

TRADITIONAL BUILDERS TRAINING WORKSHOP.

The architects local arch's + builders as in small cities are basically responsible for private + public building - These people are very useful because of their own experience of local building + methods of bldg + have very good ideas.

Workshop for 4 weeks between Bahman - Esfand 1355. , organised by SIDP. The participants were the builders + laborers of the building industry of the villages in Bakhs Luristan + 2 Yazdi ~~builders~~ master masons. + D.W.

Basically used each others experience to make better use of local building materials and skills.

Aims.
2 main

aims of workshop - 1. Development of indigenous building methods based on experience & knowledge of participants.

~~The~~ group 2. To enable local people to meet the building needs of the region without relying on city based contractors + ~~raw~~ imported materials.

The training was through discussion, experimentation, practical demonstration. In detail ^{to follow} explained about different kinds of earth, foundations, walls, roofs. Each of the participants would talk about their own experience for each of the stages, and the best solutions would be agreed upon. Each building solution would be experimented

2 on in the yard and practical experiments
done on wood, stone + mud brick. From
the experiments on different kinds of earth
which would be easy for builders + owner builders
to understand. In respect to the different kinds
of local earth, to increase the mud walls
load bearing capacity and reduce deterioration
from wind and rain, stabilisers were found.

The best kind of ^{rammed} roof and domes were chosen
and the builders were taught how to build
them. An important section of the training
was training the local builders to use the
local materials in order to protect the traditional
buildings from earthquakes. We invited
a stone mason for 2 weeks to teach the builders
how to work with stone. One of the Yazdi
people from Yazd gave a lengthy talk
about the historical buildings of the area.
In the afternoons there were classes for the illiterate
local architects/builders. The workshop
demonstrated the basic importance of
literacy by relating it to their work. By gearing
a literacy program directly to the
becoming literate.

In general the aim of the workshop was to produce
a way of methodology of training the builders
with their minimal knowledge education so that
it would be easy for them to use their local ways
of building. This methodology, based on problem-
solving - within the workshop.
(identification)

MASHKOURI

By that time there were many local architects and builders who could take responsibility for the plans, and these people started teaching new trainees and using the same methodology of the workshop.

[2]

In the first ^{session} meeting ~~we do~~ ^{we} (everyone) ^{the builders} discussed the aim of the workshop and what they would do at the end. In this meeting it was agreed that the local ways of building was the main structure of the program. Besides the ways of local building being the structure, it we would then discuss ~~the~~ ^{the} role of building ⁱⁿ development, especially in Rural Dev, in respect to economic, social, environmental considerations. To be able to solve or improve / (overcome the problems) the local ways with the use of local materials (resources). It was agreed that the design of the building; drawings, working drawings, management of building would be done by the local builders and even calculation ~~of~~ ^{of} estimates for materials and ordering, and the ~~different~~ ^{different} stages of building from foundation to roof would be discussed, experimented and practiced in the workshop. And it was explained that by visiting and observing the buildings in gaps which were built with developed local technologies, exchange of local ^{skills} technology from one area to the other would be possible.

② One of the basic comments that the builders made was that by seeing the different complicated building one could understand the skills, but then the skills should be experimented on, and that the ways of building would much depend on their economic status, and therefore when they are in much better economic situation they would for example change the walls of their houses from chineh to mudbrick and with a better financial situation it would be changed to fired bricks. We agreed that it is true that it depends upon their financial situation, but by observing examples of developed local skills discussions would be held with a much wider view & their experience would richer.

Observation and experimentation complement each other. So it was agreed that $\frac{1}{2}$ of the time of the workshop would be spent on training observation and the other half to ^{training} experimentation.

Although it is true that economical status is one of the basic factors in the way of improving housing and with the improvement of the economic status housing will be improved, but one should bear in mind that with improving the skills of the people, the quality of building and housing could be improved too. One could give the best efficiency to the locally available cheap materials by researching ^{about them} and improving them. For example mud bricks in Yazd is of very good quality, and the people of Luristan can use the Yazdi ways of making mud bricks.

In addition the new methods for the improvement of the material and the skills can be taught in this workshop and be experimented on so that

5 The best results are would be used by the villagers. ^{It would not}
About the way that the workshop works, ~~it is not~~
~~going to be the same relation as teacher/student,~~
~~but would be more like observation and practical~~
activities it would not be anything similar to the way
that school classes work, which is basically a
relationship between the teacher and students
relationship and the lessons would be purely
Observation and practice, but these ~~are~~ meetings
will be discussions which everybody will be
using each other's information and experiences
and the problems will be discussed in groups.
and therefore solutions which everybody agrees
on are necessary, so that everyone can use
each other's knowledge in the best way. <sup>(for someone who
is experienced and
has 4 yrs exp)</sup>
In this case one must be very patient
and be able to listen to those with minimal
experience as they might have precious comments
to make.

3# This patience must be kept all the way through
the practical + observation activities and the
more specialised jobs of builders and labourers, eg mixing
mortar, brick carrying will be done by everyone.
Otherwise you must be ready with
an open mind to be trained, and not think
that we are an expert in a field and we do not
need to learn about it. We should not be annoyed
from each other's criticism and start defending
ourselves - one has to think about it and see
whether the criticism is right or wrong. We
should not be proud of ourselves and of
everyone uses each other's knowledge, obviously
one will learn more. Most of you are from
a rural area which you know about its particular,
and would like to develop the area.

The aims of the workshop are basically developing architectural skills to satisfy the needs of the villages and small towns like Aashatav. The workshop's activities are centralised on the necessary skills for the villagers and they would be less used in larger cities. The precise workable program and its timing is based on the needs and the intelligence of the people taking part in the workshop; but there will be a scheduled program which will be distributed to the participants.

At the end of the meeting the bulldos suggested that in their spare time literacy classes are formed so that those who have been in such classes could teach the others to read and write. This suggestion was praised by the other members of the workshop and it was agreed that the literacy classes would be in relation with the architectural and drawing.

Meeting 2. Discussion on endogenous development.

At this meeting ^{attempted to present and discuss} ~~it was tried to~~ problems and solutions of development ~~on the basis of~~ depending on the area on the basis of the potentials of the region. ~~were presented and discussed.~~

Therefore questions about the potentials and the problems of the area were put forward and the bulldos answered these questions.

- ①. Think about your area and explain the negative and positive points about it.
- ②. Lots of water resources; fertile land; productive agriculture; animal husbandry; tough grazing of sheep/goats in scrub forest; lime; clay; timber beams historical remains; (after a little bit of help about the social relationships, answers continued) close relationship between neighbours and relations;

(fellow workers) and serious friends:
Social cooperation

Q.2 Explain the negative points and problems of your area.

A. Shortage of bread + meat; unpurified water; ~~short~~ shortage of public transport; no bus terminals; high prices (in general); absence of factories and shortage of workplaces; school; being afraid of opening individual business; agricultural deterioration (absence of factories in relation to agriculture); dry farming; the landlords and Ehangs would not let the farmers take part in agriculture.

Then the answers were mixed and this is what the result came to.

Positive points.

1. Natural resources
2. Possible agriculture and animal husbandry.
3. Close relationships and social cooperation.

Negative points.

1. Shortage of food and agricultural products.
2. Shortage of employment products.
3. Shortage of productive workshops
4. Shortage of services and building labourers.
5. Shortage of administrative organisations offices

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SOLUTIONS.

Q. We can see that there are some possibilities, but at the same time there are shortages. What can we do to use the possibilities to overcome the shortages.

8. ^{by builders}

A. ~~There~~ are natural resources exist; ~~we~~ to build kilns for bricks and lime and chalk; ~~stone~~ to build stone masons workshops and also stone quarrying; and to make the transportation of it easier.

To use the ~~wood from~~ resources of wood from the forests and forestry ~~for~~ and reafforestation.

To collect the water from the mountains for agriculture should be done by dam building and pipe laying.

Piped^{ing} water to villages.

Improvement of agriculture and animal husbandry in order to make it easier for the ~~step~~ 'animal husband' ~~to~~ in order not to sell their animals.

There is a shortage of shepherds and the fee for the shepherds are so high that it would not be economical to hire them. The landlords do not give the farmers land to work on. and the landlords themselves plough the land.

Land has to ~~be~~ given to the farmers in order to be used for gardening (market gardening), ~~the~~ wet farming ^{and economical} and agriculture. to improve. ~~the~~

The shortage of agricultural equipment, e.g tractors, should be solved. Agricultural training and the knowledge of cultivation of various new products is necessary and should be taught to the villagers. (In this area some of the landlords would not permit plantation and only ^{annual} products like wheat were current.)

Productive workshops 102.

1. It was suggested that with the help of the gov't and the local people producing units eg. chicken farming, animal husbandry, blanket weaving, cloth weaving, carpet weaving, leather making, ~~timber working~~ sawmills and carpentry, metal working; could be set up.

Employment.

These workshops with the agricultural units would solve the problem of employment and with more possibilities of employment the economic, financial situation, of the villagers would rise.

Services and infrastructure.

To make these plans and programs work there is a need for a ~~network~~ service and infrastructural network. eg. roads, water supply, electricity, schools, clinics etc.

Stimulation of agriculture and productive workshops and service and infrastructural networks ~~will~~ improve are in very close relation to each other and will improve the area. eg. by building roads products will be transported to the market easier and another example, raining will raise the financial situation and will help the work force, therefore development of the area has to be done together.

Administrative organisations

In order to harmonize these plans there is a need for an organisation and decision making and an implementation team.

People's trust for the administrative organisations who are the representatives of the people with the government, should be taken into consideration.

- As it was mentioned before all the development units are connected, ~~who~~^{we} will now talk about the building units (services and infrastructure) so that we can see how this section can help the development of the village.

Q. How did they build public buildings like the hamaam in the village in the past.

A. The elders of the village would gather in the mosque and they would discuss the problem and they would present it to the people. People would help as much as they could afford and they would even help in the process of building the hamaam. The first group of the student corps would gather the people of the village and they would ask for their help in the process of building a school. Obviously the government would decide about the ~~of~~ student corps + they in turn would make the people pay or work.

Another way of building the public facilities in the villages would be through the direct out of the govt. Gov't organisations would choose the necessary needs of the people and they would agree on the budget which would usually end up being the same sort of plans for everywhere.

Technical Offices of the Ostan will be responsible for the plans, calling for tenders, and well known contractors will ~~take part~~ submit for the job, and

11 The winner will get the job. In limited cases the private sector is, considering the beneficial points in public buildings, will do the job.

Taking into consideration these four methods of building the public buildings will enlighten the best way of doing it.

1. Direct help of the people, with their own financial contribution, will give the maximum share of ~~and~~ ~~cont~~ participation. In this contribution will enable a complete harmony for the needs of the people and it will make the people care for what they have done so they will keep it in good condition. But because of the low income in the villages this method will not satisfy the all the needs of the people, and besides, the wealth of the country should be distributed so that the

building of public buildings are done under the ^{financial} responsibility of the government. &

2. The cooperation of the Govt and the village

In this method if there is a minimum financial contribution from the Govt the problem of the shortage of contribution from the village will be solved. But because most of the plans which have been laid out by the government have been chosen and planned in advance, ~~it~~ the choice is not made by the people of the village, and so it will not be as fruitful as it would have been through the contribution / cooperation of the public and the ^{+ positive} points mentioned in ① will

12. be minimised.

3. Construction of the public buildings by the Gov't will make a closer relationship between the villagers, the city and the central gov't. The types of the plans which have been introduced and the techniques and the materials used have often clashed with the social economic and environmental condition/situation of the village, and the local people have not been able to continue to build or to restore the existing building. The contractors and materials merchants of these buildings are usually located in cities. In this case a high percentage of the building budget goes out of the village and is returned to the city. It is only the building which is left in the village which in most cases does not satisfy the needs of the society.
4. Although the group believes that under the present circumstances financial contribution of the private sector in the village would increase the villagers economy, one must take into consideration that these private financial contributions have a basic ^{personal} beneficial aim and they rarely satisfy the needs of the village. Therefore one could conclude that the ~~method~~ of ideal method of presenting services and infrastructural organisation and public building to the village is arranged by the participation of the people and the help of the gov't

13.

In this case the people of the village will be in the situation right from the start which is decision making about the public buildings that are needed until the end which is the building and the using of the public building, And they will try to harmonise it with their needs.

In this method the role of the govt is to provide finances and expertise that the village does not have.

نقشه کشی Drawing

نقشه کشی

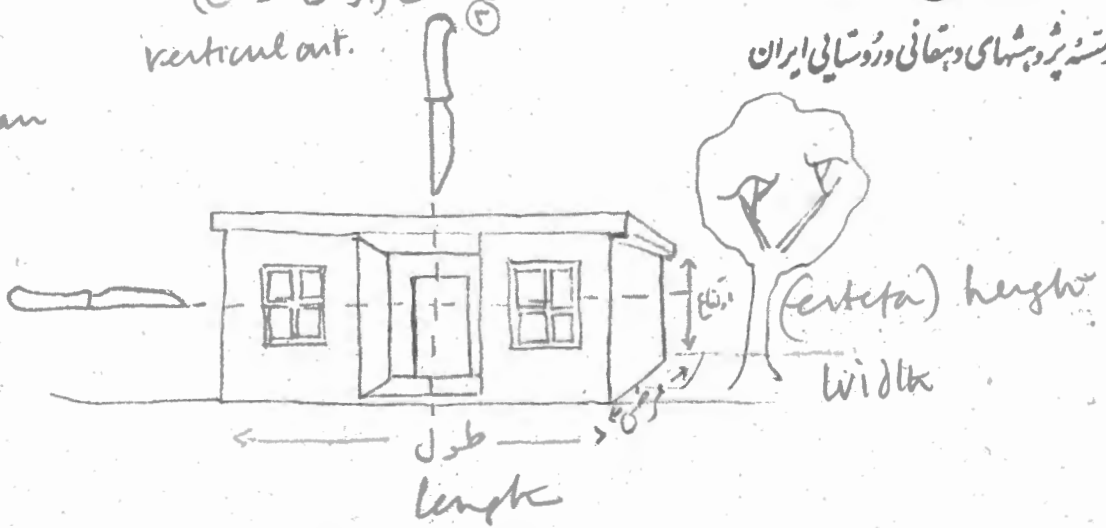


مؤسسه پژوهشهای دیندانی و فرهنگی در دستاوی ایران

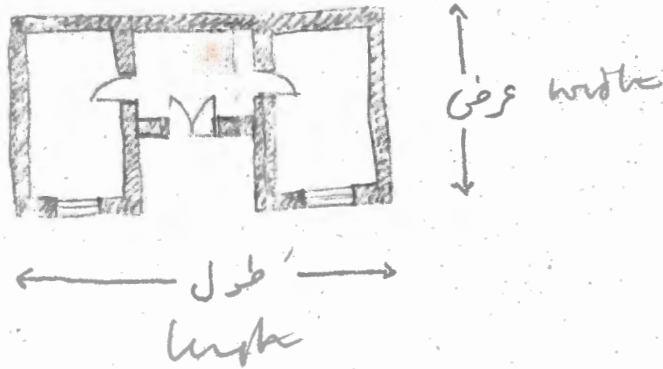
یادداشت

section (برش عمودی) vertical cut.

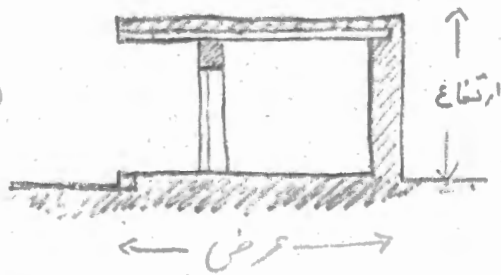
ground plan
نقشه کف
plan ① (برش افقی) horizontal cut



① پلان - نقشه کف
برش افقی



② مقطع
برش عمودی



③ نما
(دید خارجی)



5. Drawing

The purpose of drawing the plans of a building is to be able to bring all the details of the building on paper. The position of details like the interior or exterior walls, doors, windows, floor and roofs can be drawn in 3 ways on paper. These are ground plan, vertical sections and elevations.

1. Plan. If one makes a model of the building + then cut ~~through the horizontal plane~~ building in $\frac{1}{2}$ horizontally. The upper part which has the roof + the walls of the bldg + to put aside these + if we look at the lower part vertically one can see the ground plan of the building. One can see the width + lengths of the rooms + walls + the bldg + the position of doors + windows on ground floor. The height of none of these the mentioned parts will be known from the plan. One important thing must be noted and that is the lines which have been cut through must be shown with a thicker line, + the lines which are in an elevation must be thin. Cutting through the windows one must show the walls which are under the windows with thin lines but cutting through the doors which there are no walls underneath obviously no lines will be shown. The only line which will be shown for the door is the position of opening.

There are different kinds of plan which one has to draw for a building + they are: foundation plan, ground plan, beam plan.

2. Section.

If we cut through the same model vertically and look at it ~~and~~ both halves from the front we will see the vertical section; a section will show the height of the building, the rooms, exterior + interior walls + the height of the doors + windows. To show all the details of a building usually 2 sections are drawn, across + longitudinally.

An elevation of a building ^{shows} the exterior facade. In an elevation drawing the picture which one sees is when a person is standing exactly in front of the building so ~~one~~ one must draw an elevation for each side of the building.

4. SCALE.

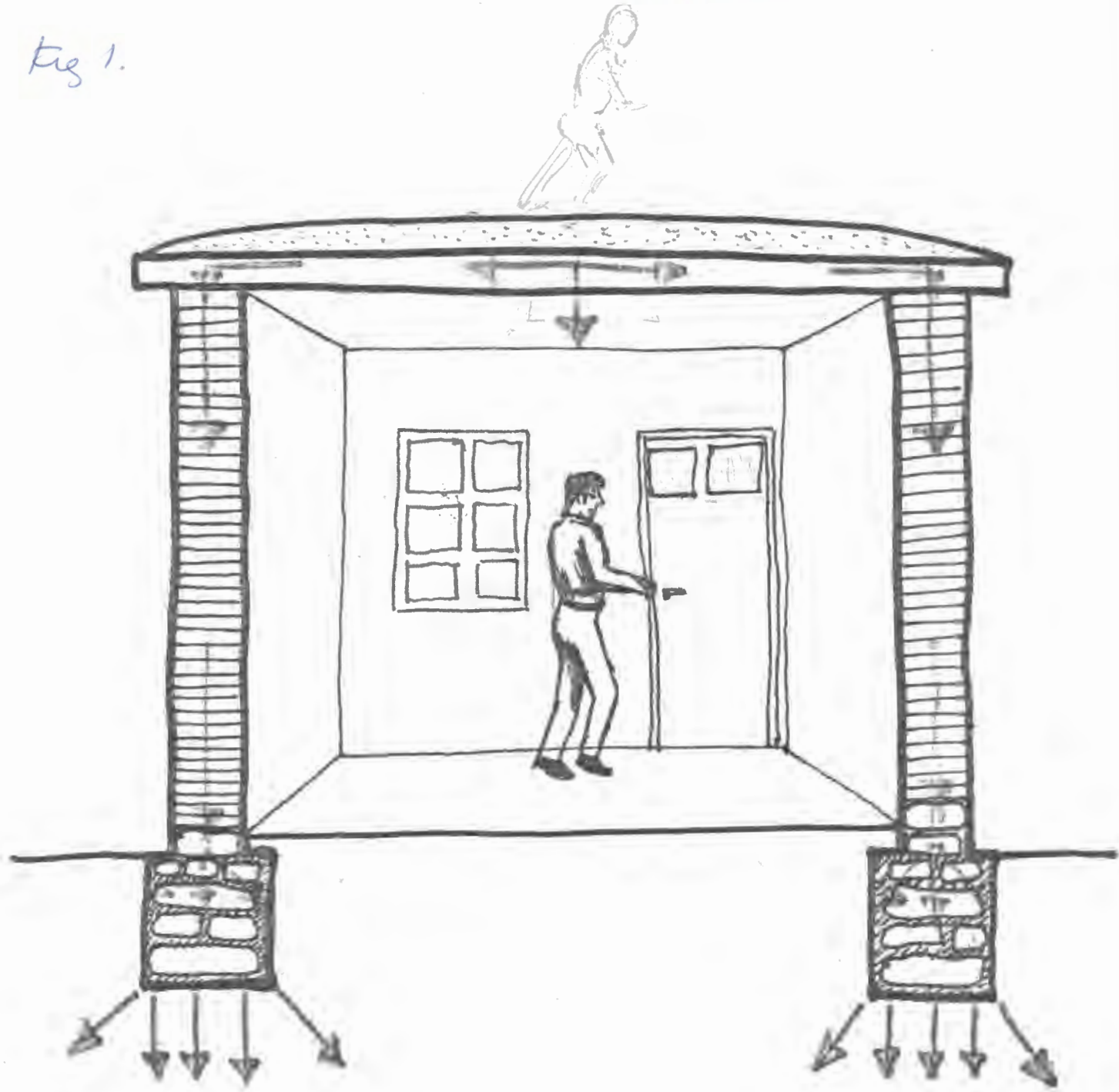
Because one can't draw the building to its original size on paper, one must miniatureise ~~the~~ all the parts of the building to the same scale so that a smaller image of the building can be drawn exactly.

Example. one cannot draw a ten metre long wall on a ten metre piece of paper but one can draw the ten metres on a ~~1~~ 1 metre paper. In this case the scale of that drawing will be 1:10. meaning, 1 metre for every 10m. The 1:10 scale will be shown at the bottom of the drawing; or one could draw the one metre as ten centimetres on paper. + in this case the scale would be 1:100. It is essential to know that one shouldn't measure the drawings with a ruler/scale in the workshop but the dimensions must be on the drawings.

- For

حمل فشارنا در ساختمان
in the building load/pressure beam

Fig 1.



Q. How do you make the foundation of your own bed?
A. 7 Big 75cms, mix straw mud, (allowed to stand overnight) when ready fill the hole with straw mud + its even better than lime.

US. We have to dig until we reach a firm base, some places its 2m + some places $\frac{1}{2}$, it depends on the kind of soil. The earth that ~~if~~ have dug, if its good earth, will mix with lime + we will mix well, because if it is not mixed it wont be firm.

1. Function of foundation

The foundation of a building transfers the load of the building and the weight of the building or the pressures which are on the building to the ground. In fig 1. we can see that the weight of the building + the loads which are on the building like people, snow etc. will be transferred through the beams on the roof to the load bearing walls (or columns) The walls themselves have a certain weight, this weight will be added to the load of the roof and is transferred to the foundation. Therefore the load of the building will be all located in the foundation + thru the foundation it will be distributed to the ground. The foundation is called known as a firm and level base for the building which will keep the building from changing its shape or buckling from the pressures which are in the building.

Therefore, ~~the~~ the width of the foundation must be more than the width of the walls in order to distribute the load of the building

19 Over a larger area. The foundation level is very important because the pressure is distributed vertically on the foundation and ground, so that foundation doesn't buckle or crumble under the pressures on it. In case of penetration of water in the foundation of the building it shouldn't become unstable and it shouldn't move.

~~Proper~~ Digging foundation - one should dig until one reaches a firm base + if we can't reach a firm base we must build a foundation so that because of the movement of the ground + it's being unstable the foundation doesn't crack or subside. The foundation shouldn't move or slide because of it not being level. (Eg. foundations which are built in sloped sites + mountainous area). shouldn't crack because of the roots of large nearby trees. The roots of the trees move in the ground and they absorb water, + therefore the immediate ground around it will become unstable. Therefore the roots of trees ~~grow~~ around the foundation are harmful to the foundation + one has to get rid of them before filling the foundation. The building should be approximately ^{as} far from the tree approximately ~~the~~ as the spread of its branches so that the roots can't harm the foundation. The

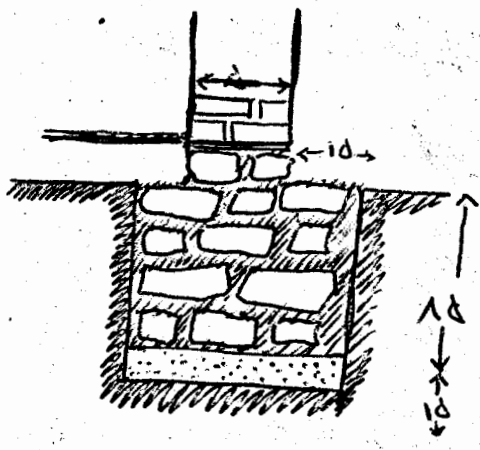
The depth of the foundation should be able to bear the load of the building, ~~mostly~~ foundations mostly settle after bearing the loads of the building. If this settling comes to an end after a certain amount of time no problems will occur but if it continues it will become dangerous and one has to find a way to prevent it.

20. Therefore foundation is one of the most important parts of the building + in blog it one has to be most careful + precise. But we can see that almost everybody doesn't take much care in building the foundation especially in rural buildings they either don't build a foundation at all or if they do they are very basic or shallow.

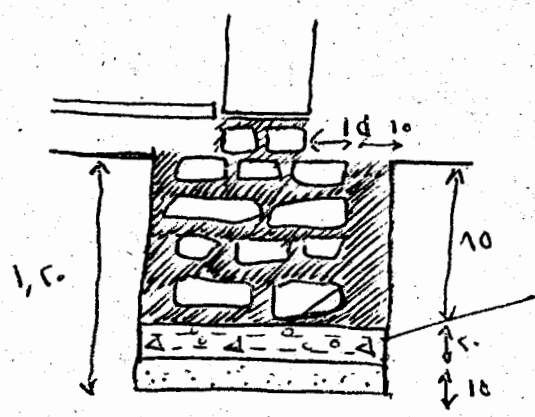
Before digging the foundation the site should be studied and the necessary info. should be gathered and this study consists of two parts. 1. Observation: and discussion with the local people in order to know how they used the land before, existence of holes which have been filled by rubbish, or the site being flooded etc.

2. Physical investigation which consist of digging experimental ditches (1 ditch for every 300m² being 2 metres deep) + experimenting the earth of the ditch in order to find the chemicals which exist in the earth. (In the next section a simple way of experimenting will be explained) By digging the ditches one can find the water table, firmness of the earth, the presence of stone and ~~and~~ waste (vegetable or other) basically stony stony ground and ^{gravelly} sandy grounds can bear a lot of pressure + they are called as firm + stable ground. Clay ground which has a lot of clay are ~~the~~ unstable + Clay changes its volume through the penetration of water + when it dries it cracks. We will now see the ways of building foundations which will satisfy the needs of rural buildings. F2.

در اینجا به نحوه ساختن پی که در صورت نشست جوارزینیا را برافشان
 دوستای میباشند میپردازیم.

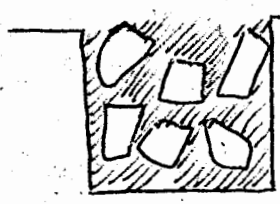


پی شماره ۱ (تصویر) برارزینیا (استقیم) پایدار
 Foundation 1. Firm + stable ground.

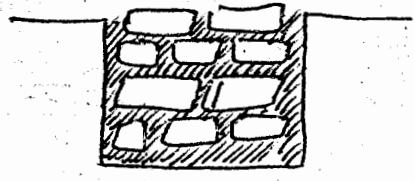


پی شماره ۲ - زینبارست
 F2

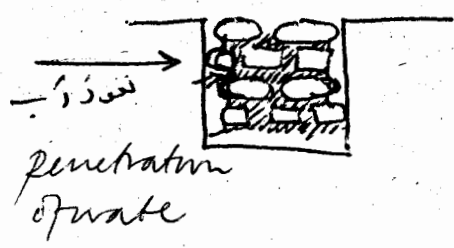
unstable.
 R.C.



X
 غلط
 wrong



✓
 صحیح
 right



5

F2

Soil testing.

The basic mixture of the soil in a village can be tested with various simple methods.

(A) Testing the soil by observation, feeling / touching + breaking the soil in the hand etc.

1. Agricultural soil because of the roots + its darker colour can be noticed with ~~the method of this~~ method.

2. Feeling + touching the soil + putting a very small amount between the teeth will show the amount of sand in it.

3. With pressing the soil in your hands + if it stays like a little ball in your hand the amount of clay is more than the sand. + if you cut the ball with a knife you can see the clay if a shiny area remains on the surface of the cut.

(B) Testing the soil by sedimentation.

Take a certain amount of earth + crumple it until you get rid of the lumps, + pour it into a cylindrical shaped bottle or jar + fill with water. ~~Stir~~ + shake it well until ^{the} soil is mixed with the water thoroughly + then ~~to~~ you leave the bottle on a steady surface without moving it for one night. in order to allow the soil to settle.

Sand and gravel which are heavier will settle sooner ~~and~~ ^{than} clay and silt will settle which are lighter ~~and~~ + therefore sand and gravel will be stored on the lower part of the jar and clay + silt will settle on top of them. Then

one can measure the amount of sand gravel clay + silt with a ruler + calculate the volume of each one.

25. The materials which are usually in reach of the villages for building foundations for rural buildings are ① Soil, ② lime, ③ Stone, ④ Gravel. (Sheffe Ahak)

Method Making Sheffe Ahak.

In the process of making sheffe Ahak which is the mortar for the foundation basic mistakes occur which will make the foundation unstable or sometimes will collapse. One of the common mistakes is mixing the dry ~~ahak~~ ~~sheffe~~ ~~lime~~ unslaked lime or dry lime with soil which makes the foundation after building it crack because the lime will be in contact with humidity / ground water. In the process of making sheffe ahak one must first pour water on the lime so that the lime 'explodes' so that the lumps will either dissolve or they can be separated from the foundation lime. The time needed for the slaking of the lime depends on the kind of the lime but basically it must be done (slaked) the night before, + the day after must be mixed with the soil. One must bear in mind that the ^{lime} lumps unexploded are not mixed with the foundation. + other particles like rubbish, plants, cloth, plastics etc, existing in the soil or in the foundation soil, are removed. The soil lumps should be crumpled or dropped in water + then mixed with slaked lime.

Stone laying in the foundation

In some rural areas the foundation of a building is filled only with sheffe ahak. as one of the trainees commented in some areas straw mud is used for filling the foundation

24. The correct method of building foundation is using stone with sheffalake mortar. Just throwing stones in without pattern which is what is usually done is not correct. The stones which are poured in foundation like this will not be bonded and therefore under pressure of the load of the building the foundation will settle. ^{The stone} must be bonded like the bonding on a wall. The sheffalake mortar must fill the spaces between the stone + the exterior surface of the ditch. in order not to have ^{empty} spaces in the foundation which will stop the penetration of water from the exterior surface of the foundation to the interior spaces between the stones + sheffalake.

The ^{role} of sand.

In earthquake zones (most parts of Iran) it is better to pour sand under the foundation to a depth of approx 15cm. The purpose of this layer of sand ~~is to stop the settling of the foundation when there is a large amount~~ is to neutralise the large amount of movement which occurs when there is an earthquake, ~~prevent~~ and the settling of the foundation from ground water penetration. When the movements in the ground occur the sand leaves the foundation in a free position to have the same movements all across it as the ground ~~to~~ - what the sand really does is that it works like a spring in a car which neutralises the strong movements.

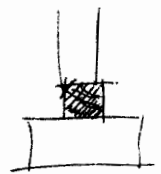
25. Limited usage of concrete.

In foundations which are built in unstable areas / ^{zone} ground one can use a layer of 20 cm thick ~~concrete~~ concrete reinforced with 12 ^{mm} ~~steel rod~~. [for buildings max 1-2 stories height] on top of the ^{sand} sand layer. (Fig) The purpose of this concrete layer is to stabilise the stones underneath the foundation and it will make the foundation settle evenly + it will resist the movement of earth.

Setting out of walls.

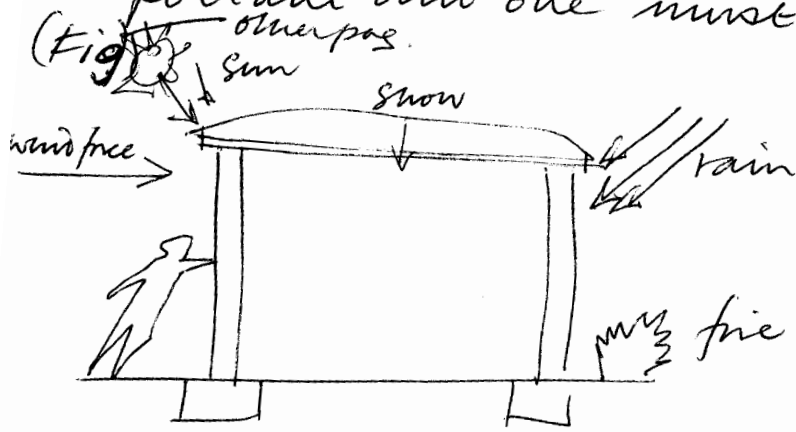
After building the foundation the way that the walls are supposed to be located on it has to be clear. The wall has to be sit in the middle of the width of the foundation so that equal pressure will be distributed to the exterior and interior surface of the foundation. If one is using mud brick, clunch or brick walls it is better to use stone for the walls in order for the wall not to have direct contact with rainwater snow + ice on the ground.

In earthquake zones this wall ^{base} sitting can be done by reinforced concrete with 12 mm rods.



This layer of reinforced concrete will halter the building ~~with~~ like tie beams around the building and it will make the building more evenly with the strong movement of the earth. On top of the ~~se~~ base of the wall, a layer of cement and then ^{a layer of} bitumen + hessian, in order to stop water penetration to the upper parts of the walls: On top of the gir gouni a layer of cement is layed and then the wall starts.

... where the layer of gir goun is eayer u...
important and one must pay attention to it.



WALLS.

Purpose of the wall

Q. ~~Why~~ Why do we build a wall? + what do we expect from a wall?

- A.
1. A wall has to be able to bear the weight of the roof, snow + its own load.
 2. To be a shelter from, rain, wind, snow, ice, sun, + other climatic effects.
 3. A security for the members of the family + their belongings against theft + wild animals.
 4. Make a boundary for the family.
 5. Keep the noise out.
 6. To have stability against earthquake, flooding + other accidents.
 7. In case of fire being able to stop spreading the fire to the other interior spaces of the house.

Explaining ~~the~~ some of the uses of walls.

1. Strength + stability of walls. As we mentioned before the walls bear the loads of ceiling + their own weight. + they transfer it to the foundation + therefore they have to be strong enough to bear other loads like snow, humans, or any other things which are on the roofs.

27. Other than the vertical forces walls should be strong enough against horizontal forces like wind pressure, or forces exerted by ~~any~~ an earthquake situation. In this case the strength of the mortar of the walls are very important and therefore if the mortar is not strong enough the walls cannot bear the horizontal forces. Another factor which is very important for the walls in order to bear the horizontal forces is for the walls to be vertical. Walls in their lifetime ~~is~~ should be stable against any kind of deformation and keep their stability.

2. The climatic function of a wall.

Walls should be built ~~in a way~~ considering the climate in a way so that they will act as a filter so that unwanted climatic factors don't get in, and to use the wanted climatic factors as much as possible. For example if we take sun and wind into consideration: In winter one must use the sunshine as much as possible for heating the interior spaces but in summer one must minimize the penetration of sunshine into the interior spaces in order to keep them cool. Wind in summer can be used to cool the buildings, but in winter one must keep it from getting in. Even in the summer one must ~~prevent~~ ^{protect} the building from dust laden winds and only to let in ~~cold~~ cool clean air.

Therefore the building should be built and organized in such a way that one can use the maximum wanted climatic factors in order to create a comfortable space ~~is~~ for the people who live there. Because the usage of climate has a close relation to the material

28. of which the masonry is built with and the section where we explain the climatic mass of the wall everything will be explained in detail.

Different kinds of walls.

Basically there are two types of walls...

1. Walls which bear the loads of the beams of the roof
2. Walls which bear the load of themselves only + not the load of the roof.

The amount of pressure which each of these types can bear is different, e.g. the ^{non} load bearing wall ② can be constructed thinner and with less stability than the loadbearing wall ①. Other than these two basic types which are based on the loads they carry there are two other kinds of walls which are distinguished by the way they are built. ①. Walls made out of a homogenous material - brick, concrete, plaster (G.R.P etc) + chalk walls - ② Walls made out of small units - like mud bricks, fired brick, or stone, conc blocks.

Chimew walls

Q. Could someone who has the experience of building a chimew wall explain the process.

A. It must be good earth, it has to be cleared and the stone + rubbish must be removed. + then straw must be added. (it will be continued in the text)

Chimew is one of the oldest types of building walls. Earth which is the basic material for this kind of wall has always been available and in reach of everyone. If a chimew wall is constructed correctly it can be a very strong and unexpensive.

429 Mixtures of earth for building chimneys.

① Rubbish - stone - bones - plants + cloth are to be removed from the earth to be used.

② Agricultural earth which has a dark colour and has roots occupies $\frac{1}{2}$ m above below the surface which is not good for any kind of construction ~~that~~ ^{which} including chimney walls.

The earth which is under this is a mixture of clay sand and gravel. The ideal ratio for building a chimney wall is 1:1 to 1:3 of clay/sand - (50-75% sand)

This percentage of sand will stop the clay from cracking + will increase the strength of the wall against rain. Clay needs a lot of straw in order to be resistant to cracking but a good mixture of clay + sand does not need a lot of straw. ~~The greater the amount of straw~~ Using a lot of straw will increase the weakness of the wall because ~~termites~~ ^{insects (termites)} will eat the straw.

The slope of a chimney wall shows the increase of pressure in the lower part of the wall. Therefore to increase the walls stability against pressure the lower part of the wall has to be thicker than the upper part. To solve this problem + economise ~~on the amount~~ in the use of the material wooden moulds can be used for the construction of a chimney wall. The wood wooden moulds will compress the earth which will make the wall straight + stable. Rammed Earth construction. (Kherat Zami.)

30. Q. How was mud brick made?

A. by Mashallah. Mud is mixed with water the night before + it is soaked until the morning. In the morning the ~~earth~~ ^{mud} must be thoroughly mixed in the pit + moved from the pit to the brick field [on the way it is shaken 3 or 4 times(?)]. In yard they usually don't mix the mud brick earth with straw and that is because the earth is suitable for making mud bricks. Earth is poured ~~into~~ ^{under} the mud brick moulds [dry earth] so that the mud bricks don't stick to the ground.

There is usually a bucket of water near the person who is making the mud brick and they splash water in the mould in order ^{for} the mud not to get stuck to the mould. Then the mould is filled and the mud is pressed down + the top cut off smooth + then the mould is removed.

The mud brick which has been made in the morning if it is exposed to sunshine is collected in the afternoon and stood on end until it's dried.

The amount of time that it takes to dry depends on the weather. In warm weather it takes 1 day to dry - in very hot weather there is a danger of cracking. In order to protect it from cracking fine earth is poured on top of it to protect it from direct sunshine.

Important points in making mud bricks -

1. Agricultural earth on the surface of the ground has plant roots + it's not good for making mud bricks.
2. There mustn't be rubbish + stones in the earth which m. b are made of.

③. Earth must be very well soaked so that the lumps of earth are completely dissolved (the earth must be ~~so~~ soaked the night before)

④. Clay will crack after drying, therefore mud brick earth must at least have ^{min.} 30% sand (the amount of sand can be measured by the experiments which were explained before) Mud brick earth must ~~be~~ have very ~~fine~~ ^{up to} fine sand and it must be 50% of the earth when is used.

Sand will increase the strength of mud brick against water and it will stop it from cracking.

5. If the amount of sand in the earth is not enough + (tables) straw must be mixed in order to protect the mud brick from

⑤. ~~cracking.~~ Earth which has less than 40% sand of its own volume has to be mixed with 10 kilos of straw for every 1000 mud bricks.

⑥. The mud for mud brick must be thoroughly mixed + turned over until it is ready for use.

⑦. The minimum time for mud brick to be dried is 2 days.

The mud bricks which have a large mixture of clay must be dried in shade gradually in order for them not to crack.

Mud brick walls are very good insulators against heat + cold - (very low conductivity factor) which is even lower than fired brick walls.

It takes a very long time for a mud brick wall

32. exposed to direct sunshine to absorb heat & it will not conduct the heat to the interior spaces of the rooms easily, therefore the rooms will be cool during the daytime. By evening the wall is completely warm and it will conduct its heat to the rooms therefore the rooms will be warm at night. by morning the wall has lost all its heat & the procedure repeats.

Performance of a wall against rain, heat.

Walls which are made out of mudbricks, chineh & even ^(some) bricks are not waterproof and rain water can penetrate and can be absorbed into the walls. Therefore to prevent the penetration of rain water into the rooms the thickness of the exterior walls of a building must allow the penetration of water to the interior surface of the wall. The interior surface must stay dry so that after the rain has stopped the amount of water that has been absorbed by the wall can be evaporated in order for the wall to be dry again. A mud brick wall which is exposed to direct rain can be gradually be washed away which will reduce its life.

Protecting mud brick walls against rain water.

1. On walls with no roof, there should be a waterproof overhang of 50 cms.
2. ~~the~~ mud brick walls are covered with straw/mud at least every 3 years to protect the mud bricks from being washed by rain.
3. In some rural areas [some areas of Luristan]

43. a layer of brick is built on the exterior surface of the mud brick wall.

4. Other coatings than straw mud (which isn't very protective against rain anyway) can be used. These coatings ^{or} plasters can be specified in 3 types.

Lime coatings

Cement coatings

Bitumen coatings -

i. Brick coating or a layer of brick on the exterior surface of mud brick walls.

This type of wall which on one hand increases the strength of the mud bricks against rainwater gives a brick facade to the building: on the other hand it has its problems. Using both mud bricks and fired bricks together will create problems like the use of mortar, eg. mud bricks can be laid with mud mortar but this mortar is not suitable for bricks. The part of the wall which is made out of mud bricks will naturally settle after a while but the brick doesn't. This makes the wall uneven if the mud brick and the bricks are laid separately, meaning to erect one wall first and then tie the other one to it, will create the problem of bonding of the walls. and they will not be strong enough against earthquakes or the settling of the building, and therefore the mud brick surface and the brick surface will come apart, and because none of them on their own have the strength to bear the loads the building will collapse. therefore the kind of mortar + the correct method of bonding in this type

34. If wall is very important. There were experiments done in the workshop which the conclusion was that it is basically dangerous to build such walls in earthquake zones.

Lime coatings (for mud brick walls)

Different kinds of lime coatings were experimented on in the workshop and they are ①. A ratio of 2:1 sand/lime. a wooden trowel is used to spread the coating on a straw/mud wall which has been soaked with water ~~the night~~ before in advance.

②. A ratio of 3:1 sand/earth with 10% of the volume being lime is mixed and mud brick wall is coated.

③. A ratio of 2:3. brickdust/lime.

After experiments like exposing these coatings to rainwater, those coatings of nos. 1, 3 showed the maximum strength. (table)

One must bear in mind that the kind of earth sand and lime differs from place to place + before using the coatings on a building they must be experimented on.

CEMENT COATINGS.

Cement cannot be used as a coating for mud walls [&] + chinch walls as simply as it sounds because cement and earth wont stick together very well, but if a ~~coating made out of a mixture of earth and sand~~ the wall is coated with a mixture of earth and sand first ~~and~~, then a diluted coat ^{of cement} can be spread on top. This coat can be 2 or 3 very thin layers.

35. Different mixtures of cement coatings.

- ①. 1 cement mixed with 12 fine sand.
- ②. 1 cement 1 lime 9 sand
- ③ ~~1 cement mixed with earth~~. Earth./Cement.

Bitumen coatings

↳ With mixing a little amount of liquid bitumen with earth a coating will be prepared which will protect mud brick walls and loam walls against rainwater. Bitumen cannot be mixed with earth easily and in order to overcome that problem soap can be used. The soap can be mixed with the liquid bitumen + then mixed with earth. The ratio of bitumen to earth will differ ~~with~~ from 1:10 to 1:16. and it depends on the kind of earth. Clay needs more bitumen than sandy earth. This coating has to be done in 2 thin layers on the walls.

Coatings

It's important to clean the walls before ~~coating~~ coating. Any kind of soft objects must be removed from the surface of the wall in order for the coat to stick well to the wall the wall must have a non homogeneous surface. Before coating the wall must be wet.

36.

Table of experiments on the ...

5 mins against rain	direct after one day	2 min against rainwater	Impact test.	Scratching surface	Kind of coating
resistant	resistant	resistant	dents + cracks	very strong + firm + hard.	2 sand / 1 lime
weak	weak cracked	weak	dents + weak cracks	medium	2 sand 1 earth 10% lime
resistant	resistant	resistant but softening	shallow dent	hard strong	brick dust + lime
resistant	resistant	resistant but soft	shallow dent	medium hard.	bitumen + naft. 5%
resistant	resistant	resistant	very shallow dent.	hard.	bitumen + naft 10%

Productive workshops

1. It was suggested that with the help of the gov't and the local people producing units eg. chicken farming, animal husbandry, blanket weaving, cloth weaving, carpet weaving, leather making, ~~timber working~~ sawmills and carpentry, metal working; could be set up.

Employment.

These workshops with the agricultural units would solve the problem of employment and with more possibilities of employment the economic, financial situation, of the villagers would rise.

Services and infrastructure.

To make these plans and programs work there is a need for a ~~network~~ service and infrastructural network. eg. roads, water supply, electricity, schools, clinics etc.

Stimulation of agriculture and productive workshops and service and infrastructural networks ~~will~~ improve are in very close relation to each other and will improve the area. eg. by building roads products will be transported to the market easier and another example, training will raise the financial situation and will help the work force, therefore development of the area has to be done together.

Administrative organisations

In order to harmonize these plans there is a need for an organisation and decision making and an implementation team.

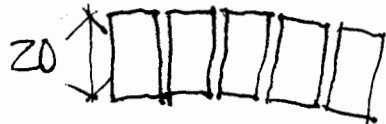
Ustad Masallah. Arches.

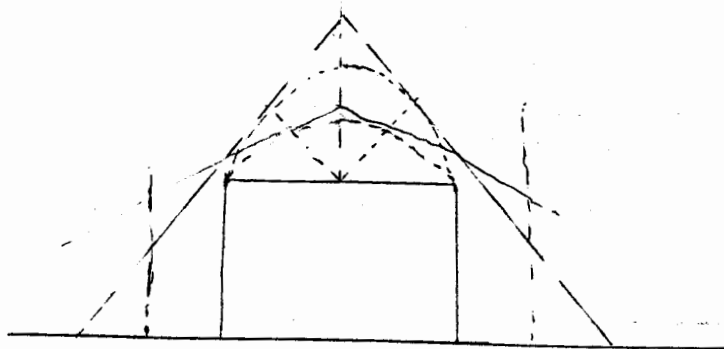
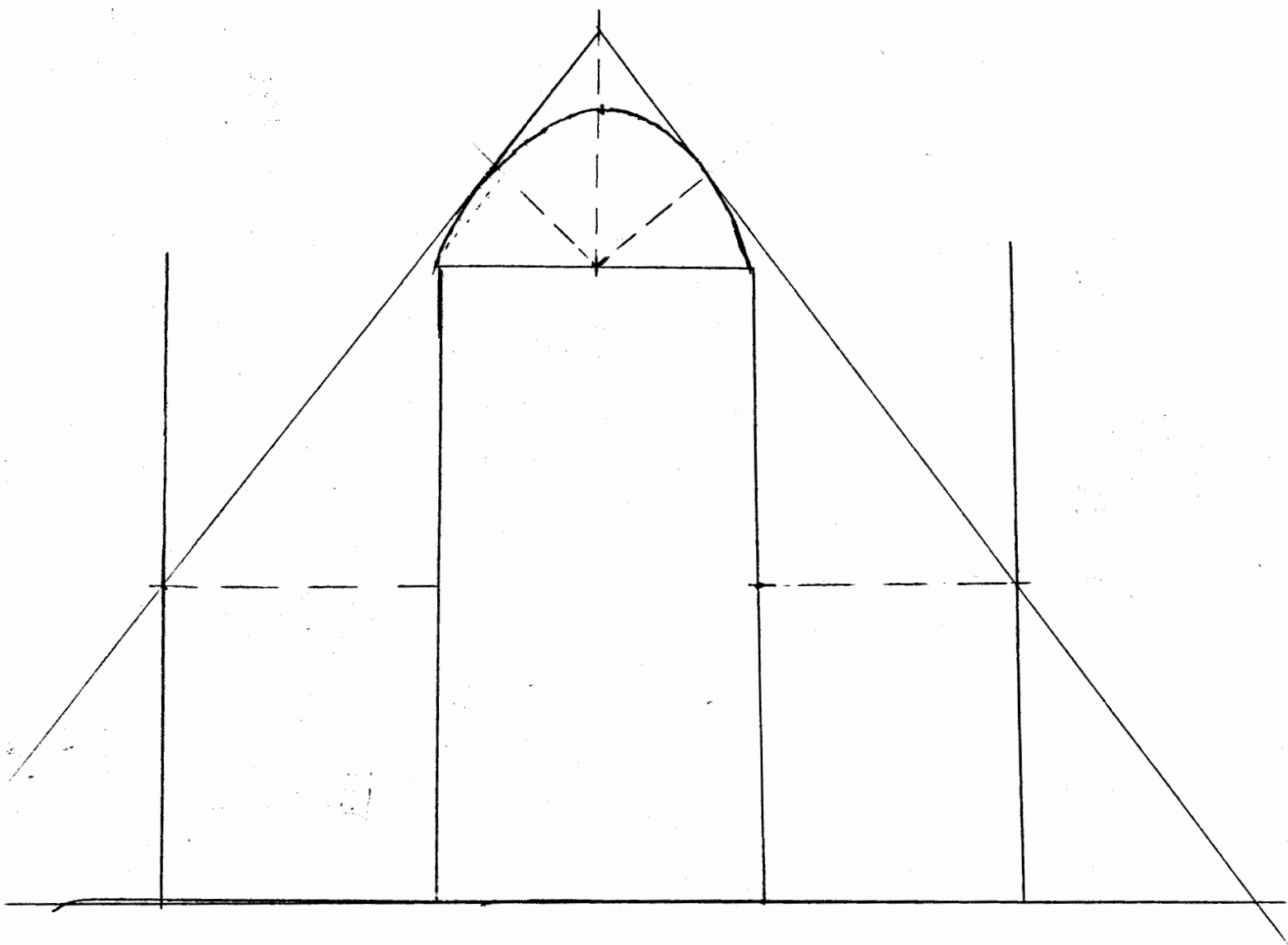
talks about arches [Rumi]

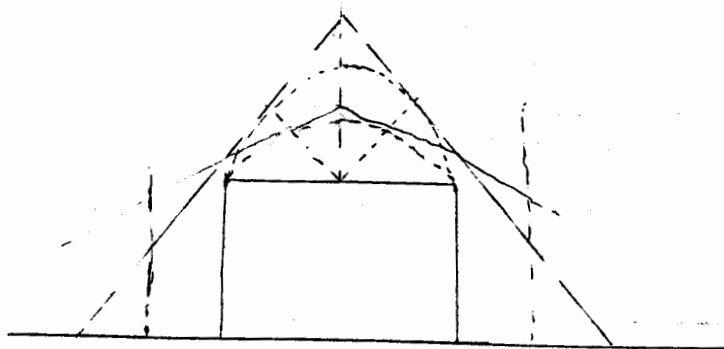
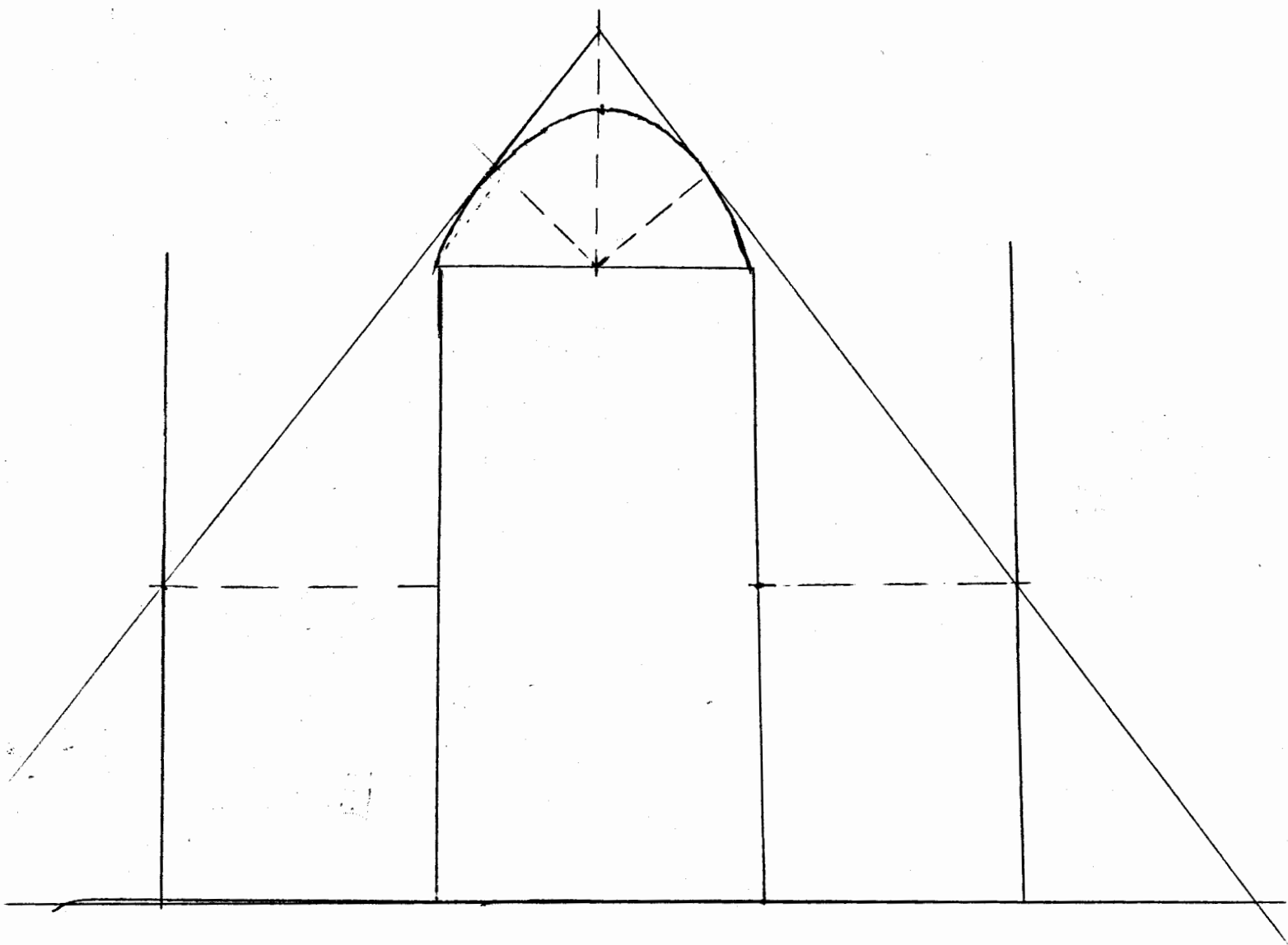
There are four kinds of arches.

1. 1 metre span - $\frac{1}{2}$ m rise.
2. 1 metre span 25 cm rise.
3. 1 metre span 50 cm rise but the arch is pointed.
Shaq^e Bozi
4. 1 metre span 10 cm rise.
5. Engineering arch 5m rise / m, + the 5 cm rise
is from underneath. On top it is level. P

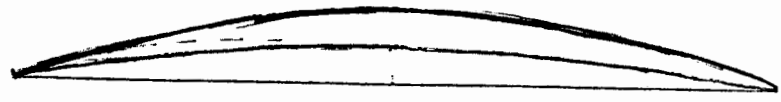
The 10 cm arch and the engineering arch must at least have 20 cm thickness, meaning the brick bricks are laid vertically. The higher the rise the stronger the arch, meaning it can bear more pressure. Of course the rises must be correct, or regular in form + repetitive form.







شماره
تاریخ
پیوست



پاشا اله در مورد روی (قوس)

1 m / 50 cm.



25 cm.

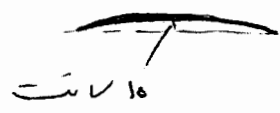
از ۲۵ سانت



پاشا اله

چهار نوع روی داریم.

- ۱- یک متر دهنه ۱/۲ متر دور - دور نصف -
- ۲- " " " " ۲ سانت دور -
- ۳- یک متر دهنه ۱ سانت دور اما سوراخ دور دورتر است پاشا اله بزرگ
- ۴- دور یک متر دهنه ۱۰ سانت دور



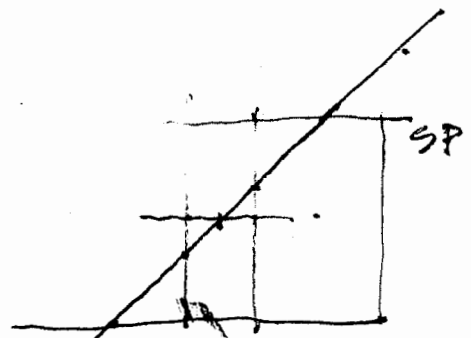
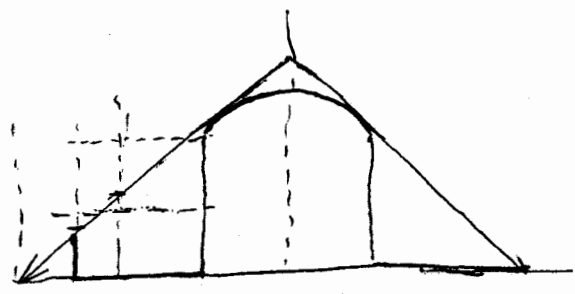
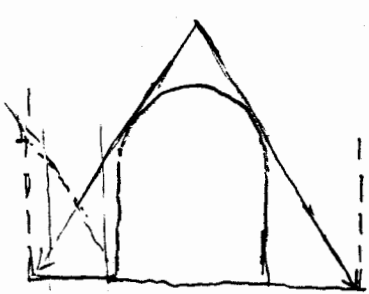
۵- روی مهندسی متر ۱ سانت دور: از ۲۵ سانت دور دارد ۱۰ سانت

از دور ترازیست میشود. روی مهندسی سوراخها را باید

روی ۱۰ سانتی متری مهندسی باید حداقل ۲۰ سانت قطعی داشته باشد یعنی اجرا است که البته مید



دو ریبستف ریبستف تحمل میکنه البته دور هم باید طبقا داده باش



Timber Roofs. Tape 18

The beams which are used in Alashan for roofing, 19, 20
Kavak, sefidchub, bid (willow) or marbar & 19, 20

It takes 7-8 years for the trees to mature. To build
the trees are felled in autumn. Autumn wood
is heavier and stronger but they also fell trees in
Spring in Turistan because the wood is paler.

The people who own and fell the trees do not agree
on felling the trees in autumn. They usually
wait until the beginning of November and the
best months are December, Jan, Feb. After
felling the trees they usually grow the trees
3 or 4 more times again.

Insert. Quote by Luitbender -

Some mustn't

Using lime on roofs ~~is~~ lime must not be used on
roofs.

Placing beams on the ground: Willow wood is
used underground - willow is stronger than Tabuzi
[black poplar]. Thinner wood is (branches) are
placed on top of the beams, perpendicular to the
beams $\#$, ^{on} the spaces ^{is} left for changing the
replacing the ^{underground. (underneath?)} beams ~~on the ground~~

The distance between the beams and the roof
doesn't change. But the underground thickness ... (!)
much.

Burning the heads of the beams which are placed in the walls was common. sometimes they use black oil.

Conclusions of the timber talk

Characteristics of timber.

1. Considering the weight of timber it has a great capacity of bearing pressure, being both used as columns or beams, meaning it is strong in compression and tension (for example concrete is only good in compression but not in tension)

Trees usually absorb the water from the ground through the roots + the cells are full of water. When a tree is felled, because of direct sunshine and heat the water is evaporated and the wood gradually dries.

This drying process is very important. When the wood is dry it being dried:

1. Its bearing of loads increases.
2. Its resistance to heat increases
3. Its resistance to ~~rust~~ insects and fungi increases.
4. Painting, nailing + gluing will become easier.
5. Easier to protect it with oil or black oil [it absorbs them better).

Therefore ^{moisture} water is a dangerous factor to wood.

• Its resistance against fire is more than R.S.J.'s, I beams of the same size. Its true that wood burns, but steel doesn't but steel melts in high temperatures and it collapses under compression but wood has to burn completely before until it collapses. When wood ~~burns~~ is on fire

the surface burns and it becomes black, the coal on the surface or around the wood stops the wood from burning inside + therefore the inside burns much later.

One of the biggest mistakes when using wood and protecting it is after the cutting which is never taken care of.

Timber talk

If wood is exposed to direct heat or sunshine in 20 days it will dry very quickly but the inside will remain wet. The surface will contract and crack and the cracks that we see in some beams is the result of this process. Therefore it is better if the wood is dried in the shade, gradually. If the wood is left on the ground it will absorb moisture and it won't dry correctly, and it will be in danger of insects.

Protecting the wood from insects: ~~Timber which~~ has been attacked by insects. The insects which attack timber will be killed by temperatures $0 - 40^{\circ}\text{C}$. For preserving the wood the beams are placed on blocks raised from the ground. The beams are placed on the blocks ^{at} within a distance from each other.

The blocks must be covered so that ~~direct sun~~ they are not exposed to direct sun in order to protect them from cracking and insects which make the timber weak. Timber is a very good material if it is used correctly and if it is available.

The minimum time for drying is 3 weeks (summer)

When the wood is moved from the drying place to the building site it must not be left on the ground nor exposed to rainwater. Before placing the beams the parts which are in direct contact to the wall and have a possibility of absorbing

timber must be covered with black oil. (nalf-e siah)
& dried again.

Telegraph poles are of this kind and they are
covered with nalf-e siah - they are guaranteed
for 60 years.

The timbers that are exposed to the outside or
used in arams again have to be covered in nalf-e siah.

Timbers exposed to air in danger of catching on
fire. In some places forests timber is dried in
kilns but in most dry areas in Iran the
natural method of drying is sufficient. Timber
should have less than 20% of its weight in
moisture.

-Continue timber talk - preservation.

Preserving timber with black oil: ~~that~~ ^{Bulbas?}

Black oil must be completely absorbed into timber in order for the timber not to be able to absorb any other fluids. Timber must be in black oil for at least 10 mins. For greater absorption the black oil can be heated and then the timber can be put in the black oil until it cools.

After felling trees must be replanted in order to have timber again for the future. Its the opposite with steel beams which ~~is~~ have taken thousands of years for the iron to be made and they can now be used in an excess amount. Sandy lands which are not usually suitable for other agricultural use can have trees planted in order to use the timber.

The method which is used in Luistun ^{for putting the} is to ~~put the~~ beams on mudbricks/brick walls is to distribute the weight of the beam only over a small area, but the correct way is to spread this load as much as possible over the wall. ~~It is~~ If a roof plate is used meaning to lay one beam along the wall and the other beams on top of this plate. In this case the force will be equally distributed along the wall. Therefore the use of a plate is necessary. If the plate is made out of wood split in half then the force will be distributed on the wall much better, and there is less timber used. The flat surface of the plate must be laid out of the wall and if the semi-circular surface is flattened, it has greater efficiency. The timber beams must be nailed to the plates this will prevent the building from the dangers of earthquake and settling of the building, and it will also produce a stronger roof. The plates will be placed on every four walls, and then they are tied together and then the roof will be one whole piece.

STONE WALLS.

Talk about your experiences in Stone laying. Good ^{quarry.} nine stones must be used. They must be lime stones. The mortar used for a stone wall must be ~~very~~ strong and it must have cement in it: 6 Sand and one Cement. The thickness of a stone wall cannot be any less than 50 cm. ~~The stones must be bonded, not more than 4 layers can be layed in a day. Because they must be~~
~~Because~~ Because time must be allowed for the wet to ~~dry~~ dry not more than 4 layers can be ~~laid~~ layed in a day.

Essential points in Building stone walls.

- 1) Min. thickness of the wall must be 50 cm.
- 2) The Stones must be wet before using. in order ~~to~~ for the dust to be removed.
- 3) (In ^{each} every layer a stone which is the same height as $\frac{3}{4}$ as the thickness of the wall must be layed in every 1.5m)
- 3). A stone which is ($\frac{3}{4}$ of the thickness of the wall) long must be layed in every 1.5m in every layer.
- 4) In all corners, and all around the doors and the large windows larger stones must be layed the size of the stones must be $\frac{3}{4}$ of the thickness of the walls.
- 5) MORTAR: 1 cement, 6 Sand or 1 cement, 2 lime, and 9 Sand.

FLAT TIMBER ROOFS.



Master Builder Reza From the plains of Yazd.

The [Sefkan] (Tabrizi) white
The necessary amount of poplar is sawn
(4m). 2 frames (plates) are placed on the two opposing
corners of the walls (under the timber beams).

Then the Beams are placed on the frames.
60 cm apart. A board timber board with
a thickness of 3 cm (poplar) and 60 cm long
is nailed to the timber beams.

They used to ~~put~~ pour mud on top of the
board in the old days, the mud being chinch
mud. or they would fill the cracks on the board with
saw dust. They use plastic sheets to cover the boards
now a days. Straw-mud is mixed with salt and it is
spread on top of the roof to a thickness of
10 cm. Mud ~~with~~ which contains sand is usually
better. The reason for adding the salt is to stop
the roof from leaking. Sometimes the Roof Beams
are placed ~~with~~ on a slant. ~~etc~~

The mud gets ^{compacted} pounded on the roof, after two to
three days it dries. It's again covered with a
mixture of straw-mud and salt. ~~They finish this~~

The straw-mud is harrowed, the Trowel shouldn't
stick to the straw-mud. ^{smoothed}

Poplar trees ~~ever usua~~ which are usually used
in this kind of construction take 7 to 10 years
to mature. (Depending on type of the earth and the amount
of water).

The minimum diameter of a timber beam which
is used for roofs of ~~habitant~~ spaces rural habitant
spaces must be 12 cm. The trees must be sawn
in Autumn, because that is when they are in their
heaviest and strongest phase. In some areas
like "Lorestan" occasionally the trees are sawn in

spring. It is said that spring timber is usually the whitest wood, but they are weaker than the ones ~~seen~~ ^{fell in autumn.} The best months for sawing ^{down} trees are November (Azar), December (Day) and Jan, Feb. (Bahman).

The "frank" we either buy or ~~use~~ ^{cut} the timber ~~down~~, and then ~~the~~ we start building or fell trees, and then we start building.

When the building reaches the roof the timber is ready to be used. (Approximately 2 weeks after cutting the beams they are left on the ground for sometimes they are leaned against the wall.

In every metre there are 3 beams placed. In the old days ^{branches} of the willow or bark were placed on the beams. A kind of ~~the~~ A special kind of ~~thorn~~ ^{wood} is called 'Bus Boosh' in Luri [same as Sarakh's in Caspian = fir/bracken (J.N.)?] is placed on top of the beams which would protect the roof from penetration of water. Nowadays boards are nailed to the beams. The boards being 1cm thick + 1m long and then cardboard or plastic sheets are placed on top of it and then covered with a layer of hard mud and finally a layer of dry earth is poured on top, and then a stone roller [galtak] is used to compact the earth. ~~Then straw was~~ then the roof is covered with strawmud which is usually mixed with salt. Sometimes sand is added too. The salt stops the roof from freezing. In Heristan the beams of the roofs are directly put on the walls. *An ~~tree~~ was said by a Luri builder