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Object
INSTRUCTION BOOKLET
NEW SCHOOL IN UM AL NASSER, GAZA STRIP

October 2015 - December 2017

Client:
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Architectural Design
ARCò - Architettura e Cooperazione
Società Cooperativa

COMPRESSED EARTH BRICKS

GRAPHIC PROJECT BY

TOOLS

- SHOVEL
- PICK
- WHEELBARROW
- BUCKET
- MESH
- PRESS
- PLASTIC SHEET
- WATERING CAN

MATERIALS

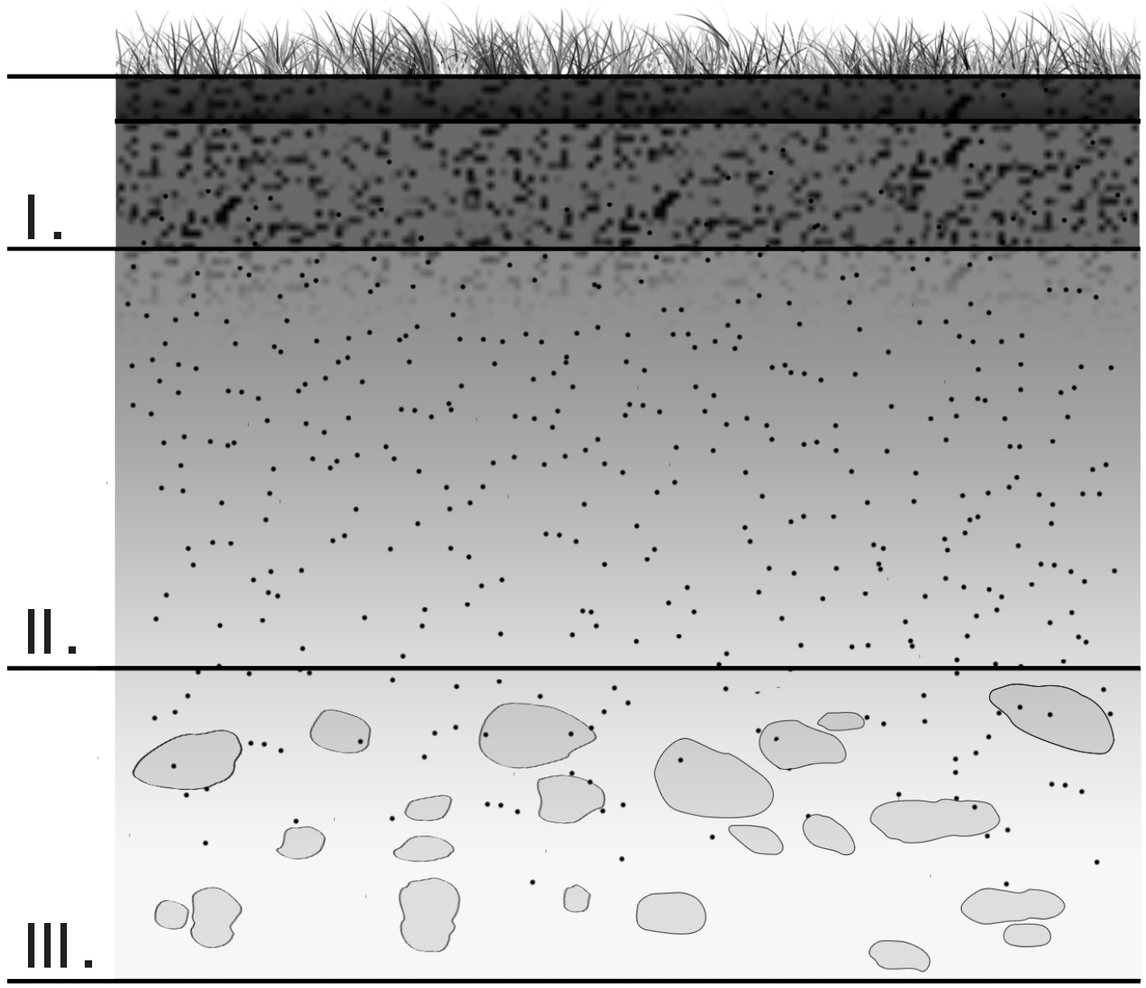
- EARTH
- SAND
- CEMENT

DETAILS

- DO NOT CHOOSE THE SOIL FROM THE TOP OF THE GROUND. THIS FIRST LEVEL IS USE FOR AGRICULTURE. I.

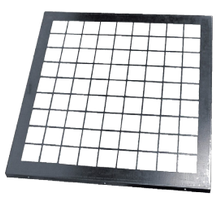
- THE LOWEST LEVEL IS A TO ROCKY GROUND. III.

- THE GOOD SOIL TO USE IS LOCATED BETWEEN
THE TWO. II.



TOOLS

- MESH
- BUCKET
- SHOWEL



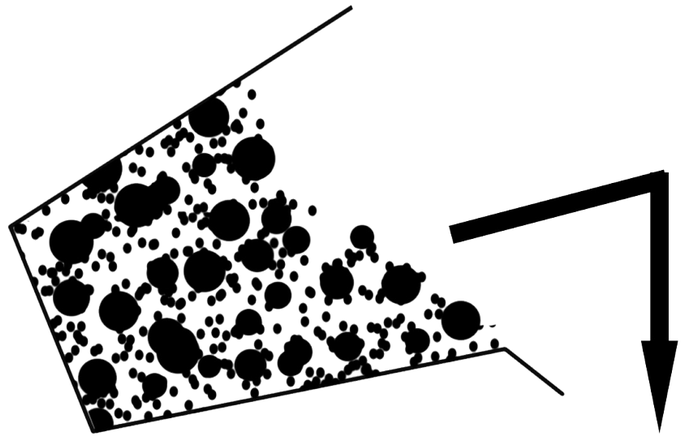
MATERIALS

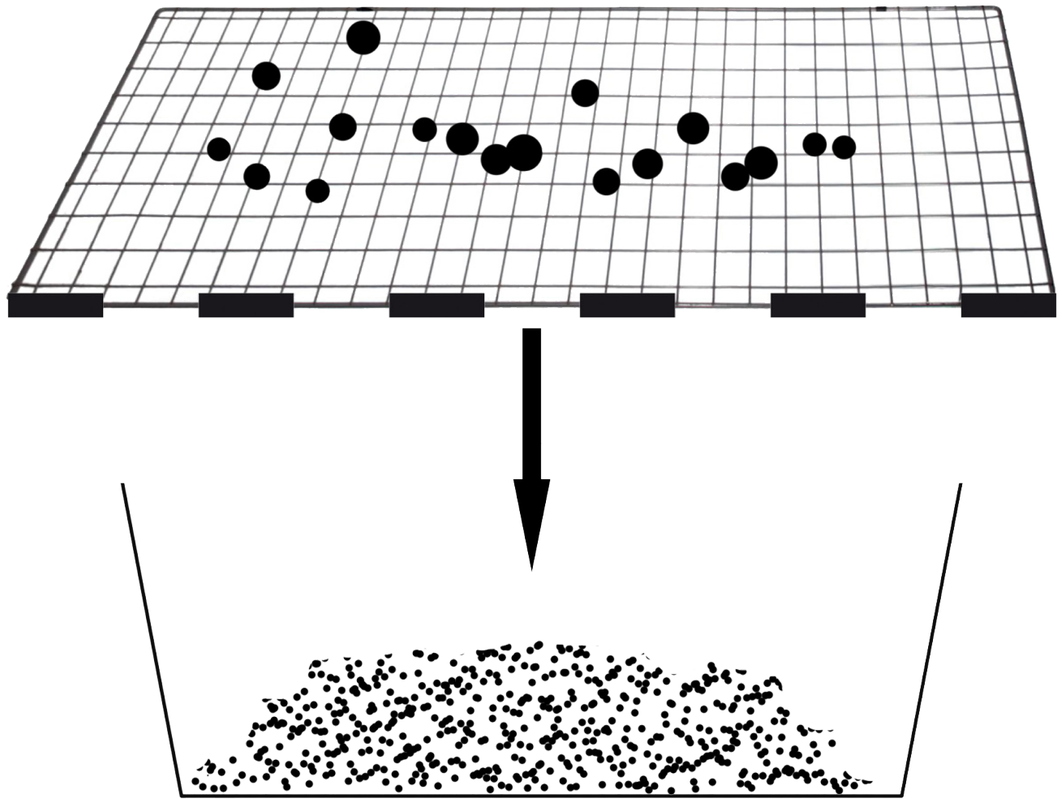
- EARTH

PROCESS

SIFTING THE SOIL

SEPARATE STONES AND GRAVELS WITH A PERFORATED GRID (LIKE A CHICKEN NET) TO HAVE AN UNIFORM SOIL





TOOLS

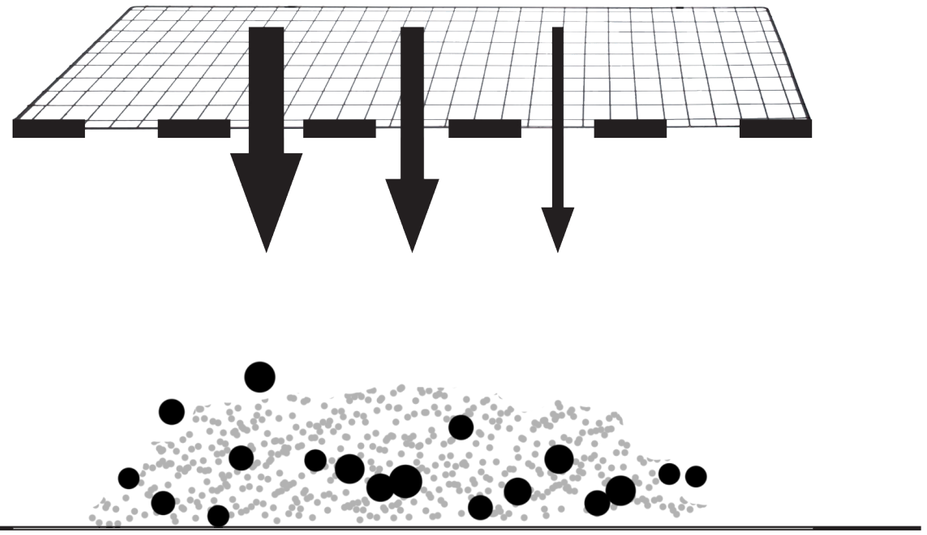
- MESH
- BUCKET
- SHOWEL

MATERIALS

- EARTH

DETAILS

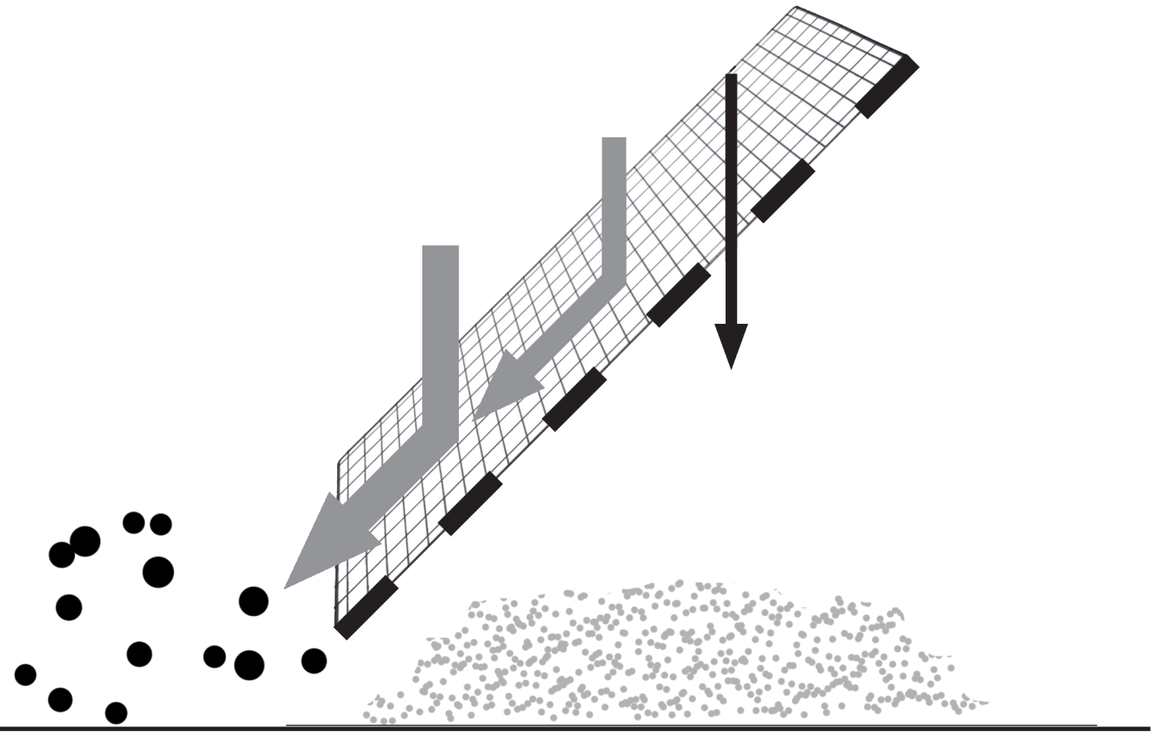
IF THE GRID IS FLAT:
ALL BIG STONES AND GRAVELS ARE FALLING THROUGH THE HOLES.



1.

IF THE GRID IS INCLINED:
BIG STONES AND GRAVELS DON'T PASS THROUGH THE HOLES.

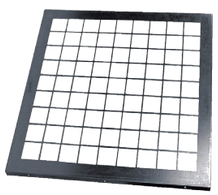
SIZE OF THE WIRE MESH: 1CM X 1 CM.



2.

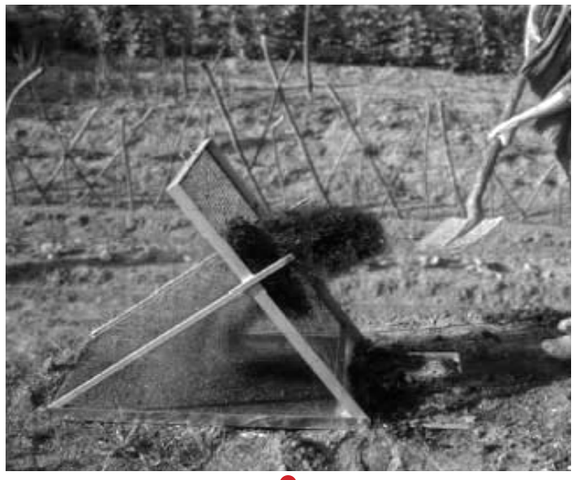
TOOLS

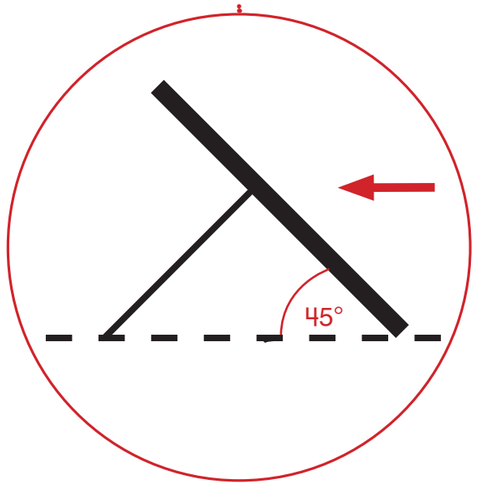
- MESH
- BUCKET
- SHOWEL



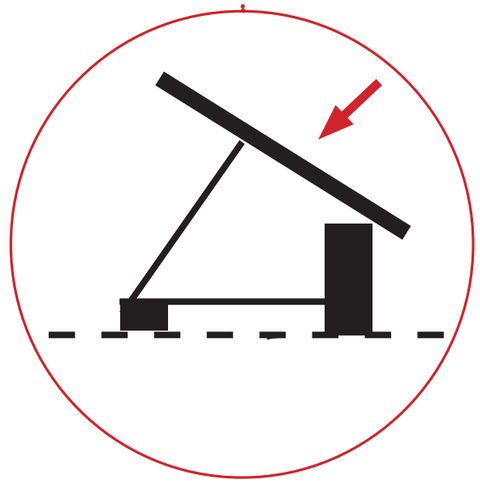
MATERIALS

- EARTH





THE STRUCTURE OF THE MESH SIMPLY LAYS ON THE GROUND WITH A INCLINATION OF 45°.
THE EARTH IS THROWN SIDEWAYS



THE STRUCTURE OF THE MESH LAYS ON THE SUPPORT NOT DIRECTLY ON THE GROUND
THE EARTH IS THROWN OVERHEAD

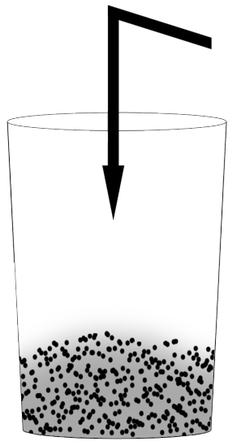
TOOLS

- PEN
- BUCKET
- GLASS

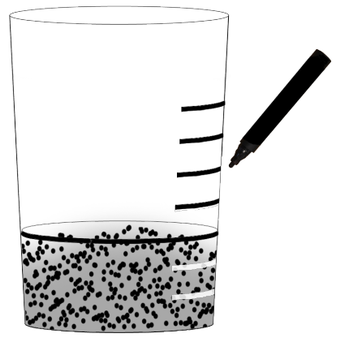
MATERIALS

- EARTH

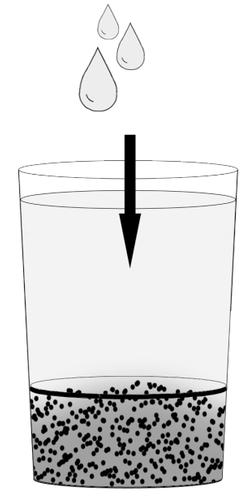
PROCESS



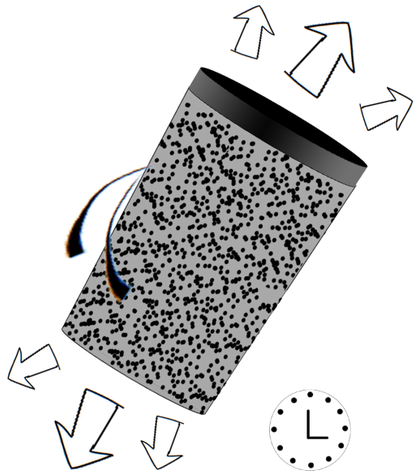
1. FILL 1/3 OF A GLASS WITH SOIL



2. MAKE A MARK AT THE LEVEL OF THE TOP OF THE SOIL

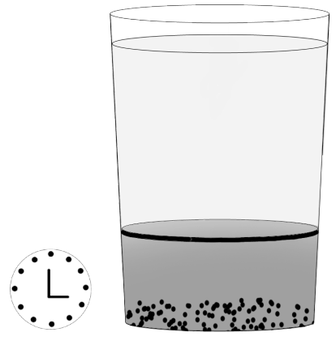


3. ADD SOME WATER IN THE GLASS



4. MIX IT AND WAIT 10 SECONDES

5. ON THE BOTTOM YOU HAVE THE PROPORTION OF SAND IN THE SOIL



6. WAIT 1 HOUR AND THE REST IS CLAY

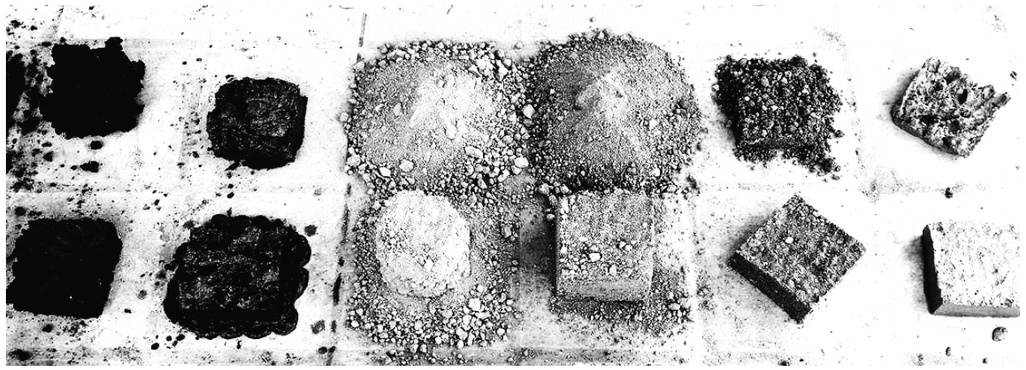
DETAILS

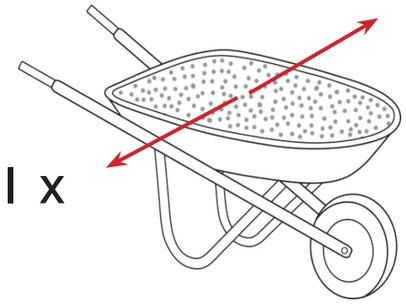
1. USUALLY THE RIGHT PROPORTIONS OF EARTH AND SAND ARE ONE WHEELBAR-ROW FOR THE EARTH AND ONE BUCKEI FOR THE SAND

2. YOU HAVE TO TEST YOUR SOIL TO FIND YOUR GOOD PROPORTIONS.

3. OUR GOOD PROPORTIONS ARE AROUND:

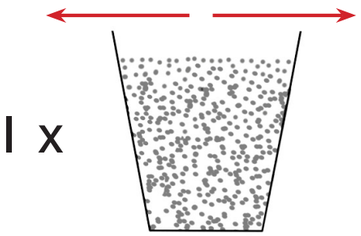
SAND (50%)
CLAY (50%)
GRAVEL (15%)
SILT (15%)
CEMENT (5%)





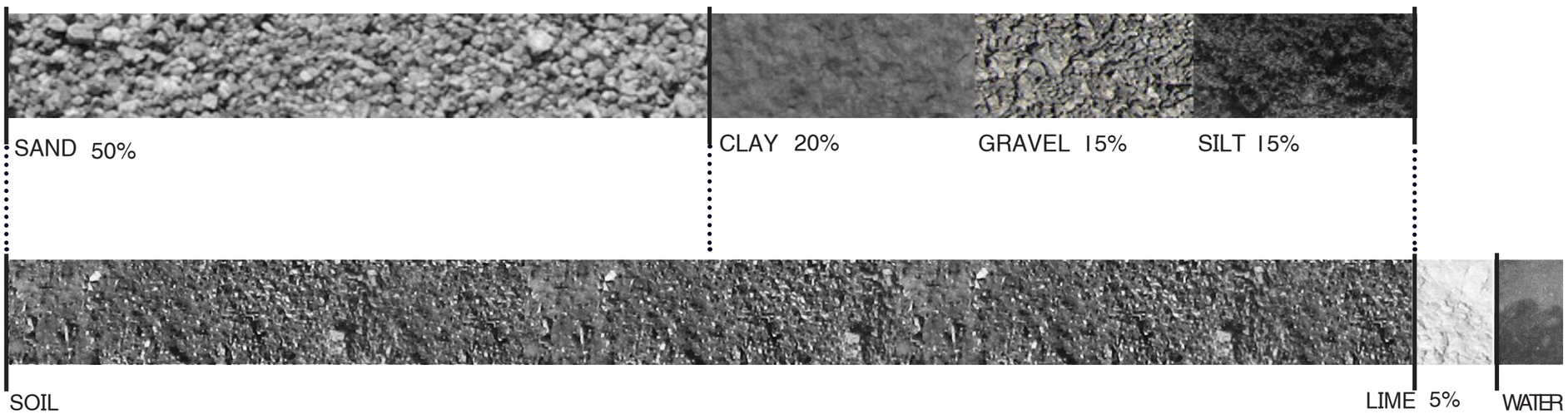
1 x

QUANTITY OF EARTH



1 x

QUANTITY OF SAND



TOOLS

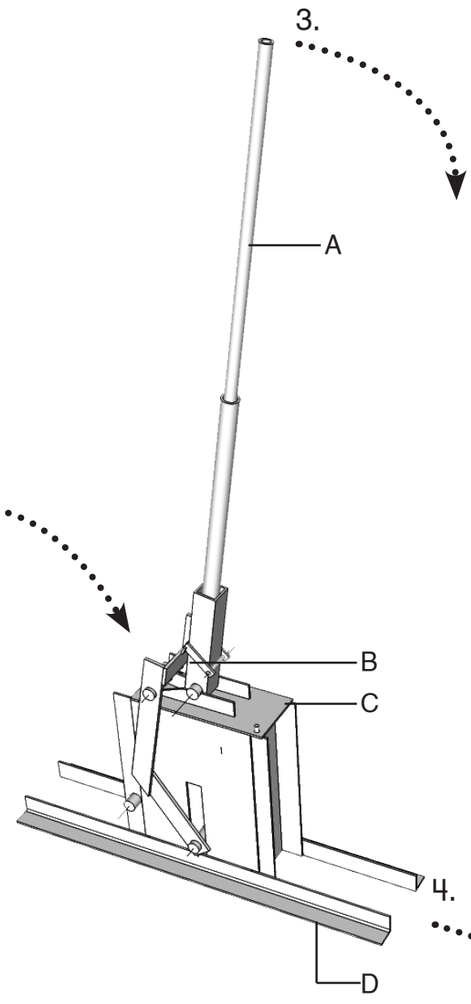
- PRESS

MATERIALS

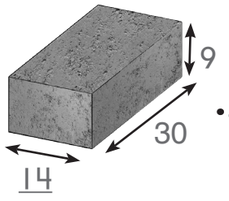
- EARTH
- SAND

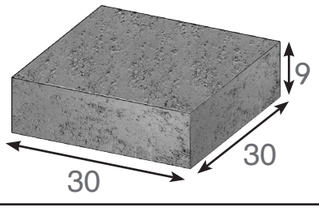
PROCESS

1. FILL THE MOULD WITH MIXED SOIL
2. LEVEL THE MOULD
3. PRESS
4. REMOVE THE BRICK



A. PRESS HANDLE
B. COMPRESSION LEVER
C. MOULD BOX
D. PRESS BASE





HUMID CURING AND FINAL STORAGE

TOOLS

- PLASTIC SHEETS
- WATERING CAN

MATERIALS

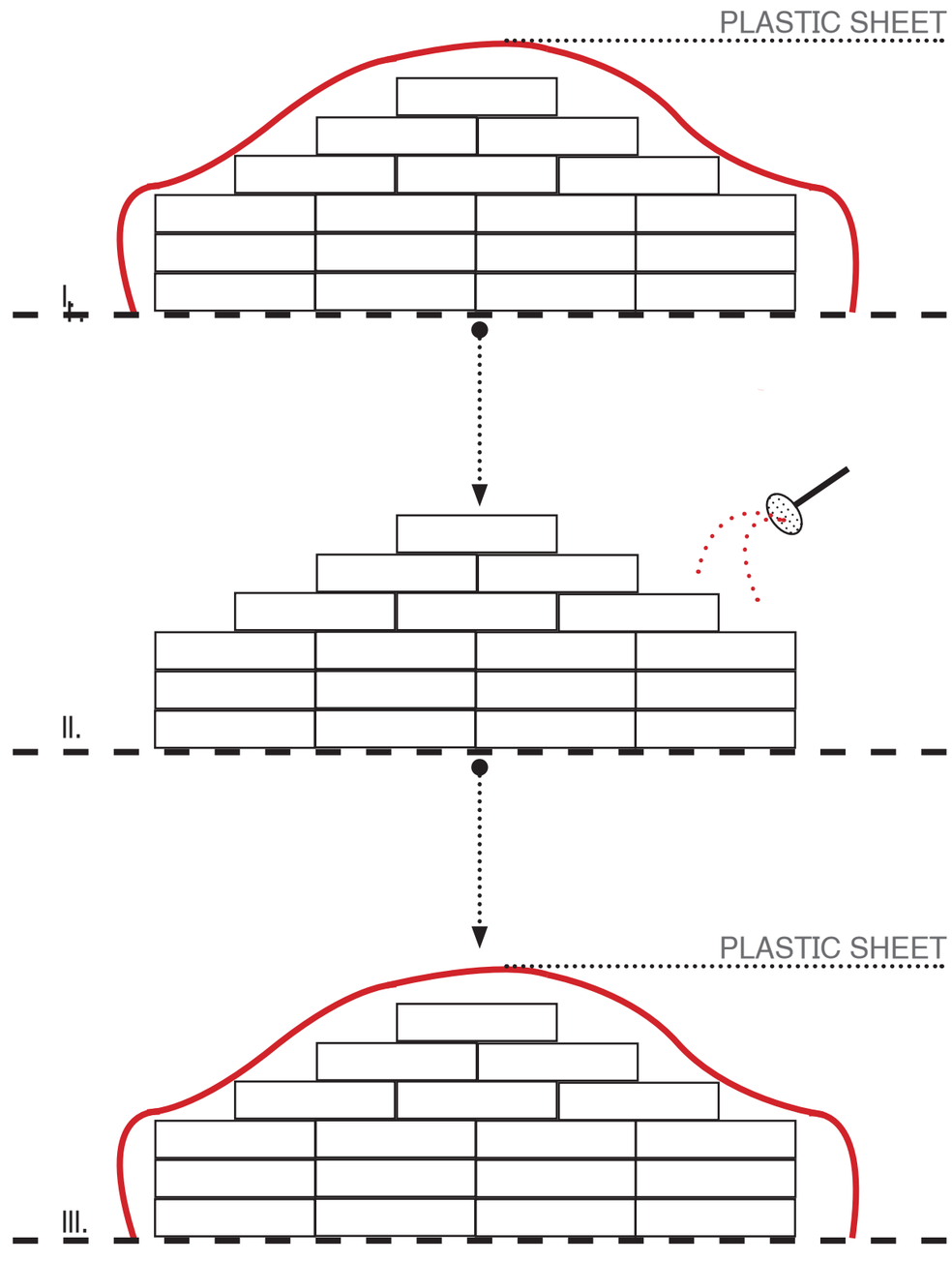
- WATER

PROCESS

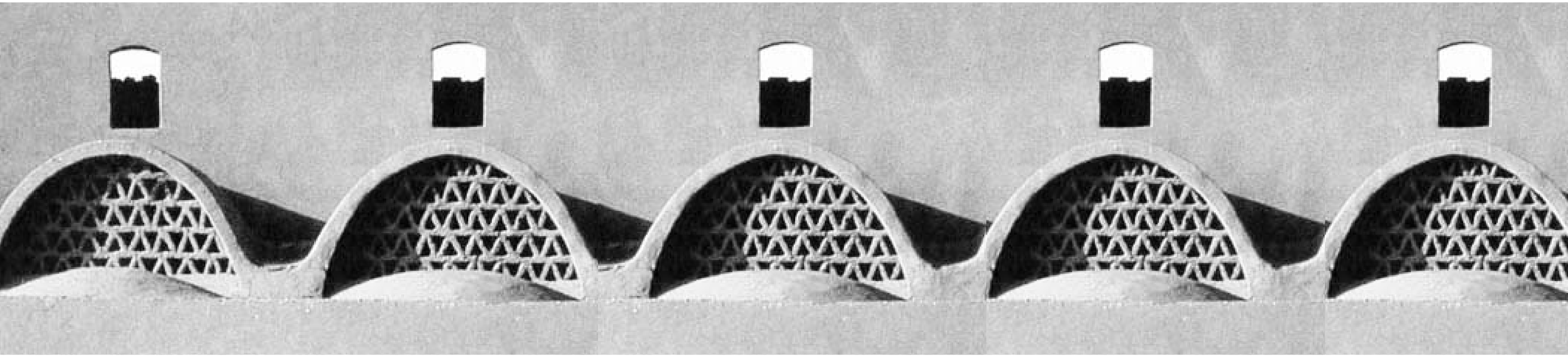
1. STORE THE BLOCKS UNDER THE PLASTIC SHEET

2. THE BLOCKS WILL STAY 2 DAYS AND 3 NIGHTS UNDER A PLASTIC SHEET

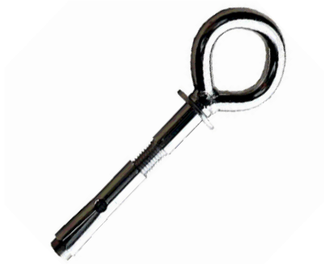
3. AFTER 2 DAYS SPRINKLE THE BLOCKS AND COVER WITH THICK PLASTIC DURING 7 DAYS

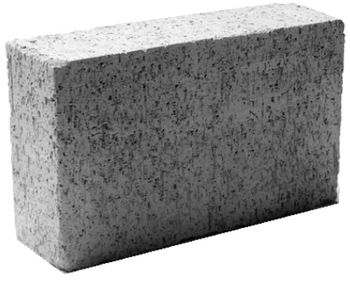


THE NUBIAN VAULT



GRAPHIC PROJECT BY





TOOLS

- MEASURING TAPE
- NAIL
- HOOKS
- HAMMER
- STRING
- TROWEL
- BUCKET

MATERIALS

- COMPRESSED EARTH BRICKS
- MORTAR
- LIME

BUILDING THE STRUCTURE I

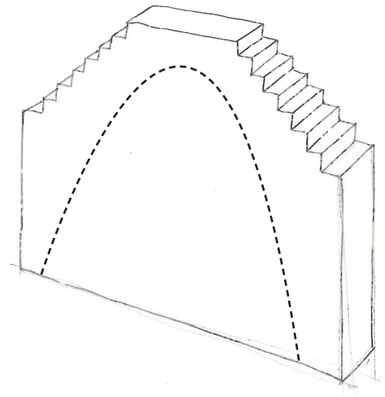
TOOLS

- STRING
- MEASURING TAPE
- NAIL
- HAMMER

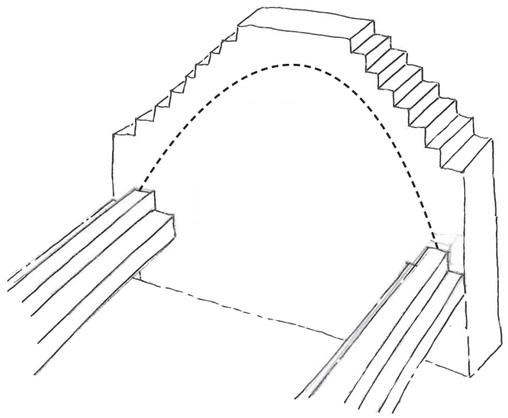
PROCESS

1. BUILD THE SUPPORTING WALL WHICH WILL BE ABLE TO WITHSTAND THE WEIGHT OF THE VAULT

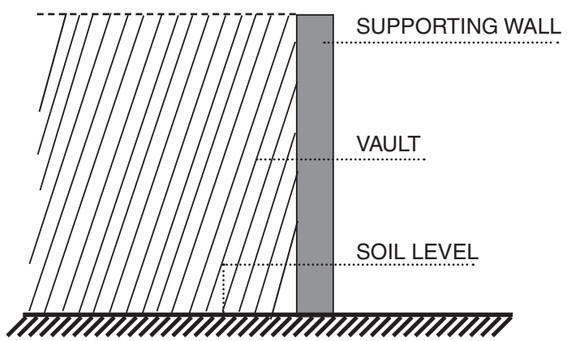
2. LAY THE SUPPORT BEAMS OF THE VAULT TO OBTAIN THE NEEDED HEIGHT



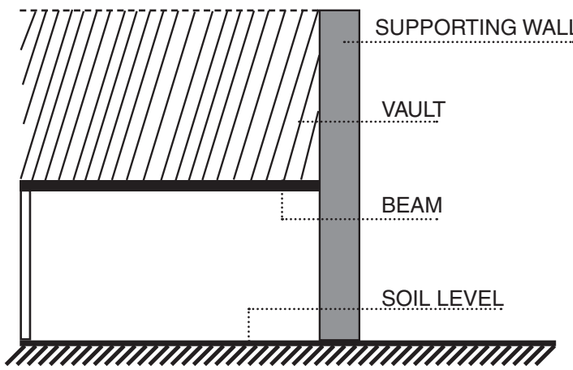
1. SUPPORTING WALL



2. SUPPORTING BEAMS



START THE VAULT TO MEASURE 0,00



START THE VAULT TO MEASURE X

WHAT IS A CATENARY VAULT?

IN PHYSICS AND GEOMETRY, A “CATENARY” IS THE CURVE THAT AN IDEALIZED HANGING CHAIN OR CABLE ASSUMES UNDER ITS OWN WEIGHT WHEN SUPPORTED ONLY AT ITS ENDS.

WHY?

THE CATENARY HAS THE PROPERTY OF HAVING A UNIFORM DISTRIBUTION OF ITS TOTAL WEIGHT AT EACH POINT. THE STRUCTURES MADE FOLLOWING THIS CURVE ARE SUBJECT ONLY TO TRACTION OR, ALTERNATIVELY, TO COMPRESSION, WHEN THE STRUCTURE IS SHAPED LIKE AN OVERTURNED CATENARY, AS IN THE DOMED STRUCTURES.

HOW TO DRAW IT?

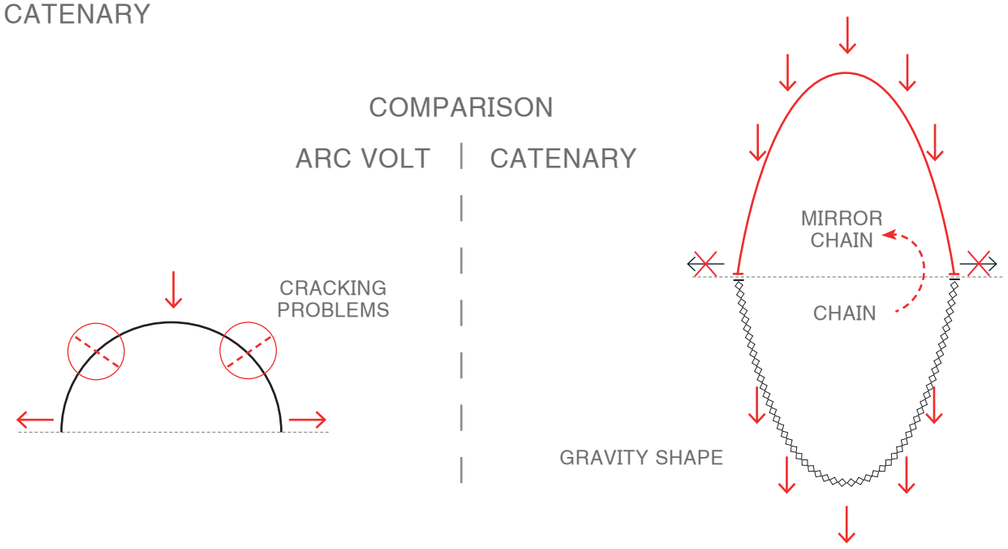
CHAIN METHOD

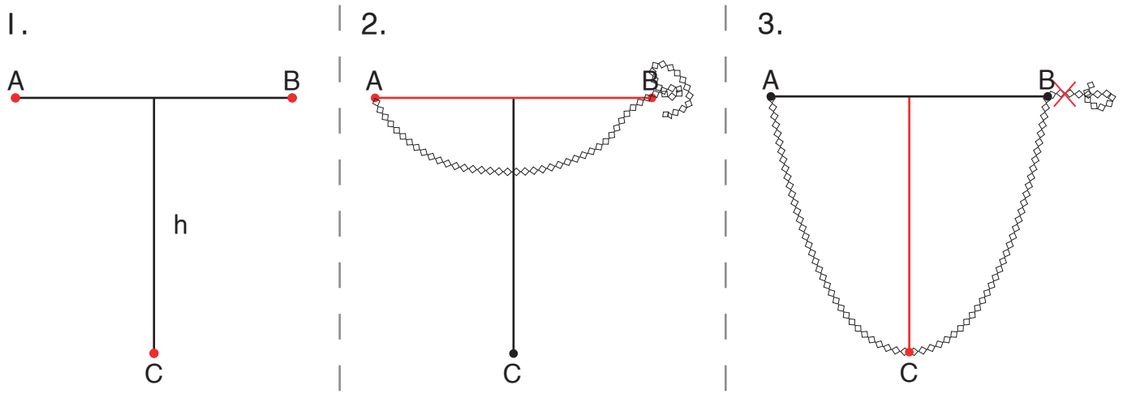
1. DECIDE THE WIDTH (“A” - “B”) AND THE HEIGHT (h) OF THE VAULT;

2. FIX THE CHAIN IN THE POINT “A”;

3. MAKE THE CHAIN LONGER UNTIL IT REACHES THE POINTS “C” AND “B” AND CUT THE CHAIN IN THE POINT “B”.

GIANT CATENARY





TOOLS

- STRING
- MEASURING TAPE
- NAIL
- HAMMER

HOW TO DRAW IT?

STRINGS METHOD

MARK THE VAULT ON THE WALL:

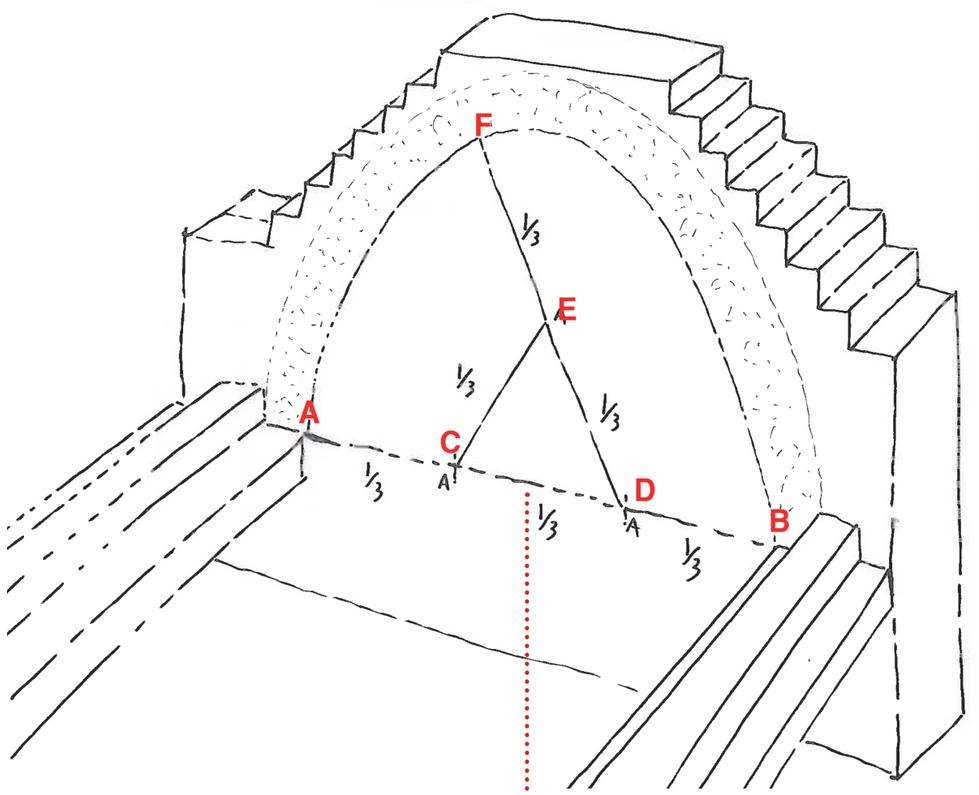
1. MEASURE THE WIDTH (A - B) OF THE VAULT AND DIVIDE IT INTO THREE EQUAL PARTS

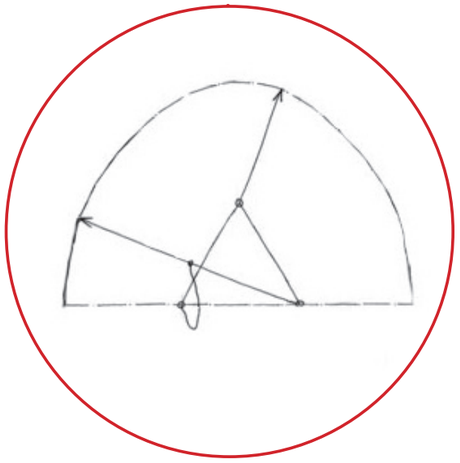
2. FASTEN WITH NAILS THE FOUND POINTS

3. TIE TWO WIRES IN ORDER TO OBTEIN THREE SEGMENTS OF THE SAME LENGTH (1/3 OF THE BASE)
(AC = CD = DB = DE = EC = EF)

4. TIE THE STRINGS TO THE NAILS AND DRAWING THE ARC

CHECKING BETWEEN STRING AND CHAIN METHOD.
STRING METHOD CAN BE EASIER BUT NOT AS PRECIDE AS THE REAL CHAIN.





DETAIL OF THE USE OF THE STRINGS

TOOLS

- STRING
- HOOKS
- NAIL
- HAMMER

MATERIALS

- WOOD

HELP FOR DRAWING:

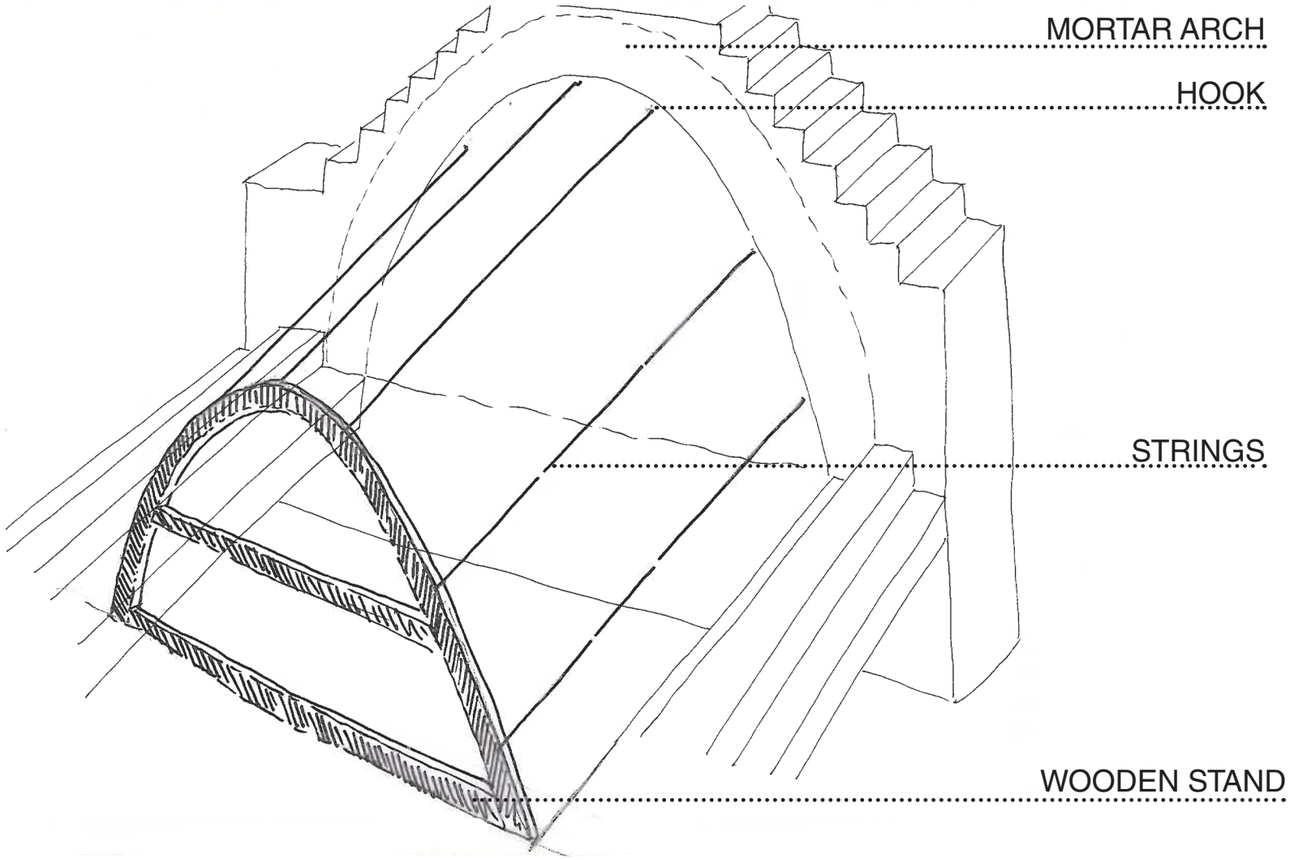
TO DRAW THE VAULT WITH GREATER ACCURACY IT IS POSSIBLE TO USE A SYSTEM THAT ALLOWS TO FOLLOW THE CORRECT TRACK OF THE VAULT DURING THE CONSTRUCTION.

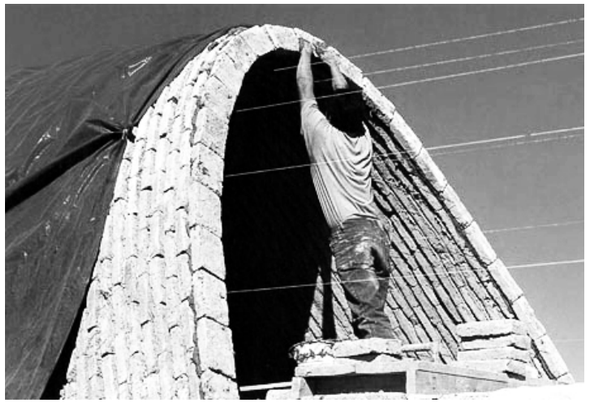
FOR THIS SYSTEM IT IS NECESSARY TO FABRICATE A WOODEN STAND.

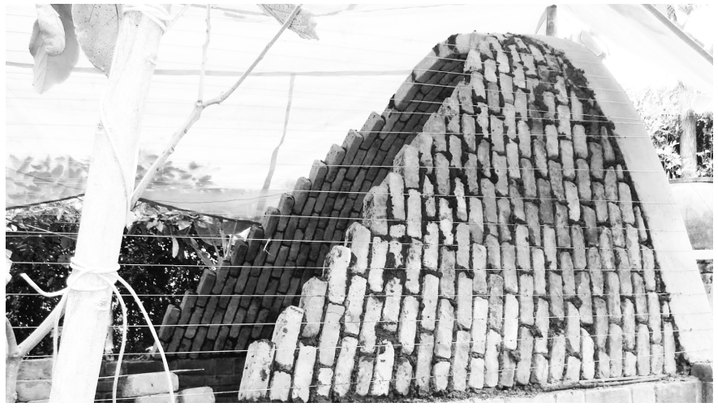
PROCESS

1. FIX THE HOOK ON THE SUPPORTING WALL

2. CONNECT THE HOOK AND STAND WITH HORIZONTAL LINE (STRING)







TOOLS

- TROWEL

MATERIALS

- COMPRESSED EARTH BRICKS
- CEMENT

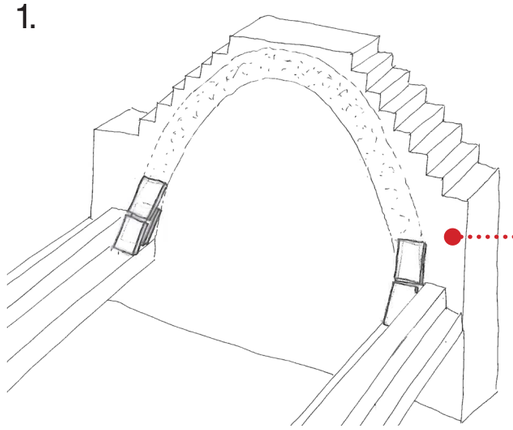
PROCESS

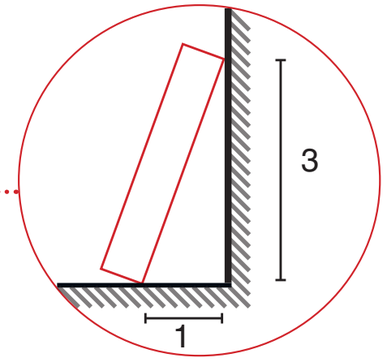
1. PLACE THE BRICKS IN ORDER TO FORM AN ANGLE WITH THE BASELINE OF THE VAULT .
THE FIRST BRICK WILL REST DIRECTLY ON SUPPORTING WALL ON WHICH WILL BE FIXED WITH THE MORTAR.

2. PLACE THE BRICKS ONE OVER THE OTHERS TO DEFINE THE FIRST ARC.

3. KEEP ON BUILDING THE VAULT, LAYER AFTER LAYER.

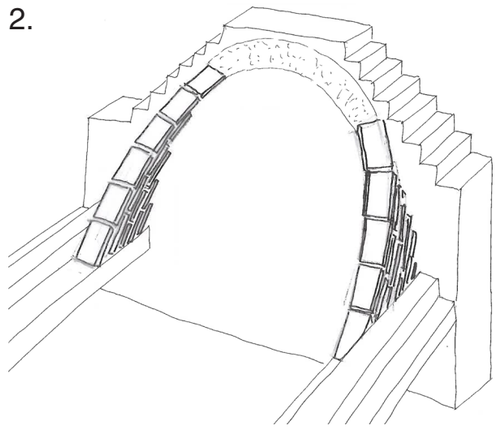
1.





INCLINATION DETAIL OF THE VAULT BRICKS

2.



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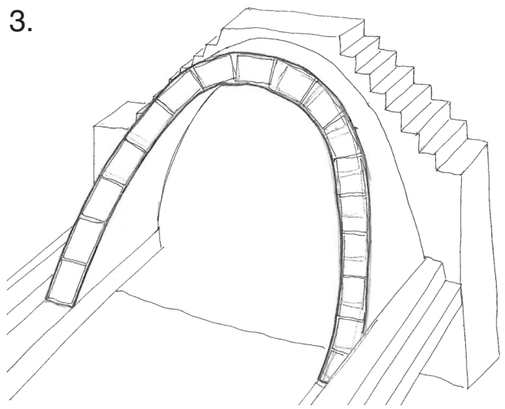


TOOLS

- TROWEL

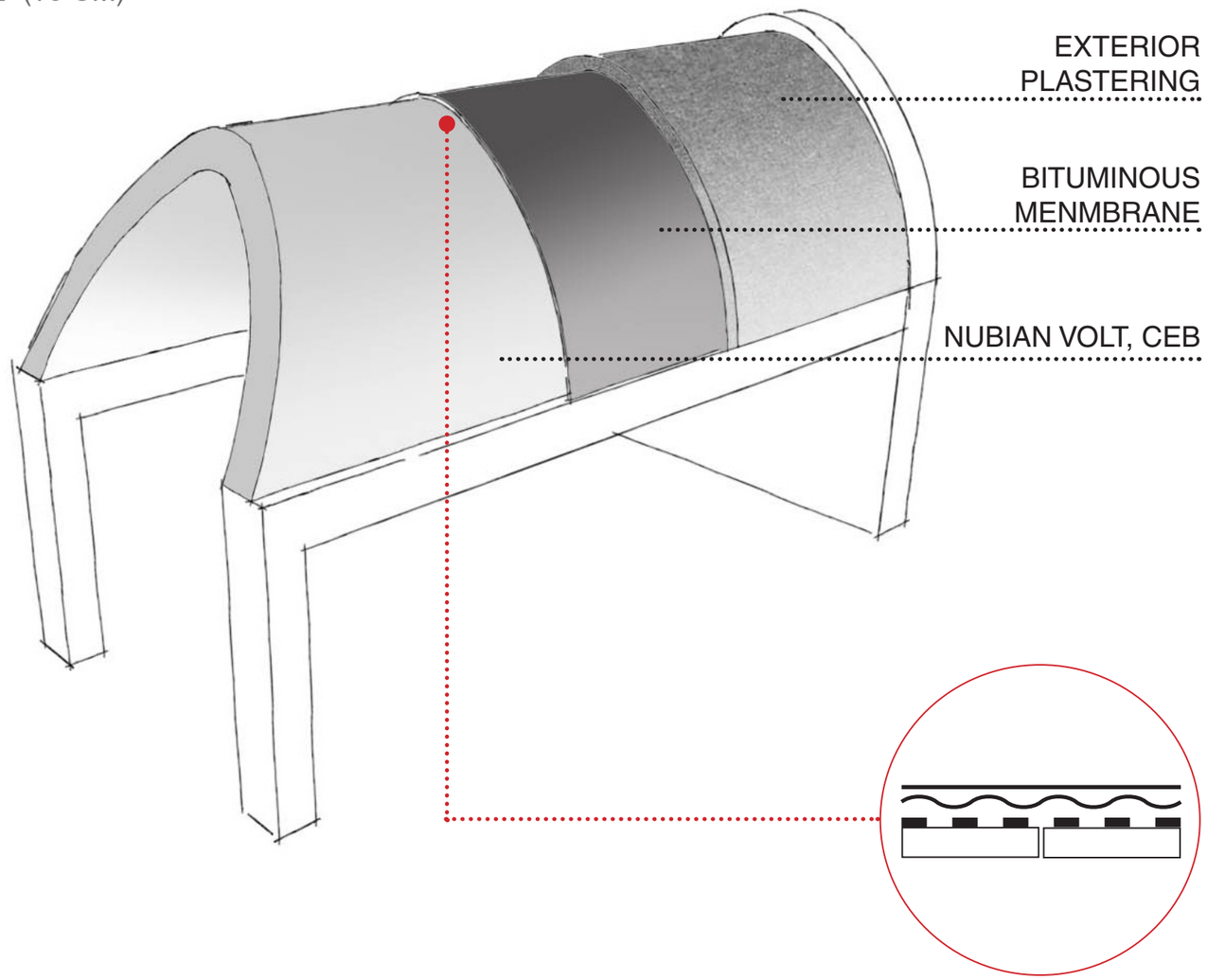
MATERIALS

- COMPRESSED EARTH BRICKS
- LIME
- BITUMINOUS MENMBRANE

PROCESS

1. LAYING THE BITUMINOUS MENMBRANE

2. COVERING WITH EXTERIOR PLASTERING OVER THE NUBIAN VOLT CLAY AND LIME (10 CM)



THE END

GRAPHIC PROJECT BY