



Construction Applied to Heritage



Erasmus+

Construction Applied to Heritage

3 ECTS

SH

Sustainable Heritage

EC

Elective Courses



Construction Applied to Heritage

SH

Sustainable Heritage

EC

Elective Courses

1. Foundations.
2. Retaining Works.
3. Drainage and Sewerage Systems.
4. The Porous Loadbearing System.
- 5. The Porous Loadbearing System. Walls.**
6. The Porous Loadbearing System. Grid Structures.
7. The Compact Loadbearing System.
8. The Porous and Mixed Horizontal Loadbearing System. Slabs.
9. The Porous and Mixed Horizontal Loadbearing System. Grid slabs.
10. Roofs.
11. Sloping Roofs.
12. Flat Roofs.
13. Façades. Porous System. Ventilated Façades.
14. Façades. The Compact System. Curtain Walls.
15. The Internal Partitioning Layout. Construction Process.

Construction Applied to Heritage

3 ECTS



05 THE POROUS LOADBEARING SYSTEM. WALLS

- Structural walls: load, containment and bracing.
- Homogeneous systems.
- Modular systems according to material.
- Seen and hidden systems.
- Reinforced concrete structures.
 - Fabricated on-site.
 - Pre-cast.

Execution process. Quality control.

STRUCTURAL WALLS

- They are active constructive elements from a mechanical point of view. Resistance and stability is required:
 - Resistance in order to support their own weight and the vertical loads (compression stress).
 - Stability for supporting horizontal loads and horizontal pressures from wind and seism.

STRUCTURAL WALLS

- **LOAD-BEARING WALLS** have a basically supporting function. They receive vertical loads from other elements of the building.
- **BRACING OR RIGIDITY WALLS**, basically, have a stabilising function. They brace the horizontal loads from other walls or structural elements.
- **RETAINING WALLS** have a double function: as load-bearing wall and bracing wall. They support vertical loads from gravity and horizontal loads from earth pressure.

STRUCTURAL WALLS.

- HOMOGENEOUS WALLS,
There is continuity in the material. There is coincidence between the element and the constructive unit.
 - Simple: isotropic performance.
 - Compound: anisotropic performance.
- MODULAR WALLS.
They are obtained by the union of small elements.
 - Based on irregular pieces.
 - Based on regular pieces.

STRUCTURAL WALLS

- CONNECTION OF MASONRY WALLS

Walls will be connected in corners, conversion or crossing.

They must be joined and executed at the same time if possible.

- STABILITY OF THE GROUP

In order to assure the stability of the group as a whole, walls perpendicular to load-bearing walls must be disposed.

Symmetric or the most equilibrated possible layouts are convenient, mostly in high seismic acceleration areas.

STRUCTURAL WALLS

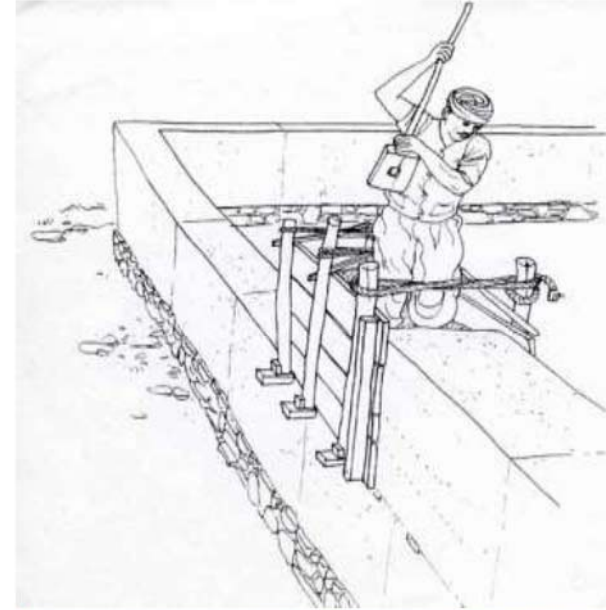
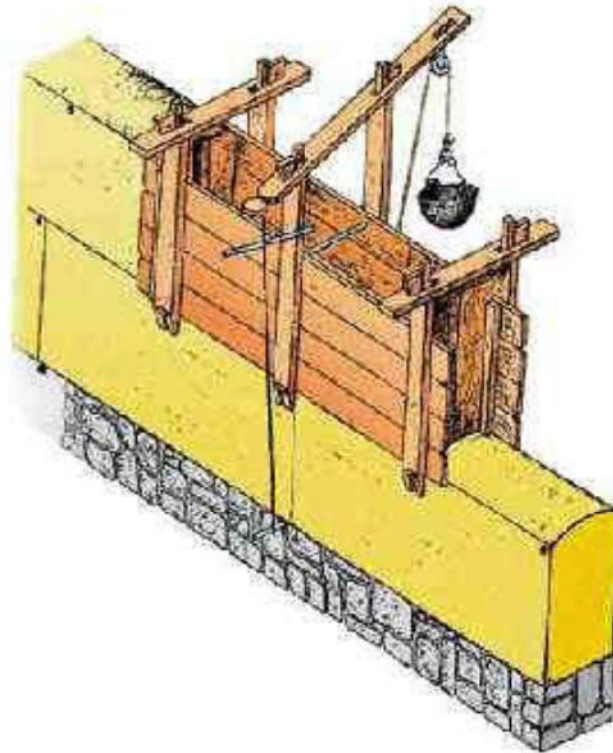
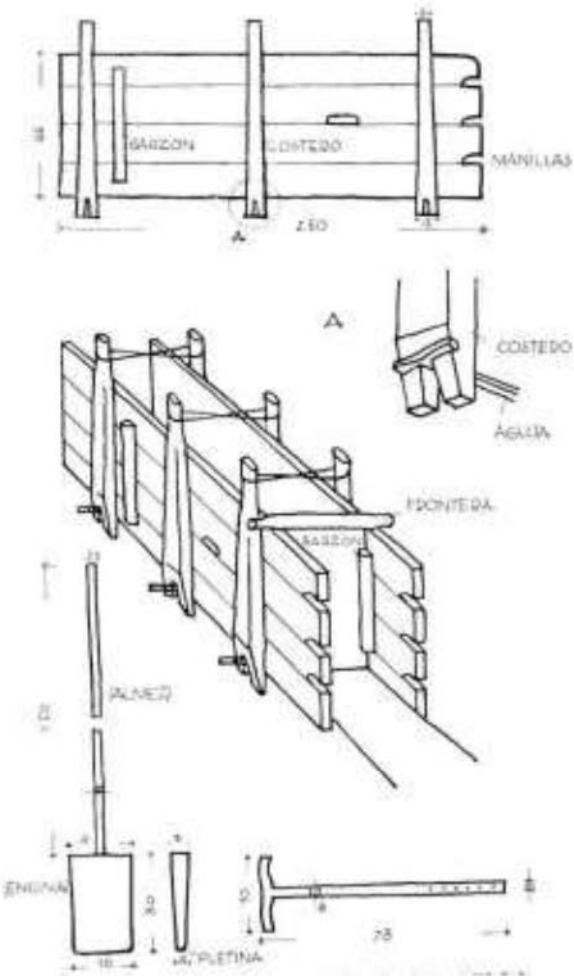
SEEN AND HIDDEN WALLS.
ACCORDING TO THE MATERIAL

- Earth walls.
- Stone walls.
- Bricks masonry walls.
- Reinforced masonry walls.
- Ceramic blocks walls.
- Reinforced concrete walls
- Concrete blocks walls

STRUCTURAL WALLS

EARTH WALLS

- Mudwall.

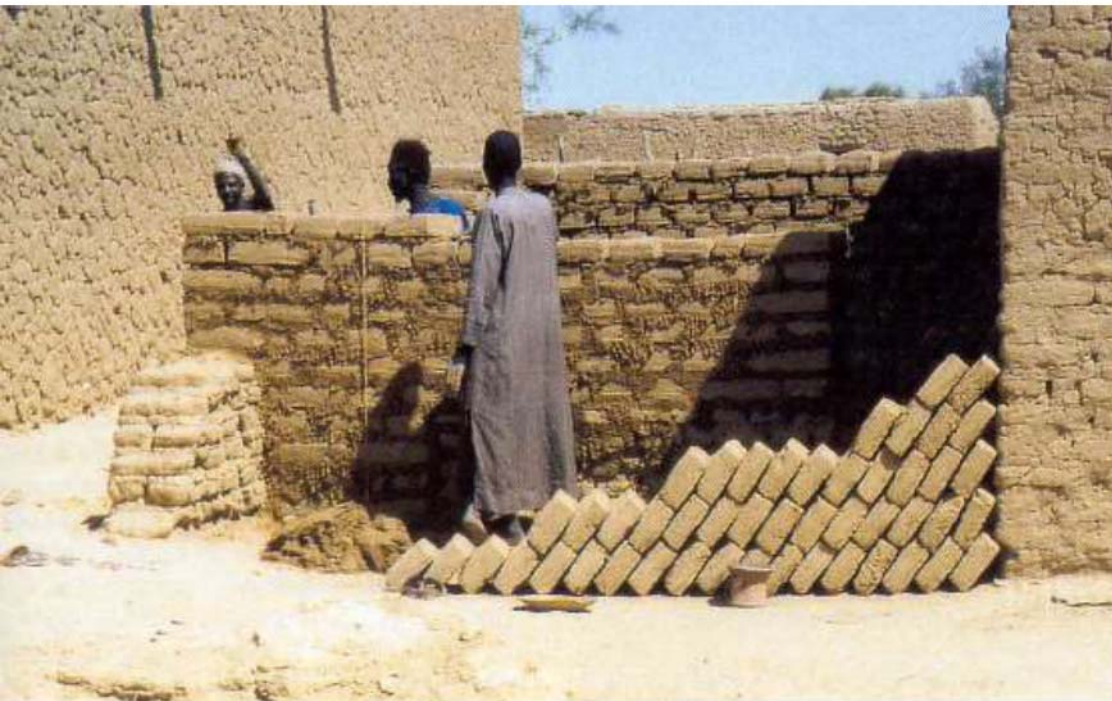


MODULAR SYSTEMS

STRUCTURAL WALLS

EARTH/SOIL WALLS

- Adobe (sun-dried brick)



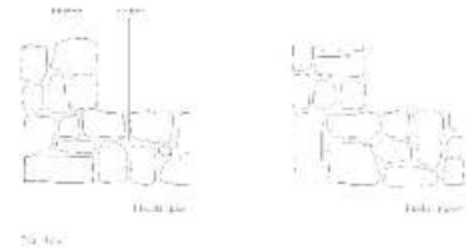
MODULAR SYSTEMS

STRUCTURAL WALLS

STONE WALLS

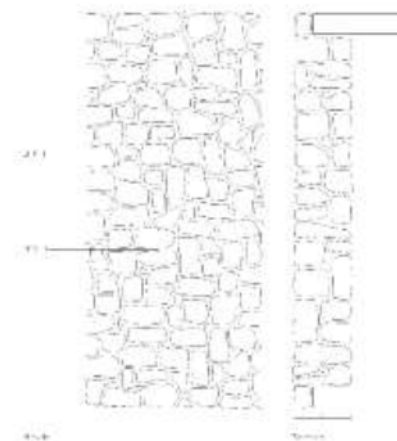


CORNER JOINT

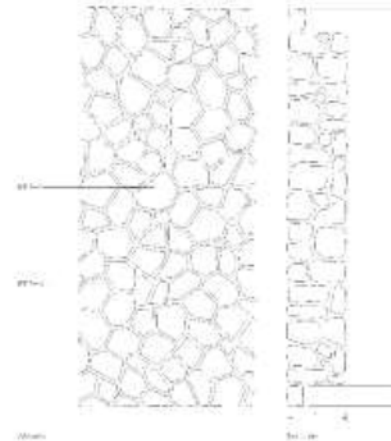


STONE WALLS

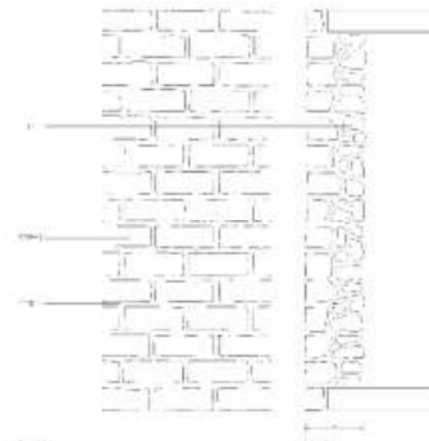
ORDINARY RUBBLE WORK



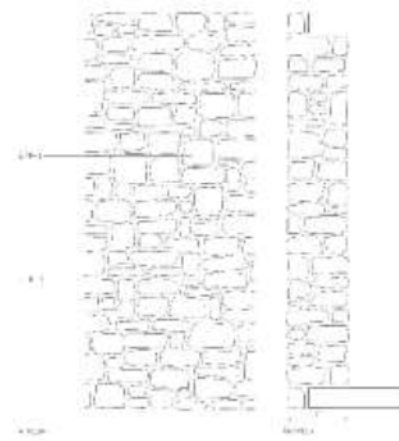
POLIGONAL RANDOM RUBBLE WORK



COUSED ASHLAR WORK

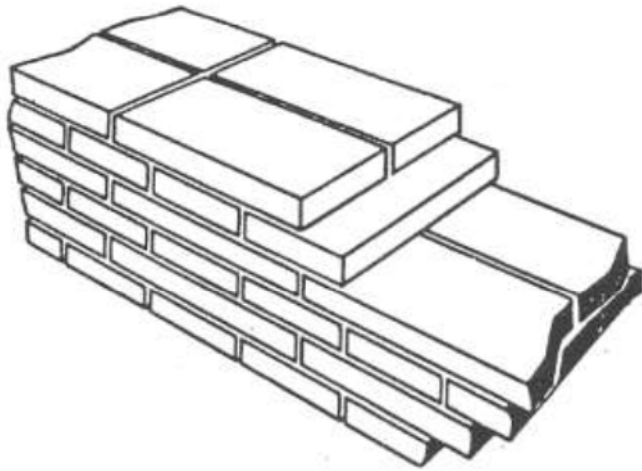


ASHLAR WORK WITH IRREGULAR COURSES



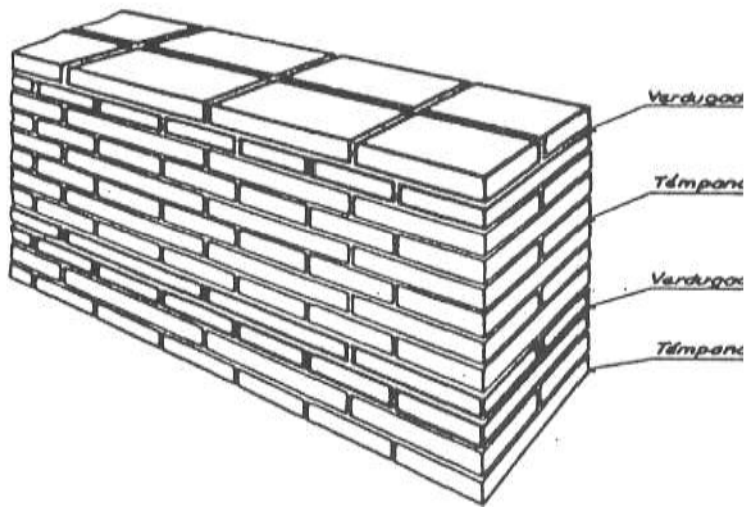
STRUCTURAL WALLS

CERAMIC MASONRY BRICKWORK WALLS

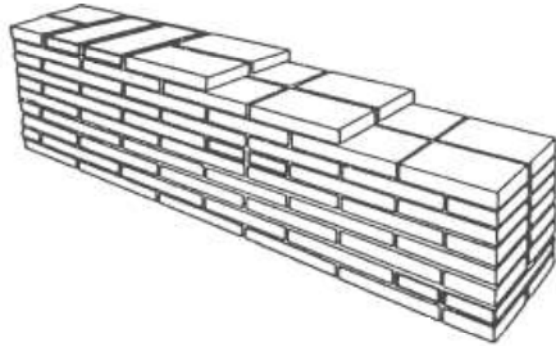


According to the constructive display, walls are clasified as:

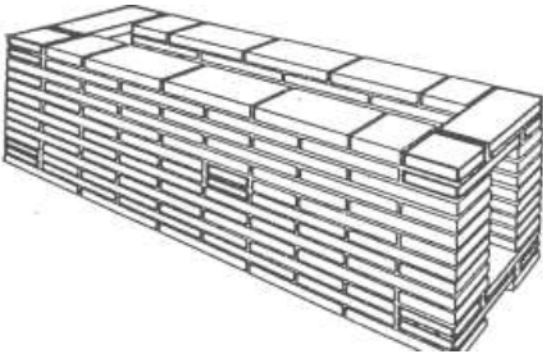
- ▶ **BRICK BONDED WALLS** are bonded for its entire thickness with only one type of construction element.
- ▶ **MIXED BONDED WALLS.** Elements alternate with others which are more resistant and allow steel reinforcement.



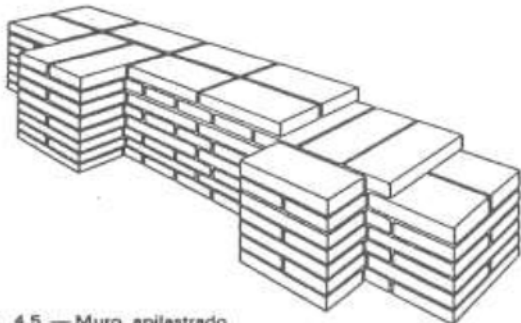
STRUCTURAL WALLS



- DOUBLE COURSE WALL,
two layers -same or different kind of constructive element- and elements that bond them such as a courses of different material, metal wall ties or anchors.



- ▶ CAVITY WALL,
two layers -same or different kind of constructive element- with an internal cavity and elements that bond them such as a courses of different material, metal wall ties or anchors.

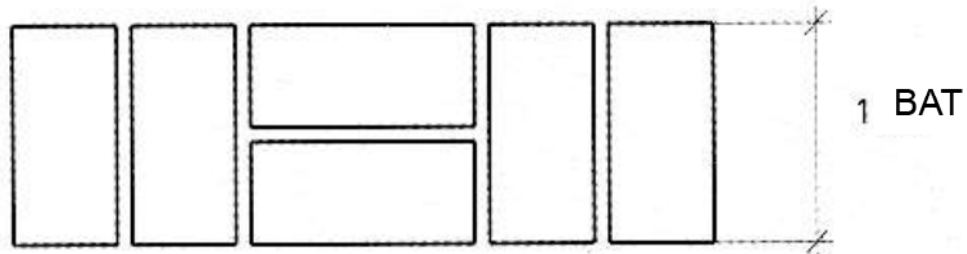
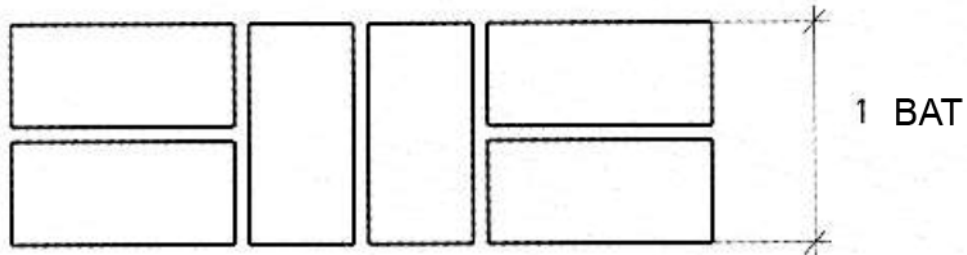
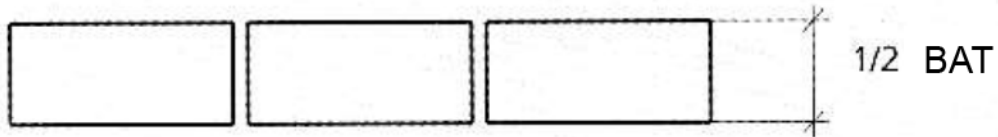


- ▶ PIERS WALL,
bonded wall with piers.

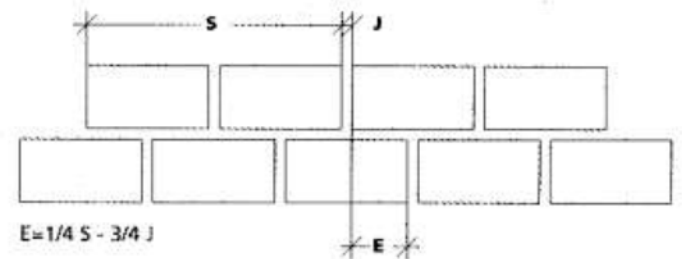
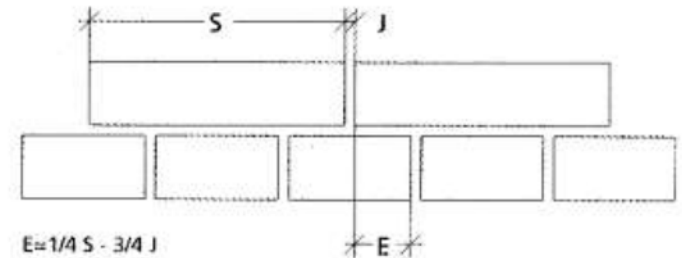
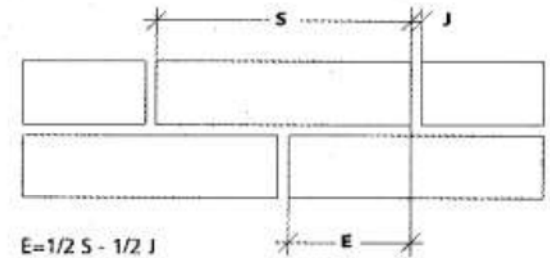
STRUCTURAL WALLS

CERAMIC MASONRY BRICKWORK WALLS

TYPES



MINIMUM OVERLAPPING



REINFORCED CONCRETE WALLS.

TYPES OF JOINTS

- **Structural expansion joints**

Every 30m along and through the whole building, except in the foundation.

- **Expansion joints**

Every 10 - 20m or at shorter distances on perimeter walls exposed to the sun or frost.

- **Working joints**

They depend on the workplan and timing.

- **Retraction joints**

Maximum every 25m along and through the whole building. They can be:

Orthogonal:

Allow orthogonal dilatation to the joint.

Width from 2 to 2.5 cm.

The joint is empty or can be filled with soft insulation.

On the outside it can be covered with metal or plastic flashing.

Sliding joint:

Allows expansion movements only parallel to the joint.

Joints location:

In general, they are placed where they do not interfere (behind downpipes, in corners, etc.).

They must be left uncoated to avoid deterioration of the linings or cladding.

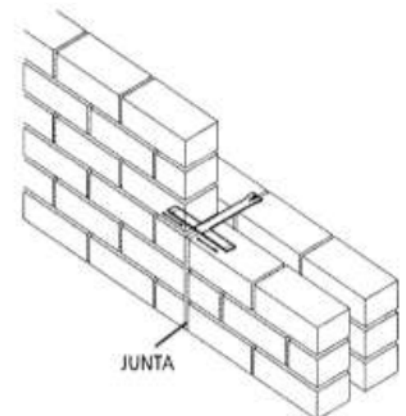
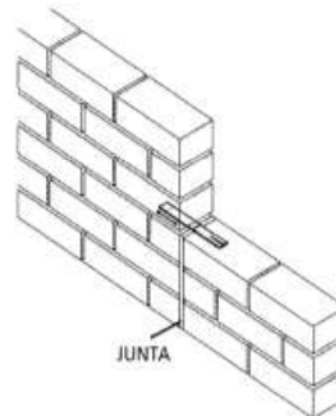
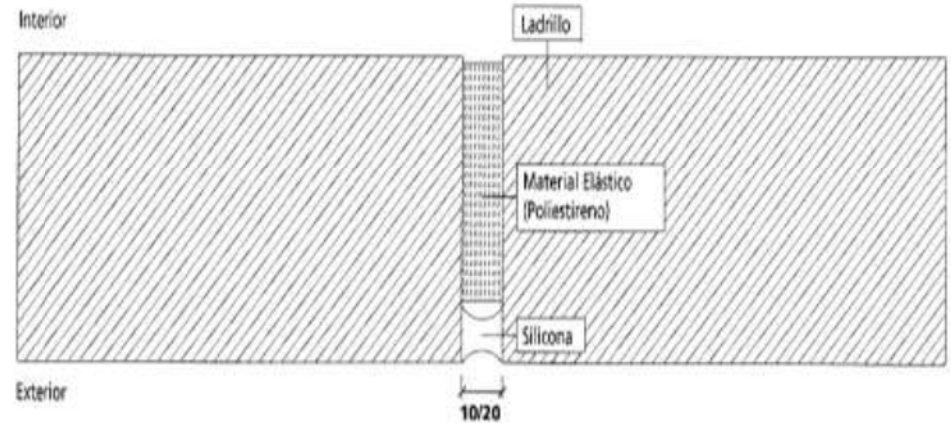
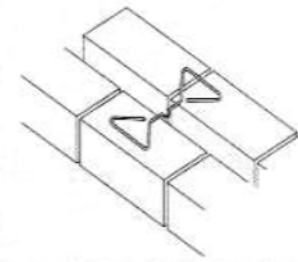
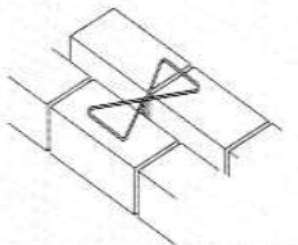
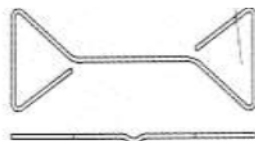
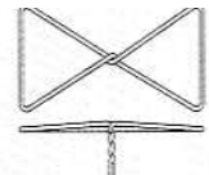
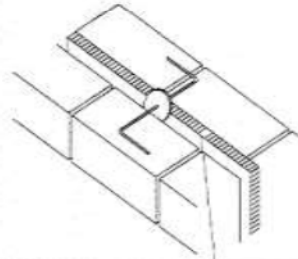
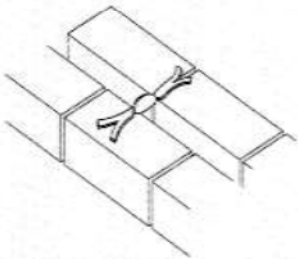
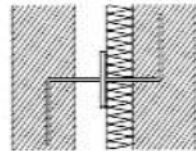
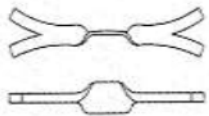
Joints sealing:

Materials used to seal them depend on the circumstances of each case.

STRUCTURAL WALLS

CERAMIC MASONRY BRICKWORK WALLS

STEEL WALL TIES



STRUCTURAL WALLS

CERAMIC MASONRY BRICKWORK WALLS.



Flash or plain cut



Raked



Weathered struck



Sticking out

POINTING TYPES



Pointing detail plan on a expansion joint

FINISHINGS:

Common brick for masonry brickwork with external cladding.

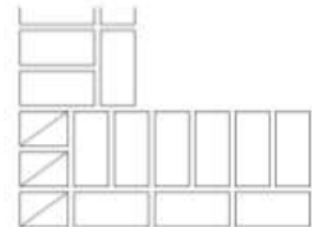
Facing brick for masonry brickwork without external cladding.



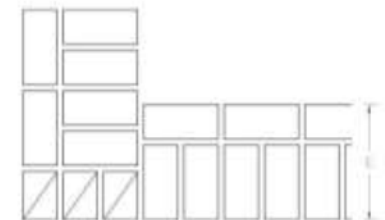
Hloda per



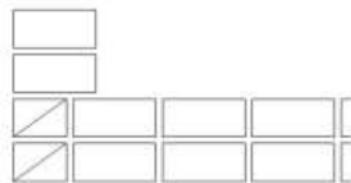
Hloda inpor
E=4 5.3 6.5 9 11.5 14 19



Hloda per



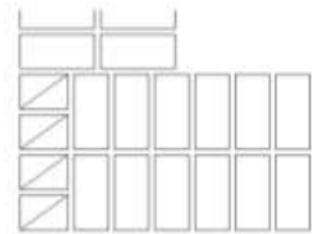
Hloda inpor
E=36.5 44



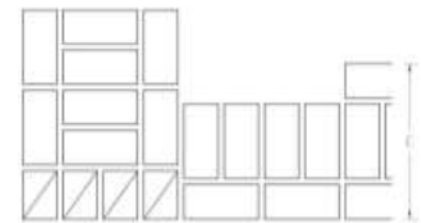
Hloda per



Hloda inpor
E=24 29



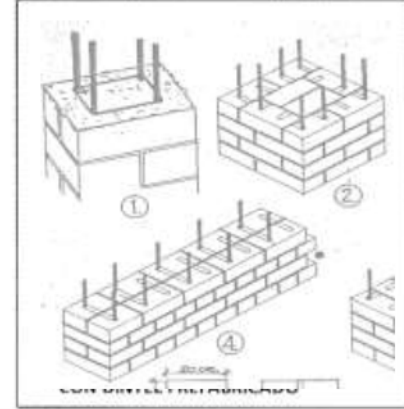
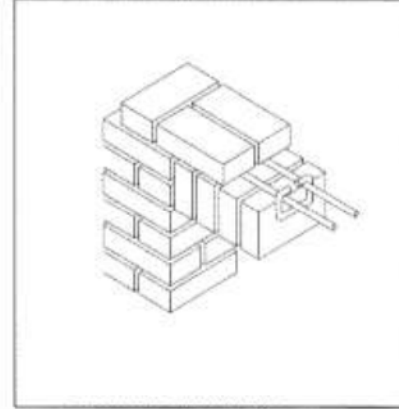
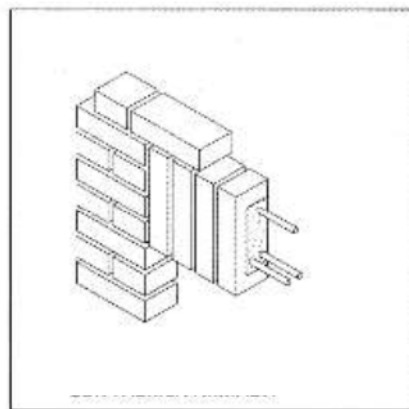
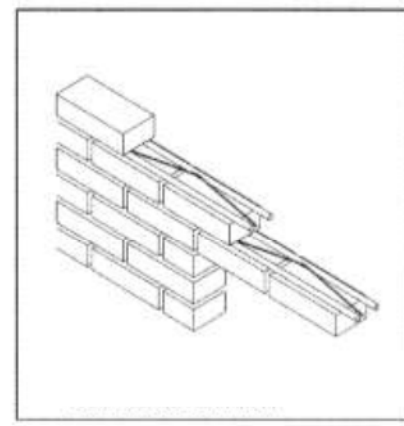
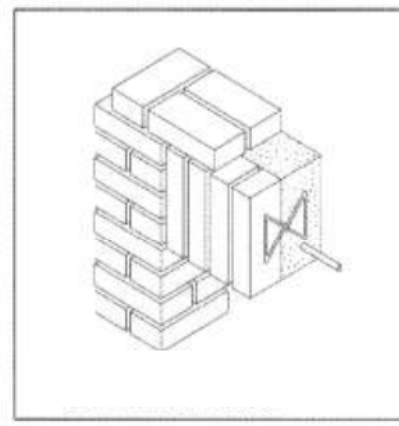
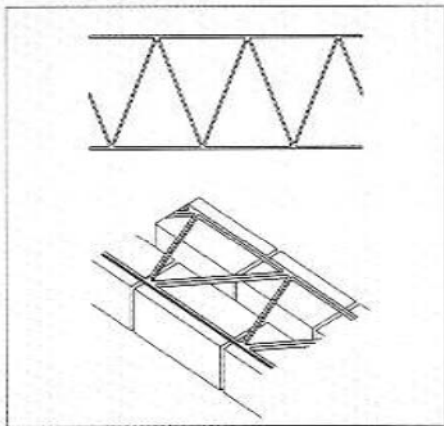
Hloda per



Hloda inpor
E=49 59

STRUCTURAL WALLS

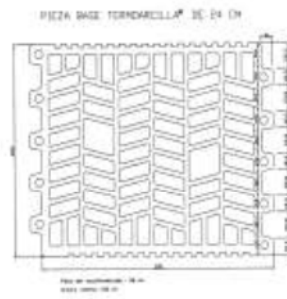
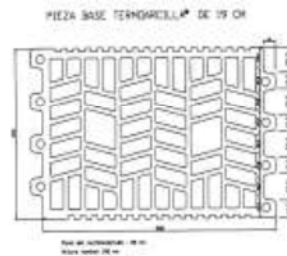
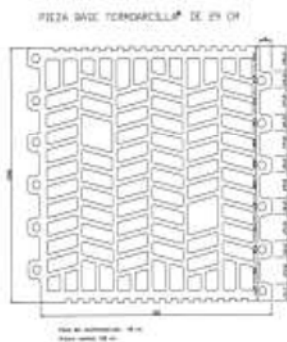
REINFORCED MASONRY BRICKWORK WALLS



STRUCTURAL WALLS

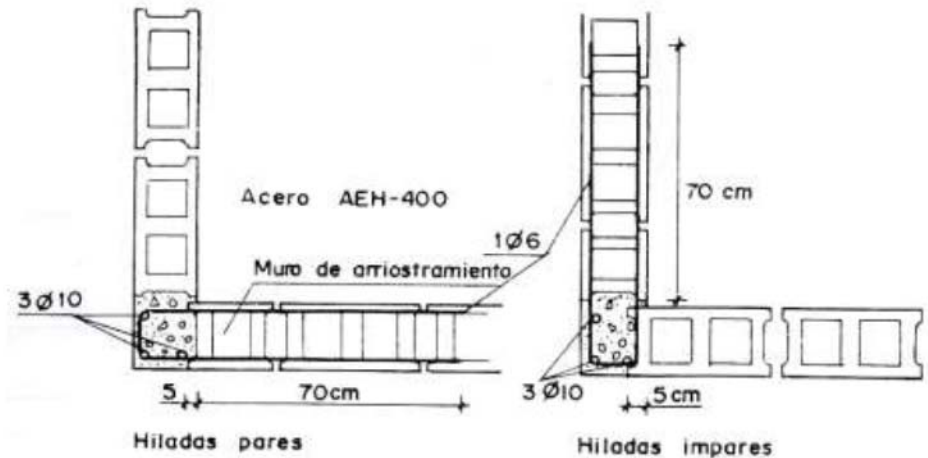
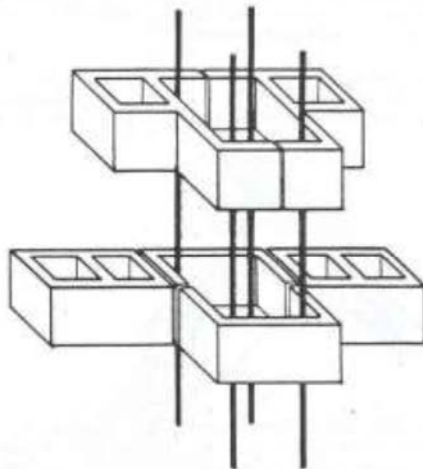
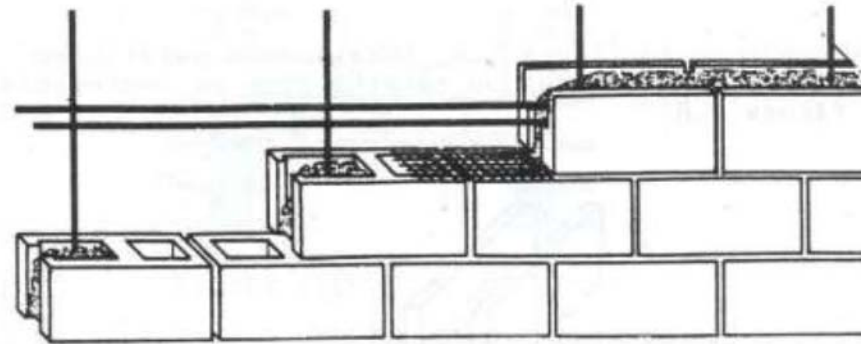
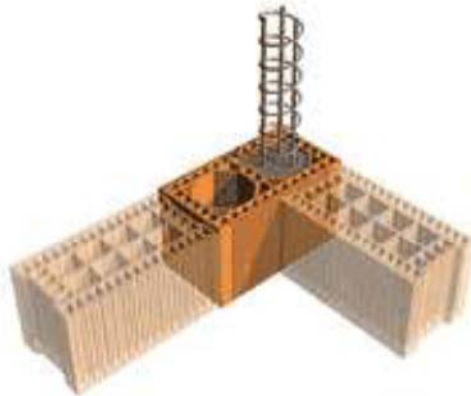
CERAMIC BLOCKS MASONRY WALLS

BLOCK TYPES



STRUCTURAL WALLS

CONCRETE MASONRY BLOCKWORK WALLS

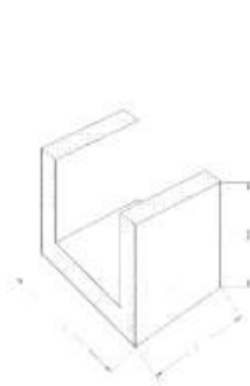
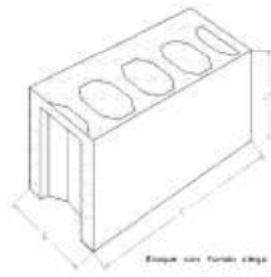
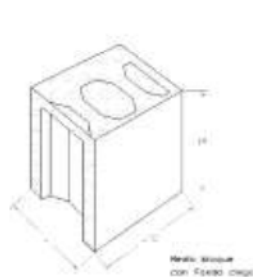
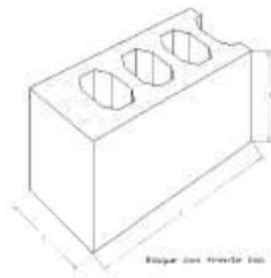
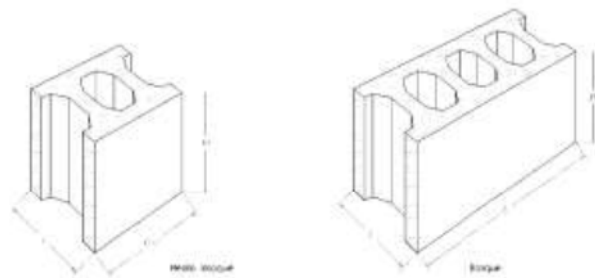


STRUCTURAL WALLS

CONCRETE MASONRY BLOCKWORK WALLS

HOLLOW BLOCKS

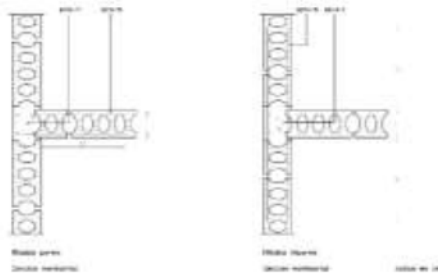
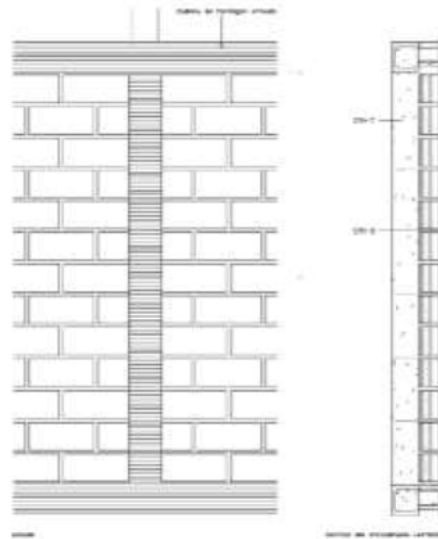
LINTEL PIECE BLOCK



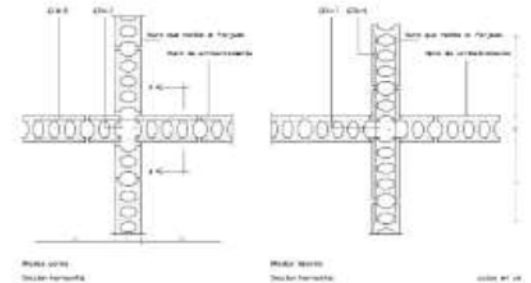
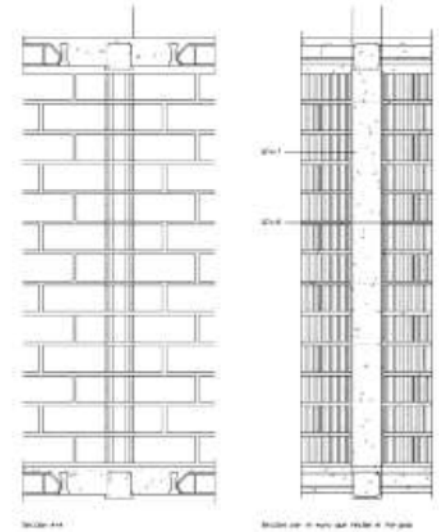
STRUCTURAL WALLS

CONCRETE MASONRY BLOCKWORK WALLS

SINGLE CONNECTION WITH HOLLOW BLOCKS



DOUBLE CONNECTION WITH HOLLOW BLOCKS



STRUCTURAL WALLS

CONCRETE MASONRY BLOCKWORK WALLS

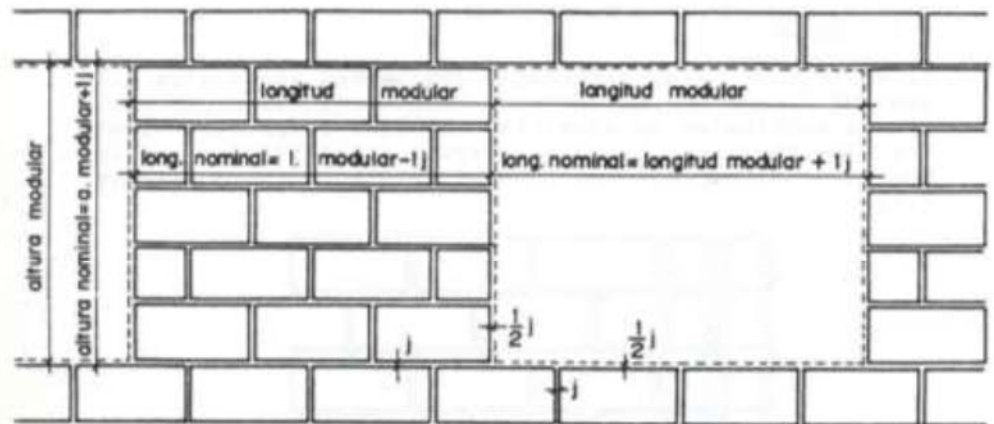
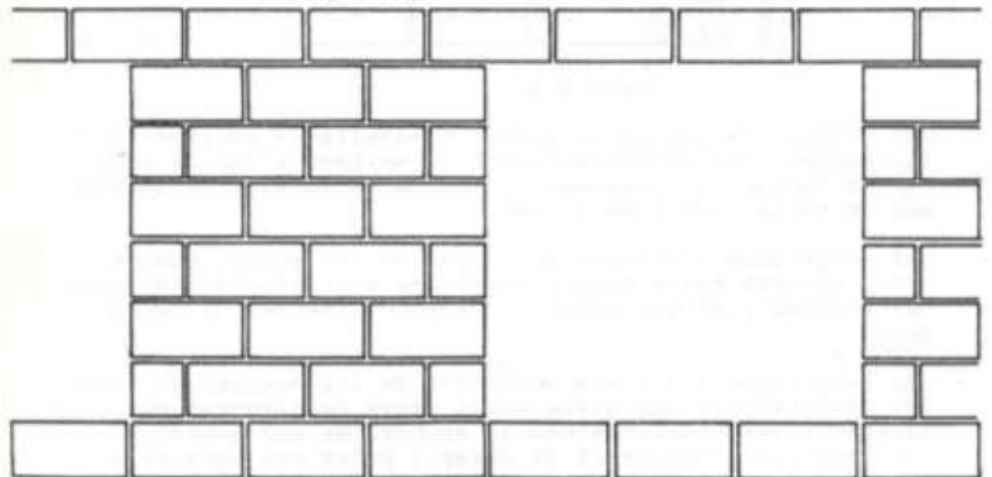
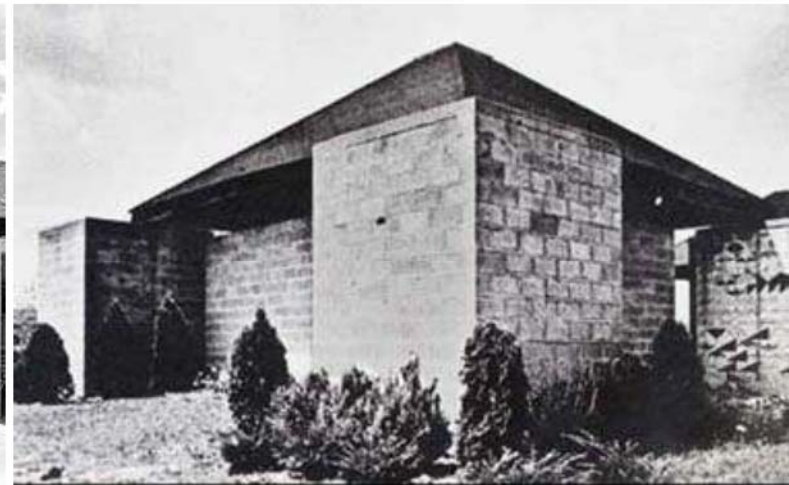


Figura 2.2



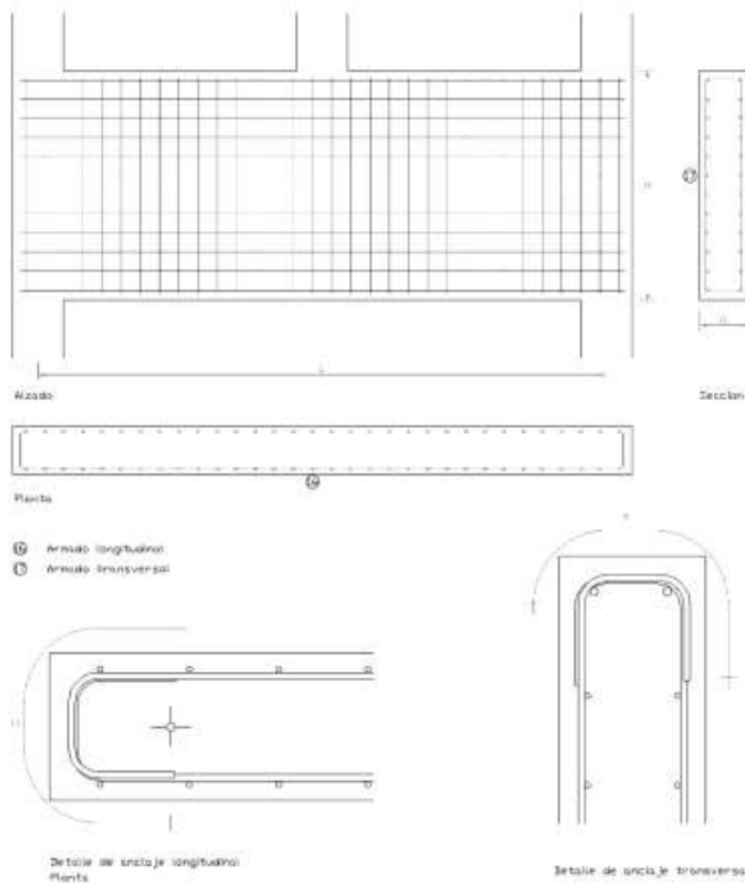
STRUCTURAL WALLS

CONCRETE MASONRY BLOCKWORK WALLS

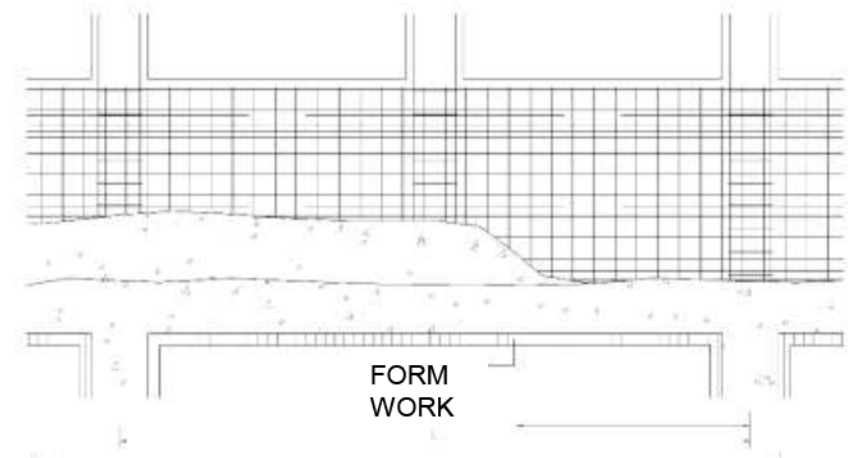


REINFORCED CONCRETE STRUCTURES. BEAMS.

STEEL REINFORCEMENT FOR WALLBEAMS



PLACEMENT OF CONCRETE FOR WALLBEAMS





**Project "SURE - Sustainable Urban Rehabilitation in Europe"
implemented in frames of Erasmus+ Programme
Key Action 2: Strategic Partnership Projects
Agreement n° 2016-1-PL01-KA203-026232**

This publication has been funded within support from the European Commission.

Free copy.

This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

**Co-funded by the
Erasmus+ Programme
of the European Union**

