Sustainable Urban Rehabilitation in Europe

Construction Applied to Heritage

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Sustainable Urban Rehabilitation in Europe

3rd Semester

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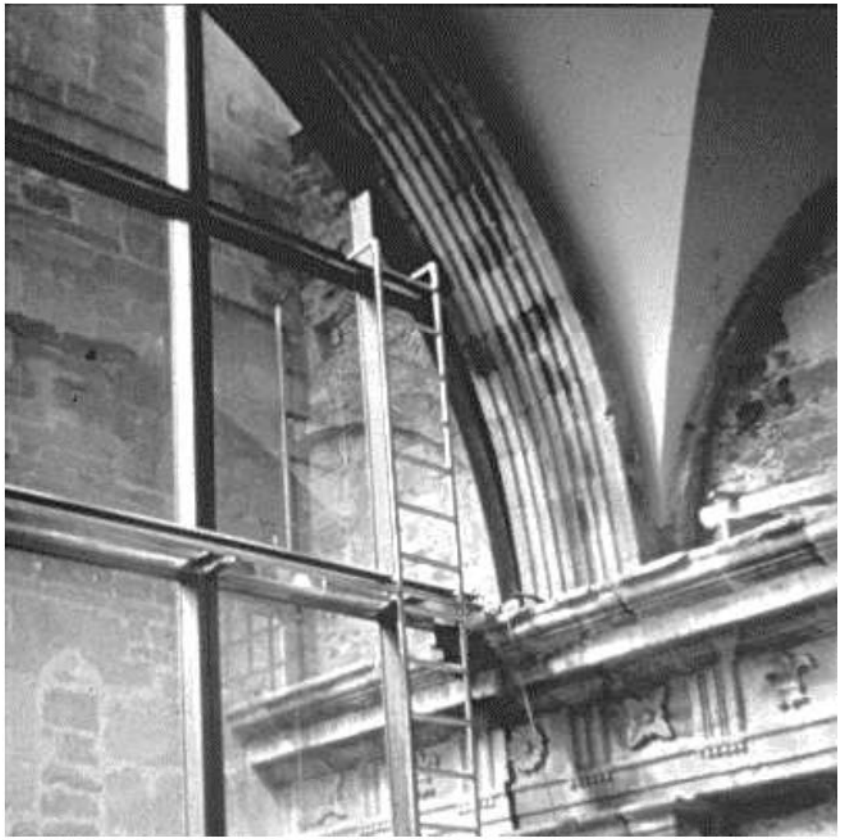
Construction Applied to Heritage

3 ECTS

SH
Sustainable Heritage

EC
Elective Courses



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SURE
SUSTAINABLE URBAN REHABILITATION IN EUROPE

UNIVERSIDAD POLITÉCNICA DE MADRID

Sustainable Urban Rehabilitation in Europe

Construction Applied to Heritage

SH

Sustainable Heritage

EC

Elective Courses

Construction Applied to Heritage may be a new construction course use to learn about close, aggregate and cover, new or even old spaces of historic buildings, to give architectonic solutions to this historic remains, to make possible its lecture and development during the times.

Sustainable Urban Rehabilitation in Europe

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.

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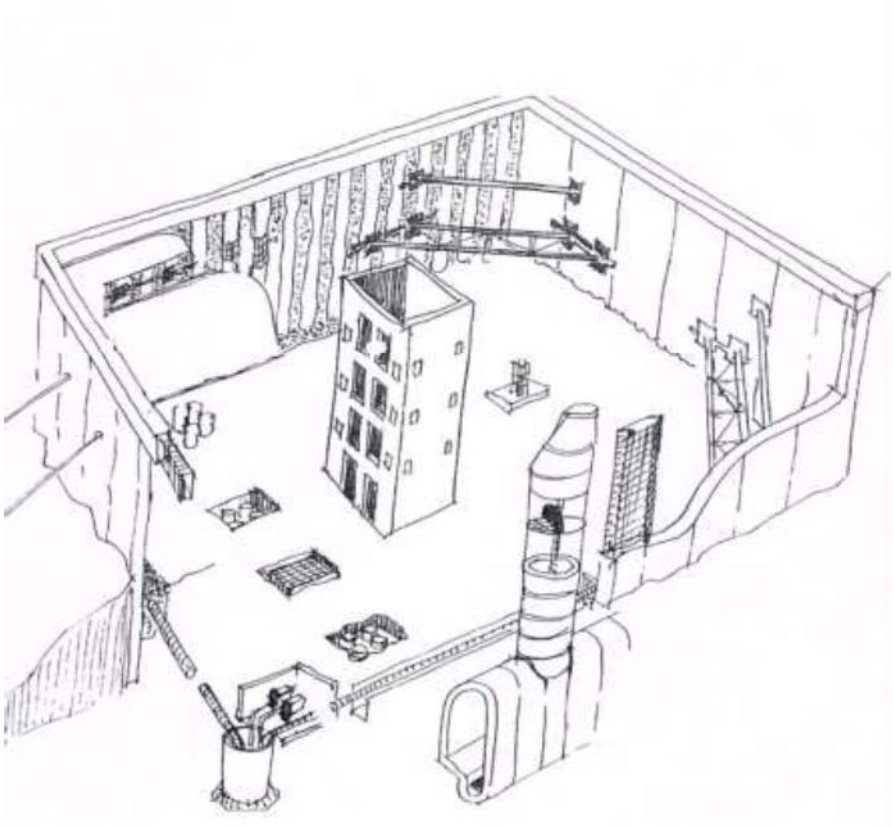
3 ECTS



01 FOUNDATIONS

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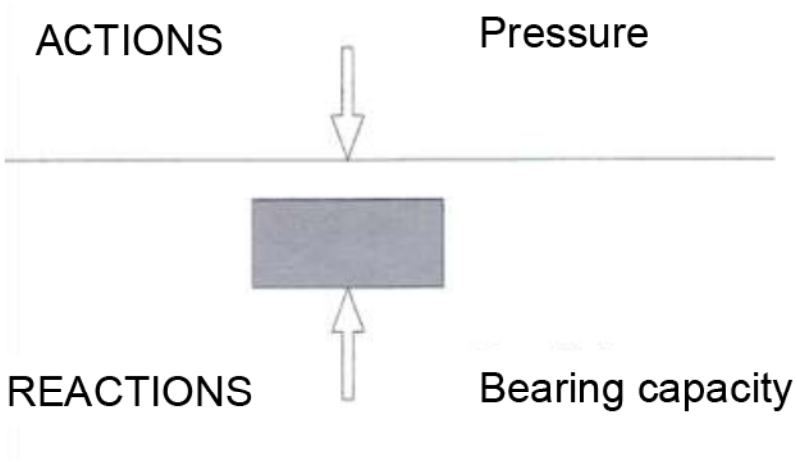
- Objetives
- Typology
- Shallow foundations: footings, slabs and plates.
- Deep foundations: wells and piles.
- Execution process. Quality control.

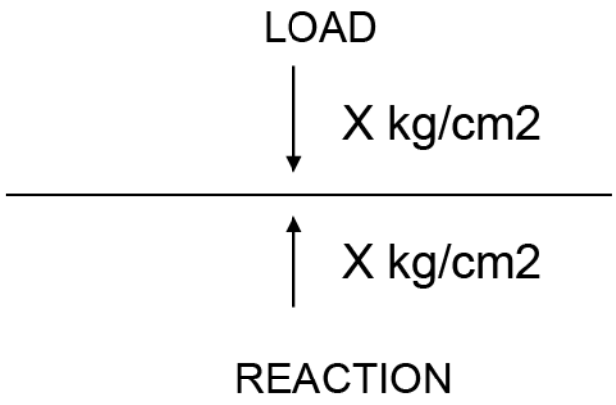
OBJECTIVES

- The foundation is the constructive system responsible for supporting the weight of the entire building and transmitting it, well distributed, to the ground.
- The foundation acts as an interface between the construction and the soil.
- The scientific confrontation between building and soil, sets the different constructive solutions obtained.



FUNCTION CONDITIONS

- The foundation evenly distribute the loads of the building on the ground that supports it.
- The section of the foundation will be calculated in each case starting from the admissible load for the least resistant material, which is generally the ground. In each point of the foundation LOAD = REACTION is met.
- Waterproofing



CONSTRUCTION MATERIALS

HISTORICAL FOUNDATIONS

- Timber
- Stone
- Brick
- Brick and stone
- Massive concrete

•Provisional foundations

- Agregates
- Agregates in boxes

CURRENT FOUNDATIONS

a)Made on site "in situ“

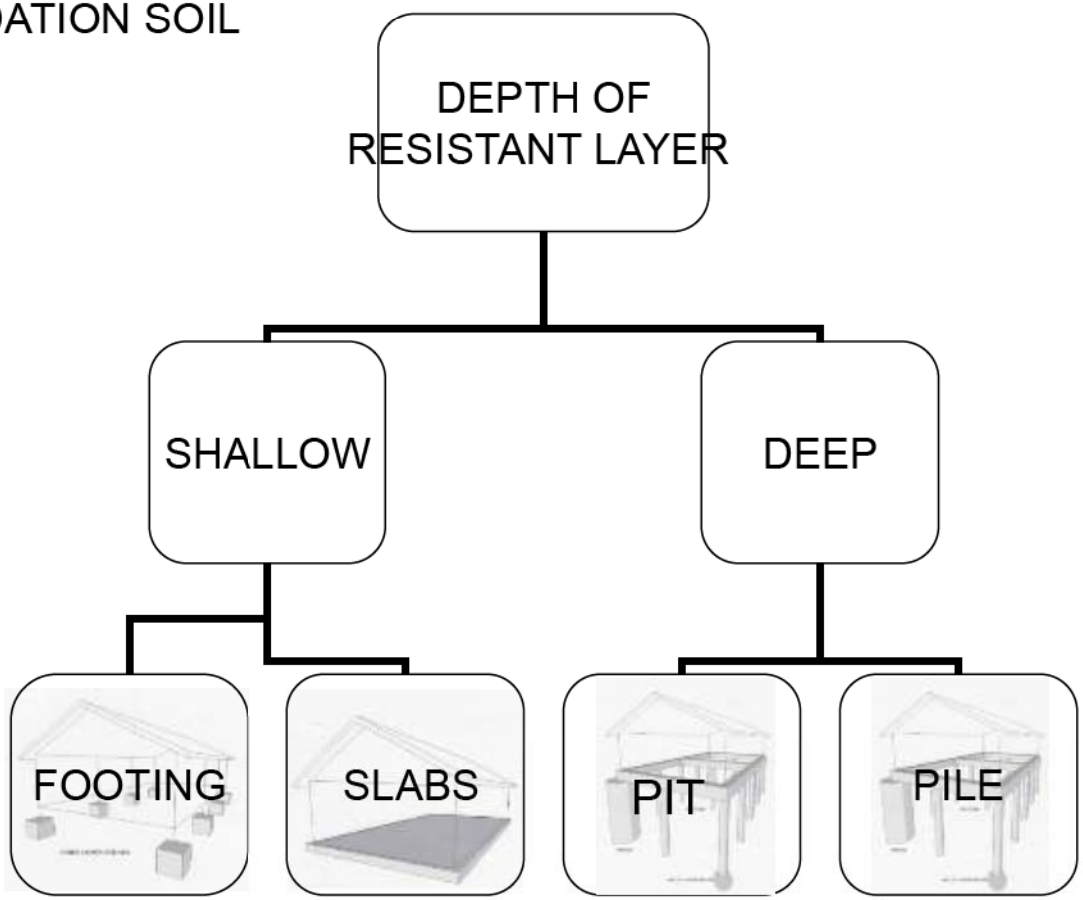
- Concrete (massive, reinforced, post-tensioned)
- Concreted steel

b)Precast

- Concrete (prestressed, post-tensioned)
- Steel

FUNCTION CONDITIONS

- MORPHOLOGY
- DEPTH OF THE FOUNDATION SOIL



CHOICE OF TYPE OF FOUNDATION

- It is a personal decision of the author of the project.
- All possible combinations can be made, so it is common more than one type of foundation to be used in the same building.
- Each problem admits a range of possibilities, among them the solution that is considered the most appropriate to the case is chosen.

CONDITIONING FACTORS

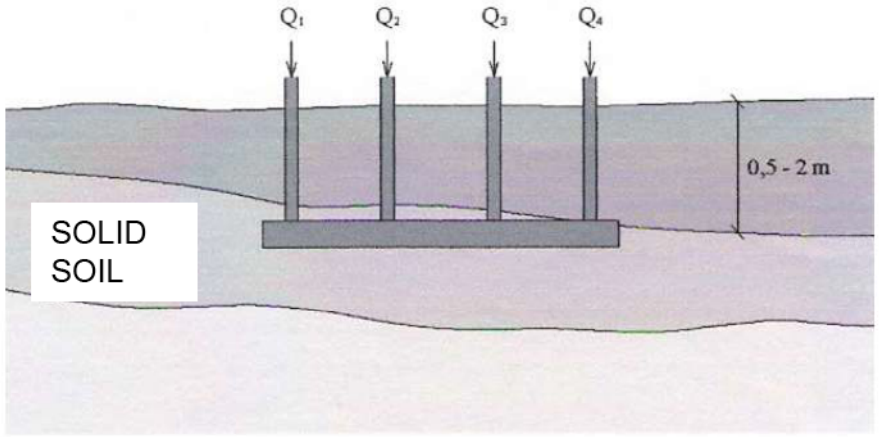
- The characteristics of the building.
- Its particularized way of generating actions.
- The particularities of the terrain, especially its ability to dissipate loads.
- The foundation's own capacity to function as an intermediate structure.

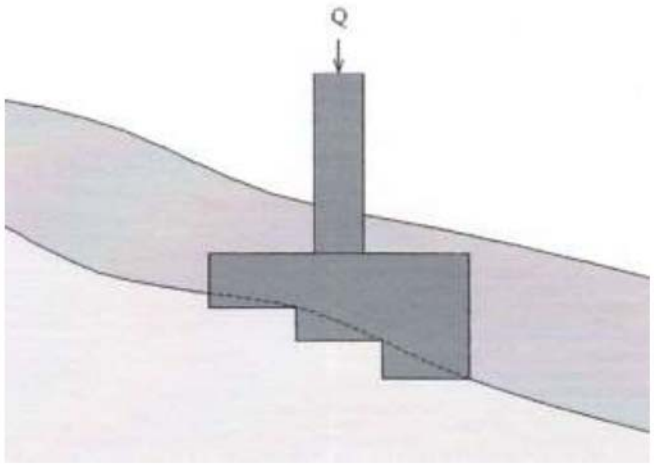
SHALLOW FOUNDATIONS

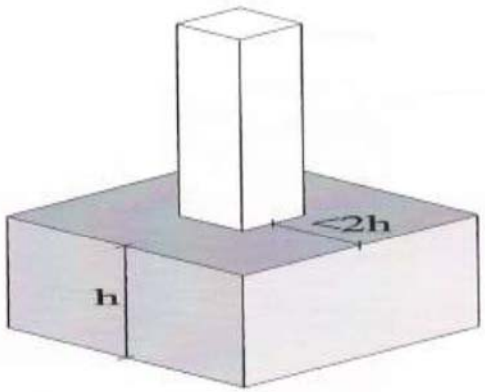
They are located at shallow depths.
They occupy a extense surface.

Types:

- By work.
- By form.
- By plant layout.



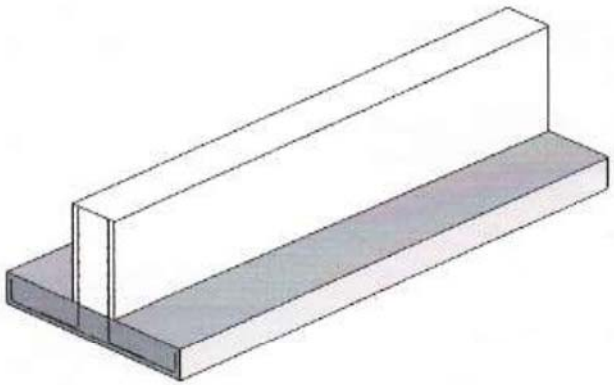




TYPES OF FOUNDATIONS
FOOTINGS

INDIVIDUAL FOOTINGS

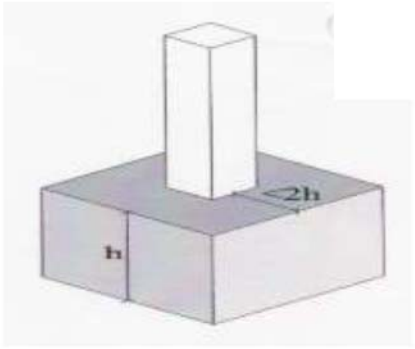
- For isolated and concentrated loads on small surfaces.
- Very economic foundation.
- Small pressure bulb, so
  It affects only to shallow layers.

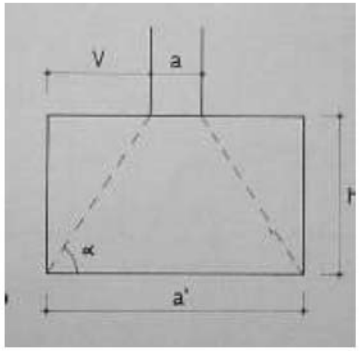


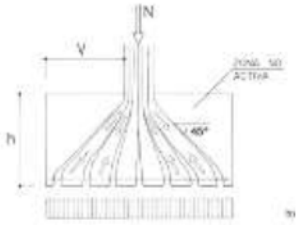
STRIP FOOTINGS

- For linear uniform loads or aligned punctual loads, reasonably equal and close.

INDIVIDUAL FOOTING TYPES

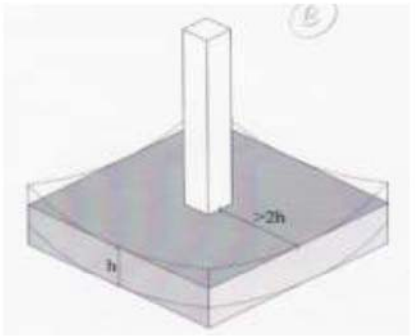


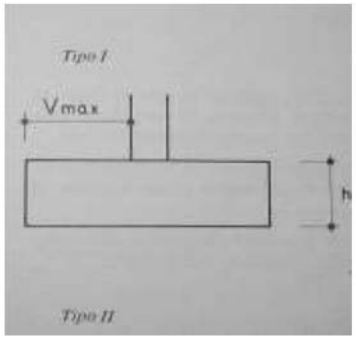


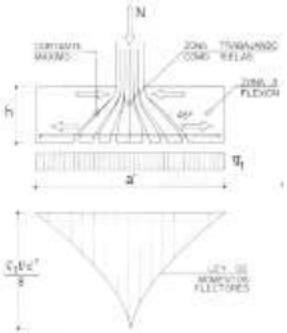


RIGID

- They work in compression
- They are made of mass concrete
- Great width
- Without steel reinforcement
- With cast reinforcement







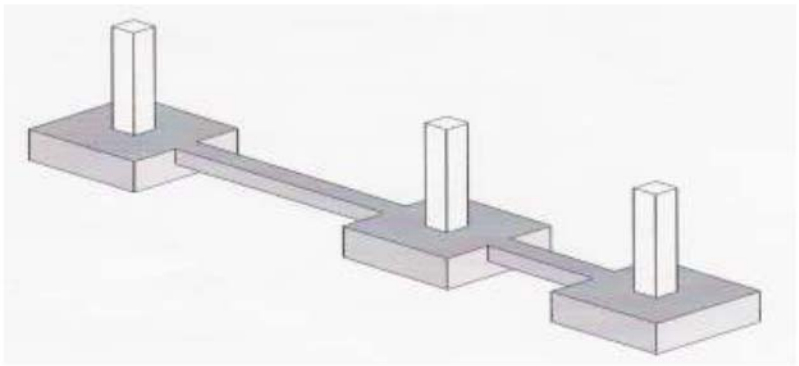
FLEXIBLE

- Bending stress
- They are made of reinforced concrete
- Small width
- With structural reinforcement

ISOLATED FOOTINGS

Its purpose is to absorb the horizontal actions produced by the structure or the soil, avoiding displacements and horizontal turns.

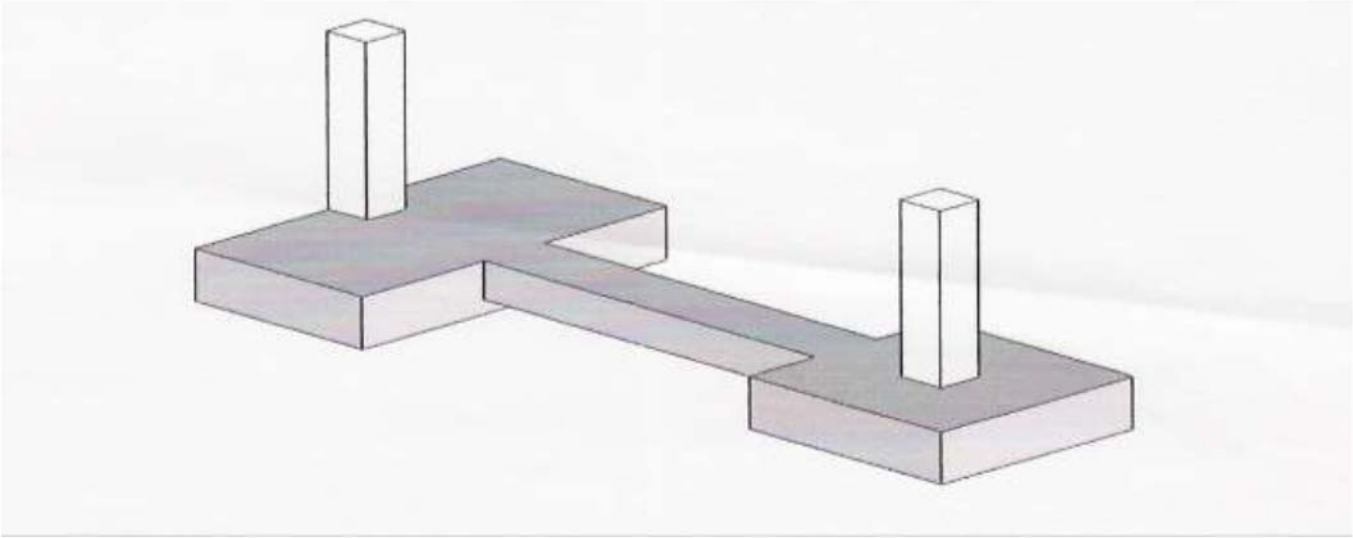
•It is achieved by reinforced concrete beams, which connect the different footings.



CENTERING BEAMS

They are used to join footings that receive off-center loads (dividing, corner, etc).

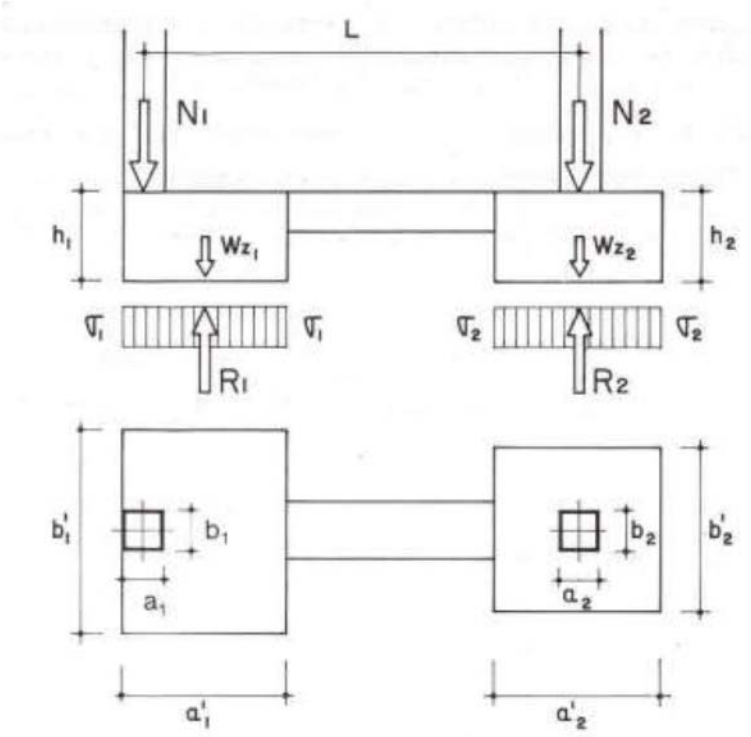
- The centering beam is a mechanism capable of absorbing the bending moments generated by the eccentricity of the loads, in such a way that the eccentricity is minimal in the delivery to the ground.



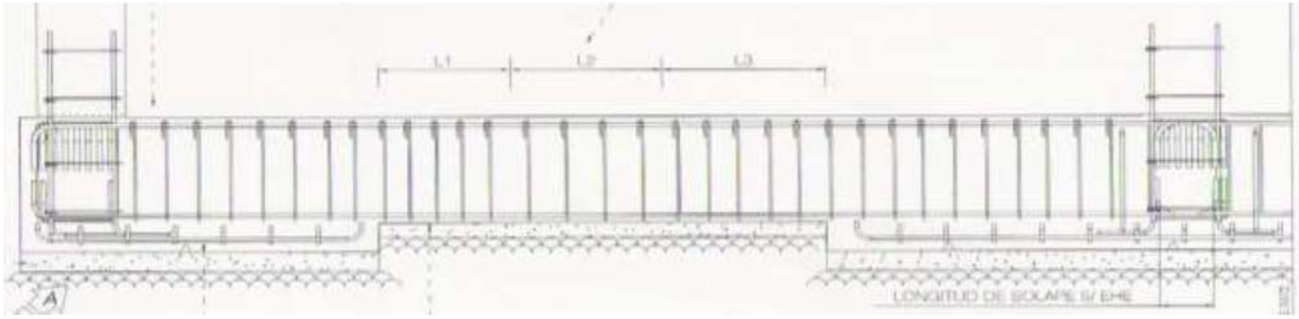
CENTERING BEAMS

Loads on centering beams

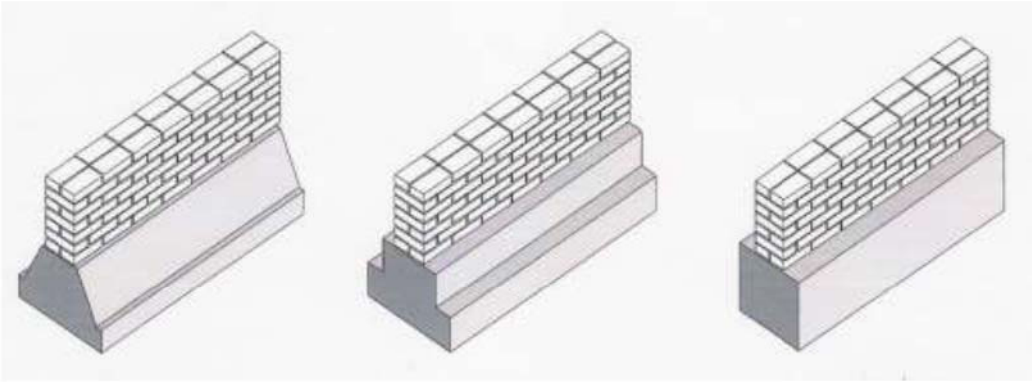
Bracing beams

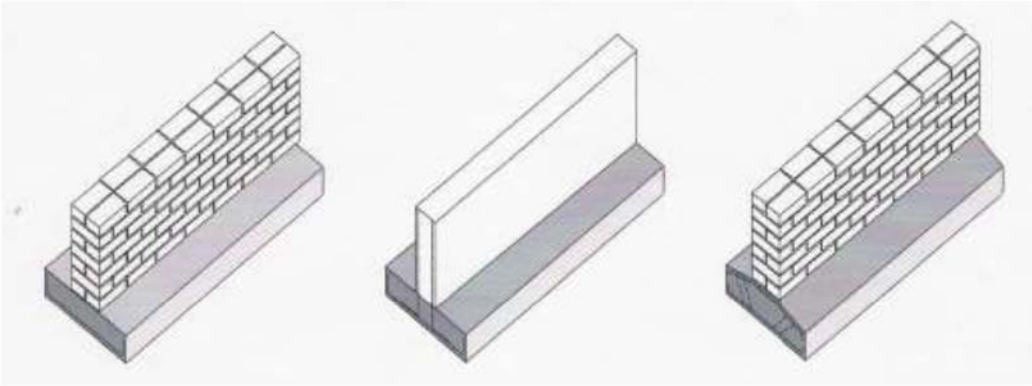


Reinforcement of centering beams



STRIP FOOTING (under walls)





RIGID

- They work in compression
- They are made of mass concrete
- Great width
- Without steel reinforcement
- With cast reinforcement

FLEXIBLE

- Bending stress
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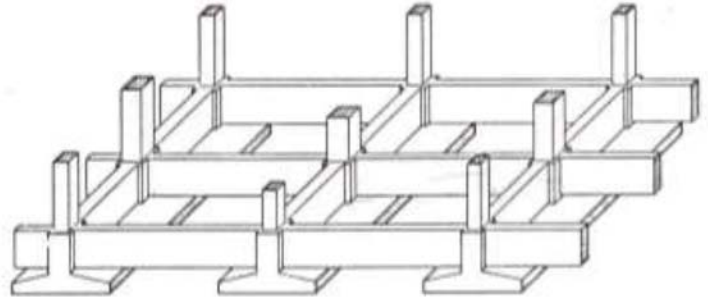
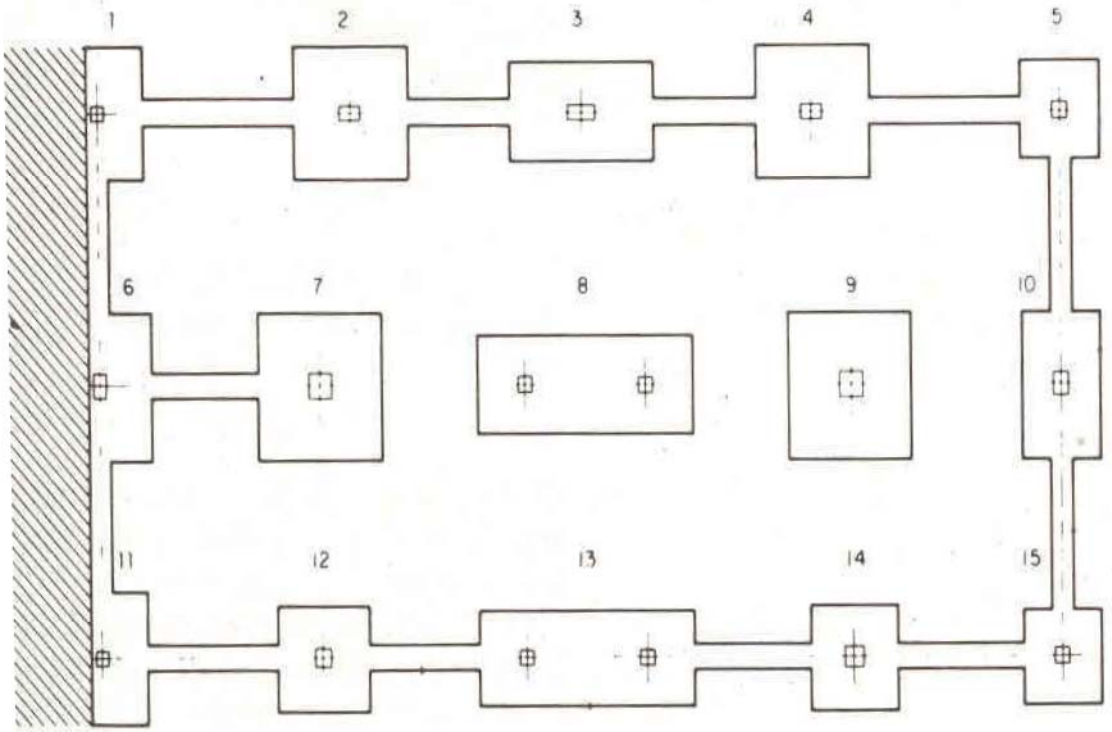
- Small width
- With structural reinforcement

FOOTING

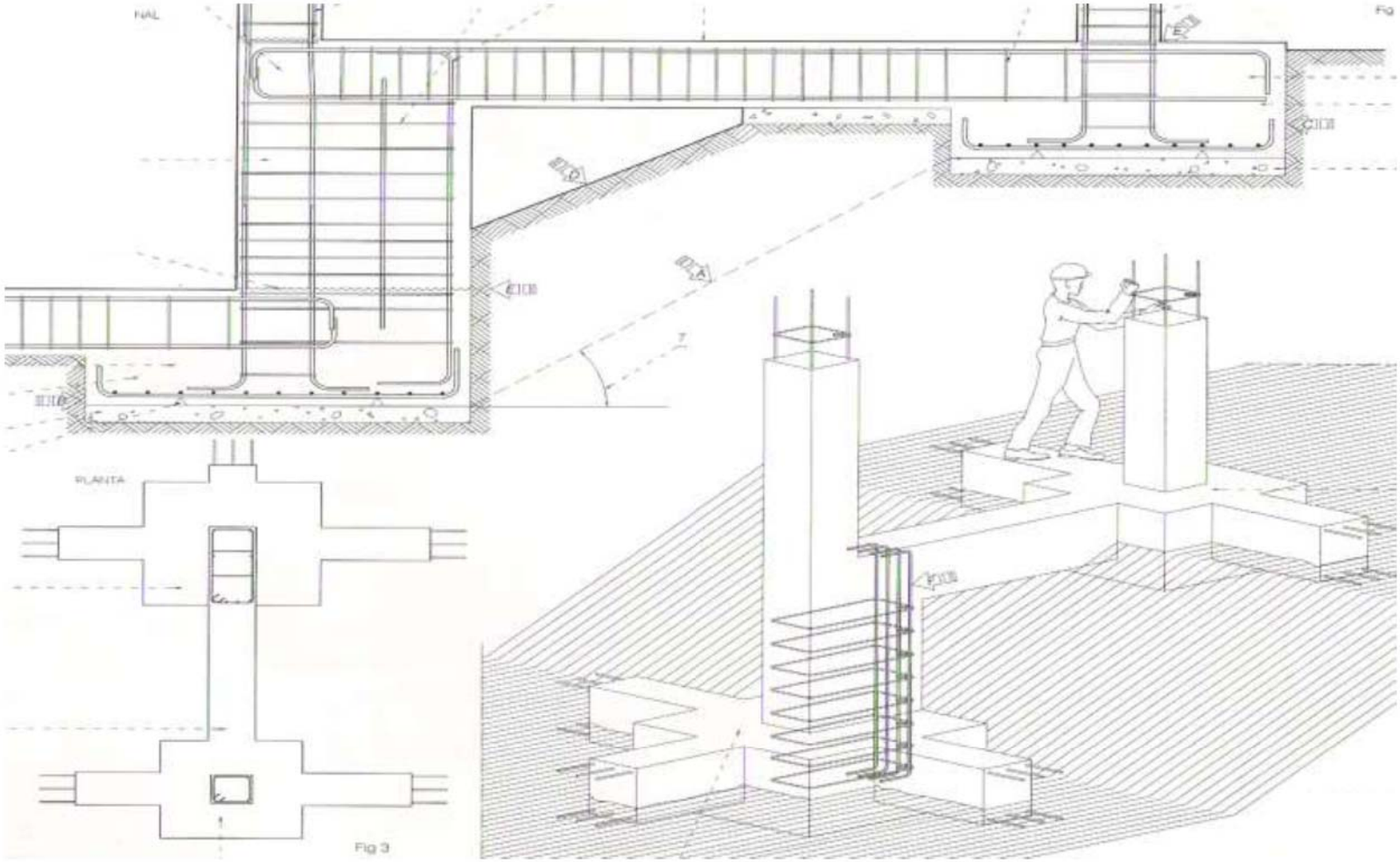
Interelation between footings



Foundations plan



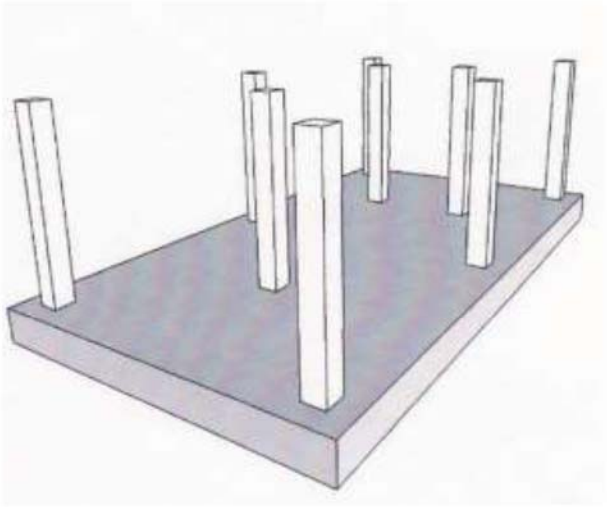
DIFERENT LEVELS FOOTING



RAFT OR MAT FOUNDATIONS

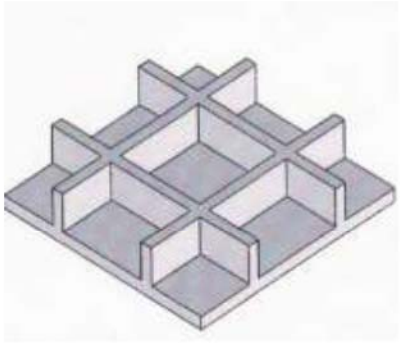
MAT FOUNDATIONS

- Continuous foundation system, mostly carried out on site.
- Suitable for soils with moderately resistant in the upper layers (good solid soil).
- Planar building subsystems for horizontal concrete placement in mass as sills.
- It may contain a uniform assembly, usually an industrial mesh.

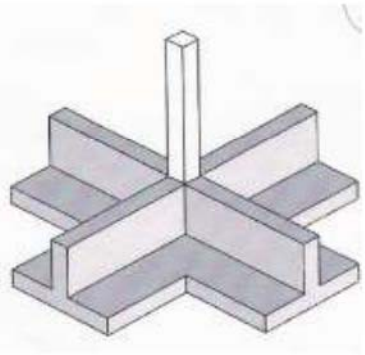


RIBBED MAT FOUNDATIONS

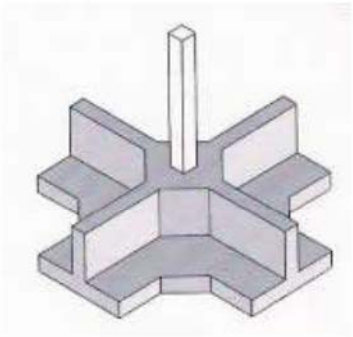
- NERVED
  With reinforced rib lines,
  singularized, which can be:
  - _ Apparent or hidden
  - _ Up or down



A) WITH PUNCTUAL REINFORCEMENTS
They contain orthohedral elements, reinforced,
singularized, which may be:
- _ Embedded or apparent
- _ Up (abacus) or down (bases)

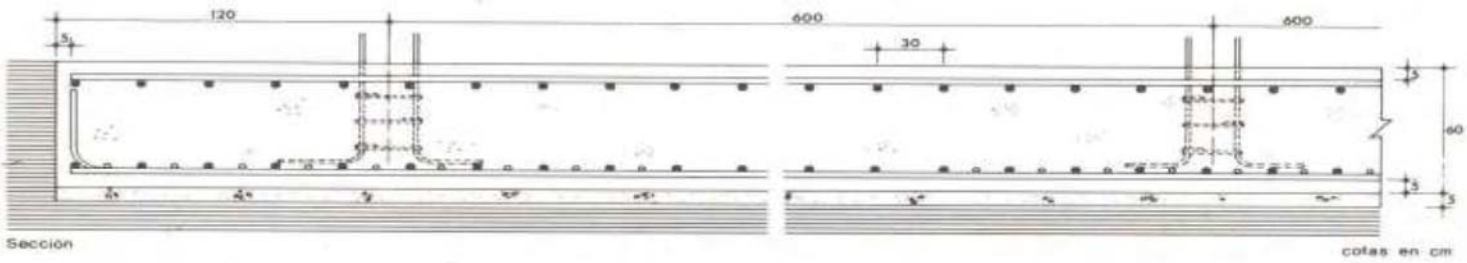


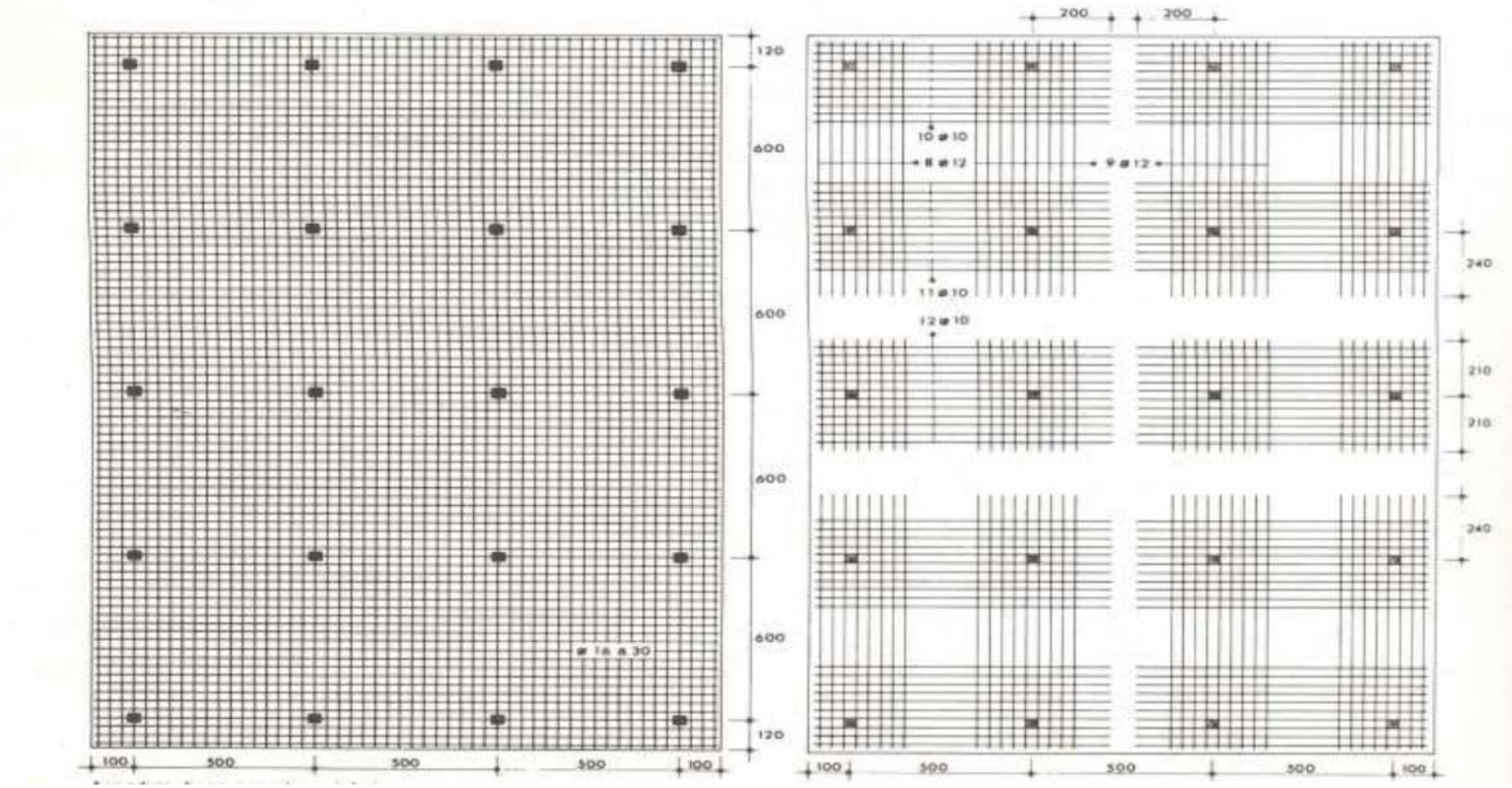
B) FUNGIFORMES, WITH OR WITHOUT MUSHROOMS
They contain conical elements, reinforced,
Always apparent:
- _ Up (abacus) or down (bases)



SHALLOW FOUNDATIONS

SLABS





SHALLOW FOUNDATIONS

SLABS



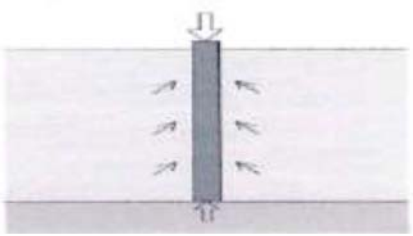


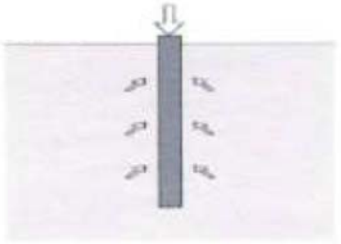

DEEP FOUNDATIONS

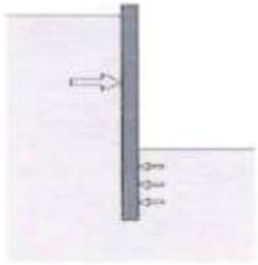
PILES

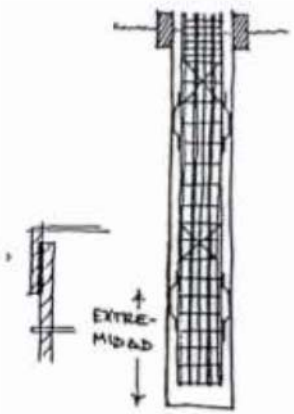
This type of foundation is very conditioned by the on-site execution that mainly depends on the machinery that can access the site, the conditions of the adjacent buildings, etc. So, each case should be independently studied and planed.

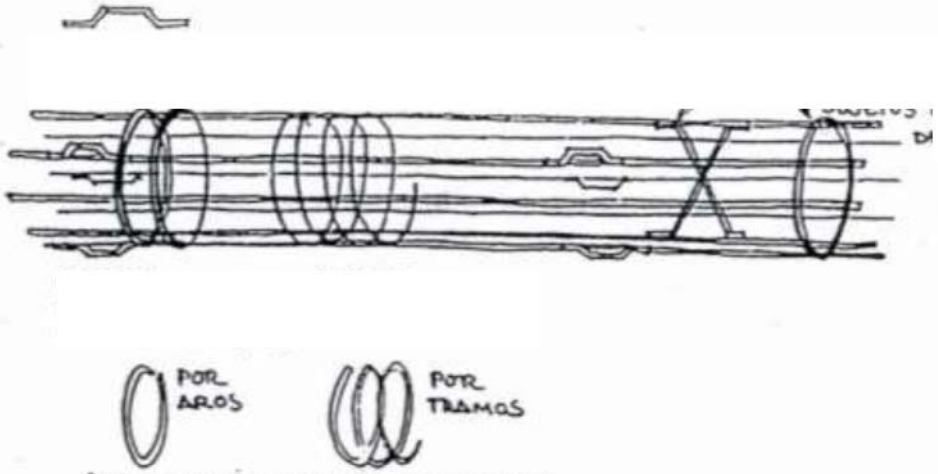
PILES TYPES ACCORDING TO MECHANICAL PERFORMANCE

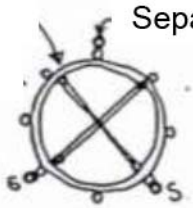


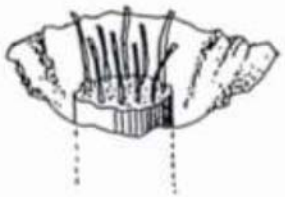


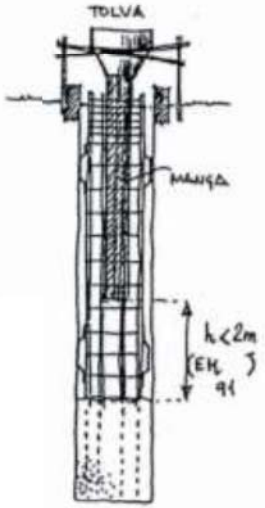






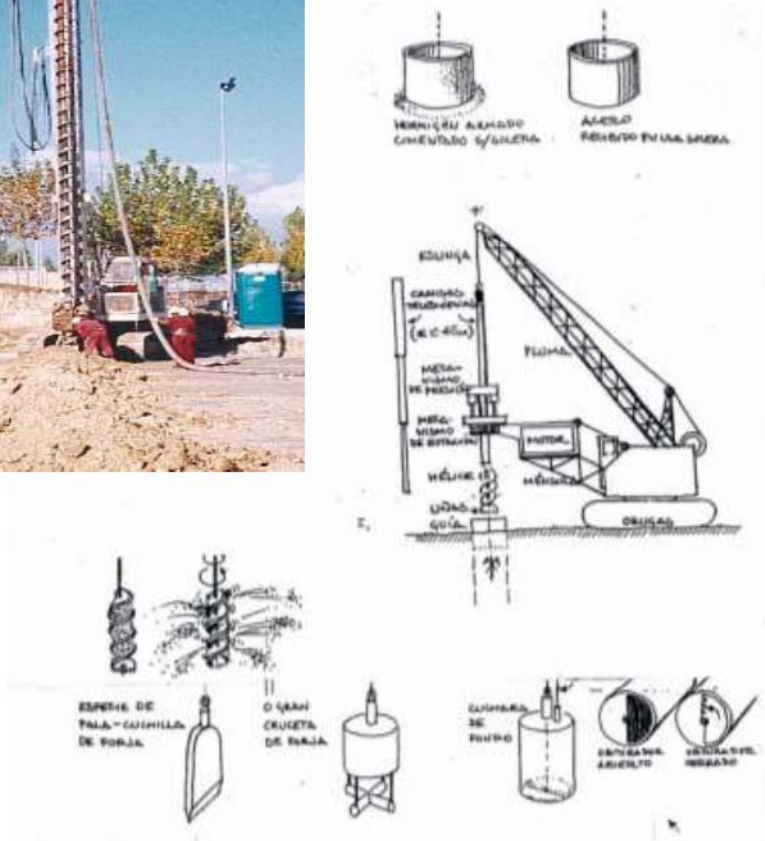




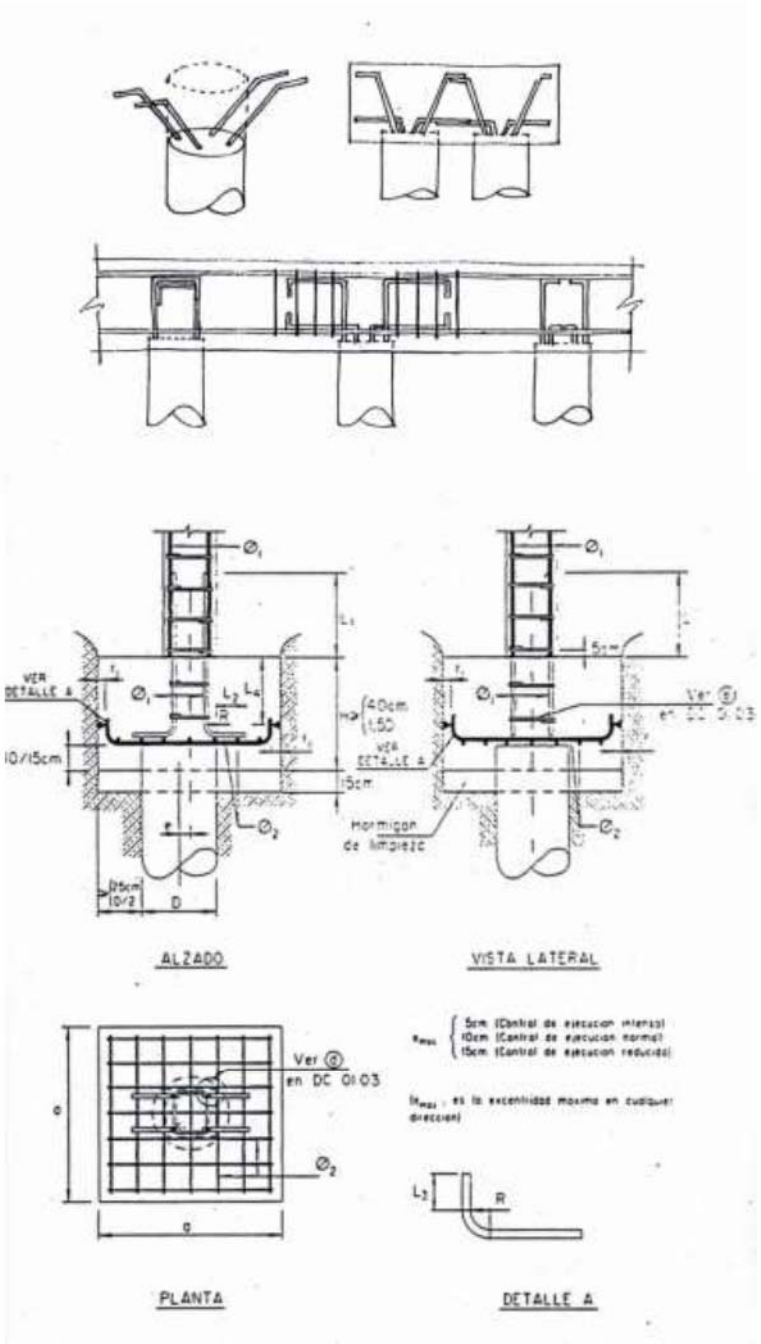


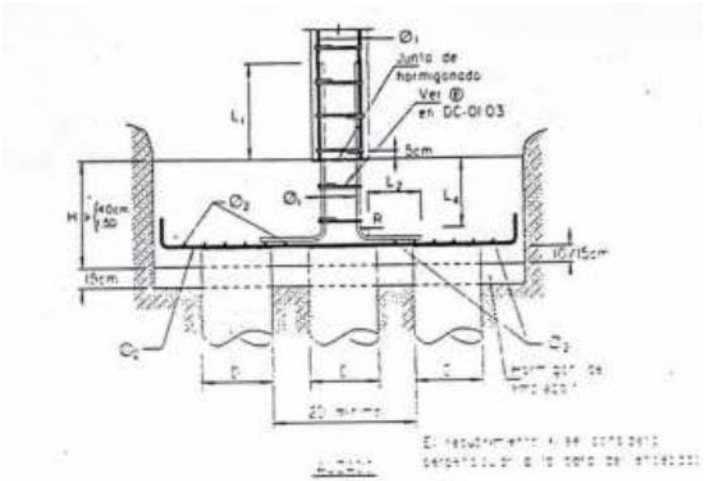
CAST-IN PLACE PILES

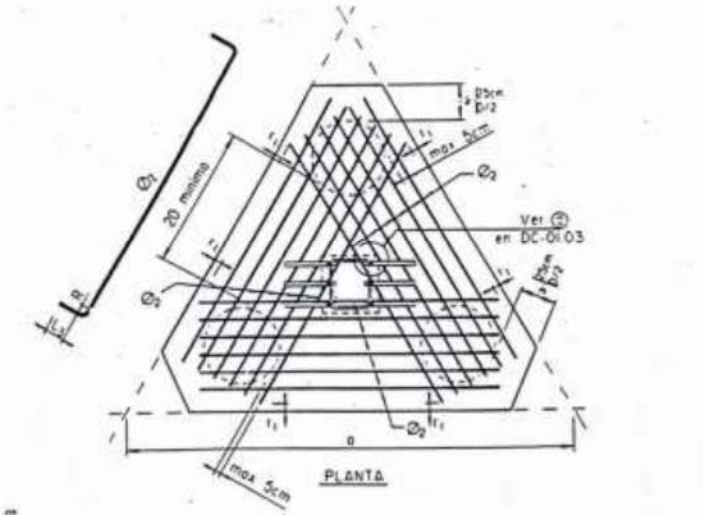
CAST-IN PLACE PILES WITHOUT EARTH EXTRACTION



CONCRETE PILE FOOTINGS







- ARAUJO ARMERO, RAMÓN. La arquitectura como técnica. Adrid, ATC edic. 2007.
- ARAUJO ARMERO, RAMÓN y SECO, ENRIQUE. Construir con acero. Pamplona Ensidesa 1994.
- TORROJA, EDUARDO. Razón y ser de los tipos estructurales. Madrid, Inst. Torroja 4ºed.
- CHING, FRANCIS y ADAMS, CASANDRA. Guía de construcción ilustrada. Limusa Wiley, Mexico, 2004.

BASIC LITERATURE

CONSTRUCTION APPLIED TO HERITAGE

- DERNIE, DAVID. Arquitectura en piedra. Blume, Barcelona, 2003
- AITIM y ARRIAGA, FRANCISCO. La Madera.
- ASEFAVE. Fachadas ligeras. Euronit. Fachadas y cubiertas. Manual Técnico. Madrid 2006.
- JOHNSON, H. La Madera. Edit. Blume ,Barcelona 1980.
- PARICIO, IGNACIO. La construcción de la arquitectura. Elementos. Edit Bisagra. Barcelona, 2000.

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