Sustainable Urban Rehabilitation in Europe

Construction Applied to Heritage

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Sustainable Urban Rehabilitation in Europe

3rd Semester

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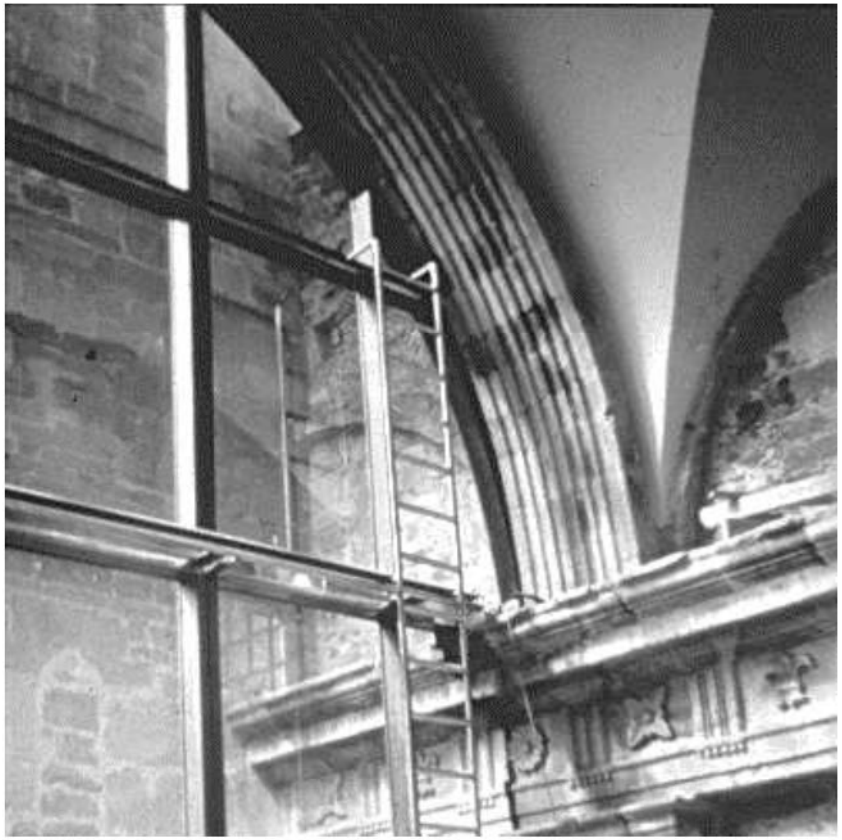
Camila Burgos Vargas

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

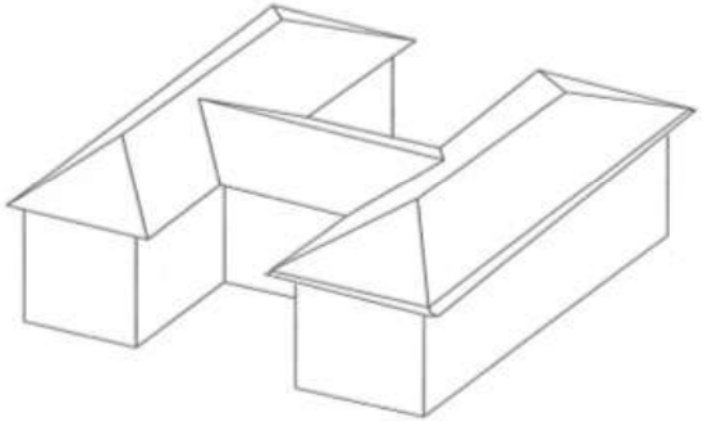
1. Foundations.
2. Retaining Works.
3. Drainage and Sewerage Systems.
4. The Porous Loadbearing System.
5. The Porous Loadbearing System. Walls.
6. The Porous Loadbearing System. Grid Structures.
7. The Compact Loadbearing System.
8. The Porous and Mixed Horizontal Loadbearing System. Slabs.
9. The Porous 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.

Sustainable Urban Rehabilitation in Europe

3rd Semester

Construction Applied to Heritage

3 ECTS



11 SLOPING ROOFS

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- Analysis by components of high slope roofs.
- Types of plans.
- Slope formation in high slope roofs.
- Structural base.

MORPHOLOGICAL CLASSIFICATION

- HIGH SLOPE OR SLOPING ROOF.

  Slope >15º

  They usually drain to the outside of the building.

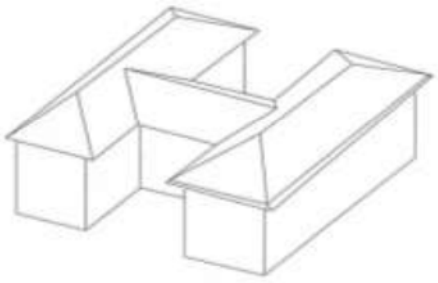
- SMALL SLOPE OR FLAT ROOF.

  Slope < 5º

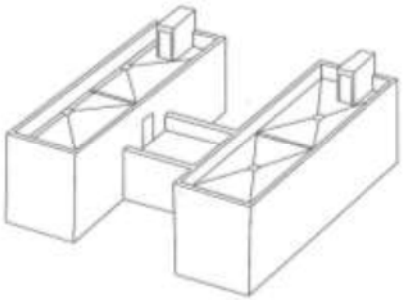
  They usually drain to the inside of the building.

  Possibility of being recoverable for transit and use.

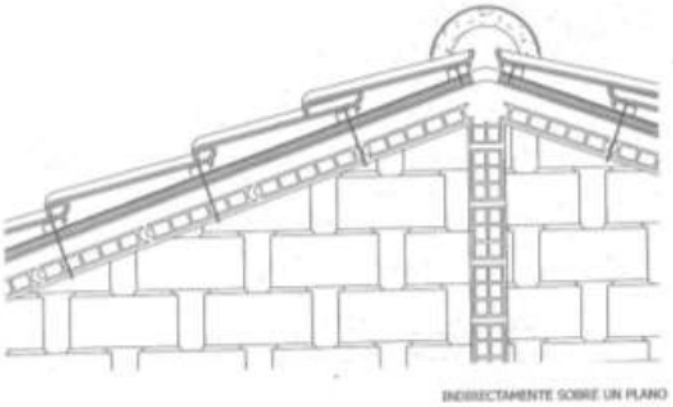
HIGH SLOPE ROOFS



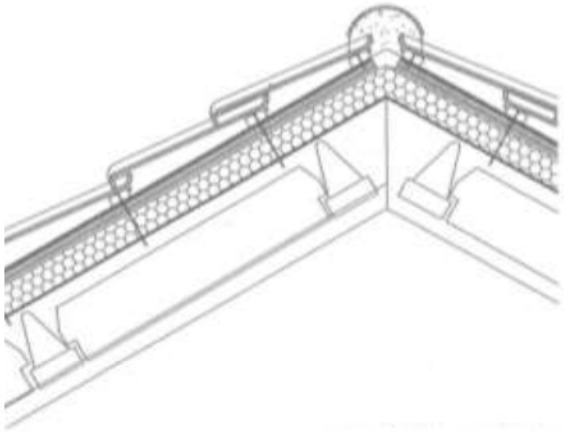
SMALL SLOPE ROOFS



SLOPE FORMATION

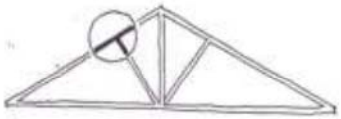


INDIRECTLY ON THE SLOPE PLANE

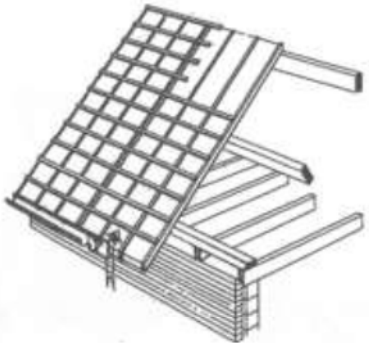


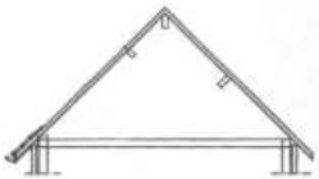
DIRECTLY ON THE SLOPE PLANE

SLOPE FORMATION (BARS)

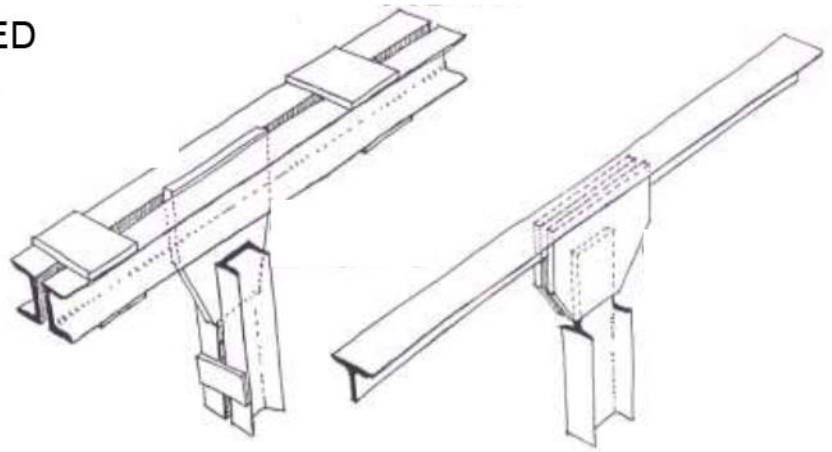


WELDED
STEEL





ISOALTED BARS



TRIANGULATE LAYOUT BARS

HIGH SLOPE ROOFS

- BASE STRUCTURE
- PLANE STRUCTURE
- ROOF DECKING MATERIAL

-**Basic types according to their organization:**

On an horizontal flat surface

- Brickwork + Bottom shuttering:
  - -Heavy.
  - -Lightweight.
- Brickwork+bars:
  - -Wood.
  - -Steel.

- **On a sloping flat structure:**
  - -Masonrywork.
  - -Modular:
    - -Heavy.
    - -Lightweight.
- **On a sloping bars structure:**
  - -Bars disposed according to
    - -Maximun slope _ Rafters.
    - -Contour lines _ Joists.
- **On a complex bars structure:**
  - -Trusses.
  - -Triangled beams.
  - -Portal frame.

HIGH SLOPE ROOFS
CLASSIFICATION

Basic types according to their form:

- Eave solutions:
  - Rafter projection.
  - Tie beam projection.
  - Rafter+tie bem projection.
- Slopes:
  - Uniform.
  - Ashlar solution.
  - Mansard solution.

HIGH SLOPE ROOFS CLASSIFICATION

Types according to water drainage way:

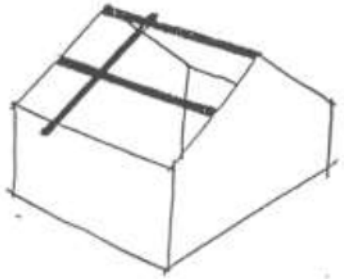
- In lines free fall: Edges.
- In points free fall:
  - Valleys.
  - Gutters + Gargoyles.
- In lines collection:
  - Valleys.
  - Gutters + Gargoyles.
- In points collection:
  - Simple absorbers (gully heads).
  - Syphon gullies + Downspouts.

According to expansion joints disposal.

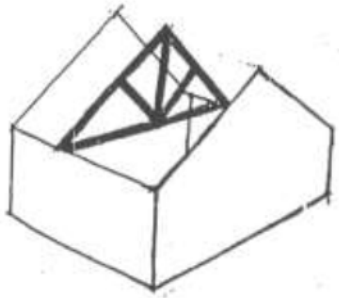
Types according to conditioning capacity:

- Thermal and acoustic insulation.
- Water proofing.
- Vapour barrier.

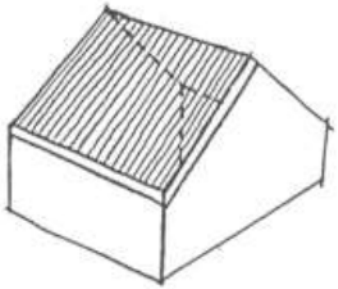
STRUCTURAL BASE AND SLOPES SYSTEM



ISOLATED BARS IN DIFFERENT POSSITIONS



TRIANGULATED BARS



CONTINUOS PLANS: SLABS OR PRECAST PIECES

TRADITIONAL STRUCTURAL SOLUTIONS:

-Bundle of rafters (+ joists):

-Directly supported on the masonry brickwork.

-Supported on sleepers: "*A par y picadero*".

-Bundle of joists (+ small rafters):

-Supported on the masonry brickwork: "A la molinera".

-Bundle of rafters on gable roof:

-Counteracting on the head:

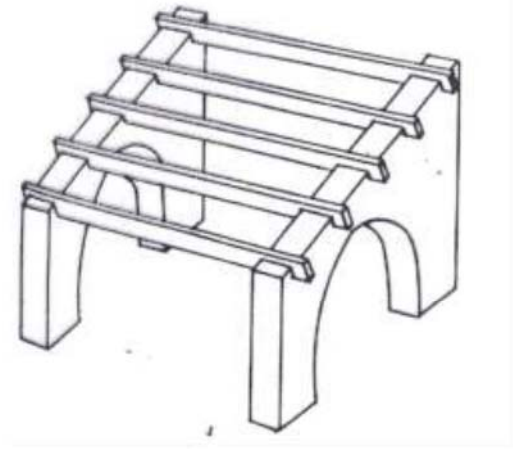
-Against a ridge bar: "*A par e hilera*" or close couple roof.

.-Counteracting on the foot:

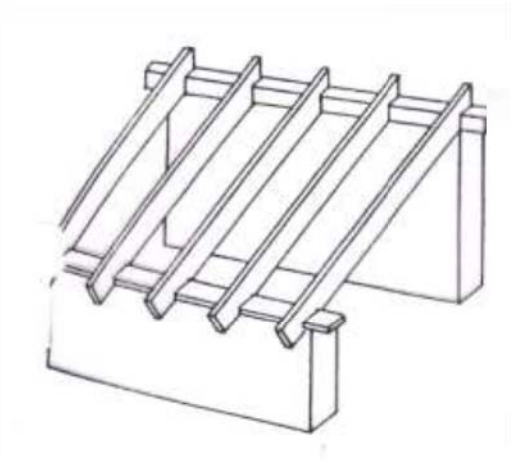
-Fixed masonry embebed.

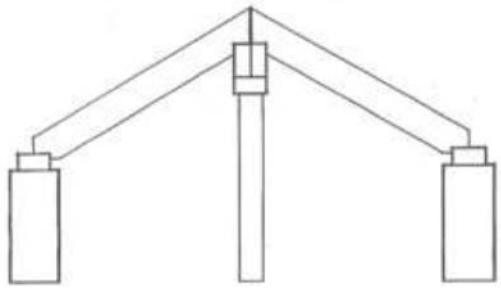
-With a tensined bar:
"Rafter and tie beam».

ISOLATED BARS
TRATIDIONAL SOLUTIONS

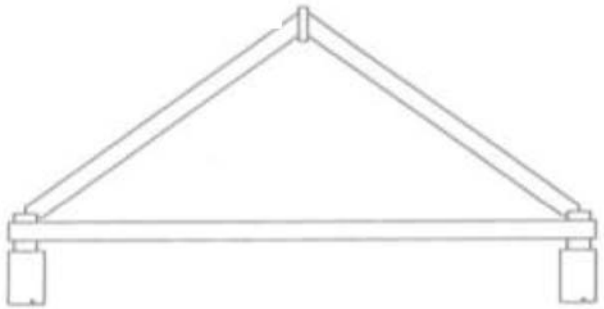


«A LA MOLINERA»

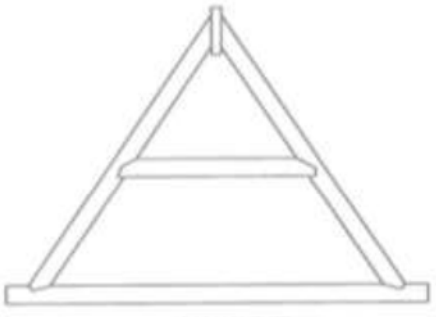




«*PAR Y PICADERO*»



«*PAR E HILERA*» OR
CLOSE COUPLE ROOF



«*PAR Y PUENTE*» OR
COLLAR ROOF

CONTEMPORARY STRUCTURAL SOLUTIONS

- **Contemporary interpretation of traditional solutions:**
  - Bundleof rafters.
  - Bundle of joists.
  - Flat pieces or other kind of bars as a complement.
  - Complex structures made of bars.
- **Directly on planar structure:**
  - Slab.
  - Precast concrete stripes.
  - Light materials prefabricated stripes.
- **Indirectly on planar structure:**
  - Slab + Brick oper work roof support"+

    -Wooden strips.

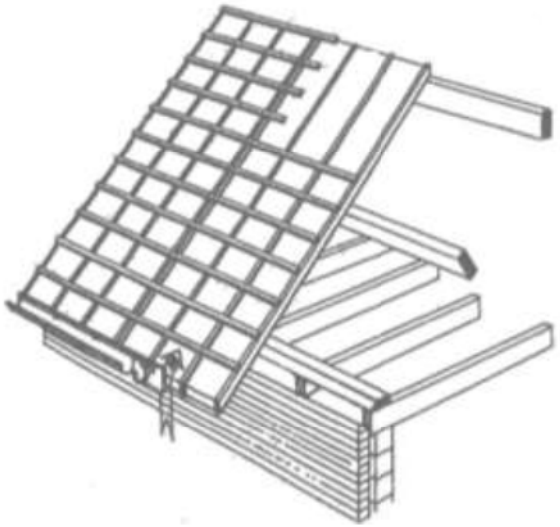
    -Steel or concrte joists.

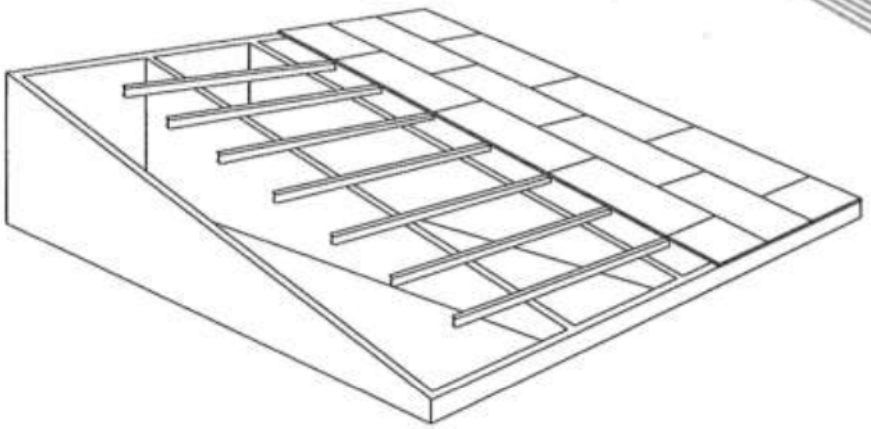
    -Heavy board.

    -Light board.

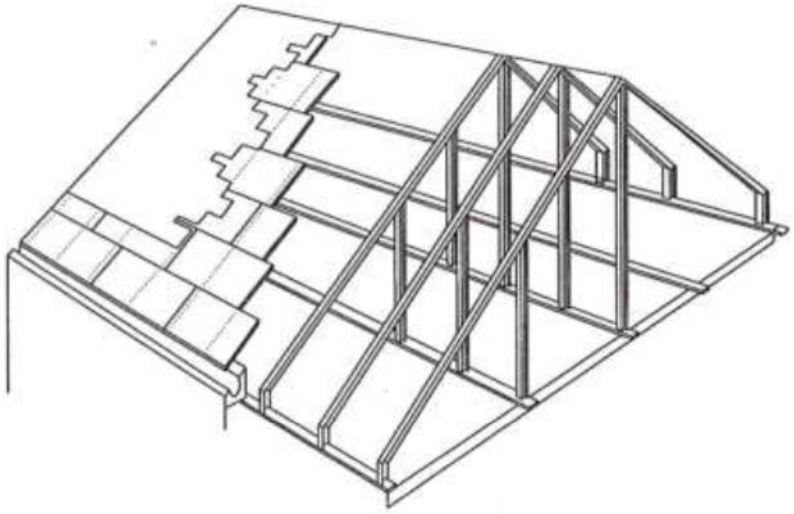
STRUCTURAL CONTEMPORARY SOLUTIONS

BUNDLE OF JOISTS SUPPORTED ON MASONRY WORK

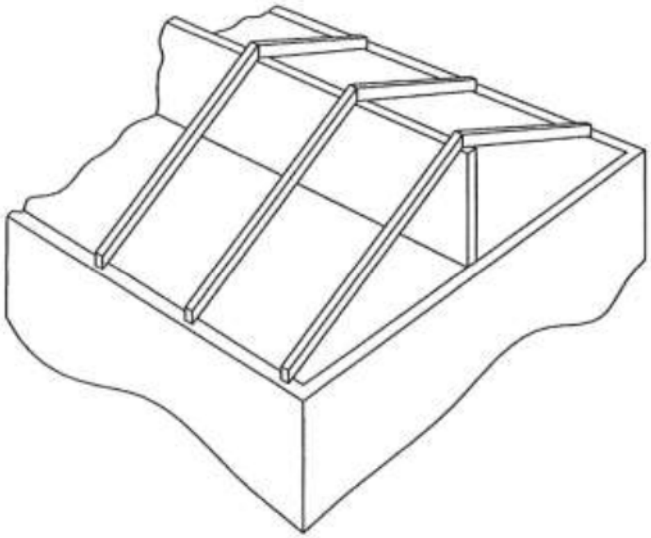




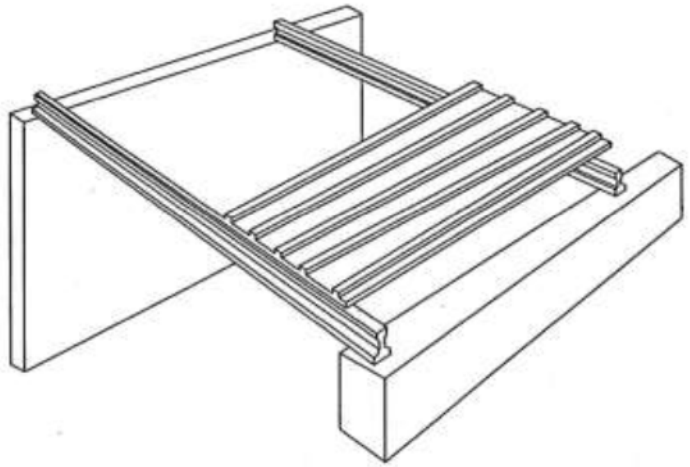
BUNDLE OF JOISTS



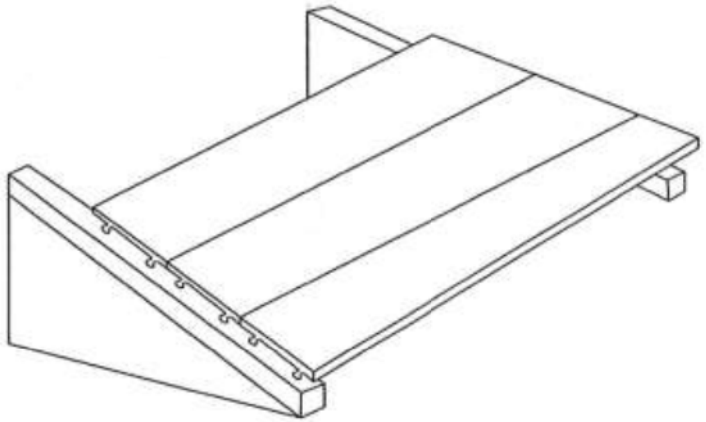
BUNDLE OF RAFTERS



SUPPORTED ON HORIZONTAL PLANAR STRUCTURE: BRICKWORK+BARS (RAFTERS)



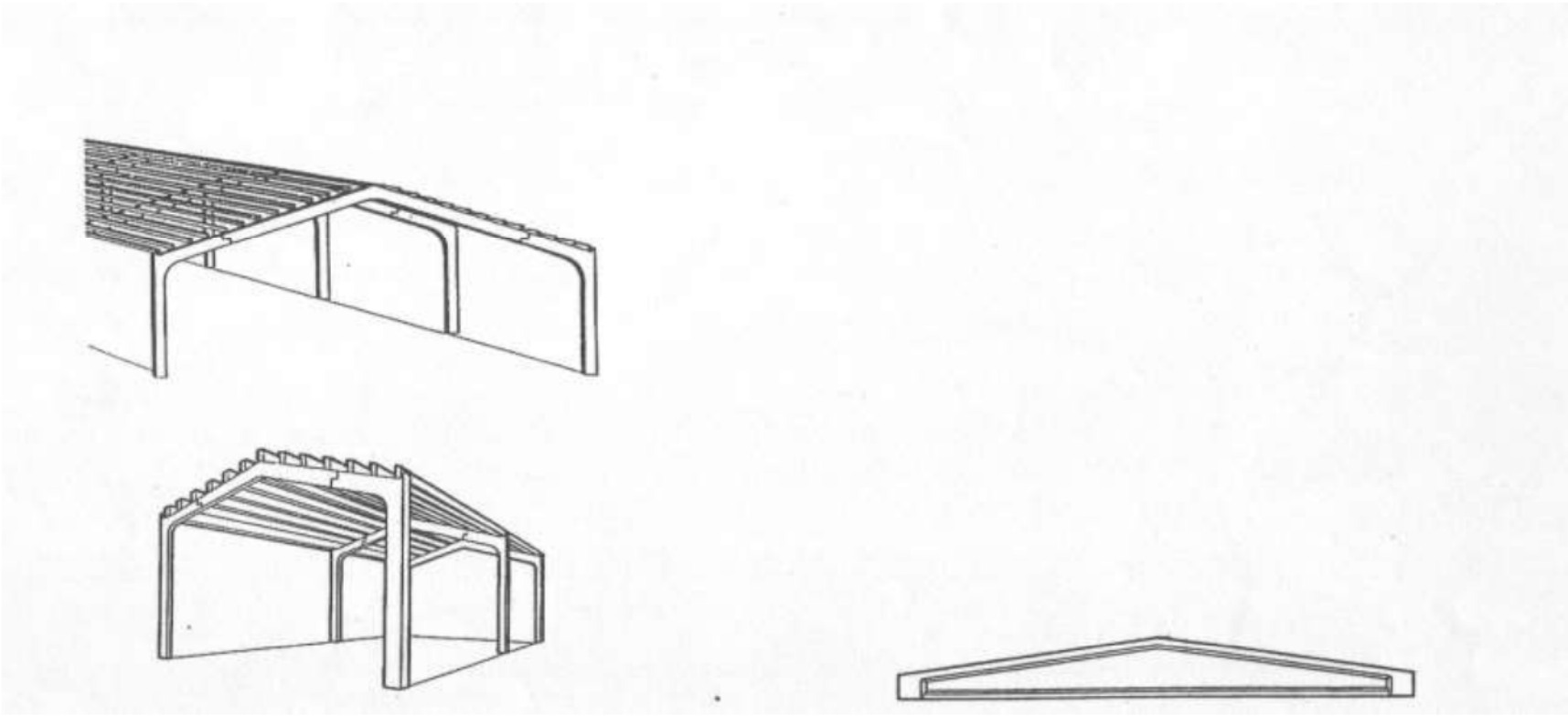
SUPPORTED ON SLOPED BARS STRUCTURE: RAFTERS ON MAXIMUM SLOPE



SUPPORTED ON HORIZONTAL PLANAR STRUCTURE: BRICKWORK+HEAVY BOTTOM SHUTTERING

ISOLATED BARS

CONTEMPORARY SOLUTIONS

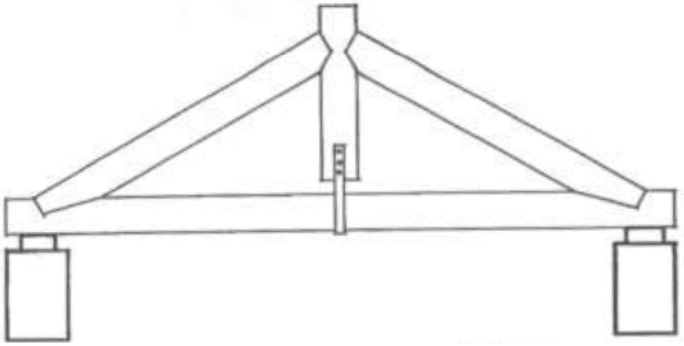


GABLE ROOF PORTAL FRAME

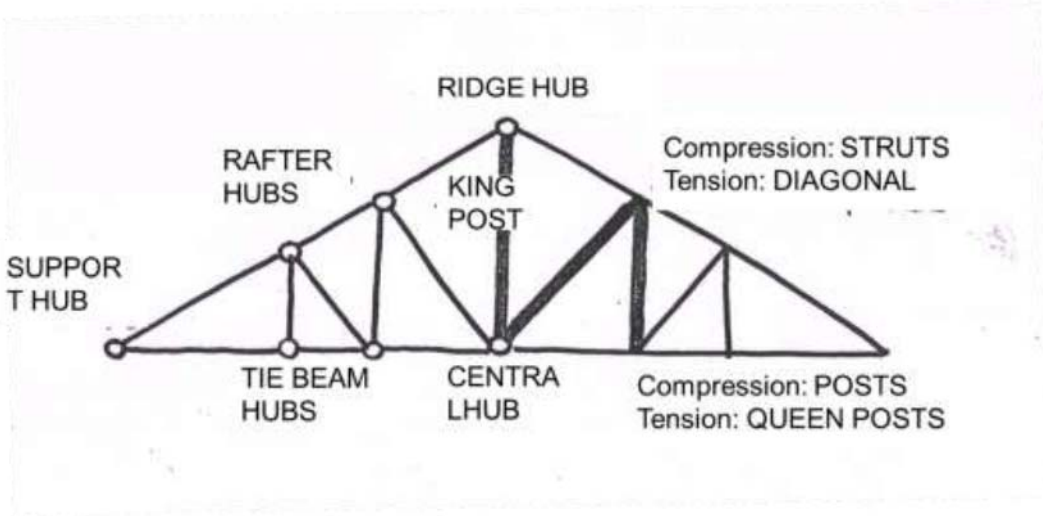
SLOPING MAIN BEAM

TRIANGULAR LAYOUT BARS

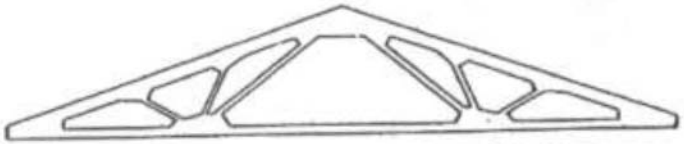
TRADITIONAL AND CONTEMPORARY SOLUTIONS



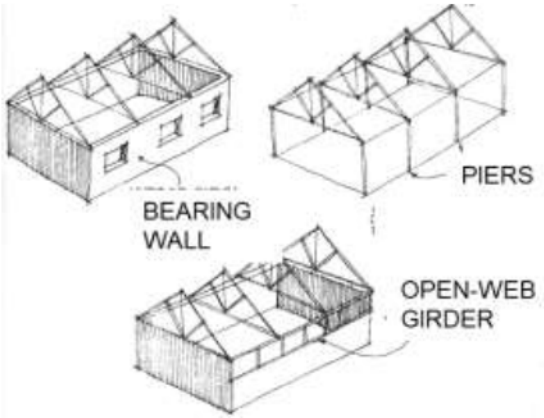
WOODEN TRUSS



STEEL TRUSS

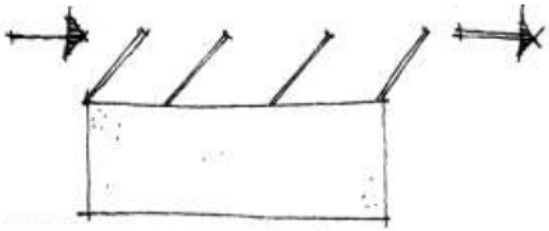


CONCRETE TRUSS



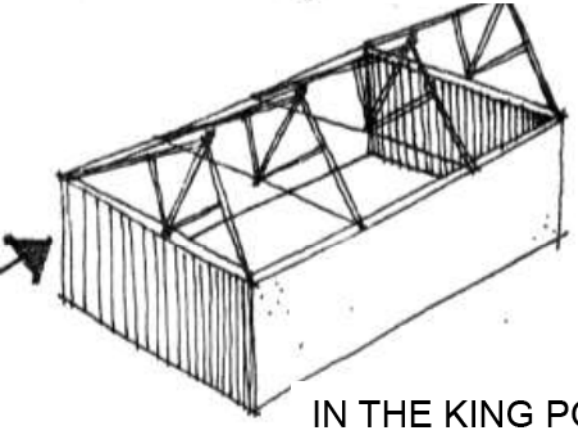
ORGANIZATION.

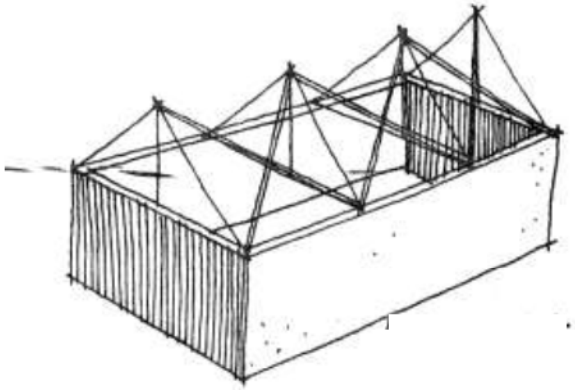
SUPPORT OF TRUSSES



BASIS STRUCTURE

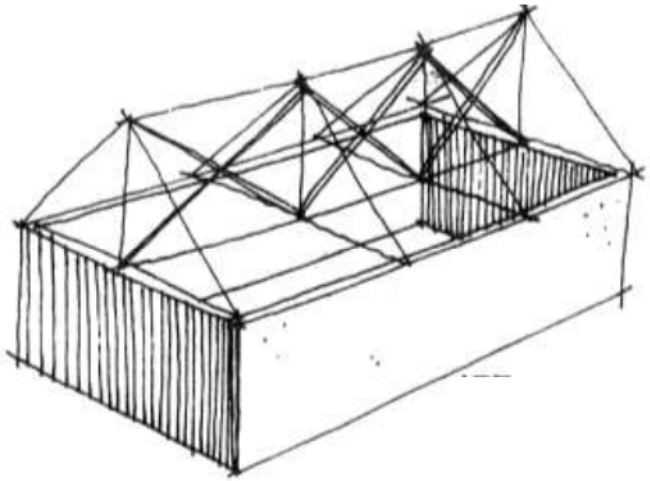
TRUSSES BRACING

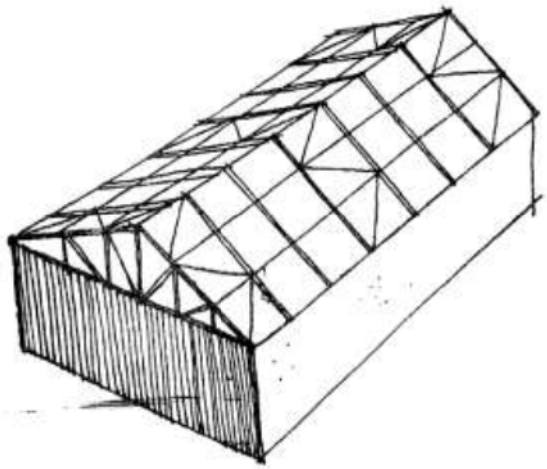


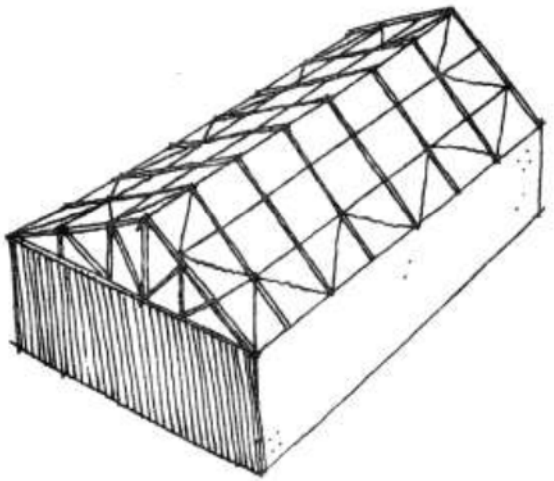


IN THE KING POSTS PLAN

IN THE SLOPES PLAN

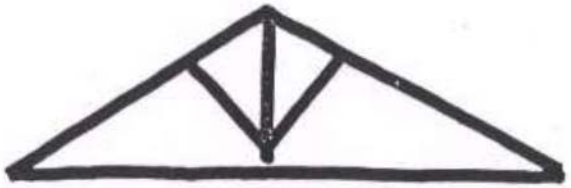




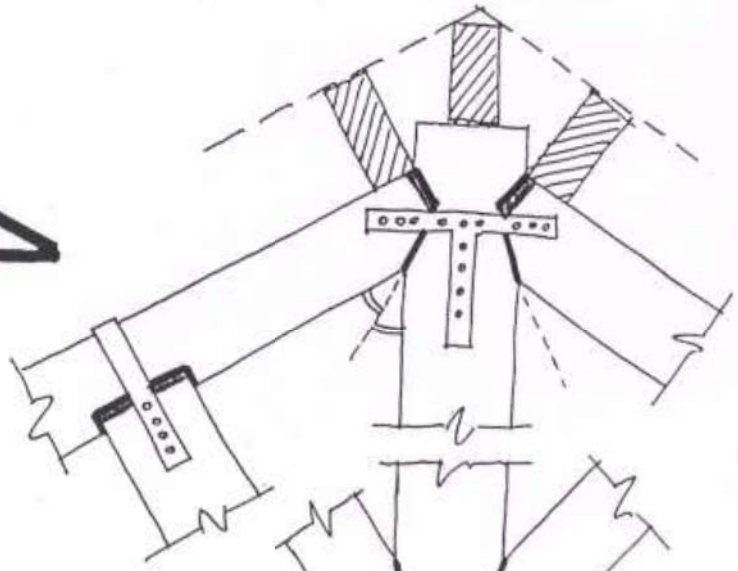


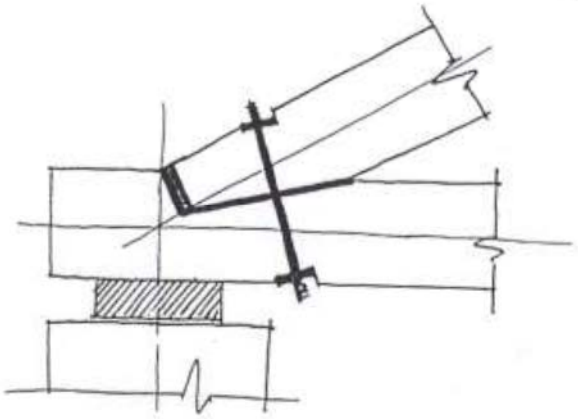
TRIANGULAR LAYOUT BARS

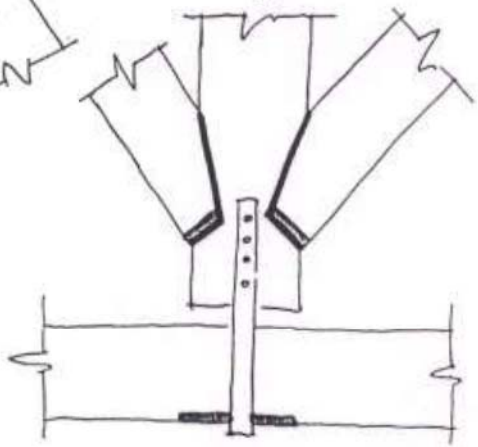
TRADITIONAL SOLUTIONS



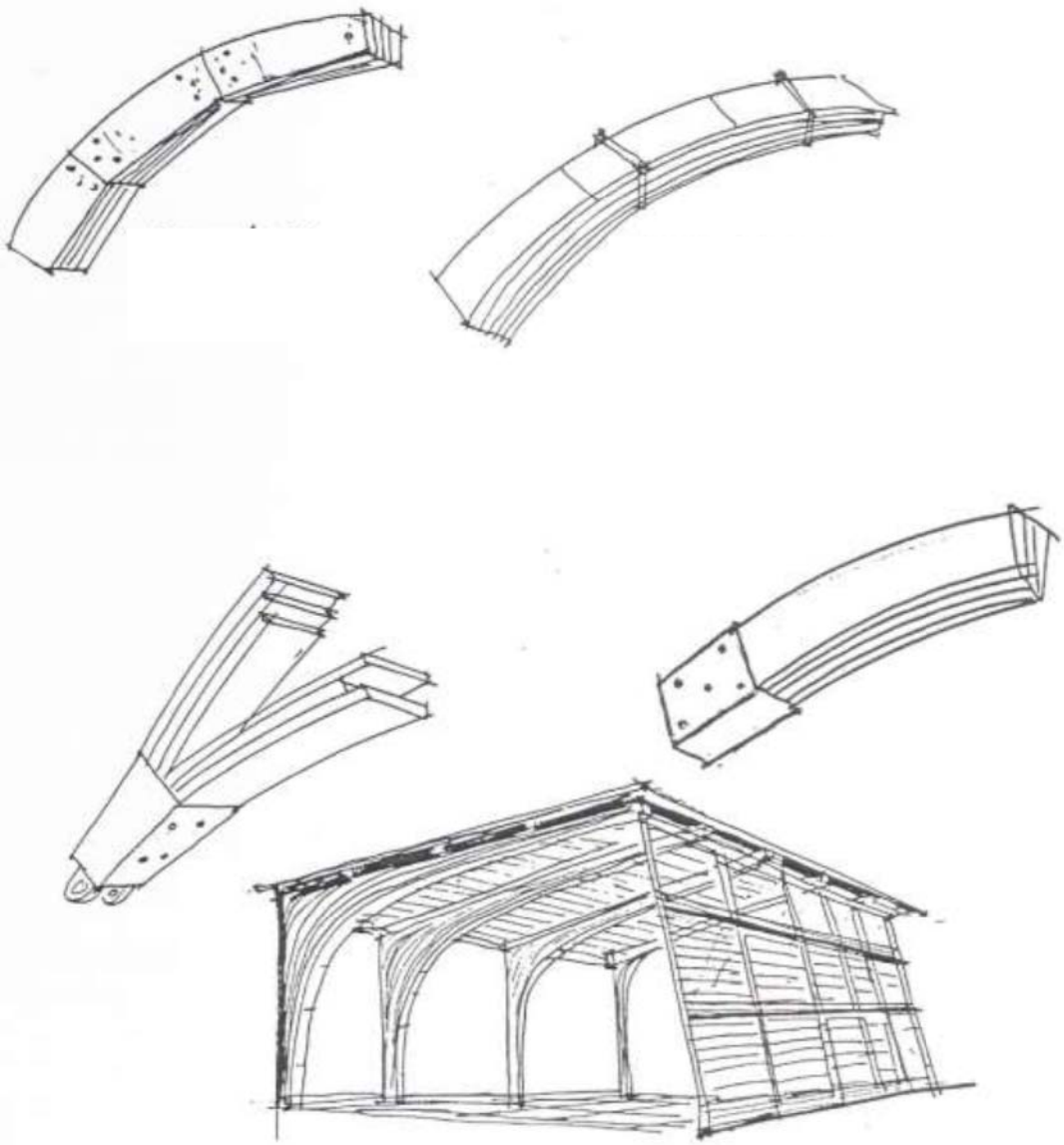
ASSEMBLED WOOD



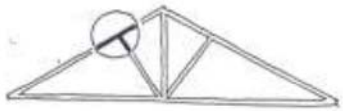




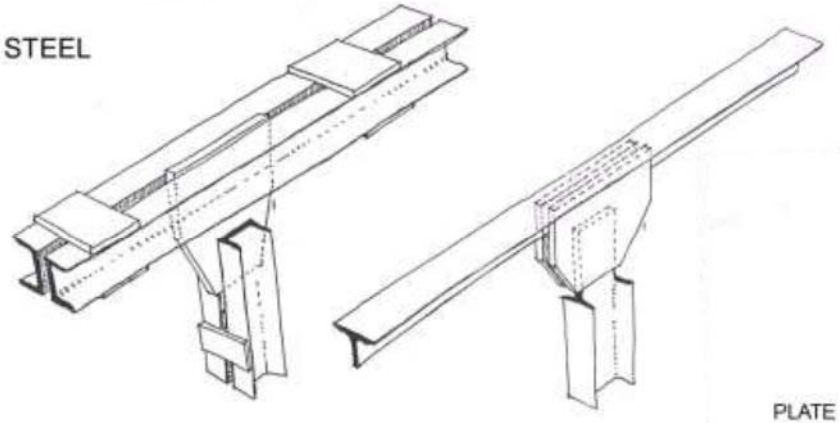
LAMINATED WOOD



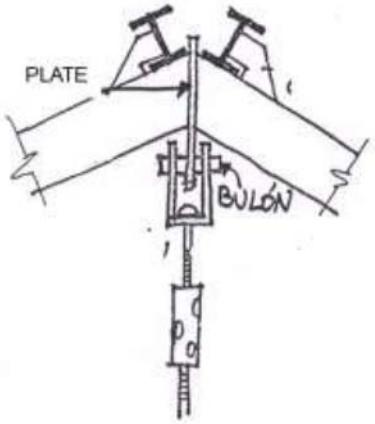
TRIANGULAR LAYOUT BARS
TRADITIONAL AND CONTEMPORARY SOLUTIONS

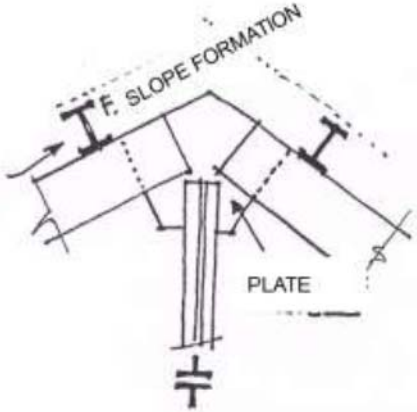


WELDED STEEL



PINNED DOUBLE JOISTS





TRIANGULAR LAYOUT BARS
STEEL. HEAVY MATERIAL SOLUTIONS

BASE AND PLANE STRUCTURE

It can be carried out by any of the following methods:

- With shingle board, (solution in disuse).
- With big hollow bricks.
- With prefabricated reinforced mortar ribbed plates.
- With hydrofuged wood boards.
- With rippled fibrocement board, when the sheathing is solved with curved tile that has the same curvature as the waves of the corrugated. It needs to be supported on steel beams.



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Key Action 2: Strategic Partnership Projects
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