.
 2. Because of their shape, the blocks support each other by mutual pressure of their own weight.
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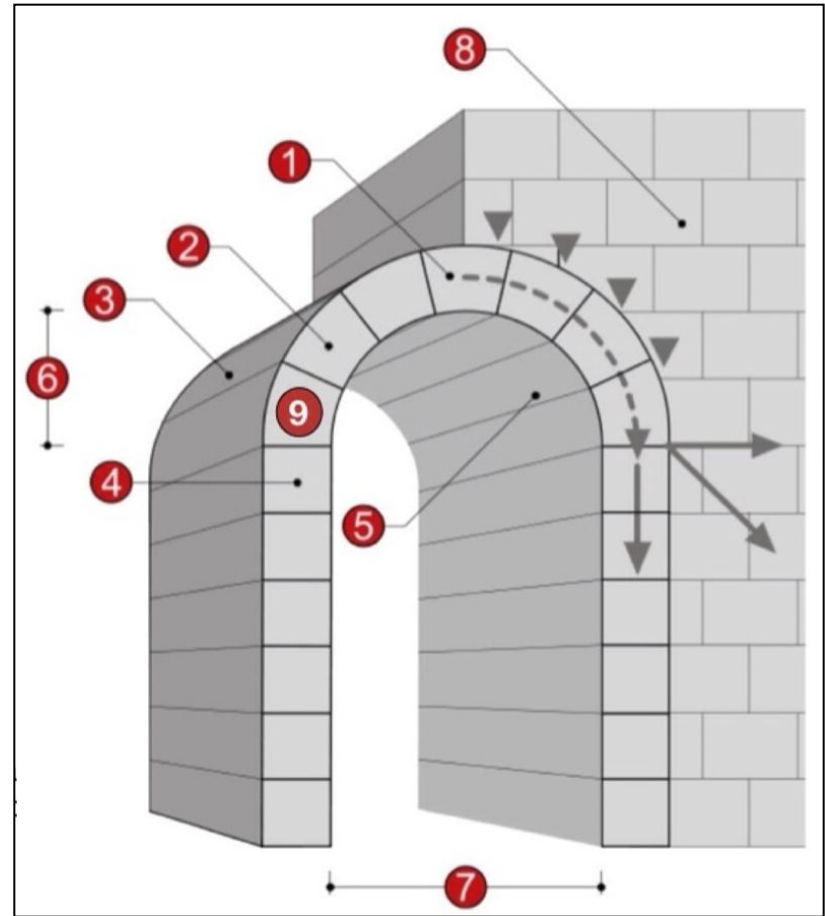
Arches Introduction

Different types of arches:



Arches Terminology

1. **Key stone / brick:** central highest block مفتاح العقد
2. **Vousoir:** a block of stone or brick comprising the arch صنجة
3. **Back**
4. **Impost**
5. **Intrados:** lower curvature of the arch تنفيخ - بطن العقد
6. **Rise:** height of the arch سهم
7. **Clear Span:** opening width الوتر - البحر
8. **Abutment:** vertical support رجل العقد
9. **Springer:** starting block خصر العقد
10. **Springer line:** line connecting starting & ending points خط الاتصال



THANKS
