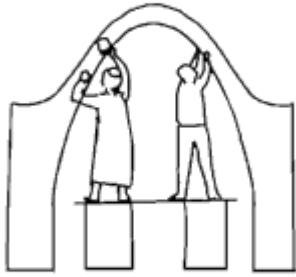


CONSTRUCTION
SANS BOIS



WOODLESS
CONSTRUCTION

PRACTICAL ACTION
Technology challenging poverty



CONSTRUCTION 2: THE TRAINING OF TRAINERS AND BUILDERS

Woodless construction: A south south technology transfer by Development Workshop over 30 years to address the environmental and construction issues of the West African Sahel region

"Woodless Construction" is the name used in the Sahel region of West Africa to describe the construction of buildings in which all the structural elements, including the vault and dome roofs, are built using hand moulded sun dried mud bricks. The most important characteristic of the vault and dome roofs is that they are built without any supporting shuttering. Thus the entire building structure - walls, lintels, and roofs - is built with locally available earth. The bricks for both walls and roofs are formed in rectangular moulds, smoothed by hand and left to dry in the sun for a few days - a method very widely used in the region. During construction, the dried bricks are laid in mud mortar.

Woodless Construction techniques have their origin in the Middle East, and combine both ancient Iranian and Egyptian construction techniques that have been adapted by the NGO Development Workshop and collaborators over the past thirty years to suit the Sahel context and to provide a viable, affordable and accessible alternative to a dual problem:

- to alleviate pressure on the declining timber resources of the Sahel;
- and at the same time to make affordable and durable good quality building easier for the inhabitants to achieve with their own skills and local resources



Figure 1 & 2: Builders are trained on specially designed training structures and there is no stigma about making mistakes and redoing the work.



(see *Woodless Construction - 1: An overview* in this series of case studies).

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technical brief

At the core of the promotion of Woodless Construction in this arid region bordering the Sahara is the development of a range of skills amongst the inhabitants of the towns and villages of the region using a series of training modules that have been developed by Development Workshop over the past 25 years. Today the training provided by DW¹ in Burkina Faso builds on years of experience and annual review to improve the process, and in each case, is supported by *detailed training guidelines* that are used by a large team of local trainers trained by DW. Experience has shown that a structured training approach to developing skills is essential to ensure that each trainee quickly acquires the necessary comprehensive skills to build safely and well.

The overall package of training modules includes:

- starter training for young men to learn the Woodless Construction techniques, this quickly enables them to build simple, safe structures without external help
- training in preparing cost and quantity estimates
- training of woodless construction trainers (and site supervisors)
- training in drawing (and thus designing) woodless construction buildings
- training in building maintenance
- training in setting up economic interest groups (which provide groups of builders with a legal registered base for their work)
- training of women potters

All the trainers are local, and they constitute a huge resource base to both train and supervise Woodless Construction activities. And training is mobile, with each 'novice mason' training course taking place in a different locality, so that local conditions are taken into account and all the population can see the training take place.

Training for novice builders

Training for novice builders is divided into two stages.

Stage one lasts for three weeks, and involves a programme of work on specially designed training structures which are built by the trainees and can be demolished and started again if there is a mistake in the work. This means that there is no pressure on the trainee to try and finish a task without getting it right, and there is no discredit if the trainers ask a trainee to take work down and

do it again. Trainees work in groups of four, each group supervised by an assistant trainer, and the whole course is supervised by a head trainer. A training session involves a least 16 trainees supported by 4 assistant trainers, and often twice this number (32) for a single locality.

Five different training structures are used each with a specific purpose. These teach (i) laying out, (ii) good wall building and brick bonding, (iii) building different types of arches, (iv) starting and building vaults (normal vaults and 'offset' vaults which start higher on one side than the other), and (v) a structure that teaches each builder how to start the corner of a dome based on a rectangular supporting structure, where one learns the laying out and positioning of the *mobile guide* used in dome building and that locates the exact angle and position of every brick in a dome.

Before the end of the three weeks, the trainees also build two full scale



Figure 3: Every trainee pays for and builds his own house during the training.

¹ Development Workshop's programme in Burkina Faso is principally supported by the European Union.

structures, of which nowadays one is a kiln (providing practice on vault building), the other a building covered by a domed roof. These two buildings are partially paid for by the community, and in the case of the kiln, this is then used by one of the many local women’s pottery groups; the second building is, typically, used as a health facility or a similar public function.

The trainers follow a ‘*Woodless Construction trainer’s guide*’ and the trainees get the ‘*Practical Guide*’ handbook, which serves as an

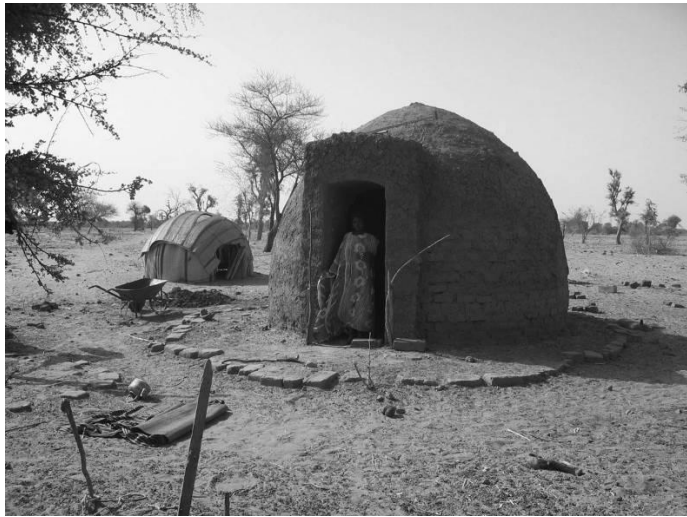


Figure 4: Small round houses are very popular and easy to build.

‘aide mémoire’ for builders, in local languages and illustrated with drawings and photos so that illiterate builders are not disadvantaged.

The second stage in novice training is that the trainees go home, accompanied by their assistant trainer for each group of four trainees, and each novice builder constructs his own woodless house – helped in turn by his three colleagues - which typically is a domed round or rectangular house of about 11m² or a vaulted structure. Some builders decide to reroof an existing house, taking out the rotten wood and making it ‘woodless’. DW covers the costs of the assistant trainer, gives a small food stipend to the trainees, and provides them with two

fired clay gutters (made by local women potters) and a door and a window. This stage is very important for each builder, as the house gives a total experience of building, and serves as well as an example of his skills to his community. And the builders pay for all the labour and materials, a major commitment to learning. They also get a certificate, the offer of additional training and ongoing technical support.



Figure 5: Teaching builders about laying out.

Advanced training

Depending on the level of interest and motivation of individual builders, DW offers additional training options, to perfect skills, learn about maintenance and renders, and to learn how to both design and draw woodless construction houses and make cost estimates.

The experience of teaching often illiterate builders to draw woodless construction buildings is interesting: woodless construction is inherently three dimensional in its conception, one has to consider how the roofs sit on their supporting structure of masonry walls and arches, and to avoid openings cutting into the

roof structure above them. One might think that trained architects would master this easily, but practice has shown that the builders, used to building vaults and domes, master the three dimensional concept faster than architects do, and within two or three days are drawing their own plans.

technical brief

Training for making cost estimates covers learning how to calculate quantities based not only on units such as a square or cubic metre (using full size examples) but also based on such things as how many bricks can one make with a cartload of earth. At the end of the session, participants each develop their own cost estimate for a small building, and then compare the results amongst the whole group, considering why some builders think they will take longer to build than others, and also considering how this can discourage future clients. For both drawing woodless construction and doing costing, there is an illustrated supporting handbook to remind people what they have learnt.

Women are also trained as trainers. Groups of women potters are trained to use the new kilns that the trainee builders have learnt to build. The introduction of kilns helps women achieve an 80% economy in fuel and almost completely reduces breakage during the firing process – traditionally pottery in the Sahel region is made without using a kiln, firing taking place in a shallow pit in the ground which is extremely inefficient. The kilns enable women to develop new products such as floor tiles, and they now make wide open ceramic gutters that replace non local metal gutters at half the price. Women are actively engaged in building maintenance and the use of traditional and improved external and internal renders, and they teach the men about this too.

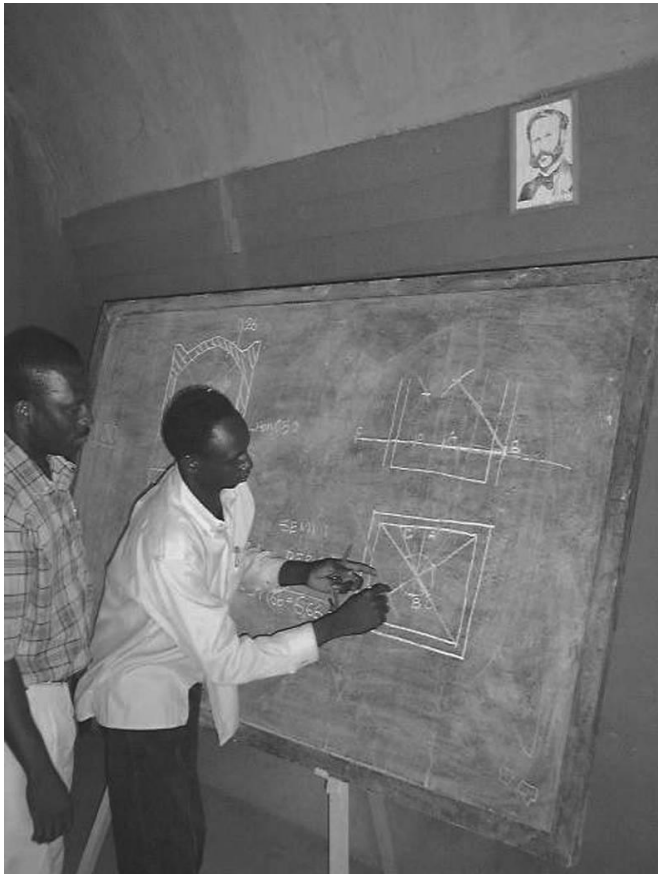


Figure 6: Teaching builders to draw plans and sections.

Not all the support that builders get is technical. To function in the public market for building contracts, builders need to be organised, and to this end, DW provides training and support to help groups of builders set up ‘*economic interest groups*’ which are a recognised institutional structure registered with the local government authority and enabling groups of builders to take on contracts and manage their revenues.

Builders keen to go further are given opportunities to train to become woodless construction trainers in their own right. They represent the core network of support skills in the community that less experienced builders can call on. Training of trainers also serves as a refresher course for builders. Once again, the training of trainers is based on a ‘trainers guide’ which details the composition of the training team required, the training structures that will be used, and then goes through each step in the whole training programme, explaining what has to be demonstrated to the trainees and then how they will carry out their learning practice on the training structures.

Trainers also learn how to evaluate trainees at the end of the training process and to maintain a daily record of the work done and the quantity of materials used.

Young people who have been trained to build using woodless construction recover pride in their ability and pleasure in the



Figure 7 & 8: Trained builders express pride in their work with internal and external decoration.

technical brief



work that they do. Many builders lavishly and imaginatively decorate their new homes with paintings and individual wall finishes and forms. And with the revenues that they bring in, they improve their lives, buying donkey carts, mobile phones and even televisions. Woodless construction not only protects the environment, it changes the quality of life for the people who build and live in these buildings.

The promotion of Woodless Construction in Burkina Faso, Mali and Niger won the World Habitat Award in 1998

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This technical brief was originally prepared for **basin**, Building Advisory Service and Information Network and updated by John Norton of Development Workshop in March 2012.

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Development Workshop works with some of the poorest communities in the world, developing local capacities to improve lives and livelihoods. For over 30 years Development Workshop has provided training and technical assistance to enable local people to deal with environmental challenges and natural disasters in more than 30 countries.

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Practical Action is a development charity with a difference. Practical Action knows the simplest ideas can have the most profound, life-changing effect on poor people across the world. For over 40 years, we have been working closely with some of the world's poorest people - using simple technology to fight poverty and transform their lives for the better. Practical Action currently works in 15 countries in Africa, South Asia and Latin America.

All photographs: Development Workshop

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