A GUIDE TO PLANNING AND BUILDING SECONDARY SCHOOLS IN UGANDA

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FEILDEN CLEGG BRADLEY STUDIOS

A UGANDA SCHOOLS DESIGN GUIDE

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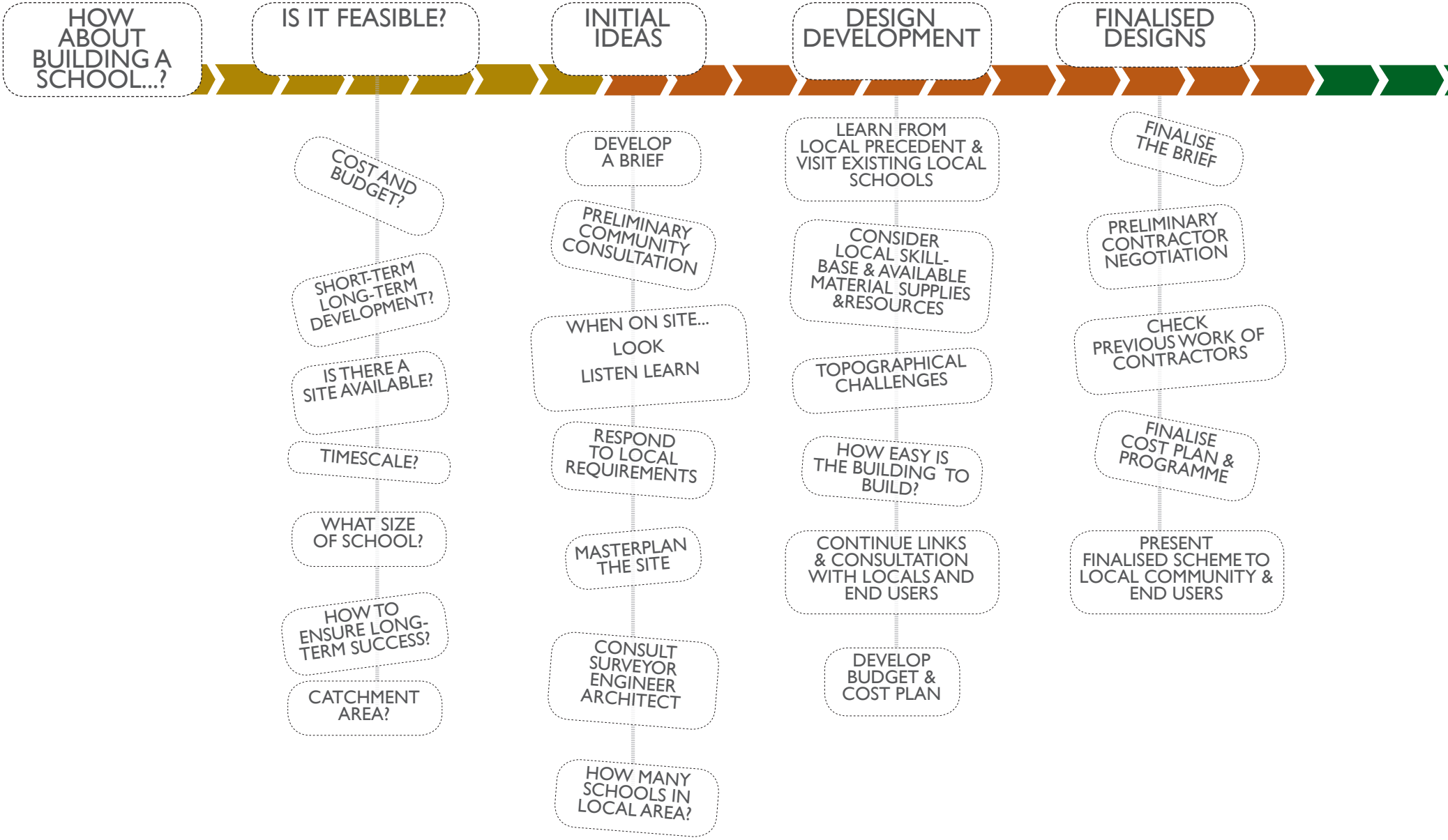
INTRODUCTION

This Design Guide aims to give the reader / user an understanding of the issues that are surrounding the design of a secondary school in Uganda. It aims to raise awareness of some of the key areas that will influence the design, implementation and realisation of any schools project that is being considered from an early stage.

Through the experience that the Richard Feilden Foundation has gained from designing and overseeing a number of different projects in Uganda and other African countries, this document aims to help organisations / individuals who are trying to start similar building projects.

As with all such documents it will remain relevant for a relatively short period of time but educational and building practices change. If you have any comments on the contents please contact The Richard Feilden Foundation and we will endeavour to bring the publication up to date as circumstances change.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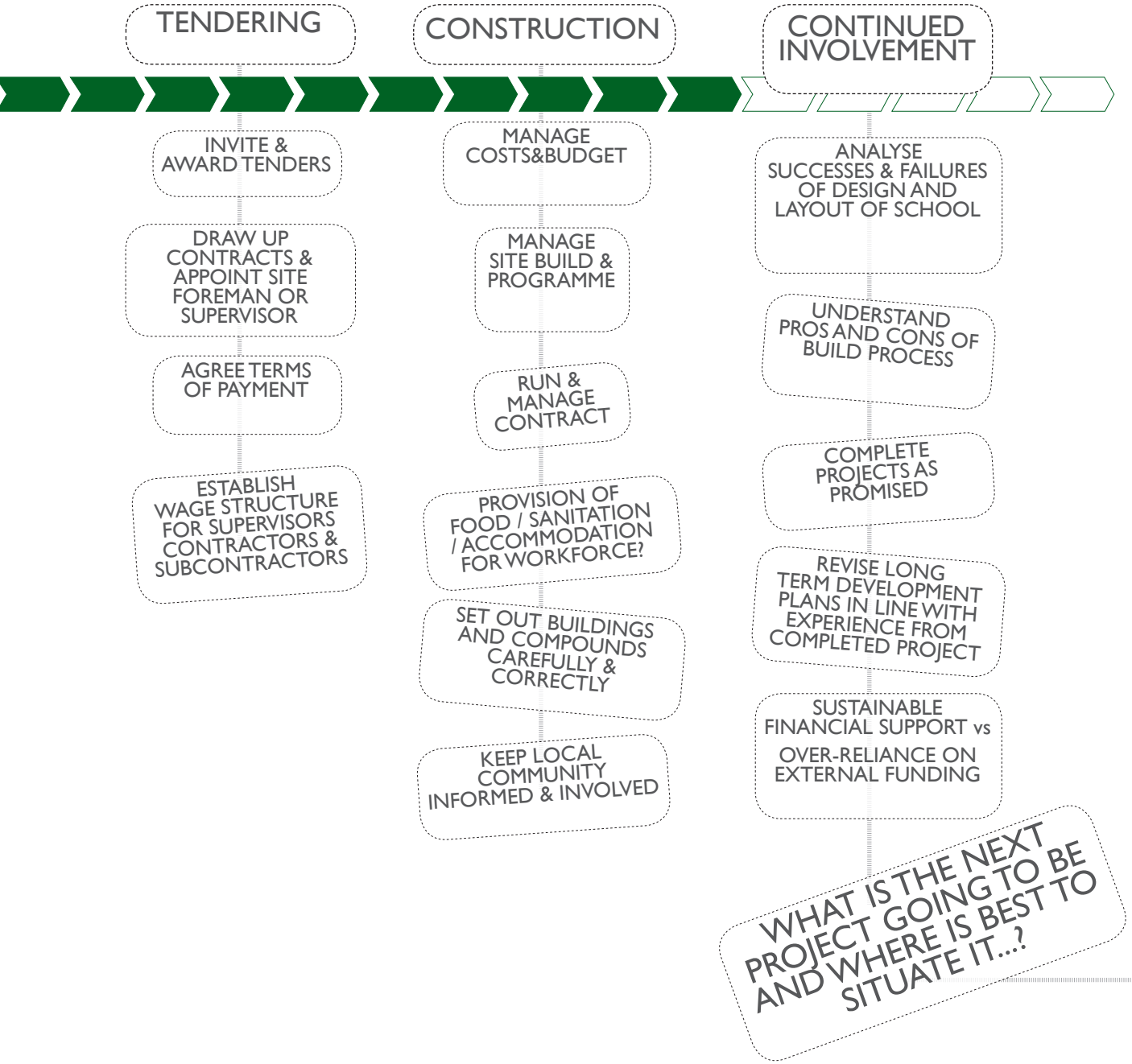


WHERE TO START?

All projects require a local 'champion', someone with local knowledge of the educational opportunities available, the needs of the local population, and what local sites may be available. Whether you are a Western designer who has not been exposed to a context or such as this, or are an African based organisation well versed in a Ugandan context, it is important to research and consider the local context for any potential project carefully before proceeding. The long-term success or failure is often reliant on the work carried out at preliminary / early stages; local community involvement and interaction is crucial in this respect.

Site visits to 'get a handle' on the context need to be planned beforehand; where possible, partnerships should be formed with organisations who have experience with the area to facilitate short-, medium- and long-term project success.

"FOR CHILDREN TO REACH THEIR FULL POTENTIAL AND COUNTRIES TO DEVELOP, THE GAINS MADE IN UNIVERSAL PRIMARY EDUCATION MUST BE REPLICATED AT THE SECONDARY LEVEL. AT PRESENT 54% OF CHILDREN OF THE APPROPRIATE AGE IN DEVELOPING COUNTRIES ATTEND SECONDARY SCHOOL..."

UNITED NATIONS
MILLENNIUM DEVELOPMENT GOALS REPORT 2008

HOW BIG IS A SCHOOL?

RULES OF THUMB

Minimum number of Pupils to make it cost effective

Boarding students help subsidise day schools & avoid long distance travel for pupils

Schools with 700+ pupils get big and institutional

Assuming single storey developments, building areas can be calculated as follows...

PUPIL NUMBERS	**CHILDREN PER CLASS**	**No. of CLASSES**	**CLASSROOMS** / AREA (m^2)	**LABS** / AREA (m^2)	**HALL** / AREA (m^2)	**LIBRARY** / AREA (m^2)	**ADMIN OFFICES** / AREA (m^2)	**DORMS** / AREA (m^2)	**LATRINES / WASHING FACILITIES**	**STAFF HOUSING**
250	30 - 50	8	7	1	2 CLASS ROOMS OPENED INTO 1 LARGE ROOM	1	2	5 3 x BOY 2 x GIRL	17 10 x BOY 7 x GIRL	12 ROOMS FOR FULL TIME STAFF
			$45m^2$ each	$45m^2$	$90m^2$	$45m^2$	$25m^2$ each	$45m^2$ each	$30m^2$	$7.5m^2$ each /$90m^2$
								TOTAL AREA		**$900m^2$**

LOOKING FOR A SITE

Think about the following issues...

ENVIRONMENTAL

Orientation - West / east? North / south?

Prevailing wind - seasonal and daily changes in directions; are there trees / buildings around the site to shelter school from strong winds?

Shade - Mature, large trees to provide external spaces with shade; communal feature for courtyards; trees useful for marking site boundaries

HAZARDS

Waste dumps - hazardous & non-hazardous waste; risk of disease and breeding ground for mosquitos, vermin etc

Noise - Adjacent roads; workshops and light industry

Fumes - from traffic, factories

Soil conditions - likelihood of landslide / subsidence / flooding?

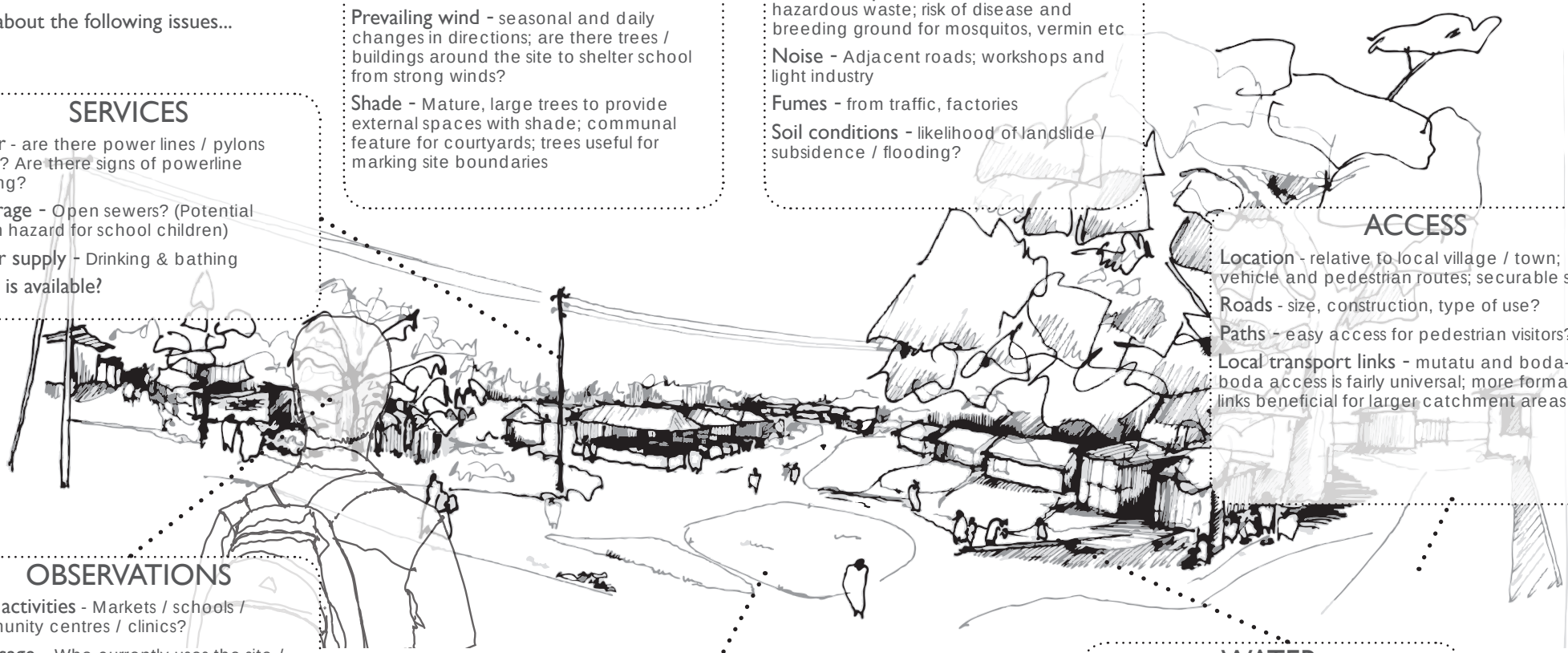
SERVICES

Power - are there power lines / pylons visible? Are there signs of powerline tapping?

Sewerage - Open sewers? (Potential health hazard for school children)

Water supply - Drinking & bathing

What is available?



ACCESS

Location - relative to local village / town; vehicle and pedestrian routes; securable site

Roads - size, construction, type of use?

Paths - easy access for pedestrian visitors?

Local transport links - mutatu and boda-boda access is fairly universal; more formalised links beneficial for larger catchment areas

OBSERVATIONS

Local activities - Markets / schools / community centres / clinics?

Site usage - Who currently uses the site / surrounding areas? Open areas for sports / communal activities?

Noticeable features - anything that would make site appealing / prominent in the local area / benefit future development as a school

TOPOGRAPHY

Flat sites - easier to build on
- fewer design issues to resolve when grouping buildings
- easier to secure

Sloped sites - usually cheaper to buy
- drain well
- require stabilisation
- potential views to / from site (local presence)
- likelihood of openness to prevailing winds

WATER

Site drainage - are there storm drains / channels present?

Flooding - is there evidence of marshy / boggy ground?

Sources - streams, wells, mains water, storage tanks; what is the quality? Is it owned by the locals or freely accessible?

ENGAGING THE LOCAL POPULATION

PARTICIPATION

Ensuring that the school is successfully integrated, and accepted, into the local community when built is a key ingredient to any project. Engaging with the people of the surrounding area from an early stage will help any given project.

Participatory planning is an established way of consulting with local communities on possible developments.

'THE TERM PARTICIPATORY RURAL APPRAISAL DESCRIBES A GROWING FAMILY OF APPROACHES AND METHODS TO ENABLE LOCAL PEOPLE TO SHARE, ENHANCE AND ANALYSE THEIR KNOWLEDGE OF LIFE AND CONDITIONS, TO PLAN AND TO ACT...'

'WHOSE REALITY COUNTS?'
ROBERT CHAMBERS

STEP 1 - OBSERVE & TALK

Observe - look, listen and learn without preconceptions

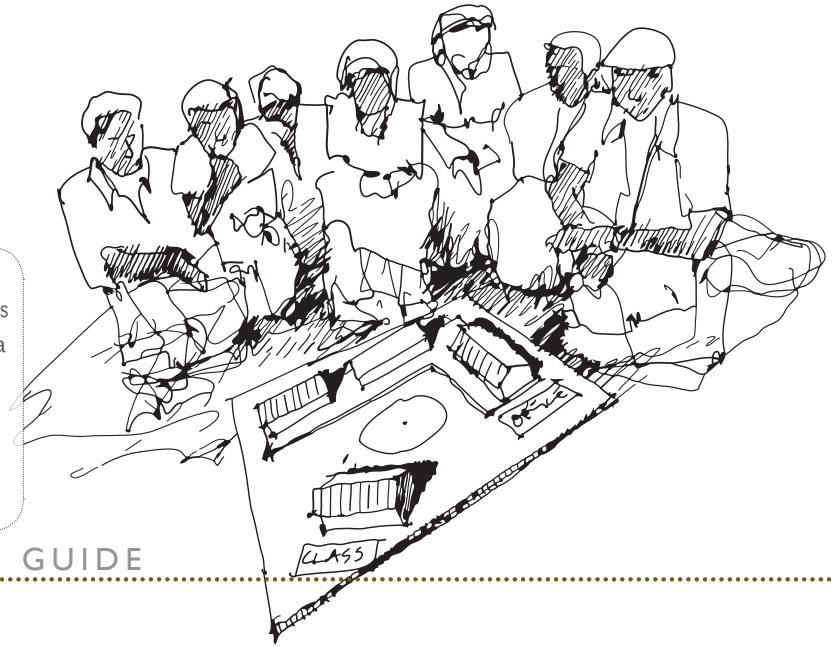
Informal discussions - Talking to locals; building an idea for what might be available in the area for schooling; what other facilities might be wanted

Formal interviews / meetings - formally organised meetings with community leaders & groups

STEP 2 - CREATE

Mapping - 'Stakeholders' map out what are the key issues in the community with physical models to encourage debate and discussion; people are encouraged to interact, to comment and to raise concerns. Maps do not need to be accurate; they are a way of bringing issues of importance to the fore of any agenda

Planning For Real - Kit-type consultation pack that helps discussions within a loose but organised framework. Opinions can be voiced anonymously for different options



STEP 3 - PRESENT

Presentation of ideas - Design team / client group present to leaders / elders; ideas developed further in conjunction within small focus groups examining certain aspects of a project; Development of ideas with community groups

Feedback - formally organised meetings with community leaders & groups

SURVEYING THE SITE

Understanding your site is crucial to creating a successful plan for your school.

You will need to know about all sorts of things before you can start master planning. The survey will also be essential to building your school successfully, since, as is explained later (Building: Setting Out), an accurate and well planed survey is crucial to building your buildings in the place you have planned to put them. Failing to do that will mean all your hard work now is wasted along with lots of your money. So this is where it all starts:

- What do you need to find out?
- How do you survey?

Two important questions and we will deal with them in that order:

What do you need to find out?

The “Looking for a site” page provides 7 headings to base your site investigations around. If you can find out about each of the things listed on that page and think of a few others which will be specific to your project and your site then you should be pretty well covered.

How do you survey?

There are 3 basic methods for collecting information about your site.

Each method has it’s strengths but you can not find out everything you need to know about your site without using all of them. Some information can only be found by visiting the site and other information has to be gathered from maps, deeds or the municipality.

The methods are presented in the order you should approach your research and you will find the first two methods useful even when you are simply looking for a site.

DESK TOP STUDY

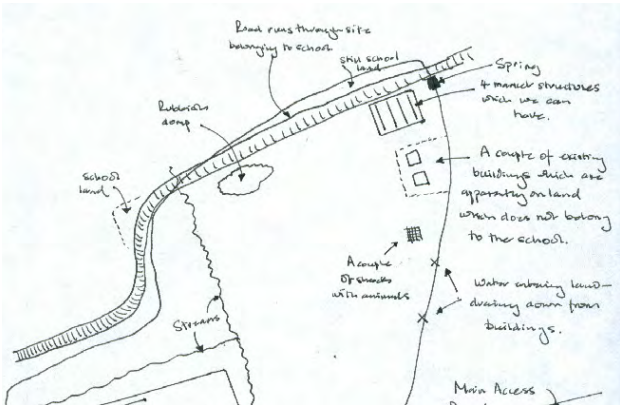
In many areas you can get a useful amount of information from aerial photographs and satellite mapping sources, such as GoogleEarth, or from local municipal maps showing legal boundaries. These should be sufficient to start planning a school in the feasibility stages of a project.

Use - Early fact-finding tool to which will allow you to identify basic and approximate information about the following:

Location and size - About how big is your site? Where local services / links might be.

Appraisal - Brainstorm ideas for layouts; identify potential problems (nearby hazards, main roads, water courses etc); access and entrance position(s).

Sources of information - check out http://earth.google.co.uk/ or www.google.com/maps.



HAND-DRAWN SURVEY/NOTES

Visit the site and make written notes and annotated sketches. Take plenty of photographs and try and record where you have taken the photos and what they are of.

Use - Early fact-finding, feasibility and school design. This is your chance to make a detailed assessment of what the site offers your school.

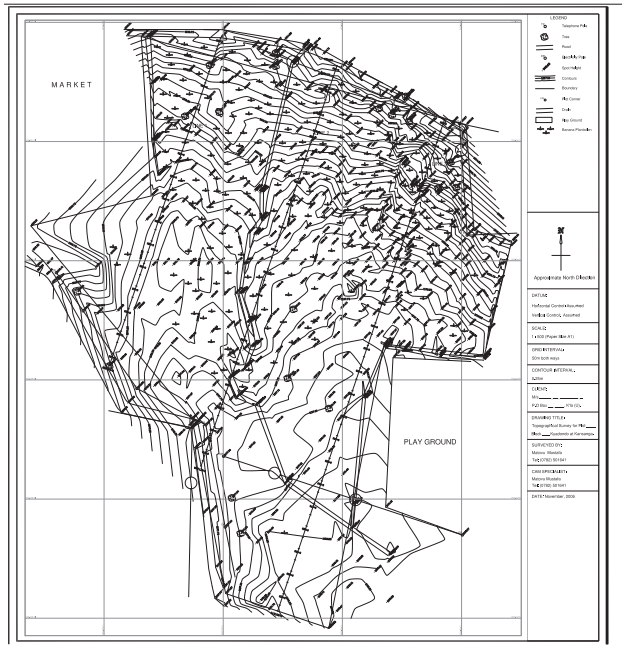
Useful tools - Take a hard backed notebook, a camera and possibly a measuring tape (although surprisingly accurate measurements can be taken by pacing out).

What to look out for - Identify and locate important landmarks, topographical features (steep banks, streams, trees, existing buildings etc). Where are the good views? Where is it quiet, shady and sunny?

Think about the things identified on the page called “looking for a site” earlier in this book.

Your notes will help you explain to the professional surveyors what it is you want them to measure.

FURTHER INFORMATION



MEASURED SURVEY

This is an accurate record of the size and topography of your site. You will need to employ a professional firm once site has been secured / bought.

This can be expensive.

It is important that when you commission the professional surveyor you agree with them exactly what they will survey and how they will give you that information before a price is agreed and they start work. The table to the right suggests the things a professional survey should include and provides a few notes to assist you.

SURVEY BRIEF	NOTES
Please survey the site at [site address]	
Please provide the survey to us in the following formats: As a computer file: • 3D CAD (computer) file • 2D CAD (computer) file • PDF file	CAD files are only useful if you or your consultants will be using computer drawing software
In a hard(paper) copy: • [State number] Paper copies at A1 (paper size) and • [state number] copies at A3	A3 is a very useful paper size for quick reference and can be copied on any photocopier. A1 (or A0) are useful because they are larger and so more information can be seen on one page. Copies must be made on specialist large photocopiers.
Please include the following in the survey: • Contours at 1m intervals • Site boundary • Site entrance • True and magnetic north • Location of power and telegraph poles • Position of significant trees • Location of streams • Other significant landmarks	You might identify which trees you consider to be significant by tying a ribbon round them on site or attaching photographs. Alternatively you could ask for all trees over, say, 5m tall or with a trunk >100mm diameter to be surveyed. Trees are useful points to help with the setting out of the buildings) You may need to be quite specific about landmarks you wish to be surveyed/measured.
• Height of trees and size of tree canopies • Species of tree • Location of boggy/marshy areas.	The last three items are useful but less important – you can probably find these out for yourself when you visit the site.

CONSIDERATIONS

ACCOMMODATION

- Staff & student sleeping quarters to be separated
- Boys dorms and girls dorm should be some distance apart
- Consider temporary accommodation for the duration of the initial phases of building

ENVIRONMENTAL

- Shelter from heavy rain and from hot sun are key issues to tackle
- Rainfall should be drained / channelled carefully to ensure flooding is kept to a minimum, especially where buildings are at the foot of a hill
- Rainwater should be stored and re-used for washing

SANITATION

- Keep toilets and shower blocks separate from other facilities
- Position close to sewage storage / treatment area
- If using rainwater to flush toilets / provide water for showers ensure water storage tanks are positioned close by

LOCAL COMMUNITY

- Actively encourage local participation
- Use local resources
- Foster good links and relationships with neighbouring communities

EXPANSION

- Is there any nearby land that could be bought / used for future expansion?
- Masterplan with future enlargement in mind (progression of courtyards; vistas through site etc)

ACCESS

- Good track / roads already in place to allow pedestrian access
- Consider access for construction vehicles

SECURITY

- The site should be secured with gates to keep intruders out (and kids in!)
- A security guard or reception hut could enhance the security

SHADING

- Make use of existing trees where possible that afford good shade for external spaces
- Where planting new trees, ensure that it is a relatively quick-growing species

WATER ACCESS

- The location of the water source will dictate where the sanitation facilities are placed
- Running water / streams are useful for washing clothes
- Boreholes / wells can be dug in appropriate places
- How deep is the water table?

CLASS LOCATION

- Think how the position can be tied in with further development
- Keep building away from edge / fence of site to reduce potential for intruders to climb on roof / arson from vandals

COMMUNAL AREAS

Classrooms and other buildings can be used to create communal spaces. Trees / landscaping can help enrich these spaces for students to relax or study in

SITE FACTORS

SLOPE

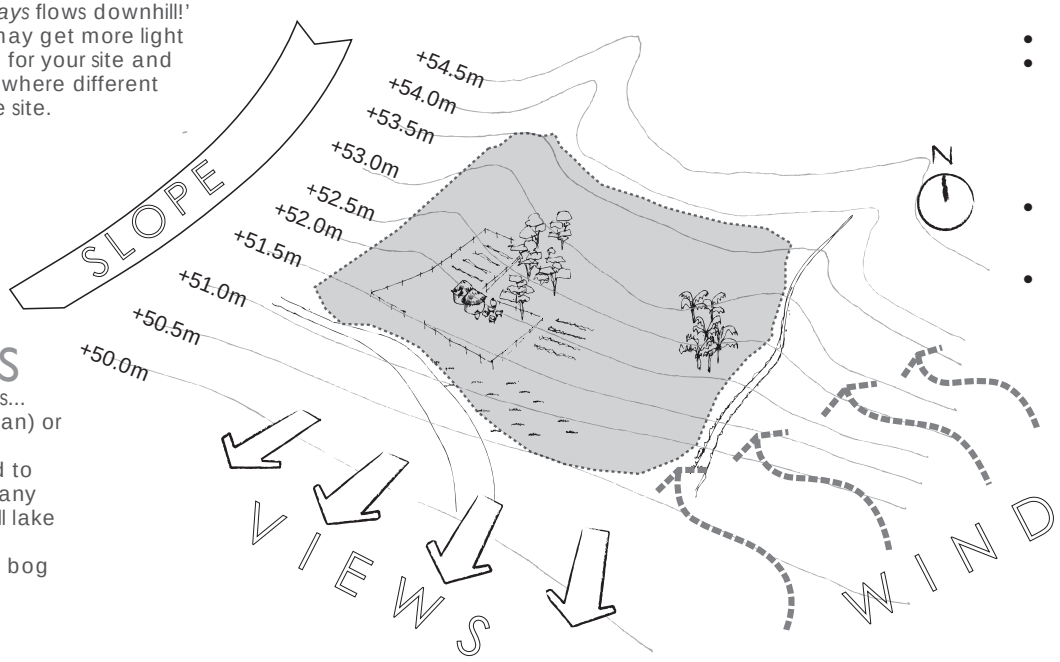
- The slope of the site will influence how you choose to position your buildings on the site. Dealing with a steep slope may prove to be expensive (see Page 16)
- Choose the flattest area possible for a sports field, providing it is well drained
- Consider how water can be collected, stored and distributed to buildings on the campus
- Consider how sewage and effluent is collected and then treated – 'shit *always* flows downhill!'
- The higher parts of the site may get more light or wind. Find out if this is true for your site and think about how this affects where different functions are located on the site.

EXISTING TREES

- Existing mature trees will provide shade and focal points (see VIEWS)
- They may also provide fruit for the school
- Thought should be given to see how they could be incorporated into any design

ORIENTATION

- Uganda is on the Equator
- If buildings are oriented east to west, they will receive morning and afternoon sun through windows. Morning sun can warm the building usefully in the Winter; however, afternoon sun can cause internal rooms to overheat in the summer
- If the building is oriented to face north - south, very little direct sunlight with come through the windows
- Shallow roof slopes facing north or south are better for installing solar collectors than those oriented east and west



WATER SOURCES

- Rivers, streams, marshes, wells and springs...
- These may provide a water source (if clean) or be a source of mosquitoes (or both)
- How will a stream or boggy area be used to the greatest advantage for the site and any school compound? Can a reservoir/small lake be created?
- Can trees be planted to help dry out the bog and create a shady cool glade?

VIEWS

- Use views of distant hills or significant features on or off the site (eg. a substantial tree) to give a space or a route through the site a focus
- Height often allows far reaching views or creates better views

WIND

- Where do the prevailing winds come from?
- Are some parts of the site windier than others?
- Is a breeze useful for reducing the number of mosquitoes in a particular part of the site – for instance around the dormitories?
- Is the prevailing breeze blowing over, or from the direction of, a water source? This can provide cooler air in the immediate vicinity of the water, and could suggest a good location for certain buildings

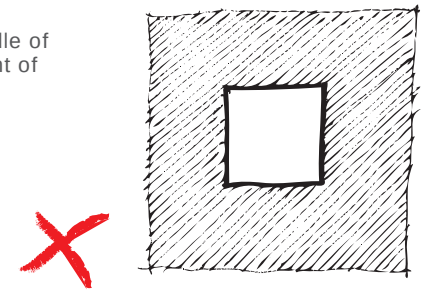
MASTERPLANNING

POSITIONING FUNCTIONS & BUILDINGS TO ZONE THE SITE

To make the best of any given site, thought should be given to how the buildings are going to be best situated on the site to create the best use of the space available. Some guiding principles are outlined on this sheet; the following sheets show how a school can be developed in phases that provide the functional requirements needed as the project progresses and grows.

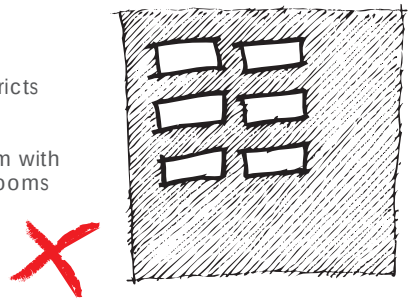
CENTRED

- Placing a building in the middle of a space minimises the amount of usable space around it



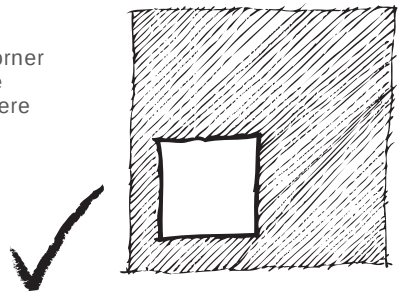
CLUSTERED

- Clustering buildings can create narrow dark alleyways and restricts the amount of natural light & ventilation in each classroom.
- There is also a potential problem with noise travelling between classrooms



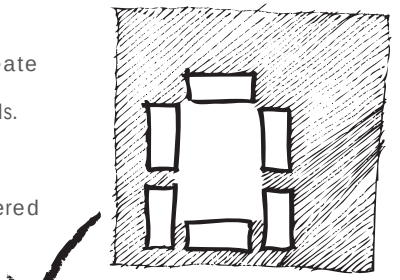
CORNERED

- Placing a building towards a corner or side of a space increases the amount of useful space elsewhere



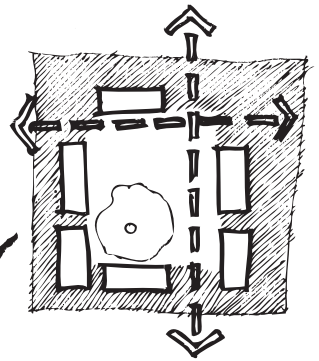
COURTYARD

- Buildings can be arranged to create useful and attractive communal spaces such as central courtyards.
- Courtyards can have different focuses; subject-based, contemplative, administrative...
- Buildings can be linked with covered walkways to provide shelter



AXES & CORRIDORS

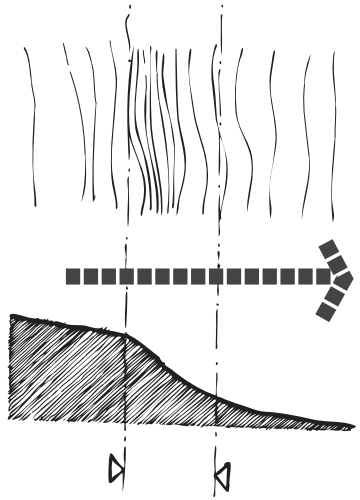
- The organisation of buildings on the site can create main 'corridors' & views through the school.
- It is important to try and arrange buildings to take advantage of existing mature trees & Other natural features.



DEALING WITH SLOPE

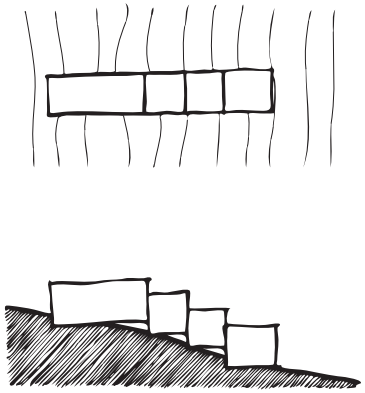
CONTOURS

- It is important to understand what the contours on a site survey plan represent:
- Contours lines represent points which are all at the same height above a datum level.
- The closer the lines the steeper the slope.
- Contour lines are always drawn at regular height intervals - eg 1m or 0.5m. It is important you know what your plan is showing.
- Draw a section through your site - you will be surprised at the height change caused by even a modest slope.



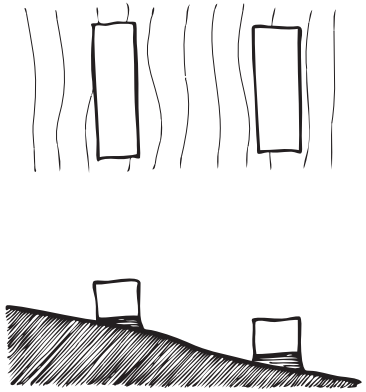
STEPPING THE BUILDING

- One solution is to step the building down the slope.
- You may choose to dig into some parts of the slope and fill out others to create a series of level platforms (floors).
- You should plan the building so that the internal walls are on the steps.
- Consider the size of each level change and how many steps you will need to get from one level to the next.
- The junctions between the buildings can be complex & expensive.



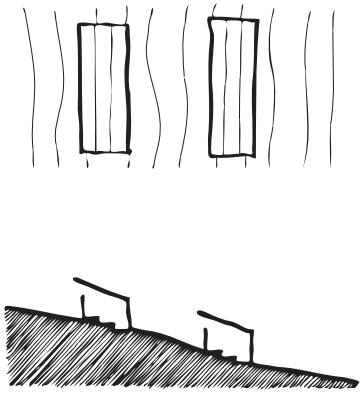
FOLLOW THE CONTOURS

- Build your buildings along the contours of your site.
- You may need to build up one edge of the building by a meter or two depending on how steep your site is.
- Alternatively you could dig your building into the slope of the site. Consider access, waterproofing (water seepage from the ground) and the cost of the digging.
- This is generally the cheapest way to build on a sloping site.



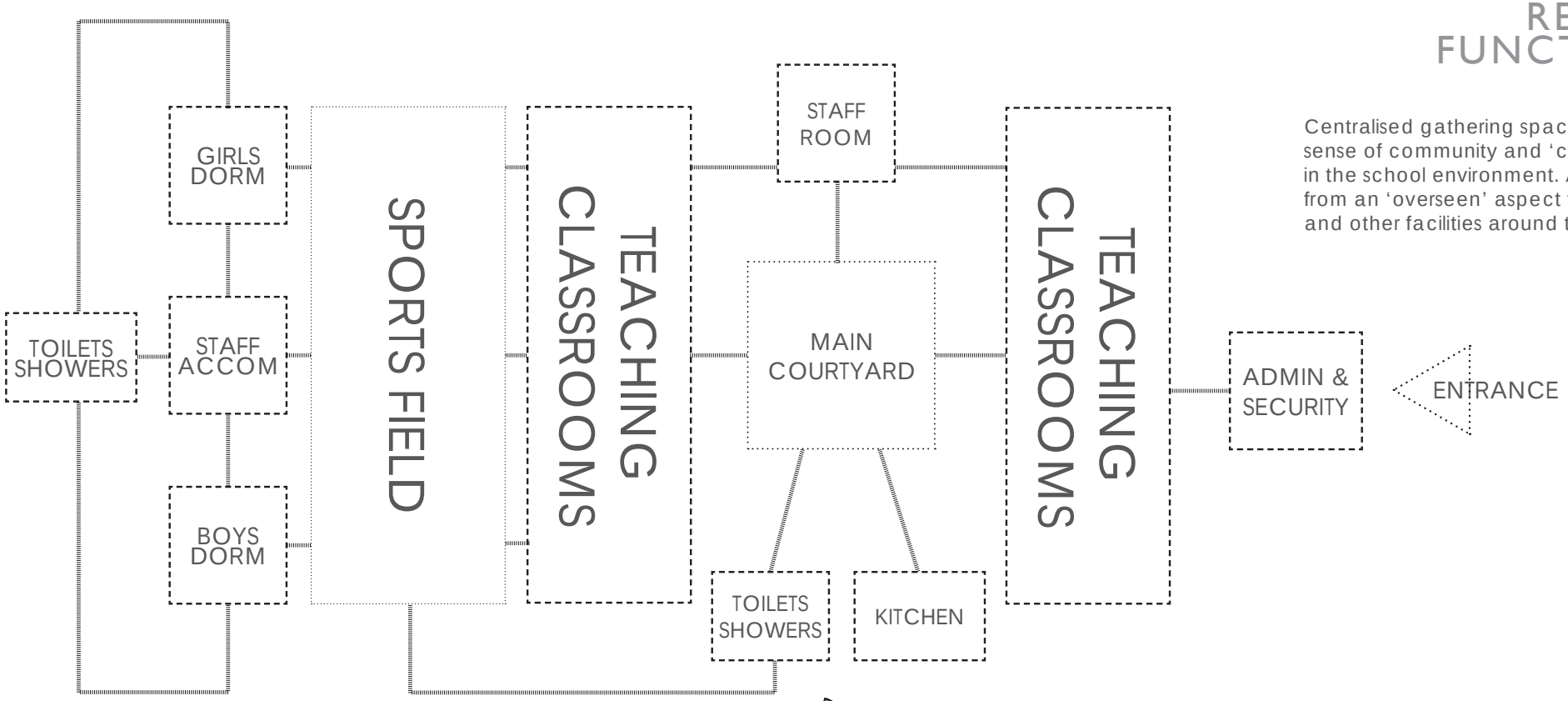
USE THE SLOPE

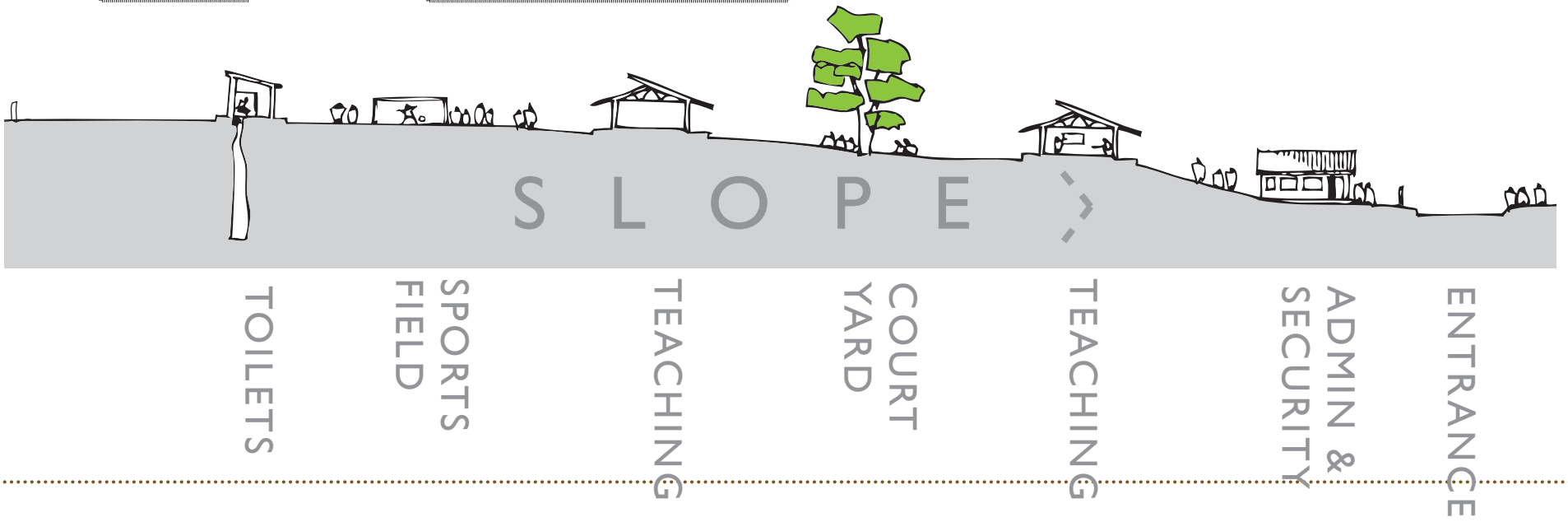
- You could use the slope to create tiered seating like that found in a lecture theatre or cinema.
- This may be a great advantage because it means there is less digging out and filling. all the students will get a good view of the teacher and the blackboard.
- The disadvantage is that the room can only be used in one way.

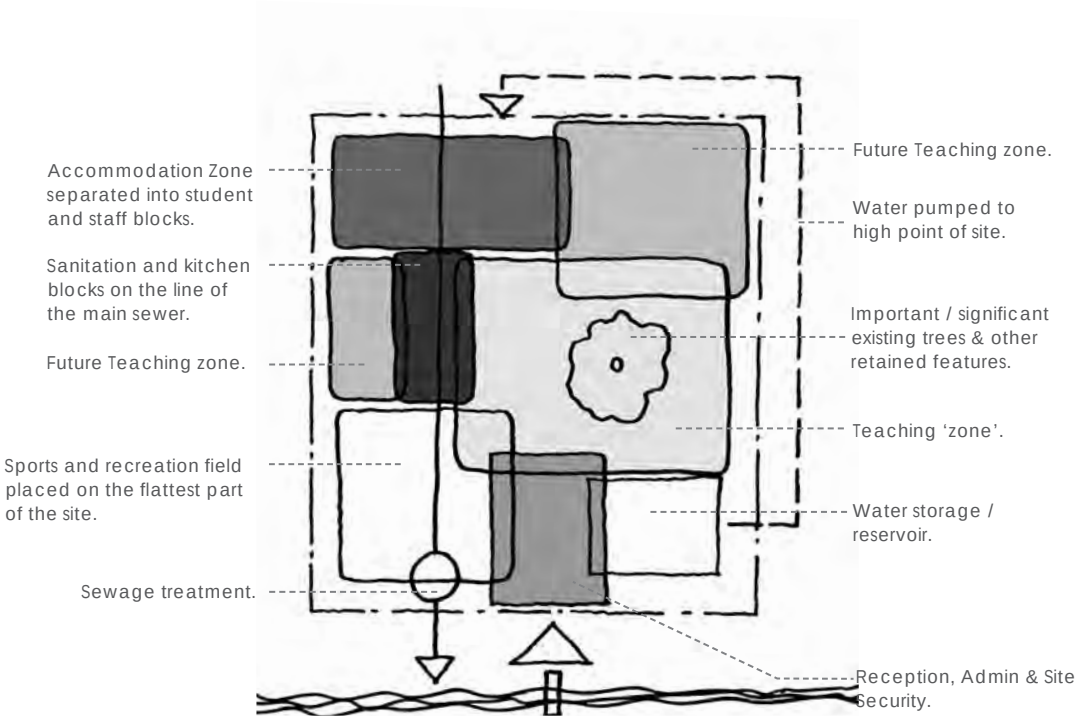


RELATING FUNCTIONS & ZONES

Centralised gathering space - ensuring a sense of community and 'coming together' in the school environment. Activities benefit from an 'overseen' aspect from classrooms and other facilities around the campus.



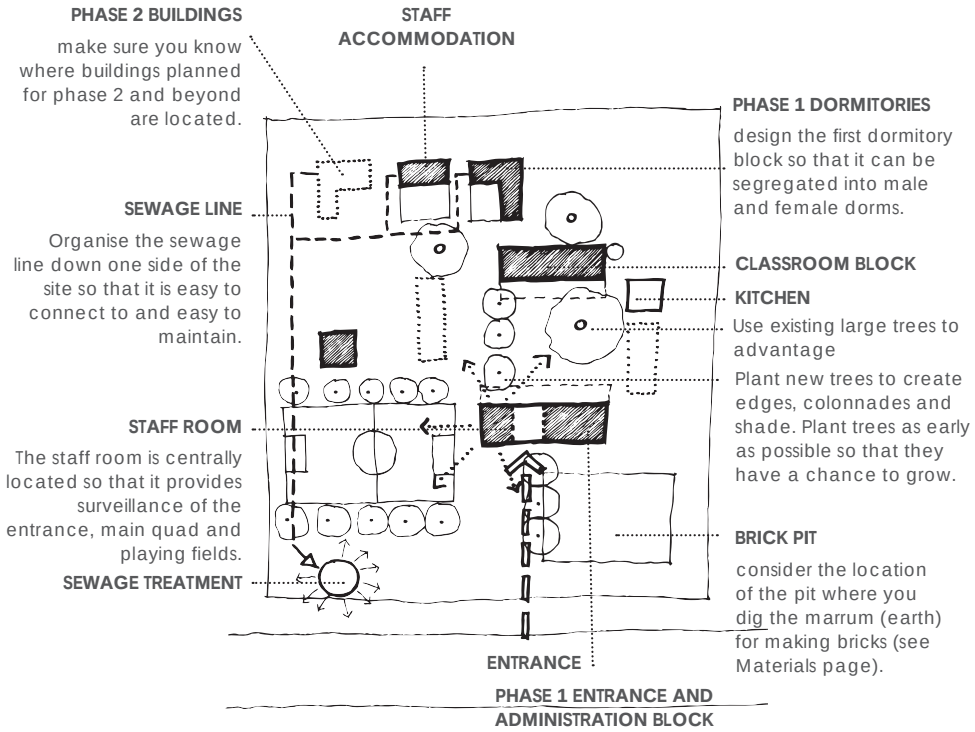




SITE ORGANISATION & ZONING

It is important to plan how the school will be organised for the following reasons:

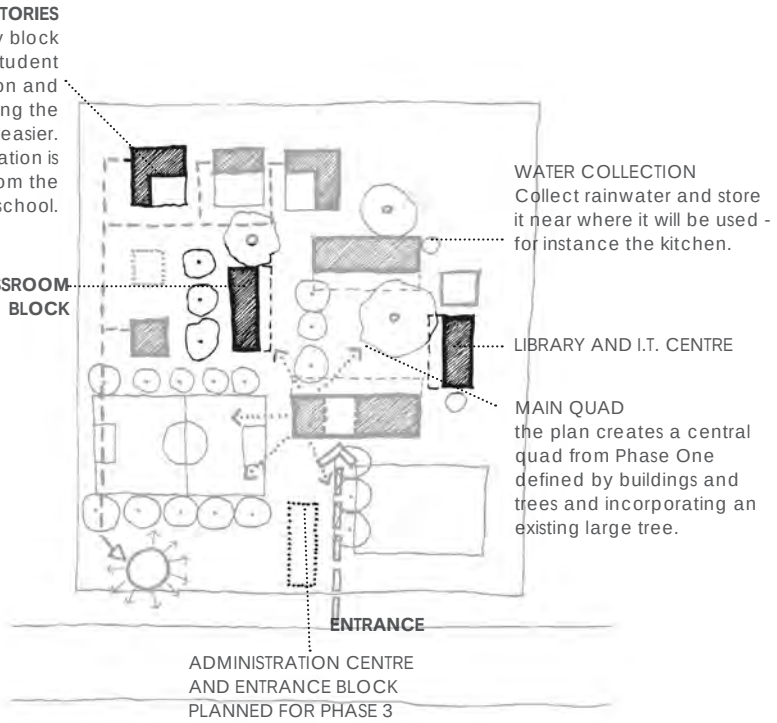
- To ensure the school is well set out and takes advantage of the opportunities offered by the site.
- Make sure everything fits on the site.
- Create useful external spaces
- Plan for future expansion



1ST PHASE (120 PUPILS)

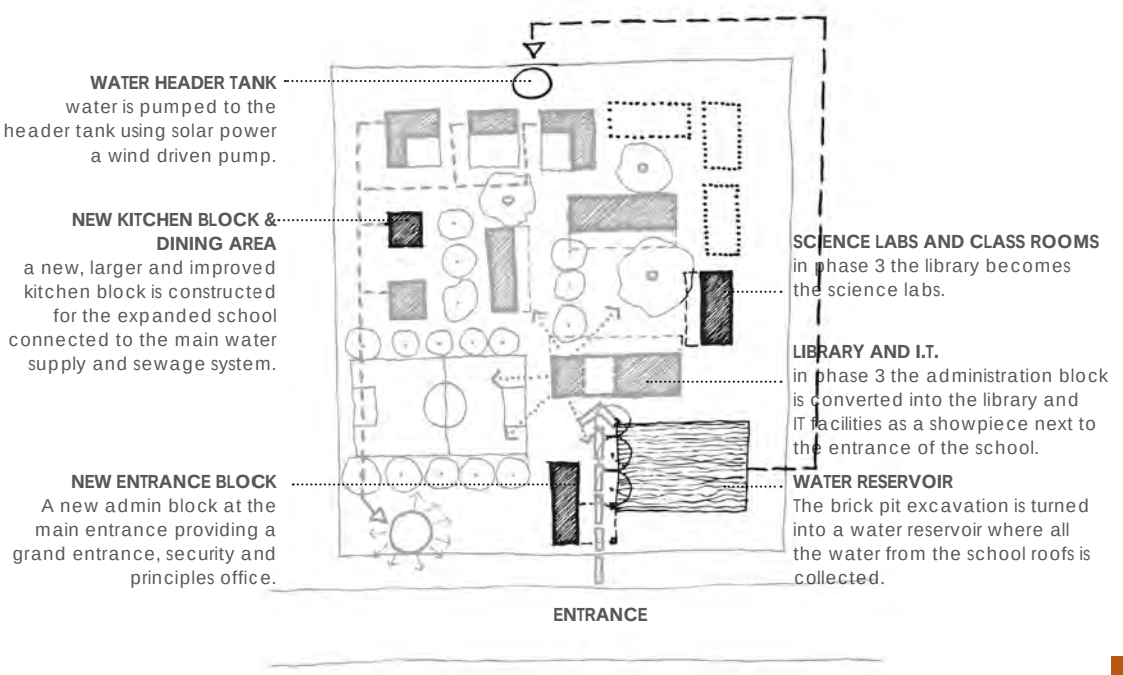
When planning the organisation of the site it is important to consider

- The order that you will be constructing the buildings
- What functions each building can fulfil now and in the future (eg a library or main office could become a classroom)
- When will the different buildings be needed? For instance in the first year only 3 classrooms and a small kitchen might be needed; in the 2nd year 2 more classrooms could be required to cope with a larger number of pupils



2ND PHASE (300 PUPILS)

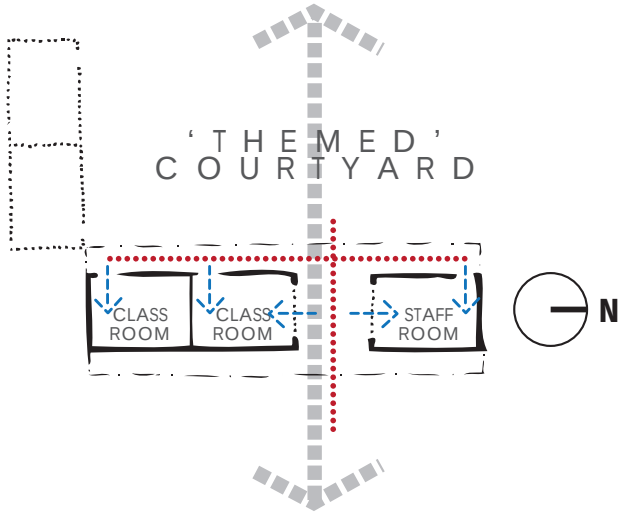
- The school becomes better established with improved facilities.

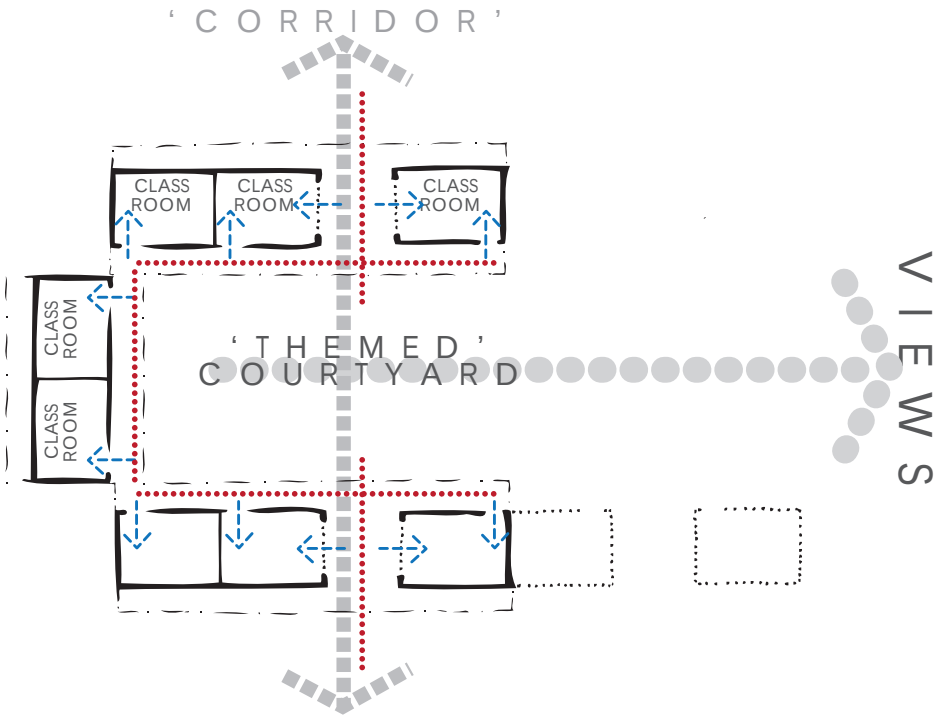


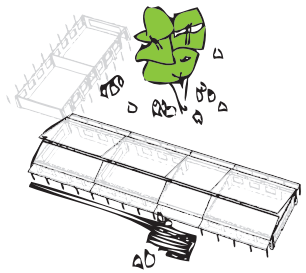
3RD PHASE (600 PUPILS)

- The school becomes fully established on the site with improved facilities.

CLASSROOM CLUSTERS

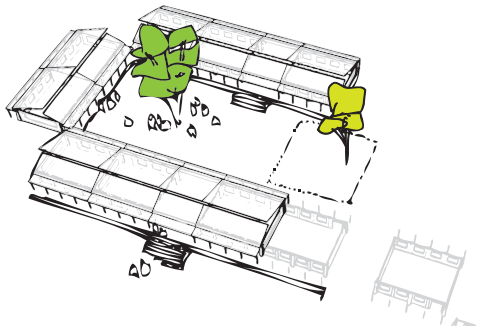






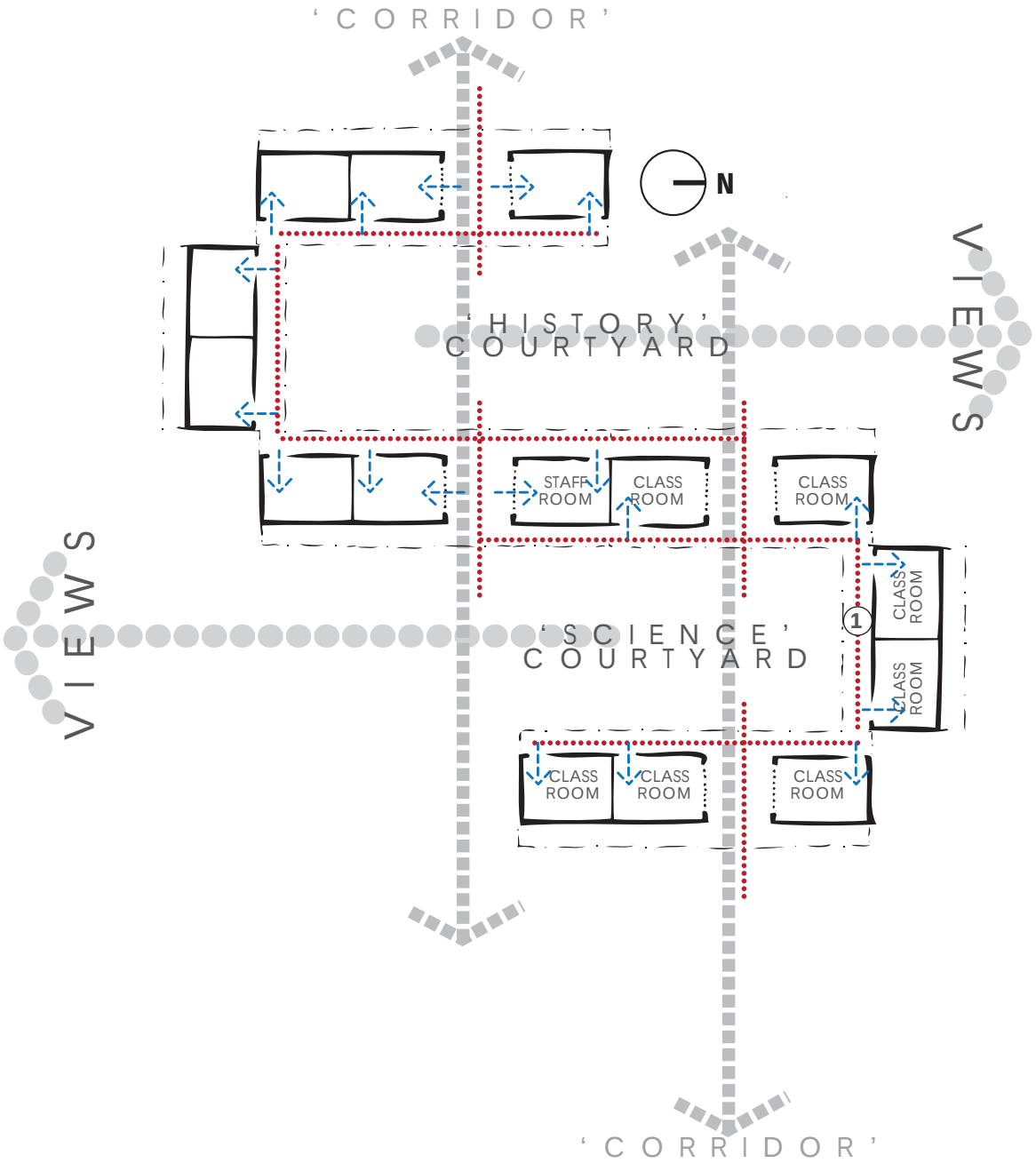
1ST PHASE

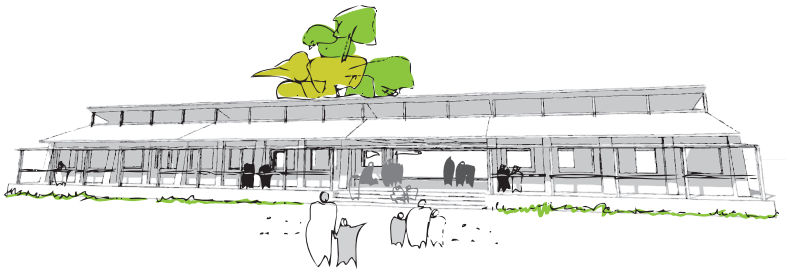
- Consider position in relation to masterplan.
- Classroom design could be repeatable to allow future development.
- Raise walkways around classrooms to prevent flooding in classrooms and allow students to walk between rooms under cover.
- Covered 'break-out' spaces between classes can be used for different purposes (eg teaching, assemblies, sheltered group study).
- Retractable screens allow areas to be closed off / opened up to suit different purposes.

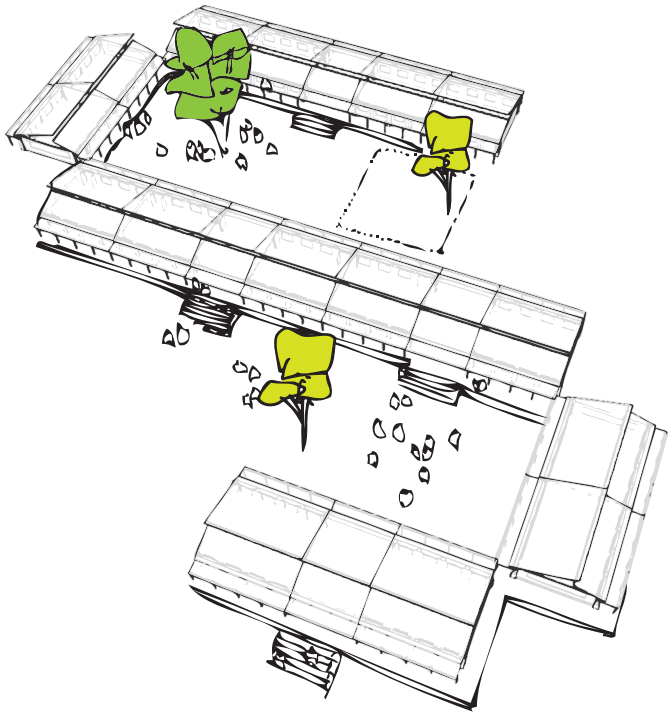


2ND PHASE

- Further classrooms allow courtyard spaces to be formed, focusing attention on a specific area.
- Courtyards could be given 'themes' appropriate to different subjects covered in classrooms overlooking it.
- Existing trees could be used to form shelter in courtyards.
- Access into classrooms should be from the courtyard to allow teachers to control spaces better.







3RD PHASE

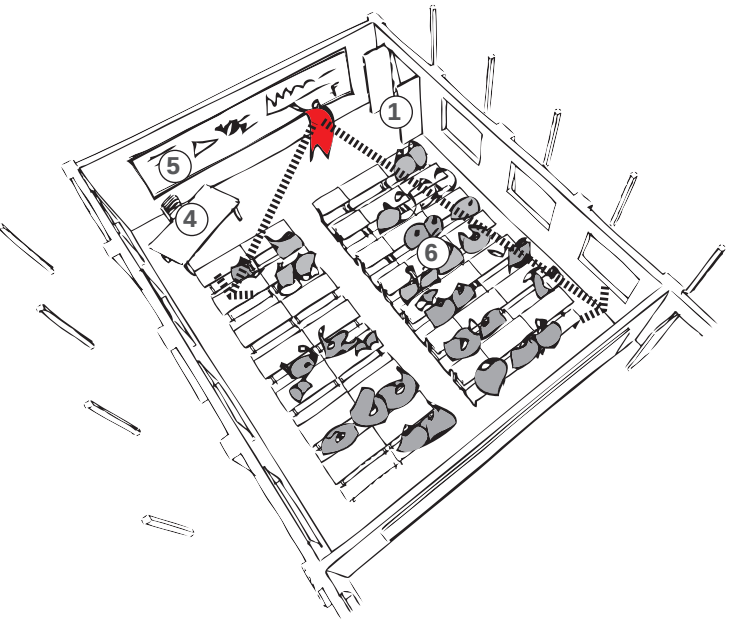
- Access / entrances into classrooms should be from the courtyard to allow teachers to control spaces better.
- Continue walkways around courtyards wherever possible (**1**).
- Classroom wings around courtyards can be 'splayed' to accommodate contours of site / views from the site / other existing features such as major trees or shrubs.
- Repetitive designs are more cost-effective in the long run; once the design has been understood and mastered by a contractor, it can be altered more efficiently using the first-built classrooms as prototypes.

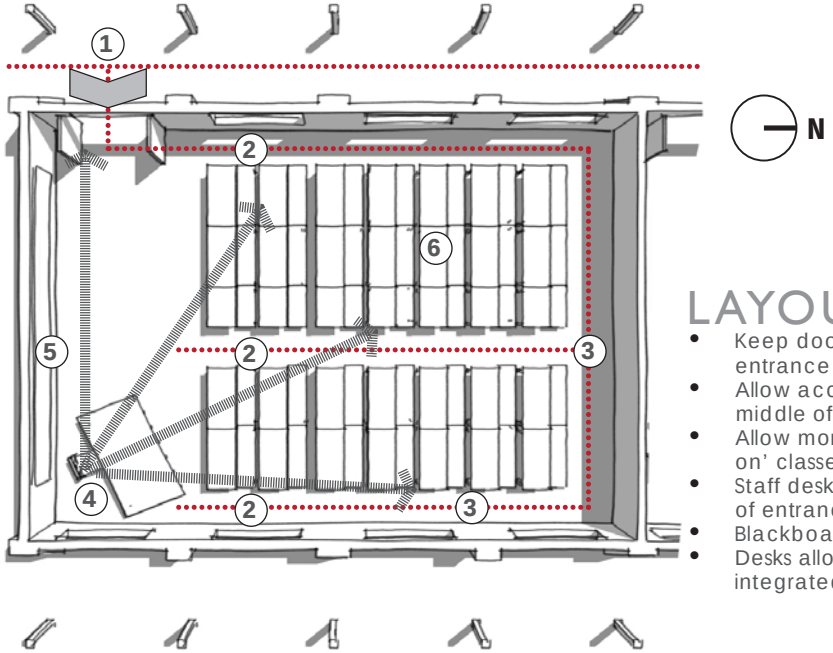
DETAILED DESIGN

CLASSROOMS

The layout of the classroom should enable every pupil to sit at their desk and get an uninterrupted view of the teacher who is giving the lesson and the blackboard that he or she is writing on. It should also allow the teacher to control the space easily, both visually and physically.

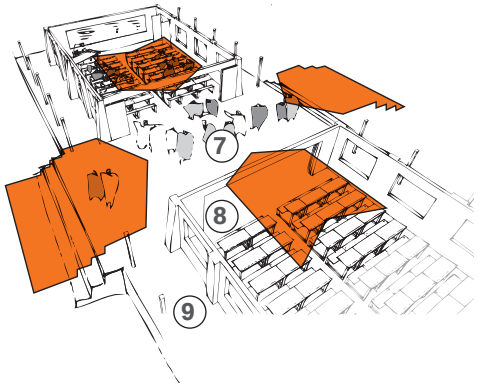
Acoustically, the classroom should not allow too much external noise to come in to disturb lessons; noise from adjacent classrooms and noise of rain drumming on the roof are 2 sources of greatest disruption.





LAYOUT

- Keep door in one corner to provide controlled entrance and exit from classroom (**1**).
- Allow access down sides of classroom and through middle of desks for students and teacher (**2**).
- Allow more space around outside of room for 'hands on' classes (science, art etc) (**3**).
- Staff desk situated in corner of room to give best view of entrance and of class (**4**).
- Blackboard situated behind desk (**5**).
- Desks allow 2 or 3 pupils to sit side by side. Chairs integrated into structure (**6**).



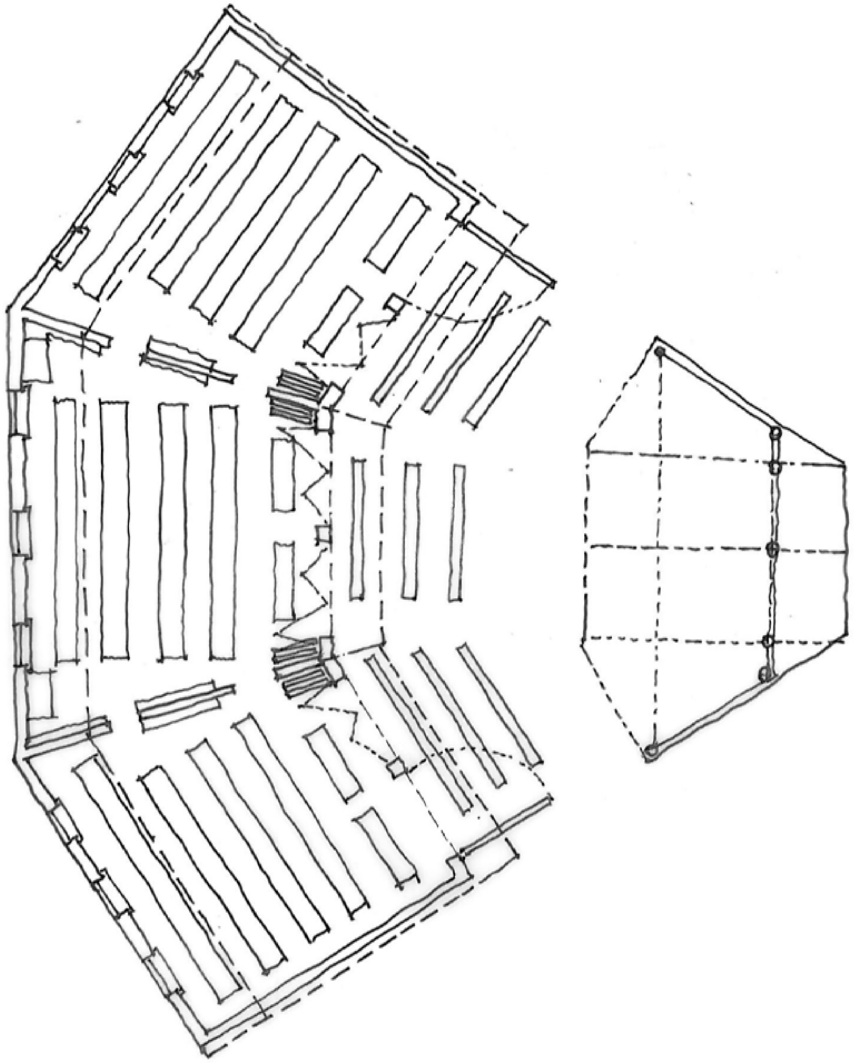
INTERNAL/EXTERNAL SHELTERED SPACES

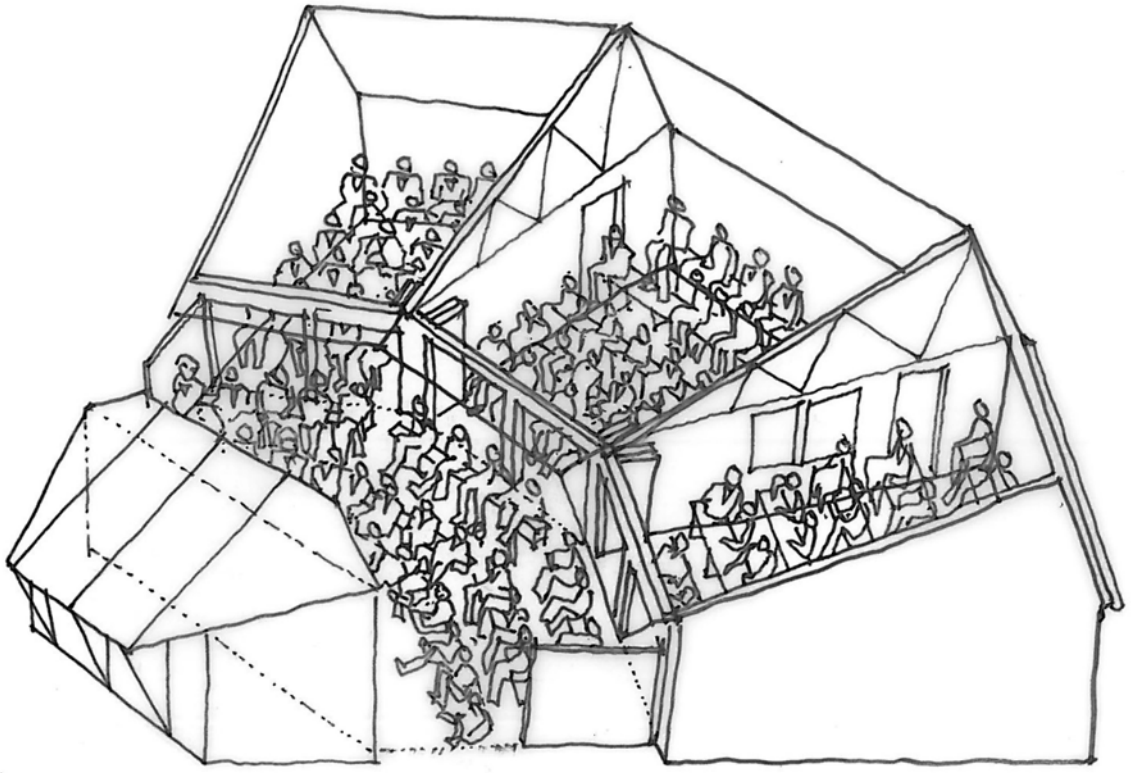
- A 'break out' space (**7**) in between classrooms and under a roof can be used for different purposes:
  - Group study
  - Teaching
  - Relaxation in between classes.
- Fold-away doors / partitions allow for larger gatherings & assemblies (**8**).
- Open spaces can be tied in with other class blocks to create 'corridors' in masterplan.
- Verandahs and walkways can be used in a similar way; seats can be built into the walls to give extra space for pupils to sit, conduct individual study and relax (**9**).

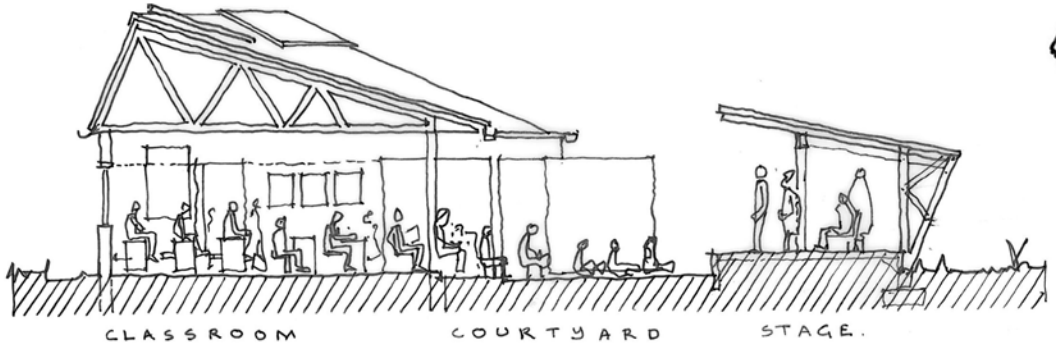
RADIAL PLAN

Arranging the classrooms in a radial pattern (around a single point) and creating large openings in the wall facing the focal point means that, combined, the classrooms can become an amphitheatre or be monitored by a single person. When used separately the main structural walls and better sound attenuation is between the classrooms.

Careful thought will need to go into site lines for those sitting in the amphitheatre, the width vs. depth of each classroom and how many openings you want or need between the classrooms.



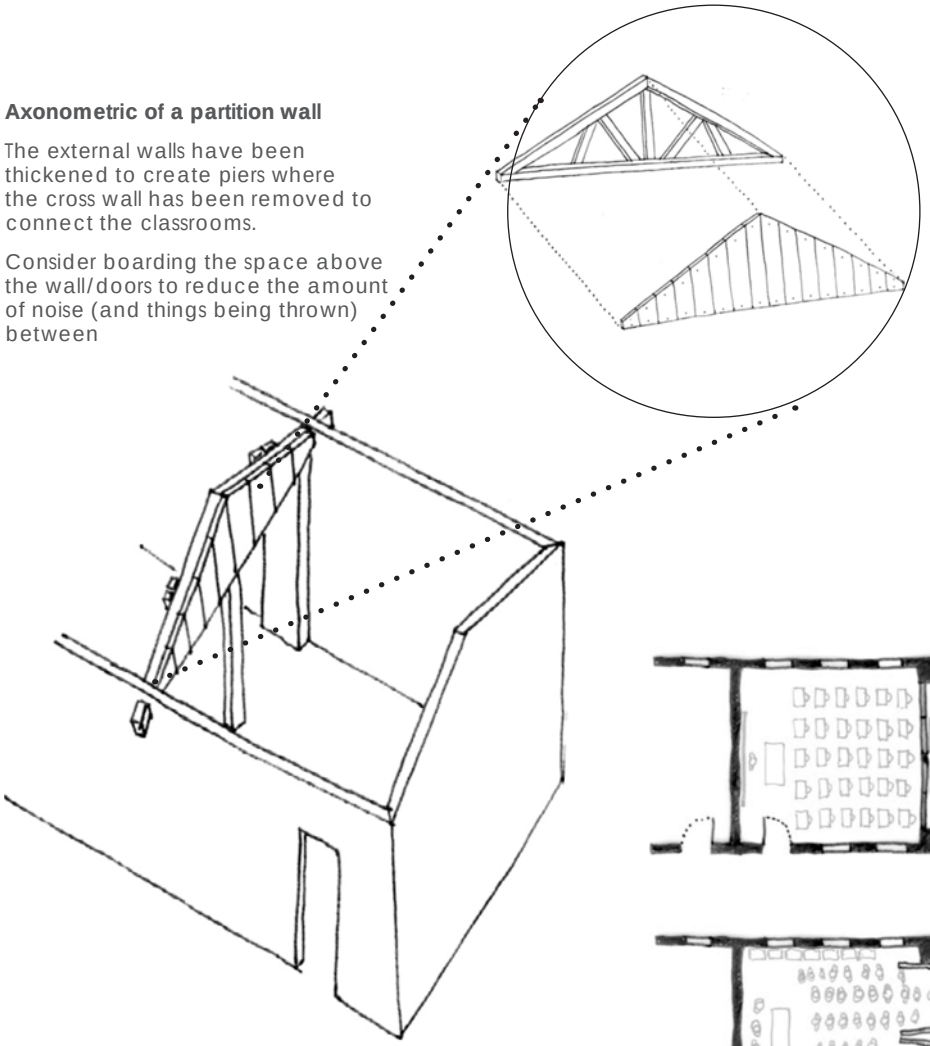


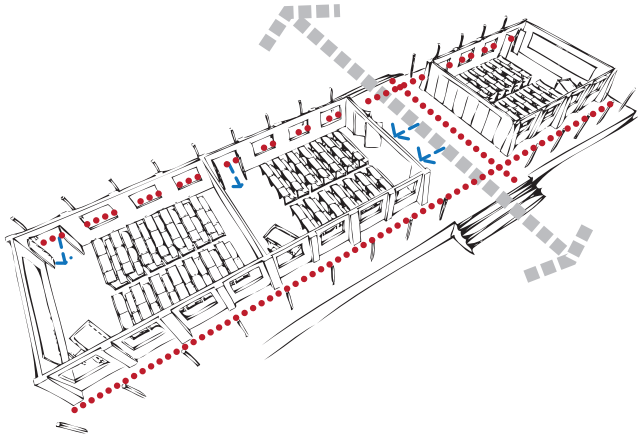


Axonometric of a partition wall

The external walls have been thickened to create piers where the cross wall has been removed to connect the classrooms.

Consider boarding the space above the wall/doors to reduce the amount of noise (and things being thrown) between





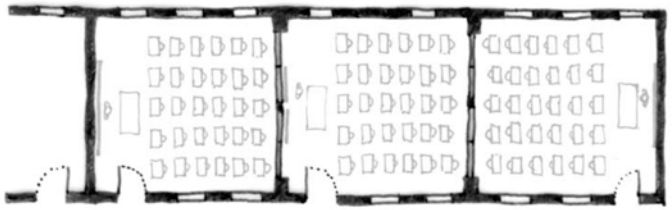
"LONG HOUSE" MODEL

A series of rectangular classrooms can be joined together by large doors in the walls between them. This allows two classrooms to be come one large room or a whole block to combine into hall.

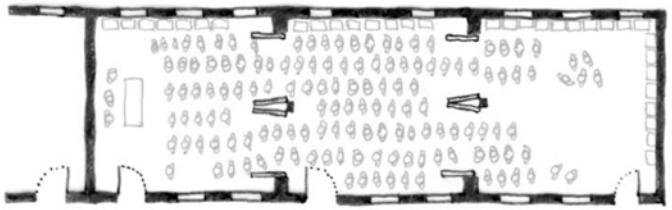
- Care should be taken with structural stability - the overall stability of a building comes from having walls running at 90 degrees to each other at regular intervals.
- Be aware of the noise which may travel from one classroom to another through thin timber doors.

Sometimes it will be necessary or economical to design a series of classrooms which can combine to fulfil another function such as an exam hall or a school performance and assembly space. Two possible examples of this are shown here.

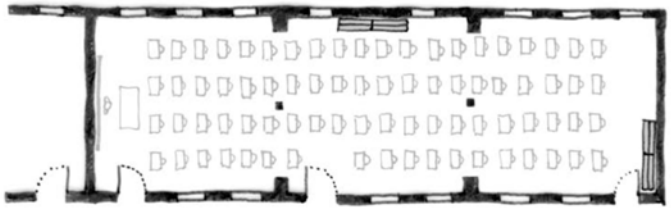
3 separate classrooms



Assembly hall



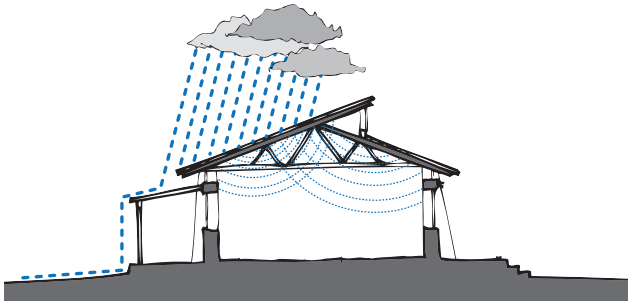
Exam hall



ENVIRONMENTAL CONSIDERATIONS

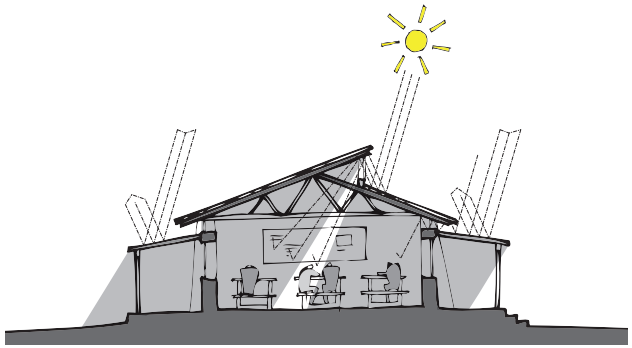
CLIMATIC CONDITIONS

- Roofs with overhangs minimise possibilities of water ingress through unglazed windows.
- Roofs over raised walkways around classrooms provide shelter from rainfall and also minimise too much direct sunlight.
- Impact noise of rainfall causes large disruption in classrooms; providing a buffer material between roof surface and room below is beneficial for teaching continuity.
- Buffer material should be carefully chosen - it should be fire-resistant, should not encourage insect nesting or deteriorate / rot / decay.
- Alternatively add a layer of reed or thatch over the metal roof.
- Lofts zones inevitably allow dust build up, as well as areas for insect / vermin inhabitation.
- Guttering should allow rainfall and water run-off from roofed areas to be channelled and collected in containers adjacent to the buildings; this can then be used for flushing toilets, watering vegetation and drinking water (if filtered).



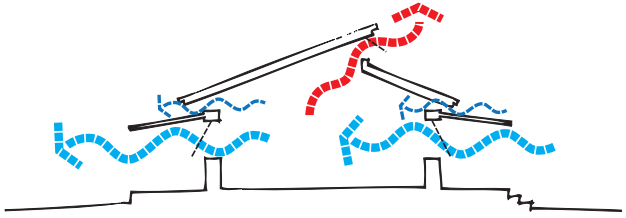
DAYLIGHTING

- Midday sunlight is more vertical due to Uganda's equatorial location.
- Optimise levels of natural daylight in classrooms to minimise use of electrical lighting .
- Polycarbonate roof panels allow light to enter without creating problematic openings that cannot be sufficiently waterproofed (beware of excessive solar gain).
- Direct sunlight causes glare and awkward internal light contrast; it can also cause solar heat gain which should be avoided where possible.
- Try to promote an even level of daylighting throughout the internal spaces by having windows at regular intervals.
- Classrooms with north / south-facing windows have better diffuse light rather than west / east-orientation.
- Verandah roofs and split roofs can act as 'light shelves' to reflect light through high-level clerestory windows.



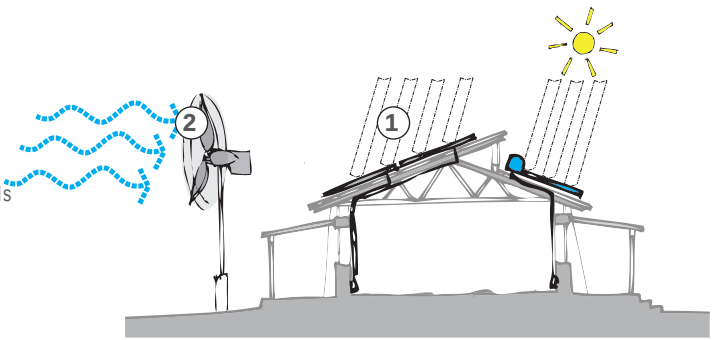
NATURAL VENTILATION

- Use openings to encourage ventilation to flow through the space to minimise overheating.
- Grilles / openings over windows & doors provide continuous air flow even when main openings are closed. Insect grilles should be considered to reduce infestation.
- High level openings encourage hot air to escape which is then replaced by cooler air at floor level.
- Unrestricted openings good for keeping spaces cool; however, classes can suffer from being too cold when conditions are overcast.

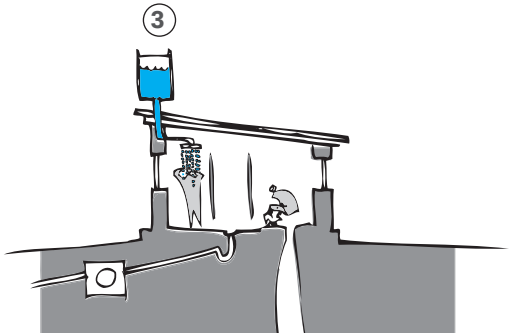


POWER & LIGHT

- Photovoltaic (PV) cells (**1**) convert sunlight into electricity; such cells have become increasingly more economical and efficient. Overshadowing, no matter how slight, should be avoided.
- Sun-driven electricity and heating systems can provide very cost-effective ways of responding to the energy requirements of schools, especially in rural contexts.
- PV and solar heating panels can be fixed to roofs that are orientated to the sun for the majority of the day; the sun in equatorial Uganda is predominantly 'overhead' so orientation is not too critical, but northerly- and southerly-facing sloped are more efficient than those facing east and west.
- Wind turbines (**2**), if prevailing breezes and winds are readily available on the site, are another source of renewable, cheap energy. It is one of the most cost effective methods of energy production, even compared to fossil fuel-powered methods.



SANITATION & TOILETS

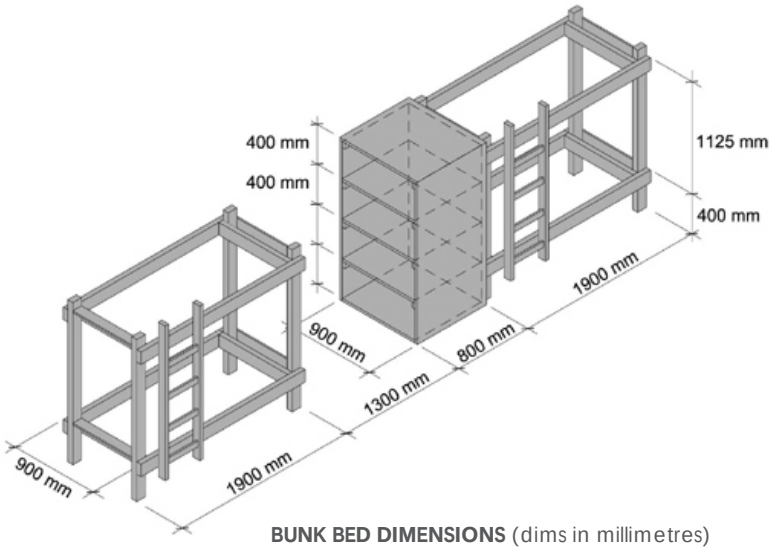


- Sanitation block should be built away from other accommodation and functional spaces to minimise smells and insect nuisance.
- Solar water heaters provide a reliable source of hot water. Flat plate collectors are more readily available than evacuated tube collectors but less efficient (**3**).
- Rainwater tanks can be used to provide water to wash and flush toilets with (**3**).
- Cess pits and tanks should, again, be positioned away from other buildings and away from floodable areas.
- Sex separation for toilets and wash facilities need to be considered; if boarding houses are to be constructed, toilets and wash facilities should be incorporated into them.

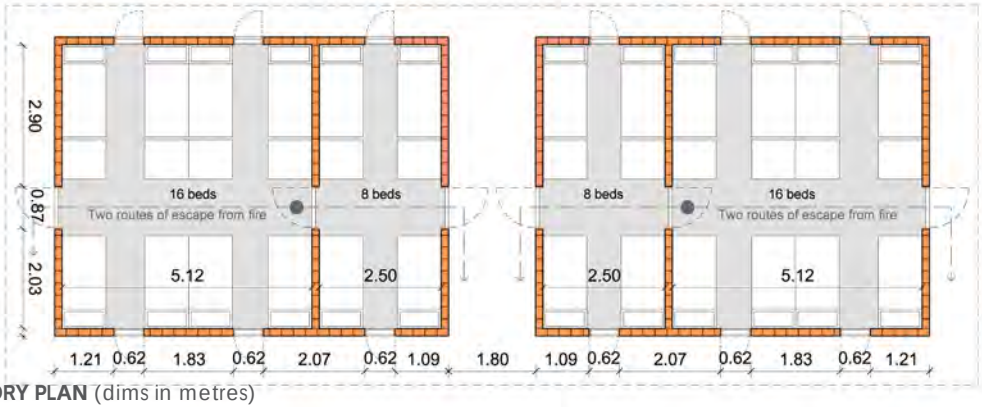
FURTHER INFORMATION

DORMITORIES

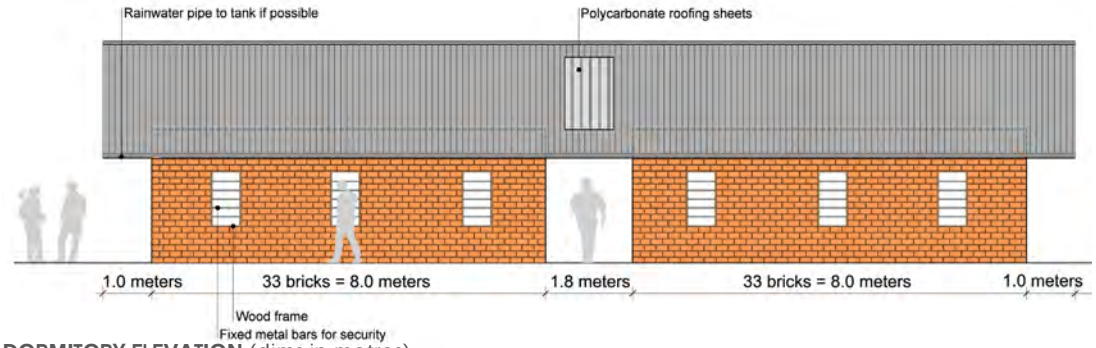
- Girls and Boys dorms should be kept separate when masterplanning the site
- Each dormitory should have its own set of washing and sanitation facilities
- Latrine / washing facilities should be built adjacent, or near to, dorms
- Roof trusses should allow enough space for at least a double bunk bed to fit underneath. Triple bunks are feasible, but will result in a higher roof
- Windows should be placed between each row of bunk beds to maximise the amount of natural daylight into the interior space
- Storage / cupboard space should be included at the foot of bunk beds, with a clear span of 1.3m between the foot of each bunk bed. This ensures a good clearance for emergency evacuation purposes
- Setting out drawings should include dimensions in metres / feet. Showing numbers of bricks can be helpful but relies on a consistent size of brick and so can be misleading. High level openings encourage hot air to escape to be replaced by cooler air at floor level
- Dorms should be built away from fences surrounding the school compound to make night-time escape or incursions more difficult; this also reduces potential for external vandalism



BUNK BED DIMENSIONS (dims in millimetres)



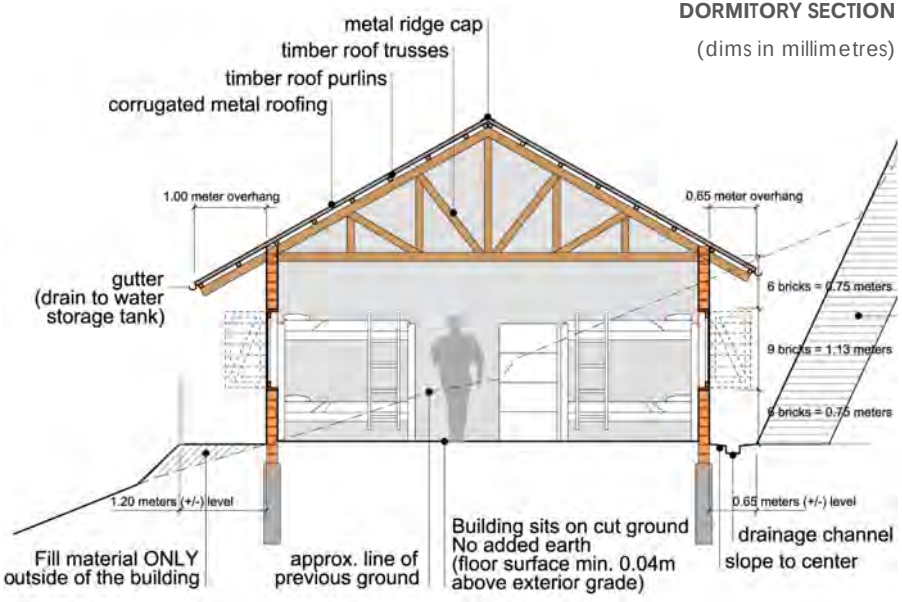
DORMITORY PLAN (dims in metres)



DORMITORY ELEVATION (dims in metres)

DORMITORY SECTION

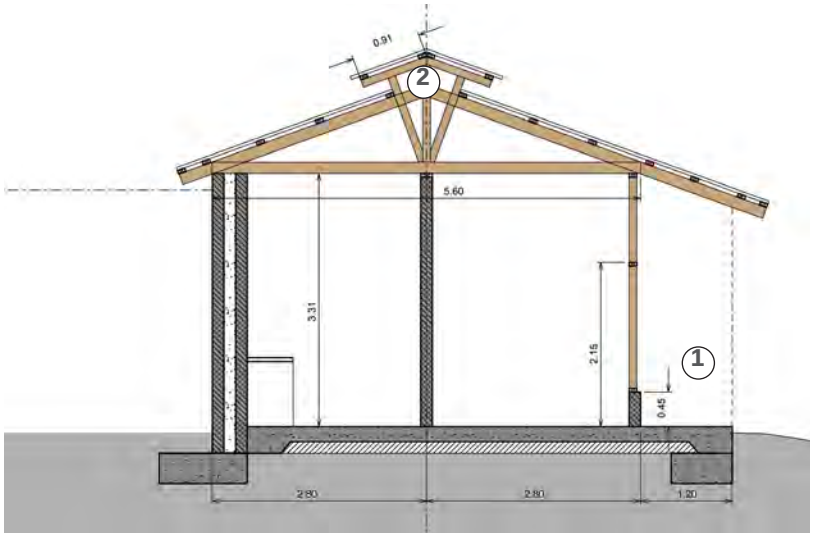
(dims in millimetres)

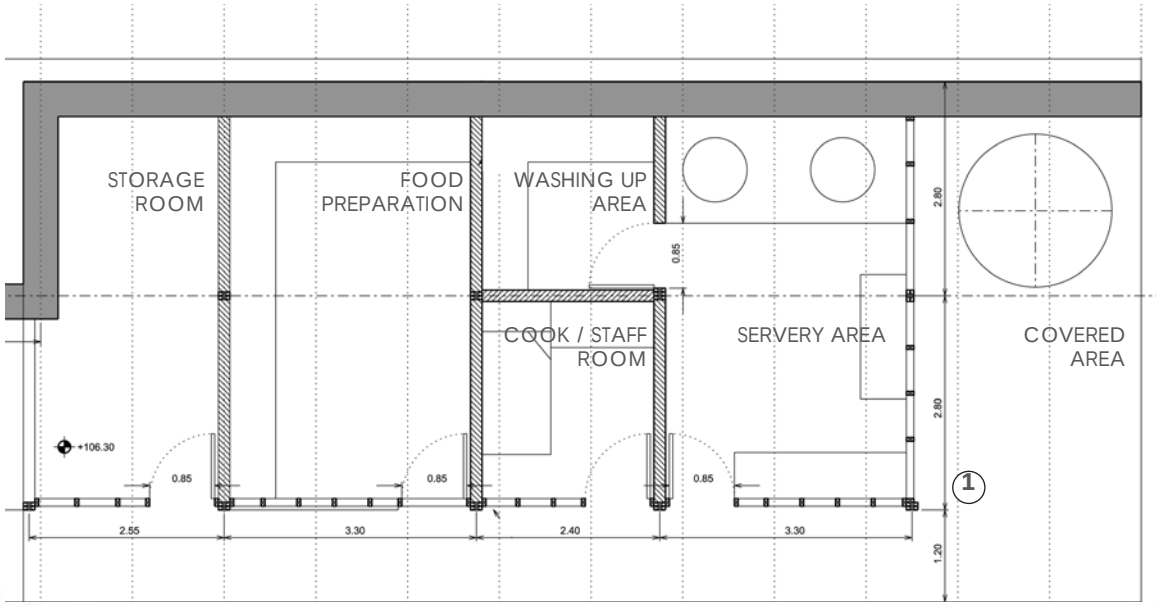


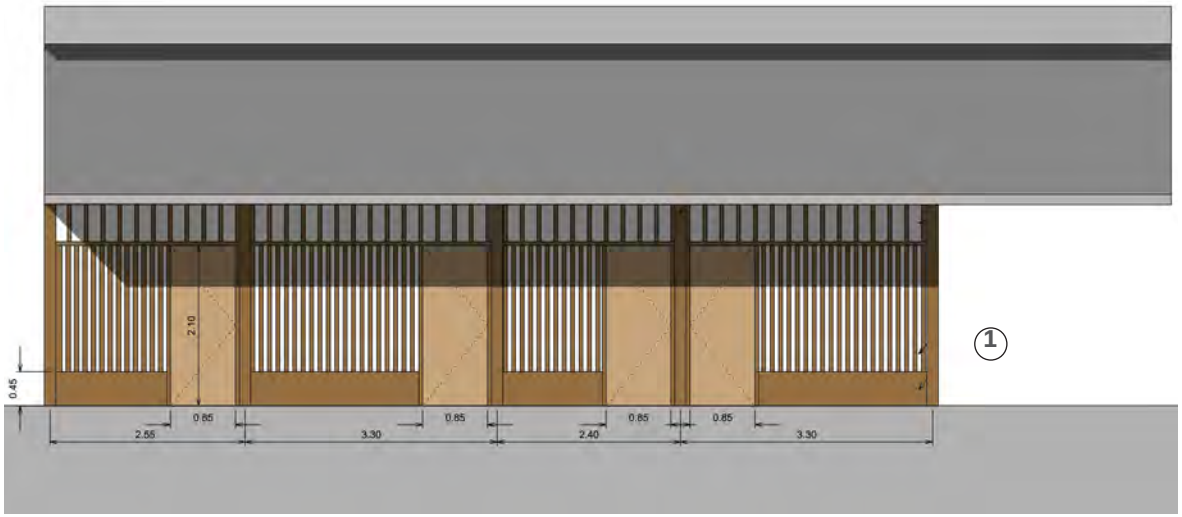
ANCILLARY BUILDINGS

KITCHEN & DINING AREAS

- Serving times should be staggered to allow a smooth flow of students through / past the kitchen servery area, to minimise waiting times and to ease pressure on the kitchen staff.
- 'Food out' and 'plates return' routes for students should be clearly defined; paths should not cross to prevent spillages & unnecessary congestion
- Because this facility is not used around the clock, more open / slatted walls can be built to encourage ventilation to disperse cooking smells and smoke from cooking areas
- Waiting and serving areas should be covered to afford protection from sun and rain (**1**)
- Ventilation cowels / raised apex to roof will allow smoke to disperse vertically if horizontal ventilation is not possible or efficient (**1**)







CONSTRUCTION

SETTING OUT

When setting out the position of a building or the location of the buildings walls it is difficult to judge distances, angles and levels. Use a long (30 or 50m) tape measure to help. There are a number of simple tricks to make sure you get the building in the right place and the right size. Accurate setting out is very important. Buildings in the wrong place will mean that other buildings may not fit on the site. Buildings which are too big cost more and are less functional. If your classrooms are too small you won't be able to fit all the children in.

Accurate setting out is not difficult and can be done with great accuracy with three simple tools and a few simple techniques:

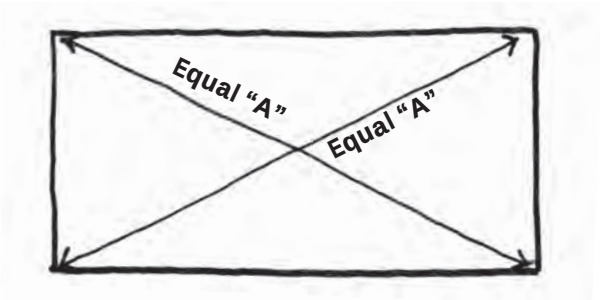
TOOLS

A long tape measure
30m minimum and preferably 50m long.

A plumb line
Allows you to transfer points vertically accurately.

A water level
A long piece (10m+) of clear plastic tubing filled with water. When the ends are held up at each end the water level will be the same – i.e. level. You may be surprised how much the ground falls across your site.

String and stakes
These let you mark out lines and points.



USEFUL TRICKS

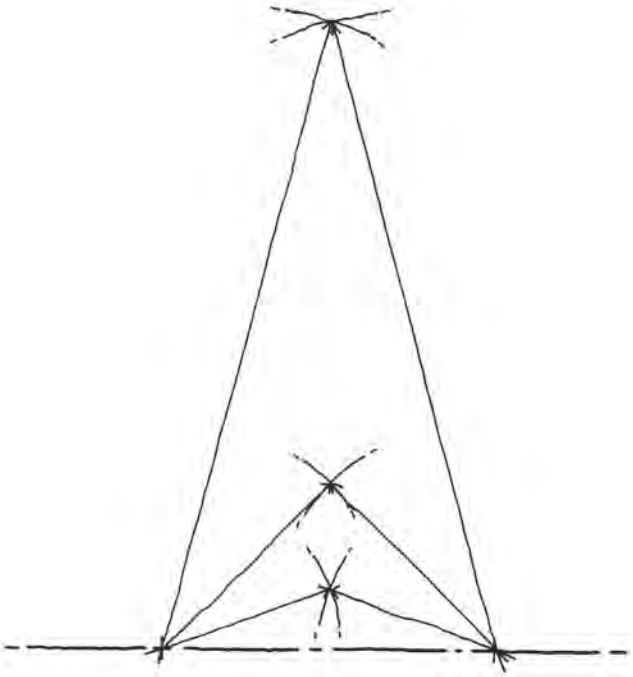
DIAGONALS OF THE RECTANGLE

The two diagonal measurements of any square or rectangle will be the same. You can use this to check that the building you have set out is square before you start building. If the measurements are not the same the building is not square.

TRIANGULATION

Locating a point on a site can be done using triangulation.
By measuring the distance to the point you wish to locate from 2 or more known points, such as a significant tree or the corner of the site, it is possible to accurately locate the position of the third point.

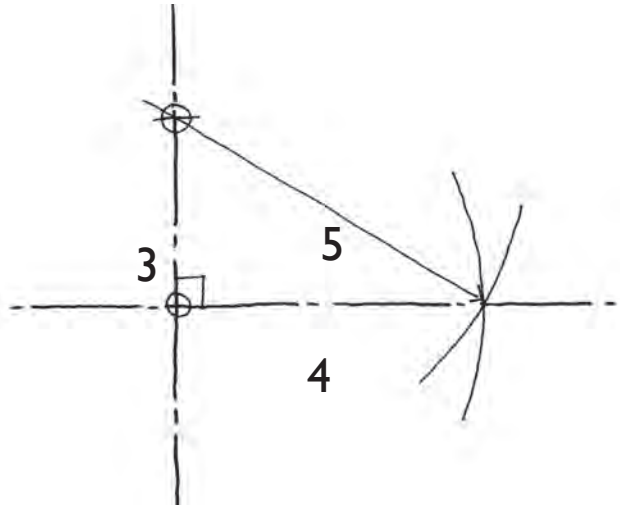
The more open the triangle you create the more accurate your setting out will be. Flat or thin triangles do not work well.



3:4:5 TRIANGLE

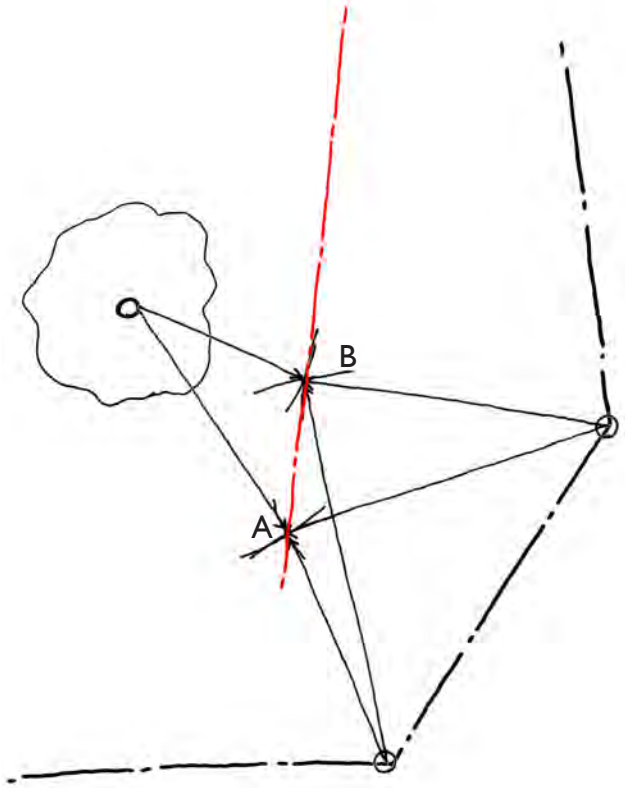
The most useful of all techniques and all you need is the tape measure. A triangle with sides which are in the proportion of 3:4:5 will always creates a 90 degree angle between the sides 3 and 4.
Use your tape measure to mark out the triangle on the ground. The tape measure can be used a s a giant compass. When you have finished you have two lines at 90 degrees to each other. The larger the triangle the more accurate it is. The table below gives you some of the proportions which work:

1 ½	:	2	:	21/2
3	**:**	**4**	**:**	**5**
6	:	8	:	10
9	:	12	:	15
12	:	16	:	20



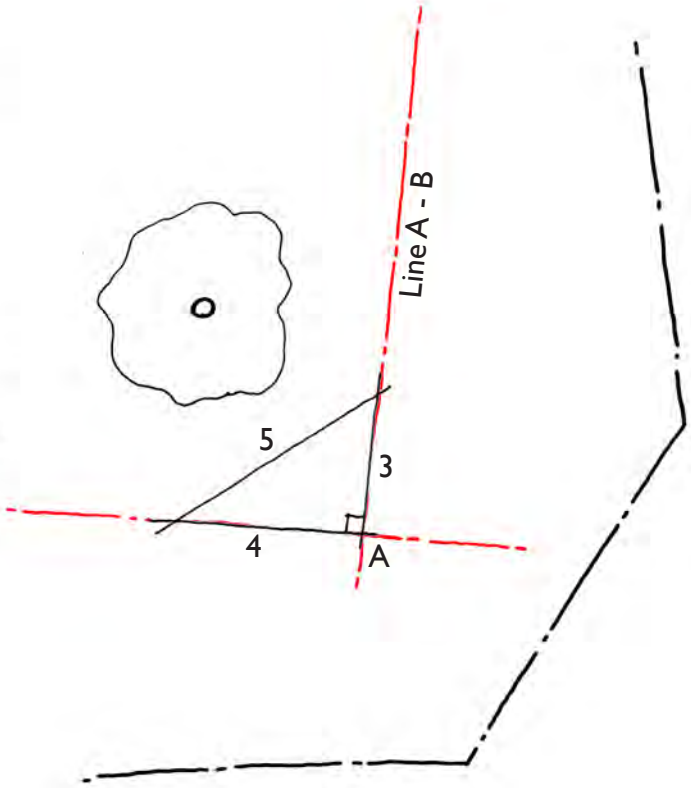
STAGE 1 - LOCATING THE FIRST POINTS

Identify two or three points on the site which are also on your plan - eg. a significant tree and two corners on the boundary.
From the plan you can scale the distance from these points to the important points you want to locate (A & B).
Using your tape measure as an enormous compass measure and mark the the distances from your known points to points A and B eg the distance from the tree to A, and then the distance from the tree to B. Do the same from the corners.
Now you know where points A and B are you can set out the line A-B with stakes and string.



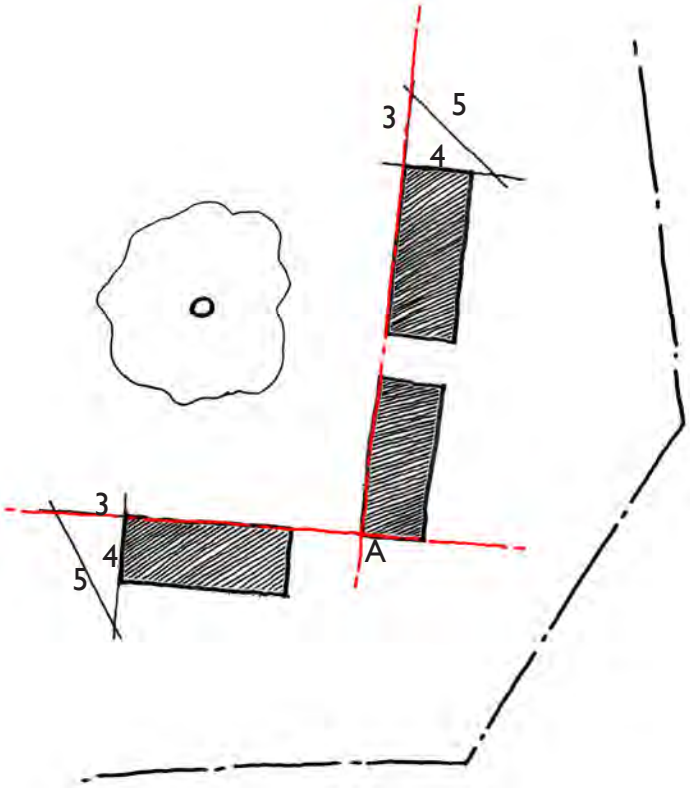
STAGE 2 - CREATING A RIGHT ANGLE

Point A might be the corner of a building or a court yard. You can set out a line at right angles (perpendicular) to the first line to mark the second side of the courtyard using the 3:4:5 triangle technique. The bigger the triangle the more accurate the setting out.



STAGE 3 - MARKING OUT THE BUILDINGS

The 3:4:5 triangle technique can also be used to mark out the buildings: Measure out the positions of the corners of the buildings along the two lines you have set out and then use the 3:4:5 triangle to set out the other walls.
You can check your accuracy by measuring the diagonals of your rectangular buildings.
Carry on using these systems to mark out all your buildings, their doors, windows and piers.



MATERIALS

A simple masonry and timber building in Uganda is a very different beast to a simple timber and masonry building in England. The quality of the timber, concrete, reinforcement and bricks are difficult to understand until you actually get there, see them, handle them and start to try and work them. The local builders have considerable expertise in handling their local materials which have some very different properties to our European equivalents so it is important any Project Director finds a reliable foreman/construction manager to provide advice.

The basic building materials in Uganda are timber, masonry, and corrugated sheeting. Metal frames, windows and doors are used almost universally to which glass can be added later if desired and affordable. Concrete is mixed by hand on site with no quality control.

MASONRY

FIRED CLAY BRICKS

- The local bricks are handmade and fired in enormous stacks above a bonfire.
- The bricks are not much stronger or more durable than handmade sun dried mud bricks.
- They crumble easily when handled roughly.
- Dimensions: brick sizes vary enormously.

ADVANTAGES

- An indigenous technology that is widely available understood and trusted locally.

DISADVANTAGES

- Expense – the local area is unlikely to be able to provide enough bricks to build a school and so you will have to pay for the bricks to be brought in from a wider area. The cost of transport will become a significant part of your budget.
- They require the burning of a large amount of wood during manufacture. This leads to deforestation and the associated problems for the local environment and economy (cooking fuel costs).
- It is a commonly held belief that the more mortar, the stronger the wall. This is incorrect and causes unnecessary extra material costs (sand & cement), while not giving the best structural solution

Large mortar courses are a source of unnecessary expense

Traditional brick curing stores. These type of bricks have a poor structural integrity.

Consistency of finish is very difficult to achieve

ISSBs (INTERLOCKING STABILISED SOIL BRICK)

For an initial outlay cost of the block making machine, 2 trained workmen can make between 500 - 700 blocks a day.

The machine has few moving parts, can fit in the back of a large car and easily transported to the building site. Murrim, or non-organic soil, is mixed with cement and water and pressed in the machine. The blocks are stacked and covered with polythene. Four hours later the blocks can be used for building. It is that quick!

IMPORTANT POINTS

- The design must allow for the protection of the bricks from heavy rain. This can be achieved either through large overhanging eaves (roof) or rendering the walls in the traditional manner.
- Quality control in manufacturing is important and will save time and money later on. Establish a simple system of quality management and supervision:
    - Use straight forward systems such as a measuring scoop for the quantity of cement powder to be included in a barrow load of earth.
    - Another measuring scoop/container can be used the quantity of earth to be placed in the brick press (this ensures all the bricks are the same size).

ADVANTAGES

- The materials required for block production are locally available in most regions.
- Very little training is needed. Local labour can be trained in a few hours to prepare material and make bricks provided the appropriate systems and supervision re in place.
- No fuel (wood or petrol) is needed to make the bricks. This avoids expense and local deforestation.
- The blocks make strong walls because they interlock.
- The consistent interlocking form of the blocks makes them very easy to lay.

DISADVANTAGES

- This is not a well known construction system and so there may be scepticism from local builders and clients.
- A period (1/2 - 1 day) of on-site training will be required to familiarise the workers with the technology.
- It is necessary to allow for brick production time in your project programme (i.e. time to excavate the murrim and manufacture the blocks).

STEP 1
The mix is prepared and put in the machine press...

STEP 2
...an oily rag is placed on top...

STEP 3
...the press is operated by 1 person...

STEP 4
...and the pressed brick emerges to be placed in the sun to cure and dry.

TIMBER

Timber is an incredibly useful and versatile construction material. It is readily available and easy to use.

There are a variety of types and sources of timber available and so some thought and care needs to go into choosing which type of timber is used.

GENERAL COMMENTS ABOUT STRUCTURAL TIMBER

- Poles should be sound and free from decay and attack by insects.
- Minor insect holes are acceptable providing these are, either not larger than 15mm in diameter and do not exceed 5 in number, or not larger than 1.0mm in diameter and do not exceed 20 in number, evenly distributed in any 100mm length of the pole.
- Cracks: cracks across the pole and the gain should not be tolerated.
- All timber should be sawn or planed before treatment to achieve the finished cross-section at the moisture content at which the timber is to be used. Where this is not possible cut surface are liberally brushed with preservative solution. The aim is to maintain an outer envelope of treated timber. All crosscutting, boring, drilling or other fabrications should be carried out before treatment.
- **PRIOR TO CONSTRUCTION** On visual inspection, the surface of the timber should be free from mud, dirt, inner and outer bark, sawdust and shavings. It should also be free from paint, polish or other surface finish.

	ADVANTAGES	DISADVANTAGES
PINE	• Generally high quality. • Straight grain. • Does not twist and split. • Regular sizes.	• Expensive. • The timber is soft and so needs to be well protected from the weather and other sources of damp. • Probably hard to find outside major cities.
HARDWOOD	• Resistant to weather and damp. • Hardwearing.	• This is not felled in a sustainable manner. • Expensive. • Very dense and therefore very difficult to work. • Very heavy so difficult to move around on a building site (or get there).
EUCALYPTUS	• The most common construction timber in Uganda. • The local tradesmen are familiar with it and have developed techniques to deal with it's various idiosyncrasies. • Fast growing and generally from managed plantations so it is, in general, a sustainable timber. • A relatively dense and hardwearing timber. • The least expensive structural timber available.	• Prone to splitting. • Develops twisting – particularly in roofs (but this can be dealt with). • The section sizes from the sawmill are not regular.
PLYWOOD Laminated & Processed	• Very stable. • Depending on the particular type it is strong. • Very useful for bracing frame structures (but there are lots of other solutions).	• Extremely expensive. • Difficult or impossible to find out if it is from a sustainable source. • Difficult to source in Uganda – even in Kampala.

ROOFING MATERIAL

METAL

This is the most common roofing material in Uganda and is manufactured to various profiles and colours. It is easy to use and to buy.

PLASTIC

Translucent corrugated sheet is available in Uganda although it is less common than its metal equivalent. It is very useful for letting diffuse light into a space while keeping out the rain.

TILING

Translucent corrugated sheet is available in Uganda although it is less common than its metal equivalent. It is very useful for letting diffuse light into a space while keeping out the rain.

ONWARDS & UPWARDS SCHOOL

BULOBA

On 6th February 2008, Onwards & Upwards Secondary School was officially opened by the Ugandan Minister for Gender, Labour and Social Development. The school is situated to the west of the Ugandan capital, Kampala, in the district of Wakiso, serving the town of Buloba and the surrounding community.

Nearly 2 years before the opening however, PEAS (Promoting Equality in African Schools) had approached RFF to help with the design and masterplanning of a new school on the outskirts of Kampala.

SURVEY OF THE SITE

A detailed survey of the site giving site was carried out for RFF giving levels, boundary and tree positions. It would have been useful to have more accurate information about the trees, their size, canopy spread, a designation (ie shade, fruit...) and photos so that the masterplanning process could include them more effectively.

BUYING THE SITE

Securing the leasehold for the site proved to be a difficult process. PEAS, the partnering NGO who commissioned the school and are now running it, looked at and attempted to secure several sites before they successfully completed the negotiations for the site in Buloba.

Prior to obtaining the land, a lengthy period of time was spent researching different options and looking at urban and rural alternatives before Buloba was finally chosen.

WRITING THE BRIEF

As designers, RFF found it difficult to develop any strategy for the school until a site was secured. A more generic approach was not helpful because it failed to consider the needs of the local community, the business plan for the school or the specific context of a site. We were able to work on ideas for the classroom and dormitory designs. The brief, and subsequently the masterplan, only developed after the site was secured.

OBJECTIVES

OUTSIDE / INSIDE - Create useful external spaces for teaching and meeting

SPORTS PITCHES - Create spaces for playing and watching sports

ECONOMY - Build a school within a defined, minimal budget that was deemed reasonable when set against local benchmarks

EXPANSION - Allow for future expansion of the school within the framework of the masterplan.

EARLY PROPOSALS

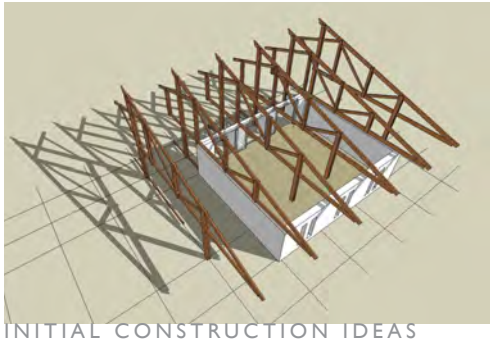
Initially ambitions were allowed to take control and we fell into the trap of designing exciting buildings for England and not Uganda.

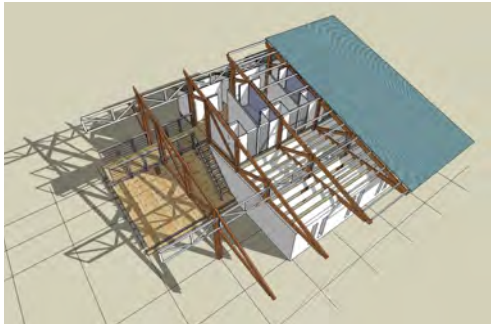
The reality of construction in Uganda is that it is predominantly single storey and that the standard of construction methods and materials would be deemed to be entirely inappropriate for Western / European construction.

The materials are, however, entirely adequate for the type of construction they are used for in Uganda.

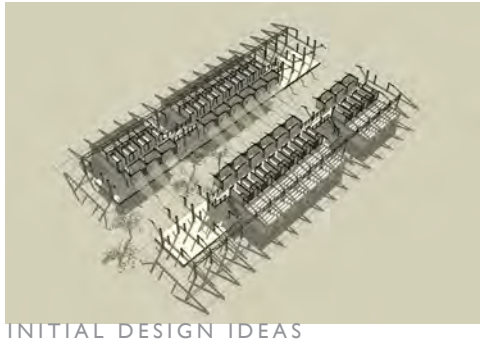
The real challenge for us was to understand how to design buildings appropriate for their context the available materials and builders.

SITE MASTERPLAN & LAYOUT
Showing phased development and layout of functional spaces

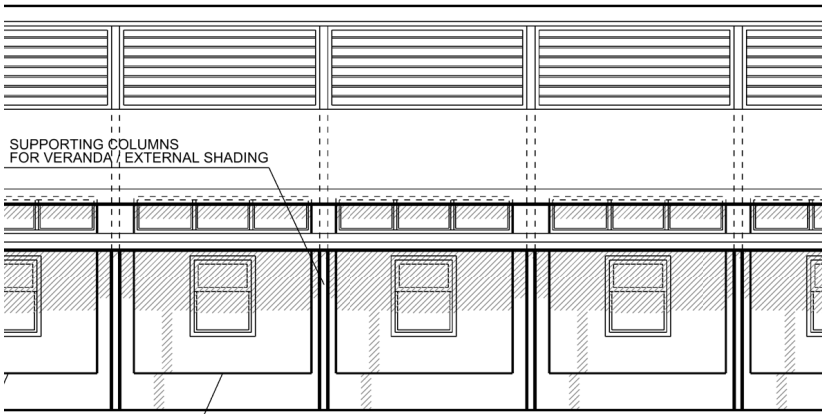




INITIAL CONSTRUCTION IDEAS
Produced in SketchUp - a free modelling program; ideas were developed and shown to the client



INITIAL DESIGN IDEAS
Again produced in SketchUp, a quick model was made to allow client and user groups to 'walk through' the school



DRAWN DESIGN...

...TO BUILT REALITY

SITE COMMUNICATION
Mock ups of how the brick piers and timber roof trusses were made to illustrate building techniques

CONSTRUCTION DETAIL
An improvised scarf joint in a roof truss

DEVELOPMENT OF BUILDING TYPES

INTERNAL WALLS

At the request of PEAS the class room blocks in Buloba had no internal structural walls. This was to enable a series of rooms to become one long room. This meant that the building lacked stability in one direction so we made the piers much stiffer than normal by increasing their size and filling them with concrete and steel reinforcement bar tied to the roof and foundations ringbeam.

LIGHT AND VENTILATION

The design attempted to get as much light and ventilation into the building as possible. We did this by creating a clerestory above the main windows but below the roof eaves. We also introduced a split roof which allows light and ventilation into the centre and highest point of the classroom.

SETTING OUT

The first few buildings set out on the site were done without the necessary care and measurement by experienced professionals / tradesmen. An appreciation or understanding of traditional (in Western terms) scaled drawings was not evident.

The result was that some buildings ended up much closer to each other than intended, which reduced the size and usefulness of the “in-between” spaces. Other buildings were a lot bigger than designed; these buildings cost at least 25% more to construct and the cost overrun had negative implications for future expansion.

It is essential that a carefully planned masterplan is executed with equal care.

The main teaching block was set out wrongly, which created a building that was 25% larger than the planned footprint! Obviously this caused unnecessary expense, effort and structural problems in the initial stages; once completed, the classrooms were too dark because of the depth of the floorplan and too echo-filled for teachers to conduct lessons in an efficient manner.

COMMUNICATION OF IDEAS

Explaining exactly what should be built is essential. 'This is obvious' you might think, but it is a lot more difficult to achieve in practice. There is a strong tendency for builders and crafts-people to build in exactly the same way as they have always built which makes even small innovations in design challenging to implement.

Proactive engagement and supervision on site is the most effective and productive solution.

The following techniques were used at Onwards & Upwards:

PLAN DRAWINGS

Easily understood by most people on the building site.

1:1 ON-SITE DEMONSTRATION

The most effective way of getting across and exploring ideas that were beyond the everyday scope of local craftsmen. It is vital to remember that local builders have a wealth of knowledge when dealing with local materials and widely accepted techniques.

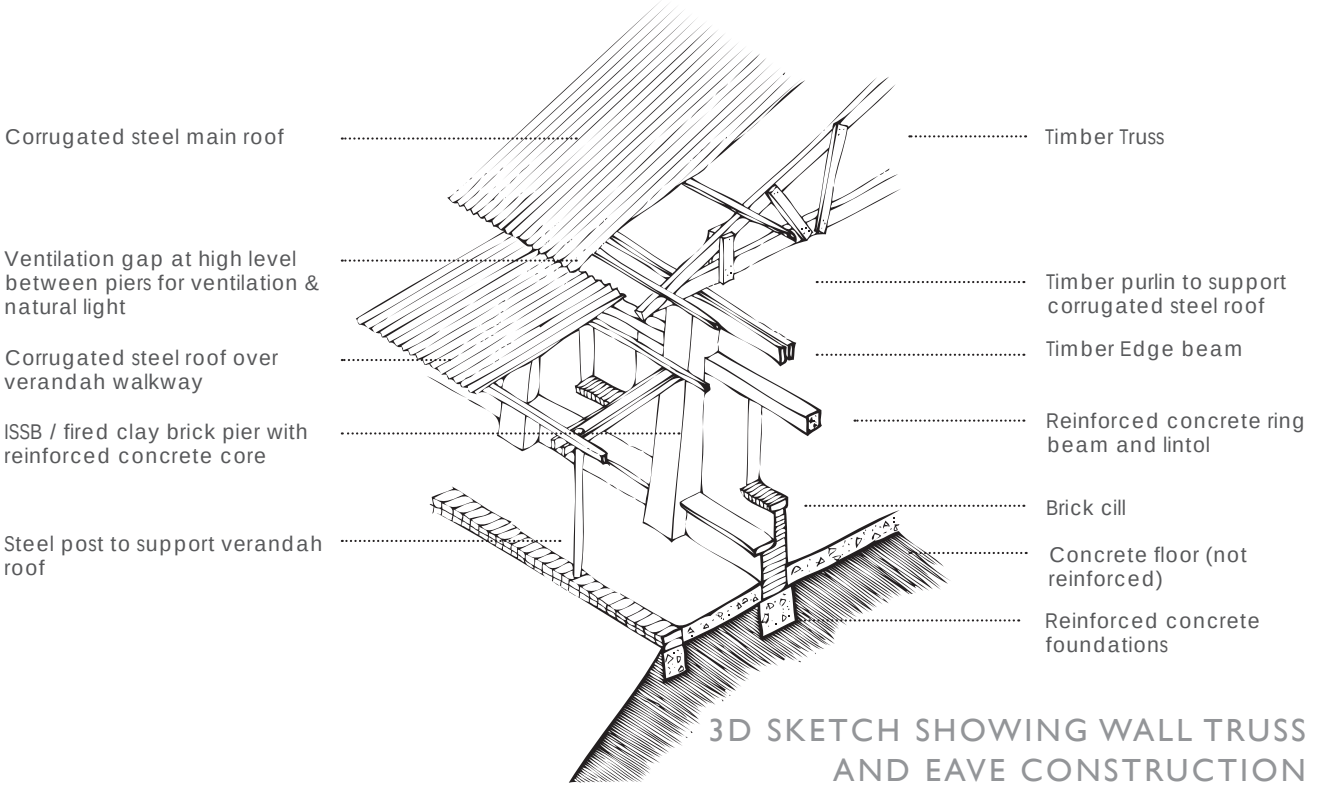
SCALED MODELS

Although this was not widely used, it would have been extremely helpful to prepare a scaled, accurate model to try and get initial concepts across at an early stage.

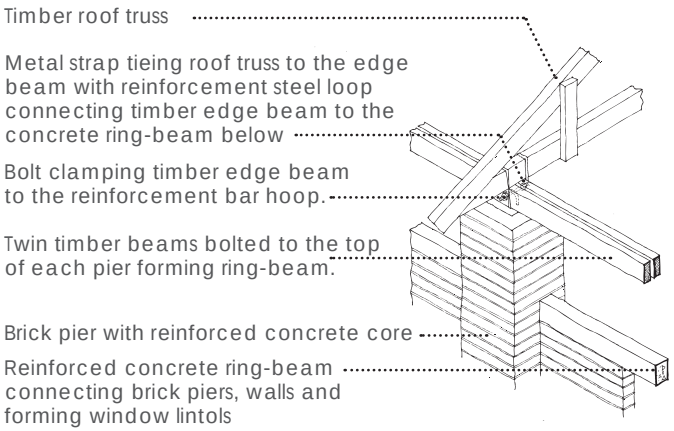
BUT...

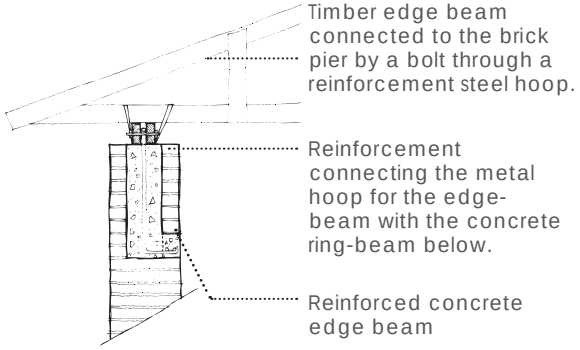
SECTION DRAWINGS

Not easily understood by many people. Most importantly these are not valued or understood by the workers on site.



3D SKETCH SHOWING WALL TRUSS AND EAVE CONSTRUCTION





FOREST HIGH SCHOOL

KIKANDWE

Forest High School opened in February 2008, serving the local rural community of Kikandwa, in Mubende District, Western Uganda, about three hours drive west of Kampala.

The New Forests Company approached PEAS to create a partnership when the New Forests Company developed a plantation near Kikandwa. Each party provided half the initial capital costs for the project.

The RFF became involved in the project after it had started on site. PEAS prepared a masterplan with other architects and intended to use the building typologies developed by RFF . This process allowed us to learn from the construction process in Buloba and improve on some of the designs for the building types.

SETTING OUT

A lot of the work RFF did on this project involved helping people set out buildings and interpret the masterplan. This was not as straightforward as it might sound since it was difficult to identify significant landmarks on the site plan and the site to locate the buildings.

DEVELOPMENT OF BUILDING TYPES

INTERNAL WALLS

The class room blocks in Buloba had no internal structural walls at the request of PEAS. The New Forest Company insisted on masonry walls between all classrooms. This had the following benefits:

- Much improved noise separation of classrooms
- More stable buildings (cross walls provide stability)
- Classrooms do not have internal temporary walls and therefore appear much more professional.

TRACY EMIN LIBRARY

One of the major contributions RFF made to the Forest High School was the design of the Tracy Emin Library. Tracy Emin donated the money to construct this library. This project provides a good case study for construction in Uganda. The time frame was approximately six weeks from initiating the design to completion.

BRIEF

The library needed to be a “landmark” building.

The library needed two rooms – one for books the other for an IT suite.

The Library needed to have space to expand.

The construction methods and materials were to be the same as all the other buildings.

SITING & DESIGN

Towards the centre of the school there is a large tree providing plenty of shade. We decided to build the library around this tree so that the tree became the focus of a shaded, cool courtyard. The first phase of the library is two sides of a hexagon, the other four sides offer plenty of opportunity for expansion.

This is an example of how local features can be used enhance a building or a space. The courtyard is now a very well used and popular space. The library roof overhangs the courtyard by around two meters to create a large sheltered external space which can be used even during rain storms.

SETTING OUT & CONSTRUCTION

The setting out of the library required an understanding of hexagons. This requires a reasonable grasp of geometry so, given the skills on site, it was important we were there to set the building out. Setting the building out had the advantage of being able o see the size and position of the building before we built it. We had only seen the site once before we started to build so it was very useful to be able to make a few adjustments on site before we started digging.

COMMUNICATION OF IDEAS

Because of the complexity of the idea and the relatively innovative design of the roof we had a big challenge communicating our ideas. We used the following methods to explain what we wanted:

DRAWINGS

There was a limited understanding of any type of drawing by those building on site.

SCALE MODEL

We built a scale model of the building which was very helpful because it showed the basic forms and structure.

1 : 1 DEMONSTRATION

We marked out the building and laid bricks out in order to show exactly how different walls should be built in order to get the correct shape, strength and form.

No-one believed that our design for the roof truss would work or understood how it related to the building. So we built one on site – the result was we learnt a lot about the materials we were working with and how they could be used. The carpenters learnt a different way to build a roof.

Building a cardboard model to scale proved very helpful at conveying ideas that were unconventional

Setting out

Building a mock-up of a truss before finalising the overall layout of the library

CONCLUSIONS

Real success comes through collaboration:

The parts of this project where we were on site and able to discuss ideas went very well. As a result the overall form and position of the building is a success.

The parts of the construction process which we were not able to influence have been less successful. This is a reflection of the difficulty of sharing ideas, aspirations and ambitions and not a criticism of the local tradesmen. The really successful parts of the project have been where the designer, project manager (maybe the same person), the site foreman and craftsmen have all been able to share ideas and work together on site. We learnt a huge amount from the people who built Kikandwa and Buloba: Things that we have been able to put into practice in projects of different scales around the world.

BUNYONYI CHRISTIAN COMMUNITY VOCATIONAL SCHOOL MASTERPLAN
(as at 08/02/2010)

- Proposed works
- Completed new works
- Existing structures
- Existing structures to be demolished in the course proposed works

COMPLETED NEW WORKS

A Completion of new 5no. classroom building & rainwater retention tank

B New girls dormitory block

C New boys dormitory block & rainwater retention tank

D Stormwater drainage system, retaining walls and stairs

E New boys 3no. pit latrine; demolition and capping of old latrine

PROPOSED WORKS

1 Cap existing girls latrine & construct new pit latrine & wash area

2 Equip laboratory room

3 Demolish & replace existing cooking hut and dining area with a new kitchen and open canopy dining / gathering area

4 Build new teacher accommodation

5 Access and path improvements

6 Build new 3no. classroom / community amphitheatre building

CHRISTIAN COMMUNITY SCHOOL

LAKE BUNYONYI

The Lake Bunyonyi Christian Community Vocational Secondary School (LBCCVSS) is a 300 pupil secondary school with vocational training courses, set up in 2006 due to high demand in the local area. Located on the shores of Lake Bunyonyi in the far south west corner of Uganda, and close to Rwanda, the school occupies a steep, terraced site above the lake, served by an unpaved road at the bottom. In this rural community the majority of pupils live too far from the school to travel in every day, so most board. Many are orphans.

Although private, the school charges very low fees and around 40% of pupils are admitted for free, being unable to pay. It is funded by its sister charity The Lake Bunyonyi Development Company, which runs a tourist camp on Bushara Island. Both organisations were set up and are run entirely by Ugandans from the local area, with no state funding.

HISTORY

When The Richard Feilden Foundation first got involved in early 2008, the school had 140 pupils. It consisted of one main classroom block with 3 classrooms and staff office; 3 small dormitories (sleeping two to a bed, with triple bunks); pit latrines; a kitchen and semi-enclosed dining area; a couple of temporary teaching areas. There was a block of 5 classrooms under construction at the top of the site but work had stopped due to lack of funding. The main building had intermittent mains electricity supply and there was a rainwater storage tank.

MASTERPLAN

A masterplan for the school was drawn up in consultation with teachers and pupils, to make the most efficient use of the space available and ensure a coherent school campus as the school expands.

The Richard Feilden Foundation and the Buro Happold Trust have together donated money for the construction, whilst Feilden Clegg Bradley Studios and Buro Happold are donating time and expertise to facilitate the school's expansion. A phased construction was then designed, based on the priorities of the school.

PHASE 1 (2008)

DORMITORIES & SCHOOL HALL

Top priority was dormitories as the existing were over-used and capacity was limiting the size of the school. The partially-built top classroom block was completed and used as dormitories initially, until another new dormitory building was built at the end of 2008.

Three of the classrooms were built with large doors separating them rather than walls, so they could open out into a single space that can be used for assemblies, meetings, and exams.

PHASE 2 (2009)

TOILETS, RAINWATER DRAINAGE, RETAINING WALLS, AND STEPS

As the school grew more latrines were built to cope with the increasing pupil numbers and to improve sanitation on the site generally. This work included extra rainwater storage tanks connected to the new building roofs, and washing facilities.

Erosion and gradual collapse of the cut banks on the very steep site was a major concern and posed a threat to the existing school buildings. Drainage channels were built throughout the site as much of the erosion was due to rainwater run-off. Some retaining walls were built in stone or sandbags to protect the steepest earth banks, whilst other banks were cut to a slope and planted.

Steps were built through the middle of the site to provide a central circulation route. As well as drastically improving access through the school, this also helped prevent erosion of the banks where students walked and climbed up them. Each student painted one of the facing boards for a step, which has brightened up the school and got the students engaged in the construction work (as well as providing an art project as part of their studies).

PHASE 3 (2010)

DORMITORIES, LABORATORY & LIBRARY

Another new dormitory was built to support increasing pupil numbers. Two existing classrooms were fitted out as a laboratory and library to improve teaching facilities. This also allowed the school to become registered.

PHASE 4 (2011)

CENTRAL DINING AND ASSEMBLY ROOM

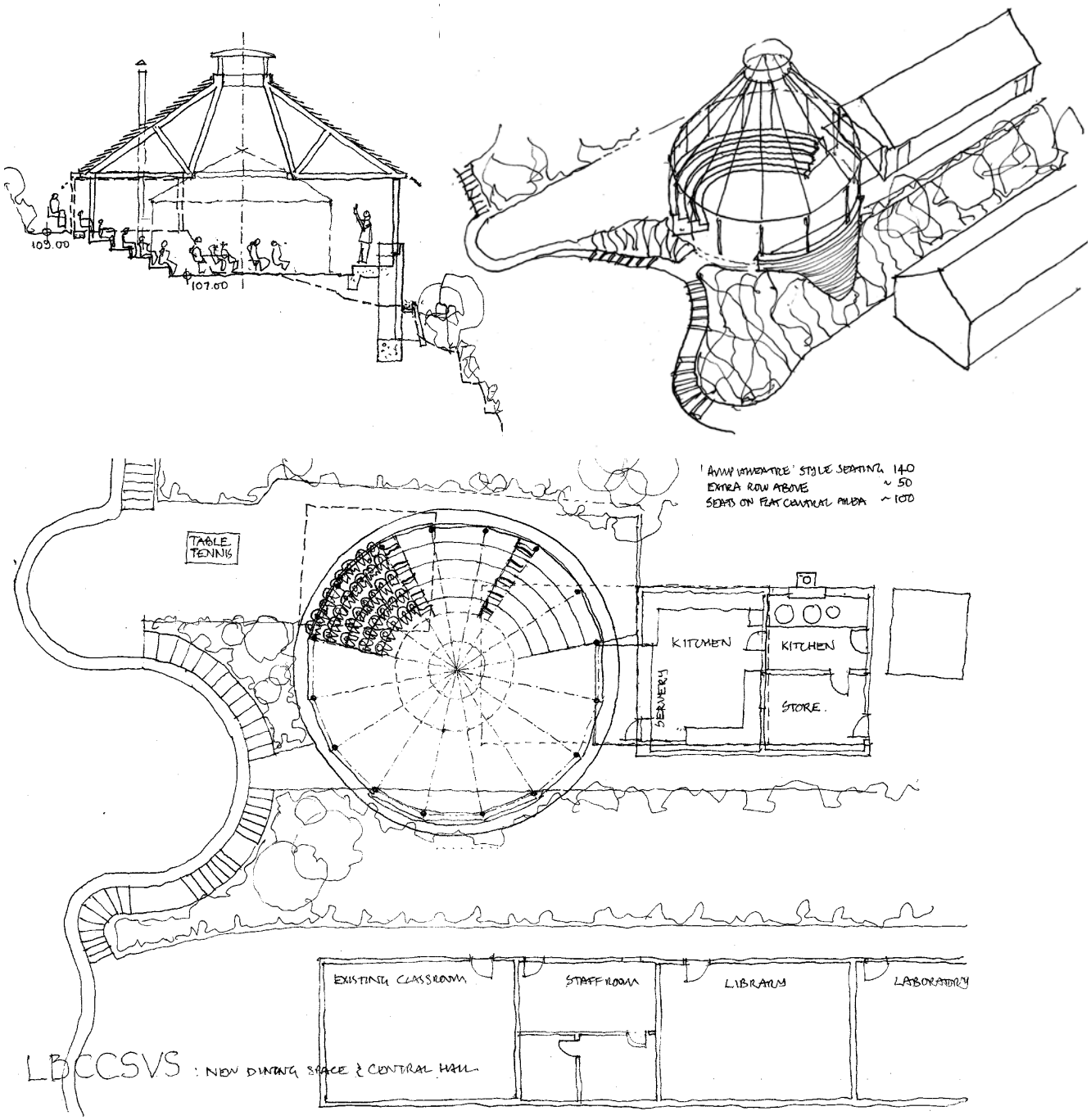
A large covered space is planned to provide a focal point at the centre of the school. This would be primarily a dining room, but also provide space for assemblies and meetings.

THE FUTURE

By 2013, the school hopes to have expanded even further and to be a model school in its district. There are plans for futher dormitories and classrooms, and staff accommodation.

The aims of our involvement are:

- Lend technical expertise to survey the site and undertake soil tests.



BUNYONYI COST BREAKDOWN

The costs below were complied during the course of construction at Bunyonyi School in 2010. The costs reflect the rural nature of the site - an 'urban' setting would be proportionately higher for labour, although material costs would be less due to ease of access and availability of transport**.**

The exchange rate between GB pound and Ugandan Schilling was taken to be £1 - UGX3,500. The rate, at time of printing, was £1 - UGX3,800

LABOUR COSTS	UNIT	RATE (UGX)
Student Labourer	day	5,000
Porter	day	5,000
Mason	day	10,000
Carpenter	day	10,000
Specialist carpenter	day	20,000
Electrician	day	15,000
Material store manager	month	150,000
MATERIAL COSTS	**UNIT**	**RATE (UGX)**
Cement	Bag	27,000
Sand	Small load	100,000
Aggregate	Small load	160,000
Fired brick	single brick	200
Timber structure	12m pole	40,000 (partially treated)
Tin roof sheeting	3m x 1m	26,500
Solar water heat panel	single item	7,000,000

BUILDING COSTS	COST	TOTAL (UGX)	TOTAL (GBP)
Washing facilities			
Materials	4,000,000		
Labour	900,000		
		4,900,000	**1,400**
4-block latrine (3 blocks were constructed)			
Materials and labour		**10,000,000**	**2,850**
Dining Hall			
Earthwork	1,400,000		
Foundations	2,500,000		
Concrete columns	1,000,000		
Retaining structure	2,500,000		
Timber frame	2,500,000		
Finishes	3,960,000		
Labour	7,500,000		
		38,800,000	**11,500**
Kitchen Block (approx 12m x 7m)			
Foundations	12,600,000		
Walls - brickwork w/ rc ringbeam	8,400,000		
Roofing - timber truss w/ tin sheet	4,600,000		
Finishes	12,400,000		
Equipment	12,500,000		
		50,800,000	**14,500**
Tools and miscellaneous items		**4,500,000**	**1,300**
TOTAL BILLED AMOUNT		**139,000,000**	**41,000**
5% contingency	6,950,000		
GRAND TOTAL	**UGX 145,950,000**	**GBP 42,900**	

USEFUL LINKS

GENERAL INFO

http://eau.sagepub.com/content/7/1/173 - 'Whose Reality Counts?' by Robert Chambers - an excellent background document that should be read by all considering to become involved with developmental projects in a Third World context

Architecture for Humanity - Design Like you Give a Damn: Architectural Responses to Humanitarian Crises (New York; Mertopolis Books, 2006)

http://other90.cooperhewitt.org/design/?c=education - 'Design For the Other 90%' - great resource for building and providing services in a Third World context

www.bestpracticenet.co.uk **'**Best Practice Network enables children and young people to achieve better outcomes... (they) do this by delivering outstanding consultancy and professional development for all those who work in education and children's services

http://www.sphereproject.org The Sphere Project is three things; a handbook, a broad process of collaboration, and an expression of commitment to quality and accountability to operating in contexts foreign to those that are familiar

Small Change: About the Art of Practice and the Limits of Planning in Cities (Hamdi; London; Earthscan 2004) - argues for 'the wisdom of the street, the ingenuity of the improvisers and the long-term, large-scale effectiveness of immediate, small-scale actions

UGANDAN EDUCATIONAL INFO

www.education.go.ug - Ugandan Department for Education & Sports

tech.mak.ac.ug - Makarere University's Technology Department

www.ugaprivi.org Its mission is to enhance unity, development and ensure facilities of collaborations and networks within Private Vocational Training Institutions and other actors in partnership

www.btvet-uganda.org This portal establishes a single entry point for Uganda's vocational training system and operates as a directory of individuals and organisations participating in or with an interest in the training of persons for jobs

practicalaction.org/east-africa/region_east_africa **-** Practical Action is a development charity with a difference... (they) know the simplest ideas can have the most profound, life-changing effect on poor people across the world... working closely with some of the world's poorest people using simple technology to fight poverty and transform their lives for the better

LOCAL TECHNOLOGY & MATERIALS

www.t4tafrica.com **-** 'an African company for African solutions. Using readily available materials, T4T is making life easier while protecting the Environment'

www.goodearthtrust.org.uk currently focus on a simple low-cost technology that can help people improve their housing whilst greatly reducing the impact on their environment. ISSB technology specialists

www.sunseedtanzania.org The aim of this organisation is of developing, demonstrating and communicating accessible, low-tech methods of sustainability in a semi-arid environment

UGANDAN-BASED EDUCATION NGOS

www.softpowereducation.com Softpower work with communities in Uganda to improve quality of life through education. Our funding comes from overland groups, independent travellers and sponsors from around the world

www.peas.org.uk ***'Promoting Equality in African Schools'*** their mission : To unlock the potential of Africa by delivering equal access to affordable, quality secondary education

UN AGENCIES OPERATING IN UGANDA

www.unesco.org

www.unicef.org

http://www.adeanet.org/adeaPortal - Association for the Development of Education in Africa