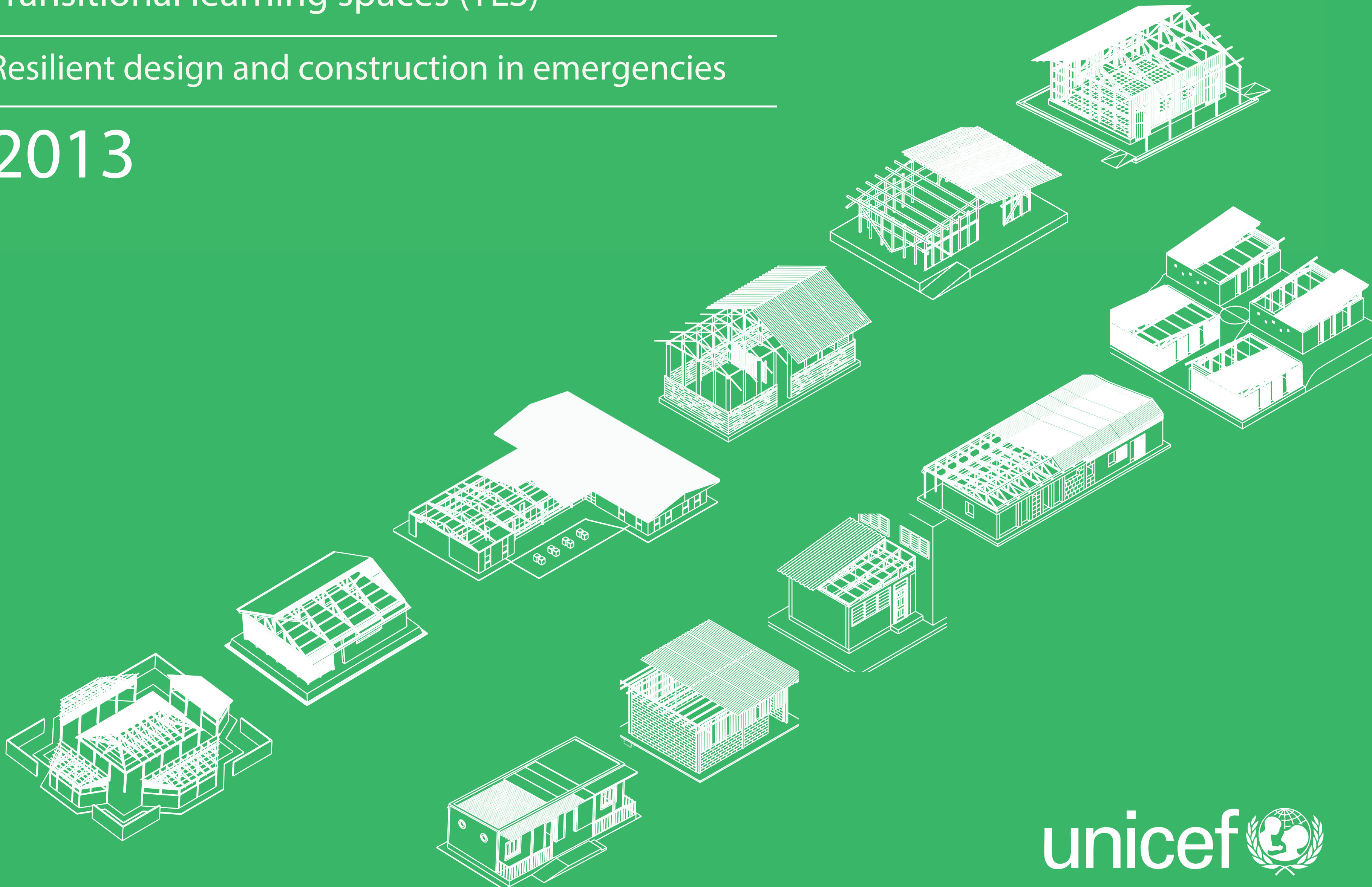
Compendium

Transitional learning spaces (TLS)

Resilient design and construction in emergencies

2013



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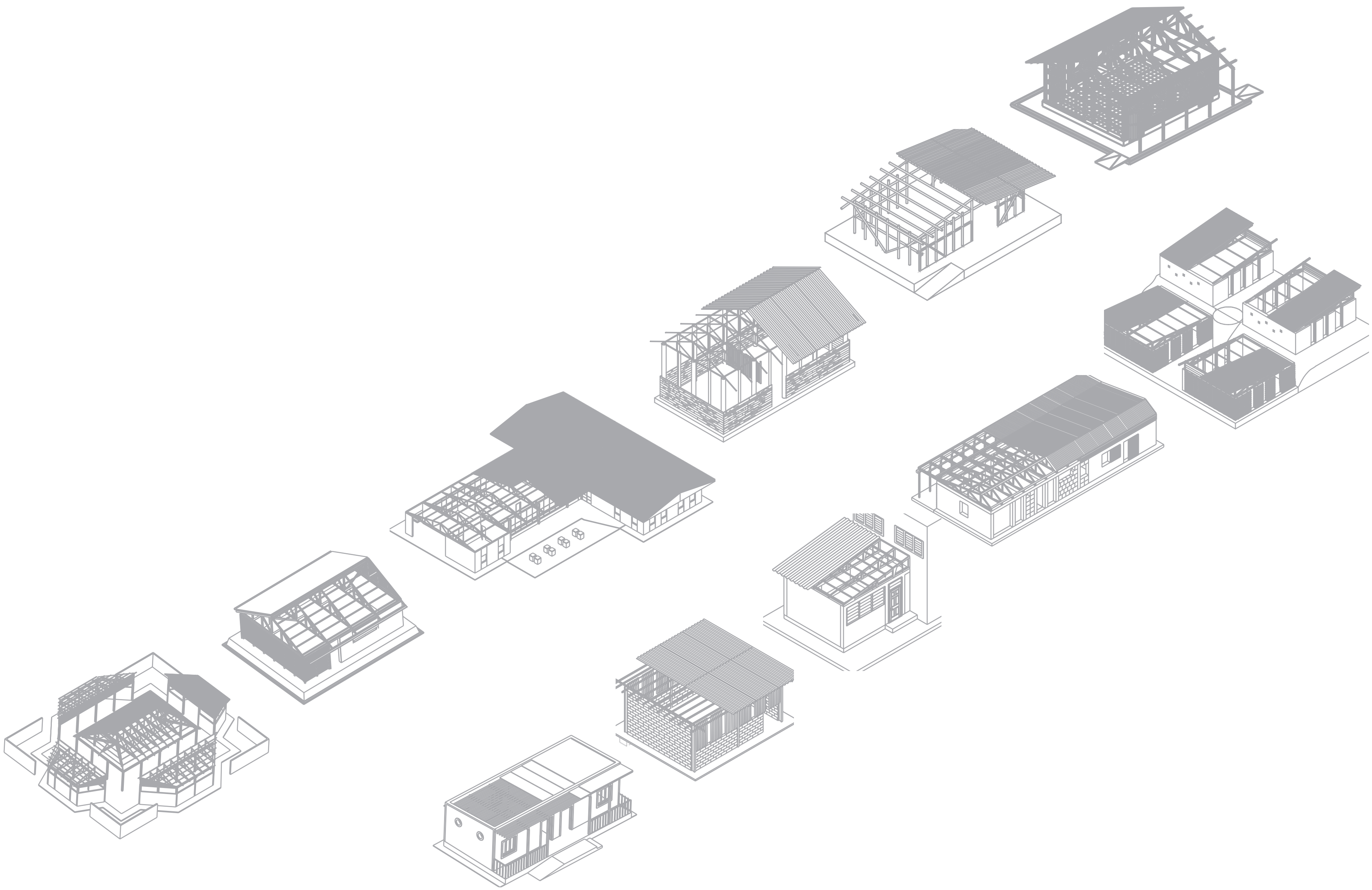

ACKNOWLEDGEMENTS

Project leader:
Carlos Vasquez, UNICEF, Programme Division/ Education

Project consultant: Annika Grafweg

Project team: Hikaru Kitai, Amanda Rashid, Mahya Fatemi, Nicolo Spina

Graphic design: Darren Cohen

Special thanks to the following individuals who have been essential in the compilation of this compendium:

Ali Ahmed, Ali Al-Nowirah, Cecila Baldeh, Tomà Berlanda, Emma Bonar, Enock Chinyenze, Elhaytham Dafaala, Killian Doherty, Nazik Elamin, Nerea Amoros Elorduy, Wedaje Ermias, Resom Habtegabriel, Sabina Handschin, Seki Hirano, Khurshidkhan Khalil, Matti Kuittinen, Elena Locatelli, Maurice Mitchell, Timothy Mutunga, Paul Neale, Crispin Ngulungu, Afshin Parsi, Sandra Piesk, Andrew Powell, Sendralahatra Rekotondradalo, Paulo Retaggi, Andrew Schaefer, Sweta Shah, Gyanendra Sthapit, Rebecca Sweetman, Bo Tang, Birhanu Waka, Denise Venturini, Khalid Zaheer

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Bar Gabar School Pakistan C 1.0

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Feburary 2013

Programme Division/ Education
3 United Nations Plaza
New York, NY 10017 USA
www.unicef.org/cfs

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SECTION C

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CRS (Catholic Relief Services)
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Plan International, South Sudan
Plan International, Darfur
Save the Children, Haiti
Save the Children, Pakistan
Save the Children, Ethiopia
UNHCR Rwanda
UNICEF Iran
UNICEF Democratic Republic of Congo
UNICEF Yemen
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Norwegian Refugee Council, Somalia

SECTION D

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D 1.0: EHCP, Govt. of Philippines
D 2.0: Tutudesk, Tutudesk UK
D 3.0: Solar Radio, Lifeline Technologies,
D 4.0: 5$ Gravity Light, Riddiford&Reeves
D 5.0: Community classroom, ASD projects
D 6.0: Eco-domes, Nader Khalili
D 7.0: Papinotas, Socialab
D 8.0: SHELL.TER, Like Architects,
D 9.0: Birth Registration, Rapid SMS
D 10.0: Habitech Centre, Thailand
D 11.0: Gando library, Francis Kere Architect
D 12.0: Palm leave school, 3 Ideas ltd.

ABE	Alternative Based Education
ARRA	Association for Refugee and Returnee Affairs
CBO	Community Based Organisation
CCC	Core Commitments for Children
CFS	Child Friendly Space
CCFS	Community & Child Friendly School
CGI	Corrugated Galvanised Iron
CEB	Compressed Earth Block
Dia.	Diameter
DPC	Damp Proof Course
DPM	Damp Proof Membrane
DRR	Disaster Risk Reduction
ECD	Early Childhood Development
ESD	Education and Sustainable Development
ERT	Emergency Response Team
FFL	Finished Floor Level
HCB	Hollow Cement Block
IDP	Internally Displaced Person
INEE	Inter-agency Network for Education in Emergencies
MDG	Millenium Development Goals
MoE	Ministry of Education
NTS	Drawing is Not to Scale
O&M	Operation and Maintenance
PCC	Plain Cement Concrete
PDMA	Provincial Disaster Management Authority
PEER	Pakistan Earthquake Emergency Response
PTC	Parent Teacher Council
QEI	Quality Education Initiative
RC	Reinforced Concrete
SAD	Safe Adequate Durable
SHS	Steel Hollow Section
SRO	School Renovation Organisation
TVET	Technical Vocational Education and Training
TLS	Transitional Learning Space
SCCW	State Council of Child Welfare
TSS	Transitional School Structure
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations Childrens Fund
USCCB	United States Confederation of Catholic Bishops
WASH	Water Sanitation and Hygiene

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Girls inside a TLS in Pakistan, C 5.0

Photo: Save the Children/Pakistan

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DRR awareness training Haiti C 2.0
Photo: Save the children/Haiti

FOREWORD

The perfect time to plant a tree was 20 years ago.
The next best time is today.

African Proverb

As we prepare to finalize the 2013 edition of the Compendium ofTransitional Learning Spaces, there are more than one million Syrian refugees registered with UNHCR, living in different countries or as internally displaced persons. The daily exodus from Syria to other Middle Eastern countries can reach up to 3,000; reports describe the hardships and dangers children must endure to escape and seek refuge across neighboring countries.

Similar conflictsare affecting local communities and vulnerable children in many parts of the world today; Mali has been engulfed in tribal violence, the Arab Spring disrupted access to education to millions of children, Myanmar witnessed an unusual spike on ethnic conflict with violent consequences and in the Democratic Republic of Congo entire villages had to relocate to safer grounds because of guerrilla activities.

And perhaps the most recognizable face to these tragedies and challenges to education is that of 14-year-old Malala Yousafzai from Pakistan, who was violently attacked because she believes and defends girls' rights to education. Her conviction to improve her life through education should be a calling for everyone to gather around her cause, and make a greater push to serve all children.

The second edition of the compendium follows the same initiative of the 2011 edition: collect technical information, centralize it, develop basic architectural drawings and provide cost effective recommendations to improve what was done. The goal is to harvest good practices and share them with the global community and practitioners working on providing and improving learning environments.

The previous focus, natural disasters' response, provided a rich array of solutions in the first edition, contributing practical solutions for recurrent emergencies in key regions. We have collected comments to the publications that serve as a monitoring and evaluation of the project. This year conflict is the focus and context for the collection of learning spaces that will be part of this edition. And back by popular demand, Section D on innovative practices brings exciting ideas for school communities and children on how to improve existing conditions; from essential health programmes to "Papinotas", a project to improve communication between students and parents, to a rapid SMS birth registration activity.

We would like to dedicate this work to the millions of girls and boys who struggle to walk long distances to attend schools, to the millions who have never seen a school and those who dream of being teachers to carry the torch. These children serve as an inspiration to improve what we do as practitioners to foster better learning environments for all children who desire, seek, dream and deserve an education.

Carlos Vasquez
UNICEF-HQ
Child Friendly School Designs

The Compendium of Transitional Learning Spaces 2013 (TLS 2013) is the second publication following the TLS 2011[1].The last compendium was received with much interest and success from field officers and practitioners, encouraging the TLS 2013 to follow the tradition to capture knowledge and 'lessons learned' from the field and contribute to further improving the quality of transitional learning spaces in the context of emergencies and our capacity to be effective.

Whereas last year's compendium focused on general design principles, construction materials and construction modalities, this year's compendium focuses on the 'hardware and software' issues to build safer and more resilient child-friendly learning environments.

Natural disasters and displacement have a devastating impact on children, youth and vulnerable communities including physical and psychosocial harm and loss of life. School facilities are often damaged, destroyed or used as emergency shelter, causing prolonged disruption of education and ultimately decreasing the quality of education.

The most vulnerable, marginalised communities and children are often disproportionally affected by disasters. Currently, thousands of children's lives are being negatively affected by the ongoing food and nutritional crisis in the Sahel region of Western Africa. Large numbers of refugees and IDP children are living in camps in the Horn of Africa due to continued conflict and insecurity. The conflict in Syria alone has generated almost one million refugees in the last two years, which has had a devastating impact on children.

Natural disasters and conflict are therefore exacerbating the exclusion of some 67million children out of school worldwide, and are rolling back years of progress toward attaining Education for All commitments and the MDGs. School safety and education are both key to reducing the impact of disasters and safeguarding the wellbeing of children. The role of education in reducing disaster risk is enshrined in all global commitments and frameworks. Foremost among them are:

- The Hyogo Framework for Action (HFA), which has acknowledged education as one of its five Priorities for Action.
- The UN Decade for Education and Sustainable Development (ESD) (2005–2014) in which Disaster Risk Reduction (DRR) is stated a core priority.
- The Core Commitments for Children in Humanitarian Action (CCCs) constitutes UNICEF's central policy on how to uphold the rights of children affected by humanitarian crises. The CCCs promote predictable, effective and timely collective humanitarian action for its programme commitments including WASH, child protection, health and education [2].

Emergencies can, however, present an opportunity to strengthen risk awareness and 'building back better' to strengthen community resilience. For this to take place, an integrated approach for safer school environments for all children is needed from the onset. Close collaboration with other sector initiatives from WASH, child protection, health and education is required to achieve the safety and education of children in emergencies [3].

The compendium references other sector documents throughout the chapters, including WASH in schools compendium [4] , The Guidance Notes on Safer School Construction, UNICEF Child-friendly Schools Manual and Minimum Standards for Education in Emergencies, Chronic Crises and Early Reconstruction.

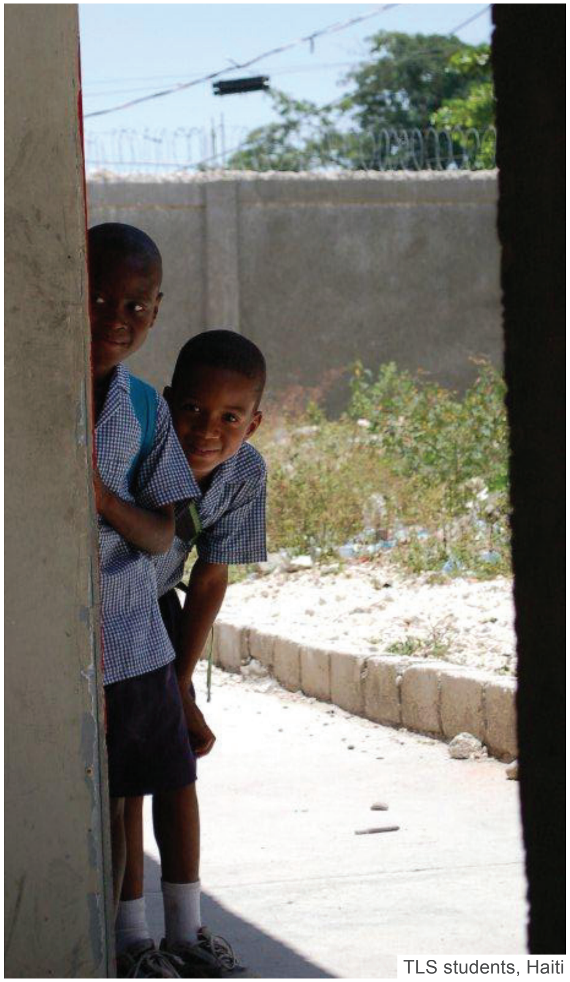

TLS students, Haiti

Photo credit: Save the children/Haiti

1 http://www.unicef.org/education/index_56204.html

2 http://www.unicef.org/publications/files/CCC_042010.pdf

3 Minimum Standards for Education in Emergencies, Chronic Crises and Early Reconstruction."Inter-agency Network for Education in Emergencies (INEE)
Guidance Notes on Safer School Construction- Global Facility for Disaster Reduction and Recovery 2009
Child friendly school manual - UNICEF 2009
Schools for All – including disabled children in education – Save the Children 2002
Teaching children with disabilities – UNESO 2009
WASH in schools raising clean hands UNICEF 2010

4 http://www.unicef.org/wash/schools/

INTRODUCTION

Eleven case studies are included in the TLS 2013 that have been implemented in response to flooding, earthquake and conflict. This year's case studies illustrate different types of child-friendly spaces, such as Early Childhood Development Centres, Community and Child-friendly spaces and Transitional Learning Spaces built to varying degrees of structural complexity, cost and lifespan. In addition, it provides 'updates' and 'lessons learned' from case studies documented in the 2011 TLS compendium.

The case studies equip field practitioners with technical information of field-tested and implemented structures. The collected and standardized information gives rapid access to information that is relevant to decision makers, field practitioners, technical staff (engineers, architects) and local communities to develop emergency specific solutions.

To compliment the experiences gained from the field, cost effective suggestions of improvements are marked in blue on the drawings. These improvements should not be understood as a criticism of the built structures, but as knowledge gained form past experiences. Ultimately, the compendium's objective is to capitalise on the knowledge gained from past emergency responses to strengthen capacity to continuously improve the quality, cost effectiveness and child-friendliness of future TLS projects.

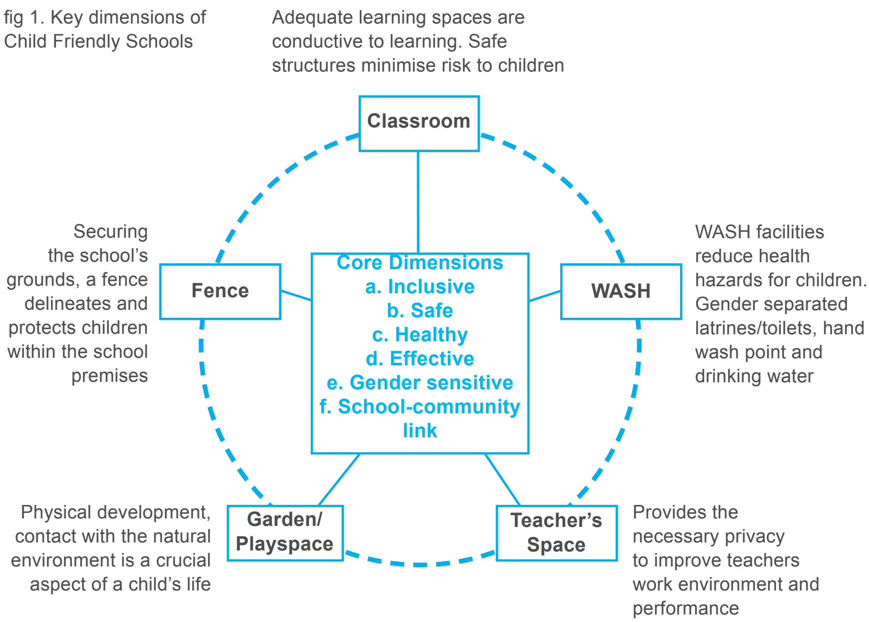
SECTION A:
TYPOLOGY OF TRANSITIONAL LEARNING SPACES

Transitional Child Friendly Spaces are not only Schools

A. 1.0 Principles of Child Friendly Spaces

Child Friendly Spaces (CFSs) are widely used in emergencies as a first response to children's rights to protection, psychosocial well being and education. They also serve as an entry point for working with the affected communities and provide lifesaving services. CFS principles are part of the overall reconstruction efforts and an important component within the early recovery stages that contribute to the care and protection of children as well as continuation of education in a wide spectrum of emergencies.
There are six key dimensions defining child-friendly design principles that give a guiding framework to create an inclusive, safe, healthy and protective learning environment for all children. The UNICEF child-friendly schools manual gives detailed guidance on the principles of child-friendly schools.

fig 1. Key dimensions of Child Friendly Schools



Inclusive environment: An inclusive learning environment, where the physical environment and buildings make provisions for all children, including provisions for children with disabilities and girls in the form of gender-separated latrines and WASH facilities. In particular, access ramps to classrooms and latrines, child-height handrails, reduced stair heights, door openings of a minimum of 850mm and special design of accessible latrines. The accessibility of the external spaces and the route to school should be included in the analysis and inclusive design process.(UNICEF, CFS Manual, and Chapter 2.3)

All case studies have as recommendation access ramps to learning spaces and latrines indicated on their technical documentation. In this regard it is important to note that ramps into the buildings are not sufficient to create accessibility, as children with disabilities need to be able to reach the child-friendly spaces in the first place. Consequently, considerations to the external space and alternative measures for getting to the school grounds require careful thought.

Safe and protective: Learning environments must be safe and protective for all children; it is crucial to design and build structurally safe and hazard resistant structures with particular consideration to the context and site-specific hazards, such as earthquakes, floods, high winds, mud slides, fire, etc.
A careful site selection and layout of facilities contributes significantly to creating a protective and safe child-centred environment. This includes the provision of perimeter fencing, easy supervision of latrine facilities by teachers and controlled entrance to the school grounds. The routes to the child-friendly facilities are an important component in site selection and require consideration to protect the children from harm.
(UNICEF, CFS Manual, Chapter 5.2.2/3.3.3)

Healthy environment: Child-friendly TLSs must provide healthy and hygienic facilities, and close coordination with WASH is essential. This includes appropriate gender-separated latrines, hand wash points, drinking water, site drainage and waste disposal as vital in providing a healthy learning environment. The inclusion of sealed internal flooring provides protection from vector diseases. Based on field experience a close coordinated effort between education and WASH can take place around the third week after the emergency. The WASH sector by this time has covered essential needs to the population and the clusters have been activated. Discussions between the two sectors can commence as early as the first week of the emergency.
(UNICEF, CFS Manual, Chapter 5.2.1)

Effective with children: Child-friendly TLSs are enabling learning environments where children can strive; therefore they need to be comfortable and child-centred spaces with good quality natural lighting, sufficient ventilation and comfortable internal temperatures through sun shading and appropriate material use. The TLSs need to be simple and open-plan spaces with flexible furniture arrangements to encourage group learning and child participation.(UNICEF, CFS Manual, Chapter 3, Table 3.1)

Sensitive to gender: Child-friendly TLSs must give attention to the needs of girls, in particular to the provision of gender-separated latrines, sufficient private space for washing within the girls' toilet, clear line of sight for entrances of latrines to allow supervision and innovative design solutions to include girls in outdoor play and activity spaces. The route to school is a key part within this. Additional supervision and assistance in the form of a parent/teacher on the route may be necessary.(UNICEF, CFS Manual, Chapter 5.2.2/ 3.5.1)

School-community links: Child-friendly TLSs are vital parts of the community. Community participation and engagement of parents, children and staff into the rapid decision-making processes on TLS design and location, fast erection/building works of suitable spaces, clearing of sites, setting up of maintenance and DRP measures are crucial.(UNICEF, CFS Manual, Chapter 3.6/Chapter 4)

Basic characteristics of child-friendly spaces:

• Mud floors are not recommended and should be avoided. Avoiding worm infestation is the main reason to provide a sealed floor. Heavy tarpaulin or if possible concrete slabs can provide a sealed floor.

• Materials like thatch or straw have a high degree of flammability, placing children at risk in case of fires.

• All TLSs must provide access to water and sanitation. This component can be coordinated with the WASH working group or cluster.

• TLSs that are implemented within IDP camps/refugee camps should carefully choose the most secure and accessible space within the camp.

• Community participation is a key to guarantee ownership, increase level of safety and disaster risk preparedness.

• Tents that specify a more structurally sound steel structure can be reused/recycled into a semi-permanent structure. Refer to case study UPDATE Haiti C.13

• The planning of the TLS should be a cross-sector effort to increase effectiveness and quality results for children.

A 1.2 Cultural appropriateness, security and child protection

The political and security situation has an immense impact on the ability to plan, build, supervise and operate transitional learning spaces. This year's compendium documents many case studies that were implemented in IDP or refugee camps. In the case study of South Sudan C.7, the possibility of reoccurring violence, sourcing of building materials and the construction supervision produced a major challenge.
Consequently, it is essential to engage the community, parents and children in decision-making processes to create emergency context-specific solutions where children feel safe and protected. This may include aspects of site selection, the need for perimeter fencing and close supervision, the assessment of dangers for children on the route to the TLS, material selection and design.
The emphasis may differ in situations of natural disasters or conflict. In the case study of Haiti C.2 the selection of the main construction materials was a key issue. Children did not feel safe in concrete structures after the earthquake, whereas in the case study of South Sudan C.7, the perimeter protection of the TLS was an important concern of the community.

The use of permanent school structures as emergency shelter for the displaced is not part of the scope of this compendium. Several of the case studies document that this is often the case. Even in the best case scenarios in which the education is not disrupted, the influx of a large number of people into the school grounds and facilities places often extreme strain on the available facilities, especially latrines and water supply, and increases the vulnerability of the children.

A 1.3 Water, Sanitation and Hygiene (WASH)

All of the documented case studies clearly show in their list facilities provided that the provision of gender-separated appropriate latrines, provision of hand washing points, drinking water and hygiene measures is essential to create a child-friendly, safe and hygienic environment. Past experiences have shown that the absence of separate girls latrines have an immense impact on girls continuing their education after/during an emergency, irrespective of it being a natural disaster or displacement situation. Consequently, close coordination between education and WASH cluster is a key to provide access to child-friendly learning spaces.

The UPDATE case study of Pakistan C.12 documents research into the number of girls attending school before and after the completion of child-friendly transitional schools with accessible gender-separated latrines. The number of girls attending school increased sharply after the completion of the TLSs leading to the conclusion that hygienic, safe and child-friendly learning environments have a positive impact on girls' enrolment.
UNICEF has published a specific UNICEF WASH compendium, which gives detailed guidance on Water, Sanitation and Hygiene matters in emergencies. It is available on request from the UNICEF website: www.unicef.org/wash/schools/

A 2.0 Types of Child Friendly Space

The documented case studies highlight the urgent need for child-friendly spaces in emergencies, which are able to facilitate all children– including vulnerable children– with a protected, safe and hygienic space to play, acquire life skills and continue their education. In many of the case studies the child-friendly spaces were used to continue education or to offer alternative-based education (ABE) programmes. In situations of displacement, such as the refugee camp Dollo Ado in Ethiopia (C.6), child-friendly spaces were constructed to address the urgent need for education and child-focused activities.

In most of the natural disaster-related case studies a major emphasis was placed on strengthening resilience through setting up disaster risk preparedness activities in the form of community emergency committee and school emergency preparedness plan (Haiti C.2, C.3, and C.14).
Consequently, it is important that the structures respond to these varied needs of the children and work within the emergency specific context of availability of construction materials, human capacity and budget.

A 3.0 Spaces for early childhood development (ECD)

Case studies of implemented ECD spaces in emergencies are not widely documented and examples are scarce. In general, spaces for primary schooling and early learning are often perceived to be the same. In most cases ECD is spatially and organisationally included within primary schools grounds and form a small part of the larger provision of protected transitional learning spaces. However, early learning activities differ considerably from primary schooling, as they focus on much younger children with different needs. Consequently, the spatial considerations should be responding to these different conditions by giving particular attention to the following characteristics:

Specific characteristics of ECD space:
Sealed and clean internal floor: Younger children spend a lot of time sitting, crawling and playing on the floor by moving around and exploring their environment. Therefore a sealed, solid and clean floor is very important to avoid worm infestation and other vector born diseases. A mud floor should be avoided and a sealed concrete floor/compacted earth floor is recommended with sitting and playing mats.

Space allocation: Younger children learn and explore their environment by moving around. Movement is essential to a child's physical and emotional development. Once children can crawl or walk, moving becomes a major focus of their day. It is thought that motor and emotional competence is closely linked in children. Consequently, younger children have a greater need for space allocation per child than primary school children, who engage in more structured learning activities. The space required for an ECD is 2 to 3sqm per child and a total of no more than 30 infants per caretaker. This is three times the space allocated for children attending primary school.

Flexible spatial arrangement: ECD activities differ from primary school activities. It is common to have several activities for smaller children progressing simultaneously within the same space. This could be group play around a table, playing on the ground or quieter activities, such as looking at picture books or resting/sleeping. Consequently, a flexible spatial arrangement is recommended and required to deliver parallel activities for different groups.

Supervision: In many cases ECD staff (more than one) need to supervise a group of younger children engaged in multiple activities simultaneously, as the younger children may require assistance and/or comforting, some may want to rest or play. It is therefore recommended to have only half height partitions within the space to allow staff to look over, also the entrance doors and stairs need to be lockable and protect the children from falling down.

Example: Ethiopia C.6

In the refugee camp of Dollo Ado a new model of a Child and Community Friendly Schools (CCFS) in form of an open and flexible learning and community space was built. The large open structure was specifically designed to address a number of challenges faced in implementing programmes in refugee camps. It allows multiple activities to progress simultaneously, such as education, technical, vocational education and training (TVET) and early childhood development (ECD) activities.

Photo: Save the Children/Ethiopia

Furniture and learning materials: ECD spaces require furniture that is age appropriate in size to children including chairs, tables and shelves allowing them to use it safely and independently. ECD specific learning materials have been developed in the form of an ECD kit developed by UNICEF as part of an emergency response plan.

Sanitation provision: Access to latrines and water facilities for smaller children are rarely considered in emergencies, especially as a majority of ECD spaces are within primary school grounds with existing sanitation provisions. Smaller children are often still learning or are too young to go to the toilets by themselves. Ideally, specific smaller scaled latrines/toilets are provided for children in this age group. However, this may not be possible, so the location and design of the latrines can take into consideration that carers have to accompany the child.

This is space for individual observations

SECTION B:
DRR AND PREPAREDNESS

DRR and Preparedness

This section offers a set of Disaster Risk Reduction (DRR) and Preparedness measures and activities that are based on best practices and past experiences from the documented case studies. The case studies include emergency responses that have been implemented after natural disasters (flooding C 5.0, earthquake C 1.0, C 2.0, C 3.0, C 4.0, hurricanes C 13.0, C 14.0), and conflicts (IDP camps C 9.0, C 10.0, C 11.0, refugee camps C 6.0, C 7.0, C 8.0,),as well as complex emergencies where conflict and natural hazard events merged, such as in the case of Darfur C 9.0 and Rwanda C 8.0.

TLSs must be designed and located on the sites to mitigate risks of future hazard events and environmental degradation in order to protect children's safety and well-being. To this end:

- The TLS design needs to be emergency specific;responding to its nature, scale and impact.
- DRR measures are an integral part of a holistic design and planning process from the onset; they are not an 'add-on'.
- Coordination with the local governments, the shelter/education/WASH/Protection/ Health and CCCM cluster or any other coordination mechanism that might be in place is essential.
- The technical skills of an experienced engineer/architect are needed to lead the design and planning process.
- Existing national building codes,regulations and standards must be followed [1].

All case studies in Chapter C have a DRR paragraph and drawing included, which highlights the specific hazard resistant designcomponents and DRP activities that were implemented.

B.1 Factors to consider when planning a site for TLS

B 1.2 Natural disasters

TLSs implemented after natural disasters are by nature predominantly located within hazard-prone areas that face reoccurring natural hazard events. Consequently, mitigating measures must be part of the TLS design in the form of structural safe design that, for example, withstands aftershocks/earthquakes, landslides, typhoons/ hurricanes and seasonal flooding. In addition, DRP activities such as planning of emergency evacuation procedures and community-led emergency preparedness plans are essential. Further details are given in Chapter B.3.

1 In circumstances where these are not sufficient global best practises/international building code should be followed.

The case studies of Pakistan and Haiti document multiple risks of earthquake/flooding and earthquake/hurricane, which created a complex hazard context to plan and design in. Sites located in densely populated urban areas (e.g.Haiti) are often at even greater risk due to their proximity to other structures of poor construction quality. In addition, many regions (e.g.Rwanda C 8.0) face underlying issues of environmental degradations, such as deforestation, that increase the vulnerability of the sites and community to the impact of the hazard events.

To this end, it is essential to conduct hazard mapping exercises and site assessment with the community and local authorities to determine the potential risks, vulnerabilities and design mitigating site works with hazard-resistant structures. More detail is given in Chapter B.2.3.

Example: Haiti U.C 2.0

UNICEF developed, in partnership with the Ministry of Education, a site vulnerability assessment form to map site-specific hazards. It includes questions regarding general context, site vulnerabilities and type and condition of existing buildings on site. Important issues, such as ground condition, soil type, exposure to wind, percentage of site on slope, presence of rivers nearby and other secondary hazards (e.g. factories, previously collapsed buildings, etc) are being mapped. The assessment was carried out jointly with WASH sections and led to several sites being refused for school construction and in other cases mitigating site works were proposed, such as terracing, retaining walls and external drainage routes.

B 1.3 Conflict

Half of the documented TLSs have been implemented in response to conflict situations. In these case studies large populations have been displaced and were forced to leave their homes and communities to IPD or refugee camps.Many of these IDP/refugee camps (Ethiopia C 6.0, Darfur C 9.0, Rwanda, C 8.0, DRC C 10.0) face a continued struggle to provide life-saving services (health, food, water, shelter) to the waves of IDPs/refugees and experience very dense and harsh living conditions.

The large population increase often places a great burden on the environment and host communities. Existing environmental challenges and depletion of natural resources, such as deforestation, issues of water scarcity and land erosion, are often amplified and increase the vulnerability of the sites and the affected communities.

Example Darfur C 9.0

The IDP camp of ZamZam in Darfur has experienced continued waves of IDPs after reignited conflict and fighting. It is located within a region that experiences seasonal flooding for long periods of time. The constructed TLS facilities have been damaged by violence that reached the IDP camp as well as by flooding that washed away the ground and caused the structures to collapse.

In addition to the environmental challenges that need careful consideration, specific camp issues need to be considered when planning a site and a design for a TLS:

I. The option to select a suitable, less vulnerable site for a TLS or child-friendly space may be very limited or not given at all. Consequently, mitigating measures must be planned into the TLS design (e.g. plinth needed to protect against seasonal flooding). More detail is given in Chapter B.2

II. The choice of construction material and design is often very limited. This may be due to local authorities' restriction on material use or challenges in procuring construction materials. Designs that are perceived as being 'permanent' may not be allowed by the authorities; this often includes the use of concrete, burned brick, block construction and concrete foundations.

III. A camp situation is, by its nature,temporary, despite the fact that many displaced people and especially children live a large part of their lives in a refugee/IDP camp. The displaced population experience great emotional stress, trauma and live in a continued state of uncertainty. In contrast to natural disasters, the affected population does not have the possibility to progress to 'rebuild' their lives in respect to their livelihoods, houses, education, etc.More detail is given in Chapter B 1.6

Further information: Sphere Project- Humanitarian Charter and Minimum Standards in HumanitarianResponse

B 1.4 Site planning

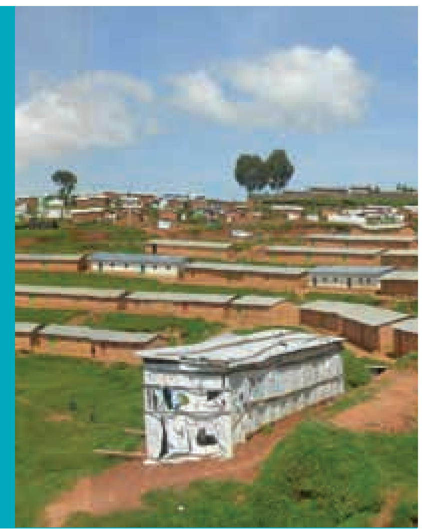
The process of planning TLS safter natural disaster or conflict may differ in many respects. However, the principle considerations of safe and hazard mitigating site planning for TLSs are the same:

I. I n general, it is advisable to avoid steep slopes, as they typically have the following increased risks: landslides, land erosion, rock fall, and problems with road access, such as fire protection equipment and emergency vehicles. Steep slopes make it more difficult and expensive to plan for accessible spaces for children with physical disabilities.

It is not always possible to avoid steeply sloped sites, as the case studies of Pakistan C 1.0 (earthquake) and Rwanda C 8.0 (IDP camp) illustrate. The TLS in Pakistan is located within the remote mountainous region ofAzad Jammu and Kashmir. To make the site both accessible and safe from landsides and falling rocks in case of earthquakes, extensive site levelling and retaining walls, external drainage and ramped access ways were required. These types of work are expensive and time consuming.

Example: Rwanda C 8.0

The refugee camp is located within a mountainous and very densely populated area of Rwanda. The whole region faces chronic environmental problems of soil,land erosion and deforestation in a very mountainous country that is affected by earthquakes and landslides.The design of the TLS proposes an overall landscape intervention with a heavy 'sandbag wall' as a retaining wall for the terraced landscape and external wall of the building. This reduces cost and protects from further land erosion and floodwater damage and avoids the usage of timber and brick (high carbon footprint).



II. Areas with risk of flooding, low lying sites or sites close to rivers or seashores should be avoided if possible. If this is not feasible, the design and layout of the TLS must take future and seasonal flooding into consideration, by raising the building of the ground through stills or raised plinths as the case study of Pakistan C 5.0 illustrates successfully.

The TLS building and latrine blocks are built on concrete plinths with sandwich panels of polystyrene material used for walls resist water for several days. During the flooding in 2012 many of the completed TTS schools remained in use and education continued. The buildings were standing within the floodwaters for weeks, but due to the raised plinth for the classroom and latrines, education was not disrupted. Girls and boys crossed miles of floodwater to continue their education in functioning schools.
III. In earthquake-prone regions, it is advisable to avoid sites that are close to the seashore (tsunami waves), on unstable and weak soil, or steep slopes. Earthquakes can weaken the ground conditions substantially and cause land slides, land erosion, rock fall and possible tsunami waves. If this is not possible, mitigating measures as described under I. and II. are required.

In urban areas it is essential to assess the construction and quality of neighbouring buildings, which may have been damaged and weakened by the earthquake, as aftershocks could bring them to collapse. Following earthquakes, debris, hazardous materials, sharp metals, fluids, solids and gaseous wastes may contaminate the site and site clearing may delay the building of TLSs and continuation of education.

Example: Pakistan U.C 1.0

The TLS building and latrine blocks are built on concrete plinths with sandwich panels of polystyrene material used for walls resist water for several days. During the flooding in 2012 many of the completed TTS schools remained in use and education continued. The buildings were standing within the floodwaters for weeks, but due to the raised plinth for the classroom and latrines, education was not disrupted. Girls and boys crossed miles of floodwater to continue their education in functioning schools.

B 1.5 Security

As described in Chapter A 1.2, security and child protection are essential elements of a child-friendly learning space and require careful design attention so children feel safe and protected after the traumatic experiences of conflict, natural disaster and/or displacement.

As the case studies of Darfur C 9.0, Ethiopia C 6.0, South Sudan C 7.0 and North Yemen C 11.0 document,safety was the priority factor in selecting a suitable location within the IDP/refugee camp. In all the case studies the sites were selected in close participation with the communities and camp management/authorities to select a location that was perceived as safest for the children. It is important to assess the immediate surroundings and route to the TLS in respect to potential risk to the children's safety.

In general, it is advisable to avoid locations close to industrial areas, contaminated sites, military camps and large traffic interchanges. In addition, a perimeter fence around the TLS grounds is necessary to monitor the movement in and out of the TLS grounds, to keep the structures safe and well maintained (e.g. Darfur C 9.0 – no perimeter fencing was built, which led to farm animals eating the roof covering of the TLS).

Further information: INEE Minimum Standards for Education, 2010

B.1.6 Issues of psycho-emotional impact on children

Natural disasters, conflict and displacement have a devastating impact on lives, especially children. Their families may be torn apart and children have to leave their home and community. Their homes, schools and familiar environment may be severely damaged and/or destroyed. Children may have to come to terms with the loss of family, friends and possessions.

The inclusive access for all children to child-friendly, safe and protected learning environments is particularly important for children who experienced these traumatic events and have to live in the often harsh conditions of IDP/refugee camps. Education plays a crucial role in promoting children's development, as well as providing structure and a sense of normalcy in an insecure environment and uncertain future.

The site planning and design process of TLSs must make it a priority to work with the children's understanding of what a safe and child-friendly space encompasses and provide them with information to give confidence in the safety of the structure.

After experiencing the devastating effects of the earthquake on many concrete structures in Haiti C 2.0/C 3.0/C 13.0/C 14.0, many children and parents did not feel safe inside a concrete building. They witnessed the collapse of the modern concrete structures and saw that older wooden houses remained standing.

Further information: Inter-Agency Standing Committee Taskforce (IASC), Guidelines on Mental Health and Psychosocial Support in Emergency Settings (MHPSS), INEE, Minimum Standards for Education in Emergencies, Chronic Crises and Early Reconstruction

B.1.7 Community participation

The active and transparent participation of affected people without discrimination throughout the whole project is an essential component of any successful TLS project. Experience has proven that engaging the community is a key factor in setting up child-friendly learning environments after emergencies that respond to the children's psychosocial needs.

The local community – including local authorities, parents, carers, teachers, children, wider community, and craftsmen– is instrumental throughout the project. Participation in needs assessment, preparation of the design brief, site and construction modality selecting, materials and construction method as well as construction supervision and evaluation should be facilitated.

Refer to Chapter B 3.1 for more detail on ways to involve the community.

B 1.8 Climate change adaptation

Disaster risk reduction measures and environmental adaptation are closely linked. The United Nations estimates that nine out of every ten disasters are now climate-related.

Site assessments for TLSs need to include analyses of the environmental challenges that are caused or increased by climate change, such as changing flood levels, coastal and land erosion, desertification, etc. It is essential to understand the risks to the site and structure by future environmental issues, despite the fact that the TLSs are not permanent constructions. Experiences have shown that many of these transitional spaces remain in use for longer periods than originally anticipated or are located on permanent school grounds where future permanent construction is planned.

Further information: Toward Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation: http://www.ecbproject.org/new-practitioners-guide-to-disaster-risk-reduction-drr/practitioners-guide-to-drr--cca; The CRS Climate Change: From Concepts to Action A Guide for Development Practitioners:http://www.crsprogramquality.org/publications/2013/2/4/climate-change-from-concepts-to-action-a-guide-for-developme.html; UNICEF, Climate Change Adaptation and Disaster Risk Reduction in the Education Sector: http://www.unicef.org/education/files/UNICEF-ClimateChange-ResourceManual-lores-c.pdf

http://www.unicef.org/cfs/index_121.htm

B.2 'Hardware' – Sustainable Hazard Resistant Construction

The 'hardware' and 'software' issues described in the next two chapters should not be understood as separate issues that can be addressed in isolation, but rather as different components of the same overarching aspiration to build safer, child-friendly learning environments.

B.2.1 Construction materials

The choice and availability of construction materials is one of the key factors that determine the design of the TLS. If it is possible within the emergency context, materials should be locally sourced to reduce cost, delivery times and support the local/host community's economy.

However, this depends on a functioning local construction material market and availability of skilled labourers. The local construction industry may be severely disrupted or even destroyed after an emergency. In the case studies from Haiti C 2.0/ C 3.0/C.13.0, construction materials were imported as there was a shortage of construction materials of acceptable quality. In IDP/refugee camps, the large influx of population and demand for construction materials for shelters and other facilities may overstretch the available supply on the local market or raise the prices dramatically.

It is therefore advisable to conduct a market survey of the locally available construction materials and skills as part of emergency preparedness planning. The understanding gained provides the background to make rapid informed design decisions in the case of an emergency.

An alternative approach is to re-use and recycle existing materials. This approach was tested by the 'rubble school' in Haiti(case study C 3.0). The overall TLS design concept was based on re-using materials from the debris of the earthquake. It re-uses the crushed up bricks and concrete from the vast amount of debris left behind in the urban areas of Porto-au-Prince.

Example: Iran C 4.0- Disaster Risk Preparedness Project

The emergency school typology was designed as a preparedness measure for future disasters. It was developed in response to the devastation after the Bam earthquake. The key objective was to design a structure that is easily and rapidly constructed and provide flexible and child-friendly spaces after an emergency.

Example: Haiti C 3.0 – 'Rubble School'

One of the key considerations for the TLS design was to achieve a low carbon footprint. The selection of construction material was based on environmental assessments that were calculated during the design stage. The challenge of clearing the large amount of debris was designed into the construction concept from the onset by using recycled rubble as one of the main building materials. The objective was to reduce negative impact on the Haitian environment. The rubble masonry from recycled concrete performed best in respect to carbon footprint in comparison to brick masonry and concrete block construction.

B.2.2 Sustainability

Almost all types of construction activities are very energy intensive and contribute to the depletion of natural resources, e.g.deforestation, water usage and pollution. Many of the case studies document that the degradation of the natural environment has contributed to the disaster impact on the communities.

It is important toassess potential construction materials in regards to their impact on the local environment and to avoid adding to the existing environmental concerns, increasing the vulnerabilities of the resident populations. It is recommended to include this research within the market research in the emergency preparedness planning.

The case studies of Haiti C 3.0 and Rwanda C 8.0 have given specific attention to the sustainability of the proposed construction materials and conducted environmental assessments during the design process.

Further information: http://www.environmentinshelter.org

B.2.3 Main building components - Foundation – Structure – Roof

In general, most structures are composed of three main building components: foundation/ground floor, main wall structure and roof structure/covering. The table below illustrates the different designs of the main building components that have been used by the documented structures, their hazard context and design rational.
long lasting semi-permanent structures.

Foundations/Ground floor

General note: It is essential to carry out soil tests before design and construction of foundations. The adequate size and type of foundation needs to be calculated/ designed by an engineer/architect. Foundation details must be part of the technical drawing set.

Type	Case studies	Application	Consideration
1) Raised plinth construction: a) Concrete plinth b) Brick plinth c) Earth plinth	South Sudan C.7 Pakistan C.5 Pakistan C. 12	- Used in flood prone area, such as seasonal flooding with standing water Advantages: - Protects foundations and soil from being washed away - Protects internal space from flood damage Important: - Plinth edge required to be reinforced against water erosion by concrete/cement/stone edge	- Ramped access needs to be provided - Protection from falling for smaller children is needed - May increase costs
2) Trench/strip foundation: a) Reinforced concrete strip foundation b) Brick strip foundation c) Stone strip foundation	Pakistan C.1 Haiti C.3 Iran C.4	- Used in earthquake prone areas, such as mountainous areas of Pakistan and urban areas in Haiti - It was designed in conjunction with a steel structure Advantages: - Creates a strong connection between ground/ foundation and main structure (such as steel structure/ concrete column/rubble cage wall elements) Important: - Strong connections between strip foundation and wall structure are essential	- Requires skilled craftsmen for concrete works, reinforcement and shuttering - Cost and availability of cement and reinforcement to be considered - Construction monitoring is essential
3) Pad foundation: a) In concrete b) In compacted earth c) In crushed brick	Darfur C.9 DRC C.10 North Yemen C.11	- Used in regions with no earthquake risks - Is used in flood prone area of Darfur to minimise use of cement/cost Advantages: - Faster/ simpler construction technique Important: - Timber needs to be treated against deterioration (e.g. used engine oil) - Depth of embedding steel/timber in ground is critical	- If used in flood prone areas, the structure needs to be located on higher grounds - Reduces use of cement and reduces costs

Main structure

General note: The adequate size and detailing needs to be calculated/designed by an engineer/architect with specific attention to hazard resistance.

Type	Case studies	Application	Consideration
1) Steel frame structure: a) Pre-fabricated	Pakistan C.1 Iran C.4 Yemen C.11 Pakistan C. 12 Haiti C.13 (concrete/steel)	- Used in earthquake prone areas of Pakistan and Iran - Pre-fabricated steel structure with steel infill cladding/insulation Advantages: - Light, durable structure that is easy and fast to assemble - If safely assembled with cross bracing for earthquake resistance Important: - Requires cross bracing, plinth beam for secure connection to foundation, ring beam for secure connection to roof	- Requires skilled manufacturing - Requires good vehicle access - Requires consistent quality production as needs to be assembled on site -Requires skilled assembly on site (bolting of steel elements, structural welding on site is not recommended) - Construction monitoring is essential
2) Concrete frame structure: a) On site construction	Haiti C.3 Iran C.4 Ethiopia C.6	- Used in earthquake/hurricane prone areas in Haiti - Used to achieve large open areas for flexible use Advantages: - If good quality concrete works, earthquake/hurricane resistant - Durable construction Important: - Requires plinth beam for secure connection to foundation, ring beam for secure connection to roof	- Requires skilled craftsmen for concrete works, reinforcement and shuttering - Cost and availability of cement and reinforcement to be considered - Construction monitoring is essential
3) Load bearing brick structure: a) Burned brick b) Block work	Pakistan C.5	- Used in flood prone rural areas of Pakistan, in combination with plinth Advantages: - Simple construction on site with locally familiar and sourced material - Cost effective and durable Important: - If used in earthquake prone areas, specific earthquake resistant detailing and design essential	- Quality of burned brick needs to be monitored and consistent - Construction monitoring is essential - Consideration to the environmental impact of burning brick(mainly done in local kilns fired by wood)
4) Timber frame structure: a) Timber poles b) Bamboo poles c) Cut timber	South Sudan C.7 Darfur C.9 DRC C.10 Haiti C.14	- Use in IPD/Refugee camps and in areas with difficult/ expensive access to cement Advantages: - Simple, fast construction on site, locally familiar and often locally sourced Important: - If used in earthquake prone areas, specific earthquake resistant detailing and design essential, see Haiti C.14 - Timber treatment/regular maintenance needed	- Perceived as an option of'non-permanent' construction -Cost effective - Consideration to the environmental impact of sourcing timber

Roof structure

General note: The adequate size and connection detailing of roof members needs to be calculated/designed by an engineer/architect with specific attention to hazard resistance.

Type	Case studies	Application	Consideration
1) Steel roof structure:	Pakistan C.1 Iran C.4 Pakistan C. 5 North Yemen C.11 Pakistan C.12 Haiti C.13	- Used in a variety of context, mainly in combination with steel structure and covered with CGI - Can be used with other roof covering, refer to C.5 Advantages: - Light, durable structure that is easy and fast to assemble - If safely assembled with cross bracing/hurricane straps for earthquake resistance Important: - Secure connection to wall plate/ring beam essential to protect from uplifting of roof - Secure fixing of CGI sheeting essential (e.g. hurricane band)	- Requires skilled manufacturing - Requires good vehicle access - Requires consistent quality production as needs to be assembled on site - Requires skilled assemble on site. (Bolting of steel elements, structural welding on site is not recommended) - Construction monitoring is essential
2) Timber roof structure: a) Timber poles b) Bamboo poles c) Cut timber	Haiti C.2 Haiti C.3 Ethiopia C.6 South Sudan C.7 Rwanda C.8 Darfur C.9 DRC C.11 Haiti C.14	- Used in variety of contexts, mainly in combination with timber or brick structure and covered with CGI or thatch Advantages: - Simple, fast construction on site, locally familiar and often locally sourced - If safely assembled with cross members/hurricane straps/gusset plate for earthquake resistance Important: - Timber treatment/regular maintenance needed - Secure connection to wall plate/ring beam essential to protect from uplifting of roof - Secure fixing of CGI sheeting essential	- Perceived as an option of' non-permanent' construction - Cost effective - Consideration to the environmental impact of sourcing timber

B.3 'Software' Disaster Risk Reduction and Preparedness Activities

'Software components' of developing community-led risk awareness, behaviour and training of children, staff, parents, craftsmen and the community is an essential dimension that needs to run in combination with the 'hardware components'of safer construction and site planning that mitigates exposure to hazard risks.

B 3.1 Ways to involve the community

The community is the key agent for any DRR and DRP activities to develop risk awareness and strengthen community resilience.The documented case studies have implemented a variety of ways to develop DRR and DRP activities and strengthen community-based mechanisms. Each case study has a specific paragraph on DRR/DRP, which gives detailed information.
The table below is a summary of the activities developed:

Strengthening of school community	• Re-activating/setting up of Parent Teacher Associations, School Management Committees, etc. through regular meetings, definition of responsibilities and roles • Develop maintenance and operations manuals for the school
Site selection	• In collaboration with school community, parents, children, local governments to benefit from local knowledge of disaster prone areas to avoid. • Use of 'transect walk' with the community to walk through potential sites and assess hazard risks (flood prone, security, steep slopes, access, adjacent dangerous buildings, etc.)
Risk assessments/ hazard mapping	• Using various participation techniques, e.g.focus group workshops, hazard/risk mapping in forms of games and drawn maps of the schools and areas
Training in DRR principles and risk awareness	• Workshops organised for community, local craftsmen, teachers and children to strengthen understanding of risk/vulnerabilities and capacities
Education for teachers in DRR education in curriculum	• Teacher/principal training to educate children in Hazard Vulnerability Capacity Assessment (HVCA) through age-specific participatory methods
Formation of emergency committees and response teams (SERT)	• Assigning key roles and responsibilities within the committee • Preparing individual school Emergency Preparedness Plan (EPP) and identifying school specific risks
Evacuation trainings	• Conducting regular emergency evacuations simulations by the SERTs
Equipment	• Provide basic early warning systems, such as whistles, megaphones, community awareness boards

Example: Haiti U.C 3.0

After hurricanes Sandy and Isaac the SERTs were Save the Children's first point of contact. The communications were established by phone and vital information on damage and extent of flooding assessed to organise the emergency response.

Further information INEE, safer school construction guidelines

B.3.2 Construction quality control and training

Safe construction detailing and design (e.g. cross bracing/raised floor level/secure foundations/etc.) can only be effective if the construction is monitored and supervised continuously and systematically.

Several case studies demonstrate that engaging an engineer/architect is important to budget and supervising the contractors and craftsmen building the structures effectively. Above all, engaging the right technical staff will guarantee the safety of children in the short and long term. TLS structures themselves are in many cases simple and inexpensive. However, the overall project cost for all facilities, site issues, planning and construction supervision add up to large project costs that require the same protection of investment and monitoring as permanent structures.

In the reported 'lessons learned' from the case studies it becomes clear that hazard risk awareness and knowledge of safer construction techniques (e.g. earthquake/flooding/typhoon/hurricane) within the local construction industry and craftsmen is lacking and training in safer construction technology is necessary.

In the case study of Haiti C 14.0 (save)/ C 13.0 a focus was placed on building skill and understanding within the carpenters and concrete workers in safer construction techniques through training, pilot projects and regular site inspection. The construction process was planned to integrate education programmes and DRR programmes to strengthen the local construction capacities.

Further information: The How-To Guide Managing Post-Disaster (Re-) Construction Projects: http://www.crsprogramquality.org/publications/2013/1/11/managing-post-disaster-re-construction-projects.html

B.3.3 Maintenance and Operations manuals

The TLS should be designed and built so the local community can maintain them. It is therefore important to design with construction materials and techniques that are locally available and affordable. Most TLSs have very limited funds for maintenance operations.

Past experiences have proven that regularly maintained school facilities provide a safer and healthier environment for its users. In disaster-prone areas better maintained facilities will minimise risks of damage and injury to users.

Maintenance plans and operations manuals are animportant part of school emergency preparedness plans and should be organised by the school community committees and emergency committees from the earliest time possible. This could include daily maintenance routines into the children's curriculum to develop risk awareness.

Further information: INEE, safer schools publication for detailed maintenance plans and toolkit for maintenance operations as part of children's education.

B.3.5 DRR and DRP in the curriculum

Education can be instrumental in building the knowledge, skills and attitudes necessary to prepare for and cope with disasters, as well as in helping children and the community to return to a normal life.

DRR should be treated systematically across the curriculum and through the grade levels. This should extend beyond the basic science and safety measures to consider prevention, mitigation, vulnerability and resilience building. The children should be recognised as both beneficiaries and as active citizens in DRR activities by including interactive, participatory and 'in the field' learning approaches through which the competencies, involvement, and confidence of the children are strengthened.
In the case studies C 14.0 Haiti (save) participatory learning content was developed and went hand-in-hand with the new school environment. Hazard/risk mapping and vulnerability assessments were conducted by the children through group work, games and active testing within the school grounds.

Refer to: UNISDR. (2007). Towards a Culture of Prevention: DisasterRisk Reduction Begins at School: Good Practices and LessonLearned. Geneva: UNISDR; INEE, safer school construction guidelines; UNICEF/UNESCO, Disaster Risk Reduction in School Curricula: Case Studies from Thirty Countries; Children in a changing climate research: Children and Disasters: UnderstandingImpact and Enabling Agency

http://www.unicef.org/cfs/index_121.htm

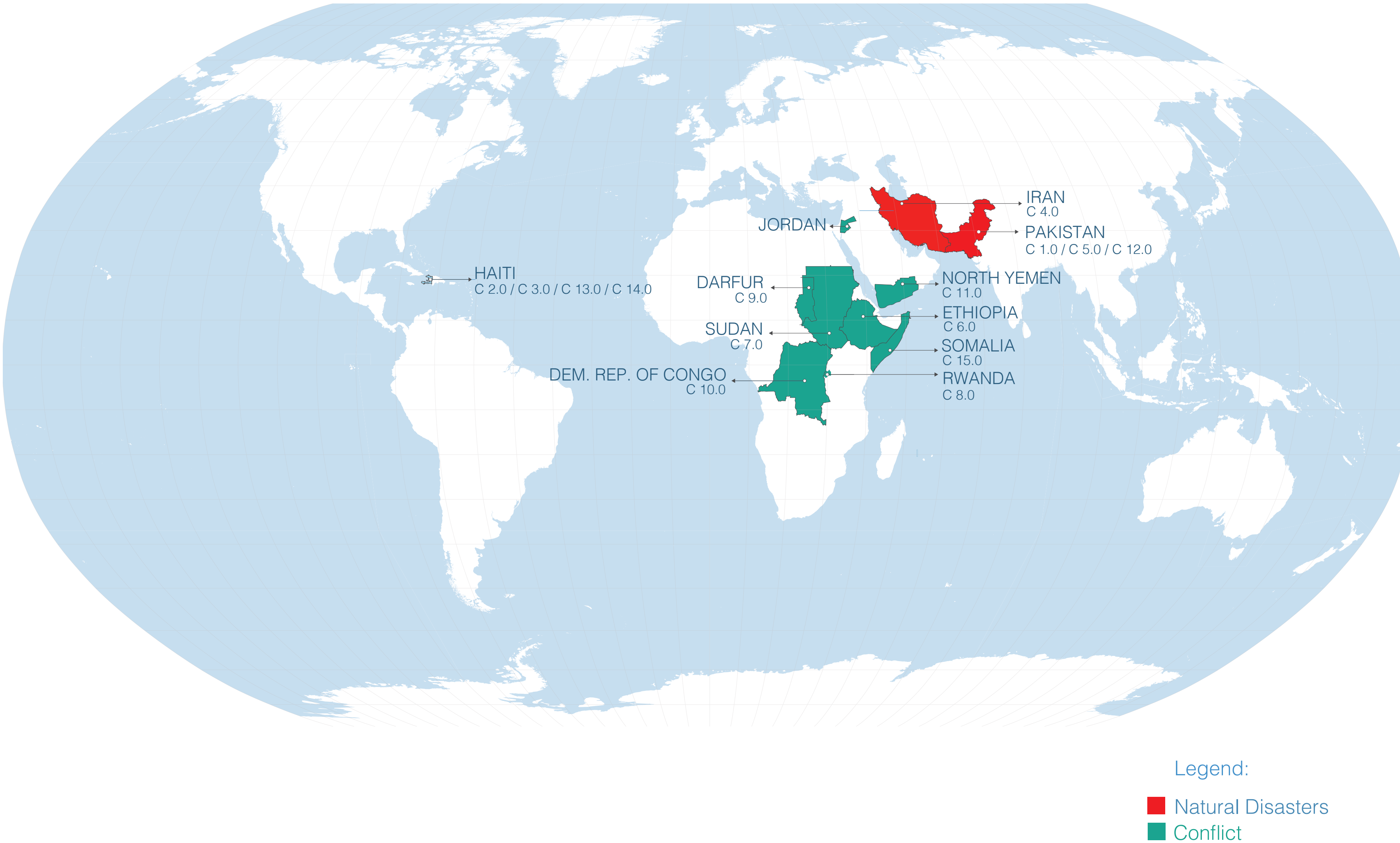
FIELD NOTES

This is space for individual observations

SECTION C:
CASE STUDIES OVERVIEW

Section C documents 11 new case studies and four UPDATE case studies from the 2011TLS compendium. Each case study includes a set of standard technical drawings, site plan, DRR specific diagrammatic section, project description, photographs and Bills of Quantity. In addition, the technical drawings are annotated with recommended improvements in blue. These recommendations aim to capture the knowledge gained from implementing the structure and best practices.

In the matrix below a comparative study has been made to place the documented TLS in relation to each other. The diagram aims to give the reader an overview of all case studies and their specific characteristics and context. The matrix gives a quick overview and way to navigate to the case study. The case studies are listed in the left column and the individual project components given on the top row.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C 4.0
PAKISTAN
C 1.0 / C 5.0 / C 12.0
JORDAN
HAITI
C 2.0 / C 3.0 / C 13.0 / C 14.0
DARFUR
C 9.0
NORTH YEMEN
C 11.0
ETHIOPIA
C 6.0
SUDAN
C 7.0
SOMALIA
C 15.0
DEM. REP. OF CONGO
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RWANDA
C 8.0
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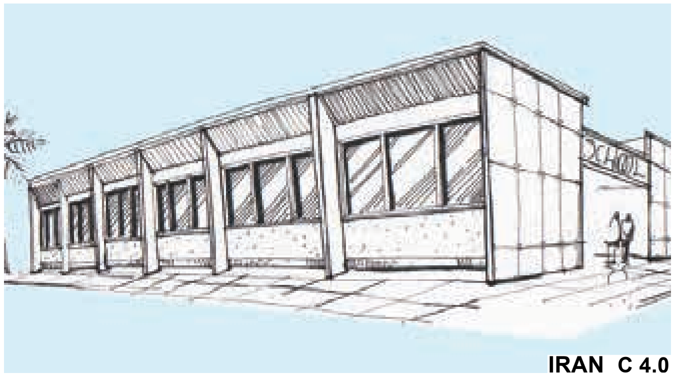
HAITI C 2.0


HAITI C 3.0


IRAN C 4.0


PAKISTAN C 5.0


ETHIOPIA C 6.0


SOUTH SUDAN C 7.0


RWANDA C 8.0


DARFUR C 9.0


DRC C 10.0


NORTH YEMEN C 11.0

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CASE STUDIES

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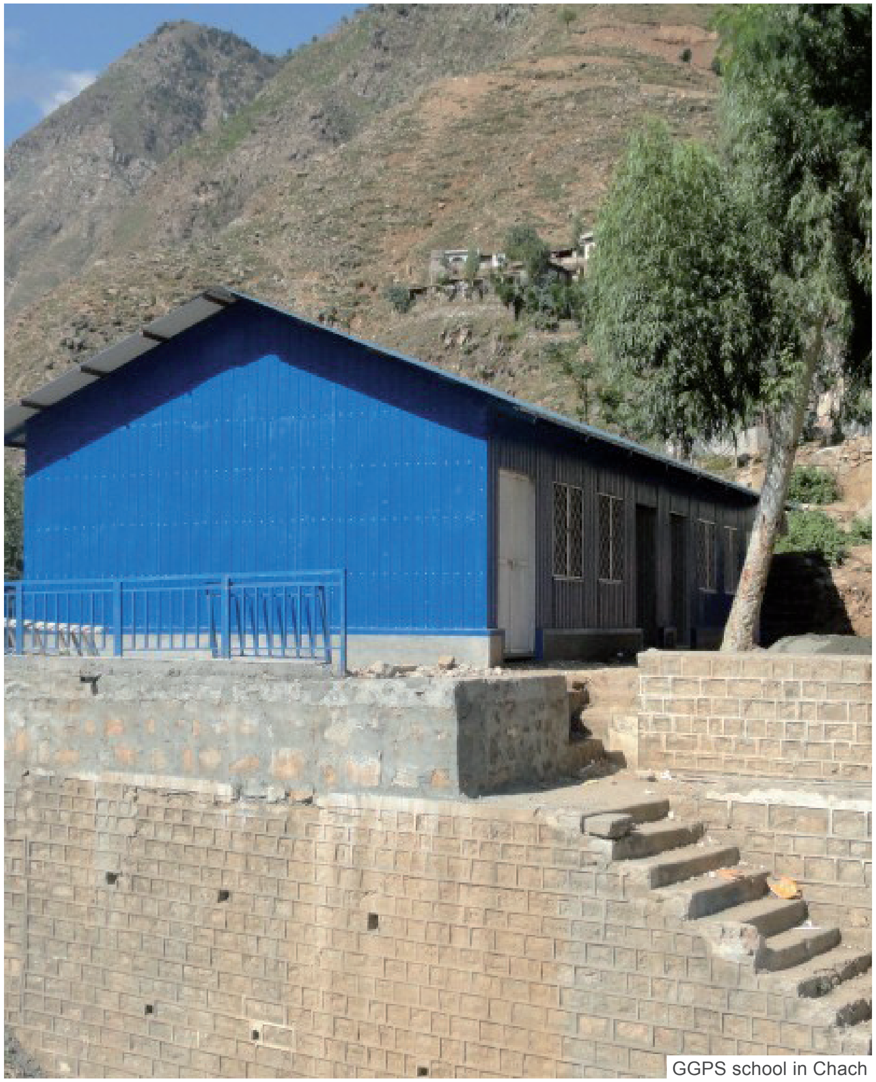
	COUNTRY	AGENCY	LOCATION	NO. OF USERS	ANTICIPATED LIFESPAN	ACTUAL LIFESPAN	FACILITIES PROVIDED	NO. OF FACILITIES	CONSTRUCTION TIME	PAGE NO.
C1.0	PAKISTAN	Catholic Relief Services (CRS), USCCB	Azad Jammu and Kashmir	5200 children 120 staff	20 years	7 years after completion schools are in good condition and working order	Classrooms, separated boys/ girls latrines, WASH facilities, retaining walls, fence	1 or 2 classroom school structures and 208 latrines	45 days (school structure, sanitation facilities)	36
C2.0	HAITI	Save the Children	Port au Prince, Leogane, Jacmel, Desalinnes, and Maissade	30 children (per class)	5 - 10 years	Not known	Retrofit of early learning centres, facilities depending on budget and space available	10 ECD retrofit projects in PAP, Herman Heraux ECD documented	Varied on the construction scope required	50
C3.0	HAITI	Finn Church Aid	Port-au-Prince, Leogane and surrounding areas	1650 children 38 staff (5 schools)	100 years	Not known	Classrooms, separated boys/ girls latrines, WASH facilities, retaining walls, fence,external play area, kitchen, bio-gas collector system	38 classrooms in five schools	12 months per school (including removal of debris, cash-for-work project / landscaping)	62
C4.0	IRAN	UNICEF	Bam/Iran	Modular typology: 75 - 250 children 6 - 15 staff	5 years	Not known	Classrooms, toilets (girls/boys) office, WASH facilities, kitchen, play area (libraries and laboratories)	Project is a preparedness measure	The estimated time for construction of the structure, considering that pre-fabricated elements are to be used	76
C5.0	PAKISTAN	Save the Children	Mirpur Khas, Lower Sindh	2249 children 65 staff	6 months	Not known	Classrooms separated boys/ girls latrines, WASH facilities, retaining walls, fence	24 TLCs (48 classrooms & 48 sanitation facilities)	1 month (2 classrooms & 2 sanitation facilities)	86

MAIN CONSTRUCTION MATERIAL	MATERIAL SOURCES	COST PER PROJECT USD	MATERIAL COST /UNIT USD	SIZE OF UNITS M^2	SIZE OF TEAM	REQUIRED TRADES	WHO BUILT THE FACILITIES?	SITE INFO
Pre-fabricated light gauge steel structure with CGI cladding on RC plinth	Locally sourced	USD 12,000	USD 9,000	44.5 m^2	4 skilled craftsmen, unskilled labourers, 1 engineer supervising	Basic construction and fabricators installation skills	Masons, electricians, carpenters, steel fabricators, engineer for monitoring	Sites on stream sides, sloped area and steep slopes
Timber for roof structure, concrete blocks	Various- locally sourced if available and right quality	Varied on size of retrofit scope	Varied	ECD varied- as site specific	Varies depending on the stage of the work	Stone masons, block layers, carpenters, roofers, and plumbers	Local contractors	Within urban areas, earthquake risk, adjacent to another building hurricane/ urban sites
Concrete, recycled rubble from debris, timber	Rubble and concrete locally sourced (recycled), timber imported	USD 156,000 (typical unit of 3 classrooms)	Dependent on contractor	Classroom: 52m^2, basic school module: 3x52m^2	Approx. 35 workmen	Unskilled, masons, concrete, carpenter	Local contractor: load-bearing frame, cash-for-work programme: rubble infill/ancillary works	Located in urban area, in seismic hazard and hurricane zones undertaken
Steel structure with prefabricated cement panels (sandwich panels)	Locally sourced	Project is a preparedness measure	Project is a preparedness measure	Classroom: 7.2x6m, 43.2m^2; Office space: 7.2x3m or 6m (modular)	Not known	Fabricators/ installers for steel structures and sandwich panels	Local contractors & communities supervised by School Renovation Organisation	Designed for earthquake-prone areas/tropical & cold climates
Brick, cement, bamboo, local grass mats	Locally sourced	USD 6,000	USD 4,970	Classroom: 5.5 x4.25m, 23.4m^2	2 skilled craftsmen & 4 unskilled Labourers	Bricklaying, basic construction skills	Local contractor	Away from flood-prone area, higher ground

CASE STUDIES

	COUNTRY	AGENCY	LOCATION	NO. OF USERS	ANTICIPATED LIFESPAN	ACTUAL LIFESPAN	FACILITIES PROVIDED	NO. OF FACILITIES	CONSTRUC-TION TIME	PAGE NO.
C6.0	ETHIOPIA	Save the Children	Dollo Ado Refugee camps, Ethiopia	Approx. 500-800 children 8-10 staff per day	35 years	Not known	Child & Community Friendly School (CCFS), gender separate(boys/ girls) latrines, WASH facilities kitchen, outdoor play area	5 CCFS	6 months	100
C7.0	SOUTH SUDAN	Plan International	3 Payams within Pibor County, Jonglei State, South Sudan	1,750 children (7 schools)	3 – 5 years	Not known	Temporary Learning Spaces -classrooms	21 classrooms	14 days (5 classrooms)	112
C8.0	RWANDA	UNHCR	Kiziba and Gihembe refugee camps	Kiziba: 3,700 children, Gihembe: 3,653 children (primary schools)	5 years	Not known	Classrooms, WASH facilities, separate boys/girls compost toilets, external play	180 classrooms and 109 latrines	Estimated: 1 month for block of 4 classrooms, infrastructure: 2-3 months	124
C9.0	SUDAN – DARFUR	Plan International	North Darfur	13,775 children and approx 225 volunteer staff, per school: 336 children approx 5 staff	Max. 18 month	Max. 12 month	Classroom structures, large feeding shelter, WASH facilities, office, security fence	41 two-classroom school structures including feeding shelter, 82 latrines	15 days per class-room, 60 days per school	138
C10.0	DRC	UNICEF	North Kivu, South Kivu, and Orientale provinces	Total programme: 70,000 conflict-af-fected children	Not known	Not known	Classroom (ECD/ primary) separate boys/girls latrines, WASH facilities, fence, ECD learning kit	3,000 protective learning spaces (adapted/set-up)	Not known	150
C11.0	NORTH YEMEN	UNICEF	Al-Mazraq IDP Camp 3, Haradh District, Hajjah Gover-norate	862 children (513 boys + 349 girls)	10 years	6 years	Classrooms, WASH facilities, separate boys/ girls latrines, security fence	16 classrooms, 16 latrines, 4 hand washing facilities, 4,000 water litres per day	5 days	162

MAIN CONSTRUCTION MATERIAL	MATERIAL SOURCES	COST PER PROJECT USD	MATERIAL COST /UNIT USD	SIZE OF UNITS M^2	SIZE OF TEAM	REQUIRED TRADES	WHO BUILT THE FACILITIES?	SITE INFO
Re-enforced concrete (RC), block work, timber roof structure, CGI sheeting	Locally sourced	USD 111,178	USD 43,960	780m² (CCFS)	Monitoring: 2 engineers from Save the Children & 1 site supervisor	Carpentry, masonry, general construction, RC works	Local contractor	Hard rocky ground, harsh weather conditions (hot and dry)
Eucalyptus poles, bamboo, timbers, CGI roof sheeting	Various (Juba / locally sourced)	USD 6,000	USD 3,000	46m²	1 building contractor, carpenters; several community helpers	Basic construction and carpentry skills, mud walling skills	Local contractor, community members	Flooding risk, high risk of recurring inter-communal conflicts
Sand bags filled with gravel and earth, d timber poles, CGI sheeting	Locally sourced (except metal sheeting sheets)	USD 6,650	USD 124	8x6m, 48m²	Not known	Basic construction, carpentry skills	Not known	Sites on steep slopes, earthquake and soil erosion risk, land ownership issues
Bamboo, plastic sheets, steel pipe, bricks, local grass thatch	Locally sourced	USD 4,500 (incl. 2 classrooms, feeding shelter, WASH facilities)	USD 563 (per unit)	8x5m, 40m², office size: 4x5m, 20m²,	2 skilled and 4 unskilled labourers	2 skilled and 4 unskilled labourers	Local craftsmen and contractors with local community	Land ownership issues/security issues
Local timber poles, plywood boards/ plastic sheeting, CGI sheeting	Locally sourced	USD 2,565 (incl. material, labour, transport cost)	USD 1,900	Classroom/ECD space: 8x7m, 56m²	Not known	Basic construction skills	Local craftsmen and community labour	Sites within IDP camps, security risks
Steel main frame, blocks, CGI sheeting, cement	Locally sourced	USD 4,000	USD 2,300	48m²	30 workers	Skilled construction workers	Local contractor, local craftsmen	Within IDP camp, exposed to strong winds and storms



GGPS school in Chach

Photo credit: A.Schaefer/CRS

2005/CRS

Agency:	Catholic Relief Services (CRS), US CCB
Location:	Azad Jammu and Kashmir, Province: Mansehra, Shangla and Kohistan
No. of users:	Total: 5,200 children and approximately 120 teachers Classroom: 44,5m^2 @ 50 children
Anticipated lifespan:	20 years
Actual lifespan:	7 years after completion schools are in good condition and working order
Facilities provided:	Classrooms, gender separated latrines, WASH facilities, hand washing point, water supply scheme, boundary walls/fence and retaining walls
No. of schools constructed:	104 one-or two-classroom school structures and 208 latrines
Construction time:	45 days (school structure, sanitation facilities)
Main construction materials	Pre-fabricated light gauge steel structure with CGI cladding on RC plinth
Material sources:	Locally sourced
Project cost/unit: *	USD 12,000 (incl. material and labour cost)
Material cost /unit:*	USD 9,000
Size of units:	Classroom: 6.1x7.3m, 44.5m^2
Size of construction team:	Construction: 4 skilled craftsmen and 4 unskilled labourers Monitoring: 1 engineer supervising maximum 2 schools at a time
Construction Trades:	Concrete works, electrician, carpentry, steel fabricators/installers
Who built the facilities:	Local craftsmen and extensive technical support
Site information:	Sites on stream sides, steep slopes, and heavy electric supply avoided

Background

On October 8th 2005, a violent earthquake struck Pakistan, causing entire villages to disappear under piles of rubble and earth. Many of the affected villages were remote, difficult to reach and especially vulnerable to the harsh winter conditions within this mountainous region.

According to government reports, 73,000 persons lost their lives including 18,000 children. Large numbers of people were severely injured and over 600,000 houses/ structures were destroyed, affecting 3.5 million people.

The education infrastructure was hit particularly hard, with over 5,000 schools either partially or fully destroyed in both Khyber Paktoon Khwa (KPK) and Azad Jammu and Kashmir (AJK)[1]. The emergency had a devastating effect on the existing weaknesses in the school system. It exacerbated teacher absenteeism and a lack of parental support to education, especially for girls. Existing girls' enrolment is low due to low education of parents, poverty, lack of female teachers and inadequate sanitation facilities at schools.

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Project Description

In response to the disaster, CRS launched the Pakistan Earthquake Emergency Response (PEER), which included immediate relief, water and sanitation, livelihoods restoration, and a key emphasis on the reconstruction of schools.

With the support of multiple private and public donors, PEER targeted affected districts of the Khyber Pakhtoon Khwa (KPK) and Azad Jammu and Kashmir (AJK) with focus on remote rural areas, which received less support from other organisations and the government. The School Reconstruction Project formed a crucial part of CRS Pakistan's earthquake recovery strategy.

The purpose of this project was to support the severely weakened school system and to ensure that children, including girls, have continuation of access to education and create a sense of normality for children after the traumatic experience of destruction caused by the earthquake.

The education programme was implemented in an integrated approach to ensure that the overall school environment provided a protective environment for all children. It included the re-construction of earthquake-resistant one/two classroom schools, gender-separated latrines, safe drinking water and hand washing points within school grounds protected by a perimeter fence. In addition to the 'hardware' components, emphasis was placed on reactivating parent and teacher committees (PTCs) and developing and strengthening working relations with the local partners, parents, education officials and religious leaders to promote sustainability, security and ownership of education services in their communities.

Shelter Description

The design concept for the community school followed CRS' three standards: sustainable, adequate and durable (SAD), as well as the Sphere standards. Several different types of community schools were designed to respond adequately to the site location and local hazards, such as steep slopes and size of community. A pre-fabricated steel structure was chosen as the main construction method due to a number of reasons: to avoid wood as construction material (deforestation), to have better quality control over prefabricated elements in this earthquake-prone region, the speed of erecting a steel structure and because of the challenge of transporting construction material to a remote rural region .

The steel structure is a pre-fabricated lightweight gauge steel frame with seismic cross bracing cables for earthquake resistance. This main structural frame is bolted securely to a reinforced concrete up-stand and foundations. The walls are made from insulated prefabricated wall panels with painted corrugated iron sheeting to the exterior and Lasani sheets to the inside. Like the main wall structure, the roof is made from a steel structure with corrugated iron sheeting and insulated internal ceiling. The insulation is needed to protect the inside space against heat and cold of the very harsh winter conditions in the region. [2]

The typical classroom is 6.1x7.3m, a total of 44.5m^2 The children sit in semi-circles on floor mats around the teacher and/or blackboard. Windows are located on both sides of the classroom to give even internal lighting and ventilation. The classroom has an electricity supply and a ceiling fan.
Water, Sanitation and Hygiene (WASH) facilities are included within all the TLS grounds. A minimum of two latrines, hand wash points and drinking water were installed. Fences or sometimes boundary walls secured the community school compound.

1 Earthquake Reconstruction & Rehabilitation Authority (ERRA) reports
2 ERRA's present policy supports pre-fabricated construction and fast construction technologies only for temporary or transitional structures.(source: ERRA website)

DRR

DRR/DRP was a very important component of the schools reconstruction programme, due to the risk of earthquake, landslides, flash floods and avalanches in the mountainous region of Khyber Paktoon Khwa (KPK) and Azad Jammu and Kashmir (AJK). It had 'hardware' as well as 'software' components.

Site selection was carefully considered to avoid steep slopes, riverbeds and heavy electrical supply lines. Site preparation works were carried out to level mountainous sites. Retaining walls were built to protect from landslides/rock fall/flash floods/avalanches. The TLS sites were selected in consultation with the Parent Teachers Council (PTC) members and schoolteachers, who have local knowledge of the area and local hazards.

To keep the external grounds hygienic, proper sanitation works were installed including underground system for the liquid and solid waste of the latrine (soakage pit, main holes) and proper drainage of the surface water.

Strengthening community-based mechanisms was a key aspect. CRS designed an Operation and Maintenance (O&M) training for PTCs through which they are trained how to maintain and renovate the structures. During the training PTC developed their own maintenance plan for the school with responsibilities and dates and durations. This plan is incorporated in the school development plan for overall education responsibility of the PTC.

Structurally the building is designed and installed in such a way that in case of an earthquake the structure may bend but not collapse. The steel structure is protected from deteriorating by three coats of Red Oxide and three coats of synthetic paint. The external doors should open outwards to avoid children getting stuck in case of an emergency escape and ideally be located on opposite walls to give alternative means of escapes.

Challenges

- To ensure that the required water for construction is available before starting construction work.

- Land acquisition. Emphasis on social mobilization to get 'good' land that was not disaster prone. This took some investment in community mobilization. The landscape in Kohistan is very difficult– steep mountains that descend into deep mountain valleys. Flat terrain is virtually nonexistent.

- Transport of materials to these locations can be time consuming (due to challenging terrain) and requires involvement of laborers/ community members to hand carrying items.

- Short construction period, as freezing temperatures can occur in December until February.

Improvements

- Include an external ramp into classroom/sanitation facilities/ school grounds for wheelchair users (this can be a major challenge in mountainous areas).

- External veranda space for children to be able to play outside during rainy and winter weather.

- Partition inside classroom to give opportunity to split space for younger and older children.

- Roof guttering and rainwater harvesting/collection for use in sanitation facilities/cleaning.

- Lowering windows to allow children to see outside and allow 'visual monitoring'.

- Additional door on opposite side of building for another means of escape in an emergency.

CRS also encouraged the use of flexible teaching techniques to engage children


GPS school in Lilai included separate girls and boys latrines and WASH facilities


It is a light, pre-fabricated construction

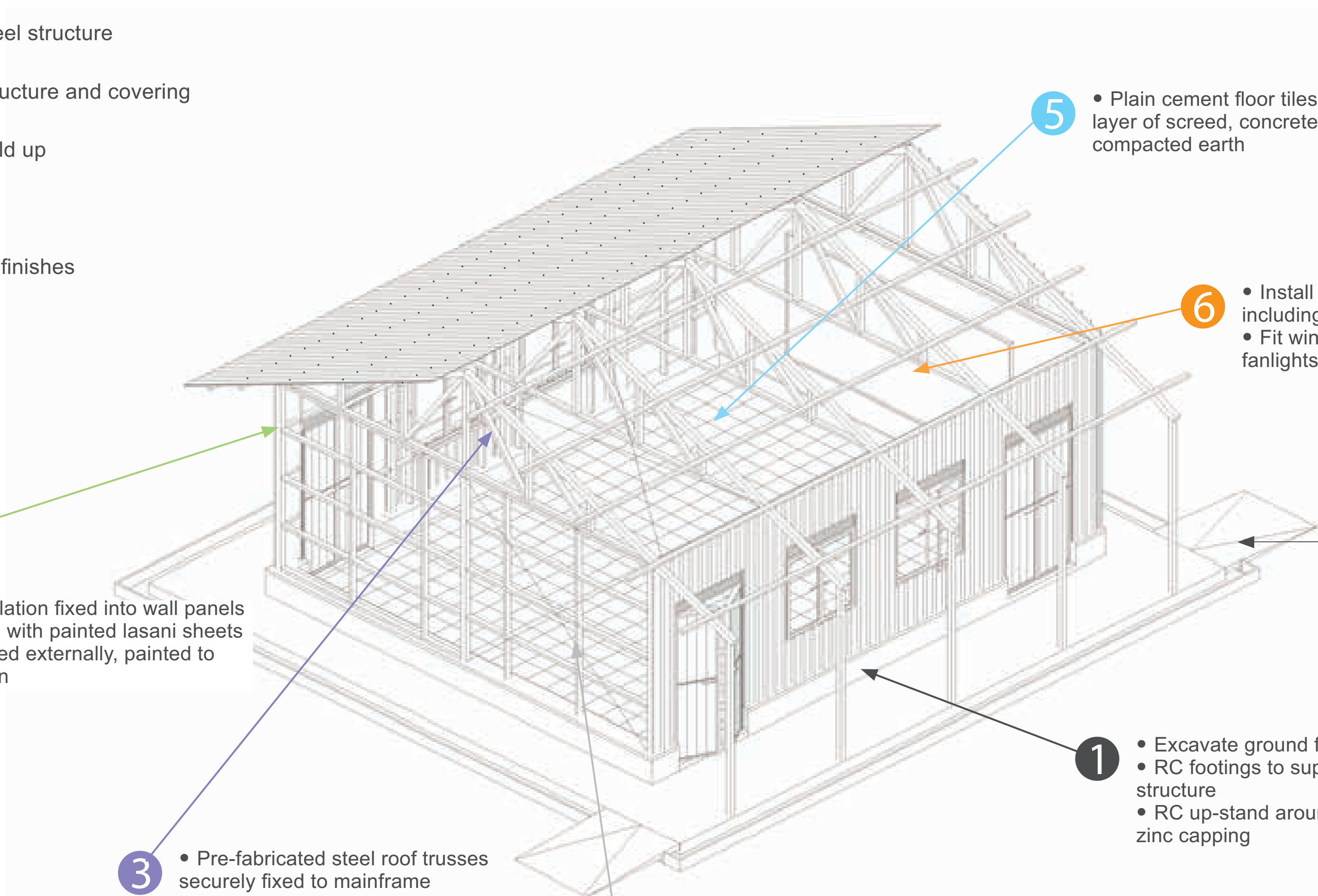

Jagori Girls school used for a community meeting


The prefabricated structural system allowed the school to be erected swiftly before the winter sets in

All photos: CRS/Pakistan

3D VIEW

1 Groundwork and foundations
2 Main steel structure
3 Roof structure and covering
4 Wall build up
5 Floor
6 Internal finishes



5
• Plain cement floor tiles laid on layer of screed, concrete slab and compacted earth

6
• Install safe electrical fittings including ceiling fan and lights
• Fit windows, doors, grills and fanlights into frame

4
• Adequate insulation fixed into wall panels
• Internally lined with painted lasani sheets
• CGI sheets fixed externally, painted to prevent corrosion

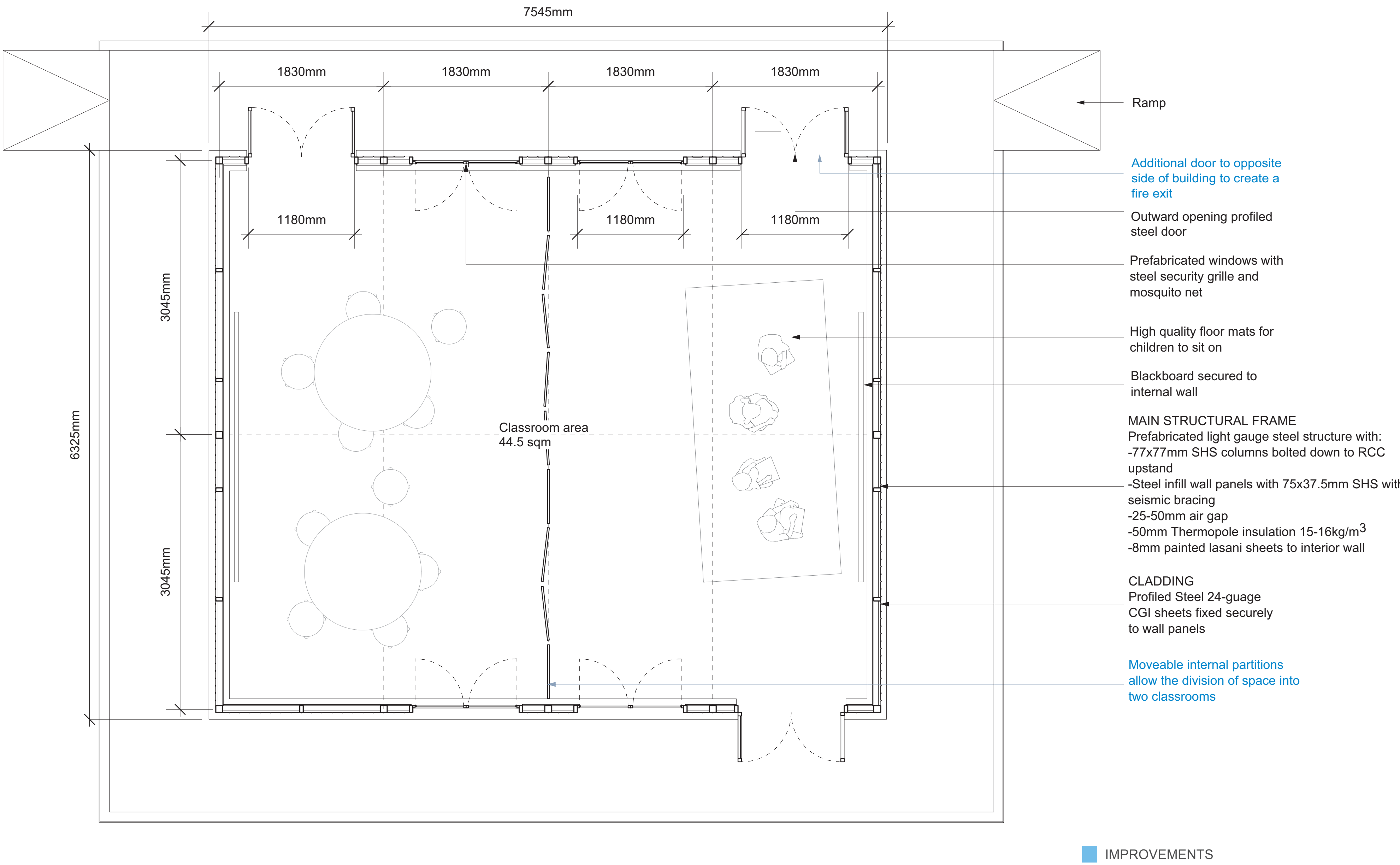
Ramp

1
• Excavate ground for concrete footings
• RC footings to support main steel structure
• RC up-stand around external wall with zinc capping

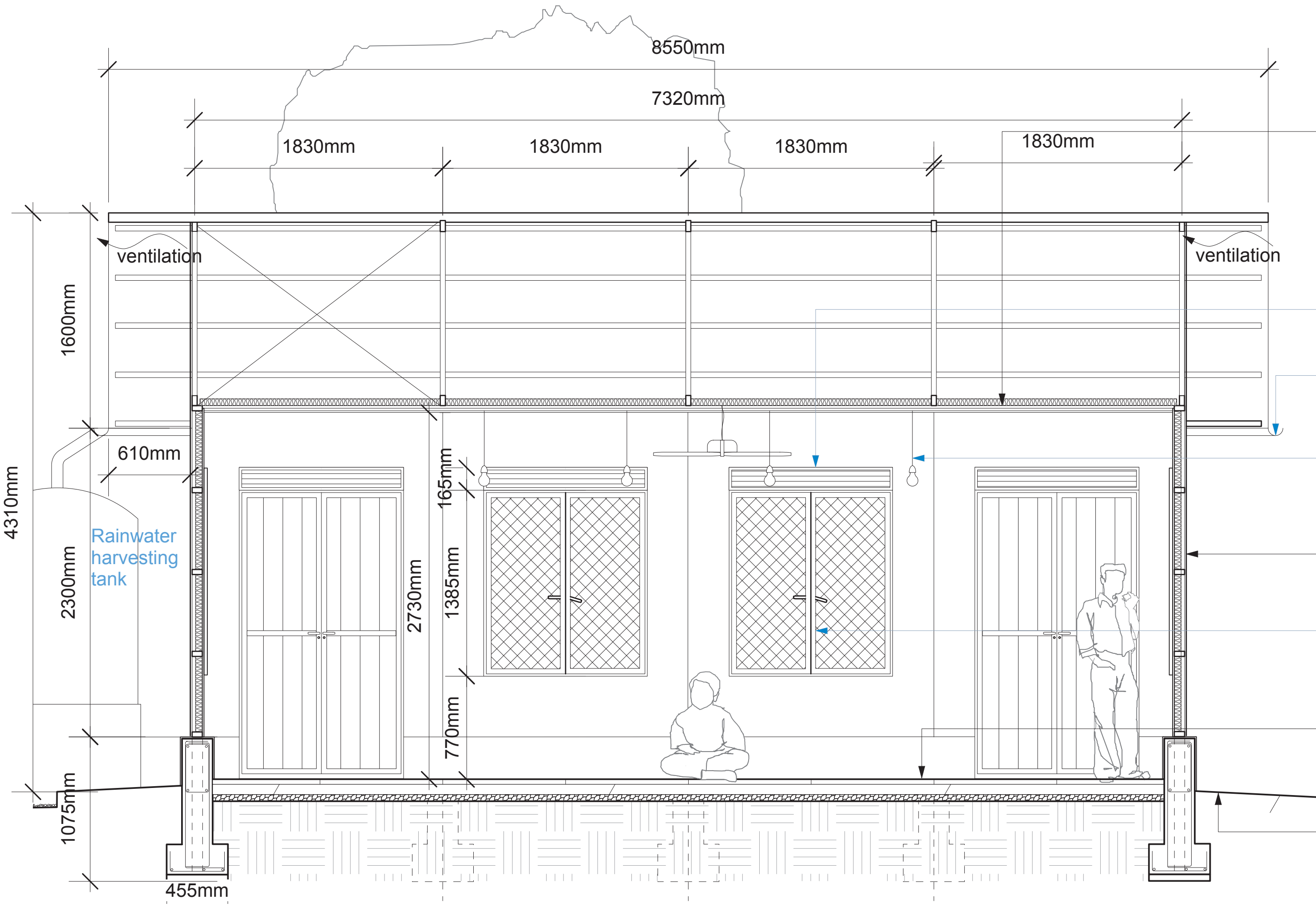
3
• Pre-fabricated steel roof trusses securely fixed to mainframe
• CGI metal roofing securely fixed with galvanised rivets on peak

2
• On-site erecting of pre-fabricated light steel gauge mainframe and in fill wall panels
• Steel cable seismic cross bracing bolted to frame and post-tensioned with spanners

FLOOR PLAN SCALE 1:50



LONG SECTION SCALE 1:50



MAIN STRUCTURAL FRAME
-77x77mm steel column bolted down to RCC plinth
-Pre-fabricated light gauge steel wall panels with 75x37.5mm SHS
-25-50mm air gap
-50mm Thermopole insulation (15-16kg/m^{3})
-8mm painted lasani sheets to interior wall/ waterproof lining

Include fixed ventilation grille above windows and doors

Drain pipe for rainwater harvesting

Provide energy efficient lighting for better illumination

EXTERNAL CLADDING
Profiled 24 gauge CGI metal sheets secured to steel structure

Locate windows +0.77m above FF

FLOOR
-37.5mm thick screed topping with
-75x75mm PCC tiles
-75mm PCC slab
-apprx 650mm compacted earth

PCC plinth protection to roof line with fall for surface water drainage

IMPROVEMENTS

SHORT SECTION SCALE 1:50

ROOF
-CGI metal roof sheeting 24-gauge, with 25mm corrugations, fixed to purlins with galvanised rivets
-50x50mm steel purlins at 940mm c/c
-Prefabricated steel truss (75x37.5mm hollow steel sections) with GI sheet metal ridge cap

CEILING
-37.5x12.5mm steel profiles for false ceiling fixed to underside of roof truss
-50mm Thermopole insulation
-8mm painted Lasani sheet fixed to ceiling profiles

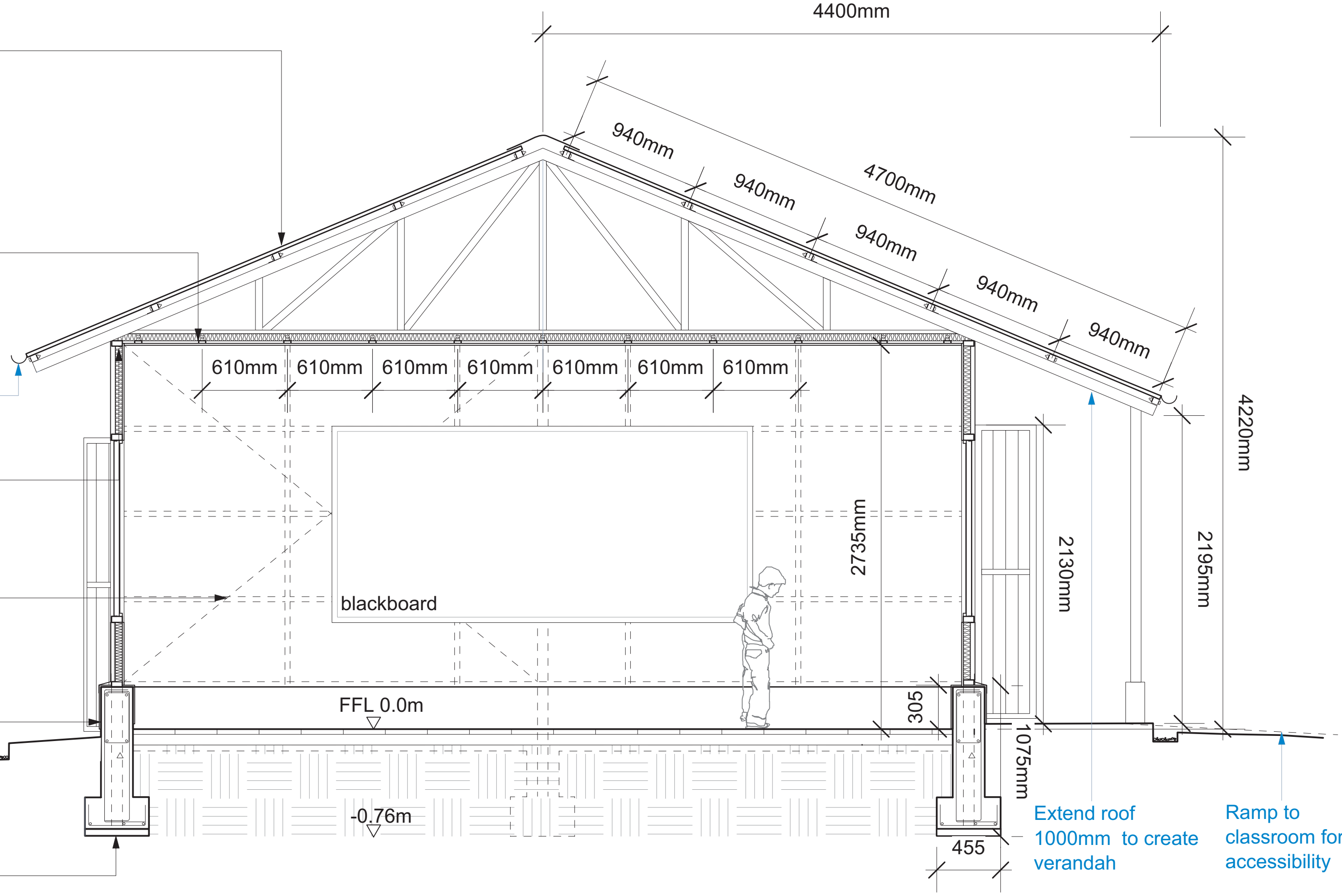
Drainage channel fixed to roof eave to collect rainwater

Steel wall plate bolted to columns

6mm steel cable Cross Bracing across wall panels post-tensioned with spanners

CONCRETE UPSTAND
-22.5mm RCC plinth with 12mm plaster face
- GI Z-profile steel sheet protective capping

FOUNDATION
-22.5x45mm RCC Concrete footing
-50mm PCC
-compacted aggregate base

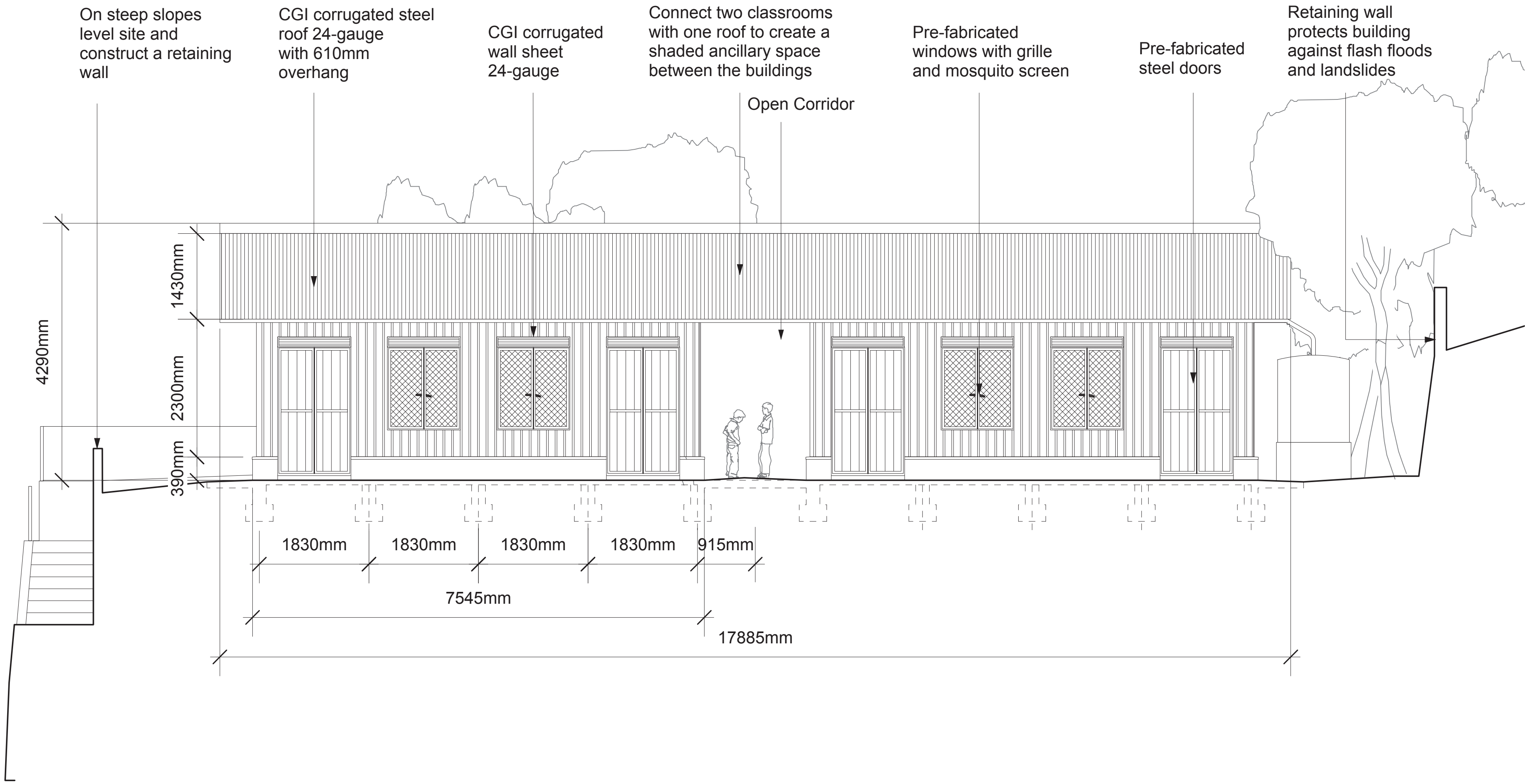


Extend roof 1000mm to create verandah

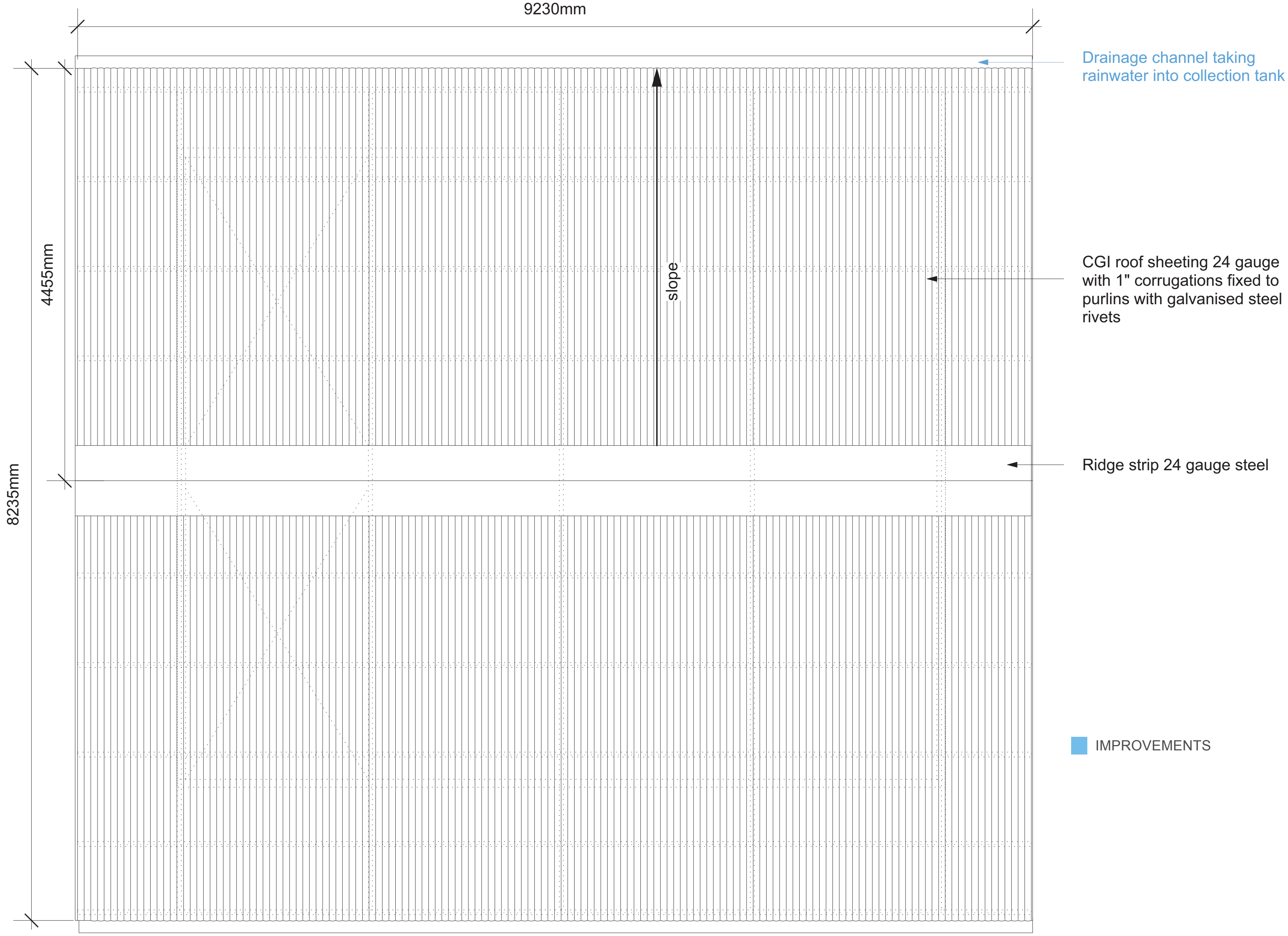
Ramp to classroom for accessibility

IMPROVEMENTS

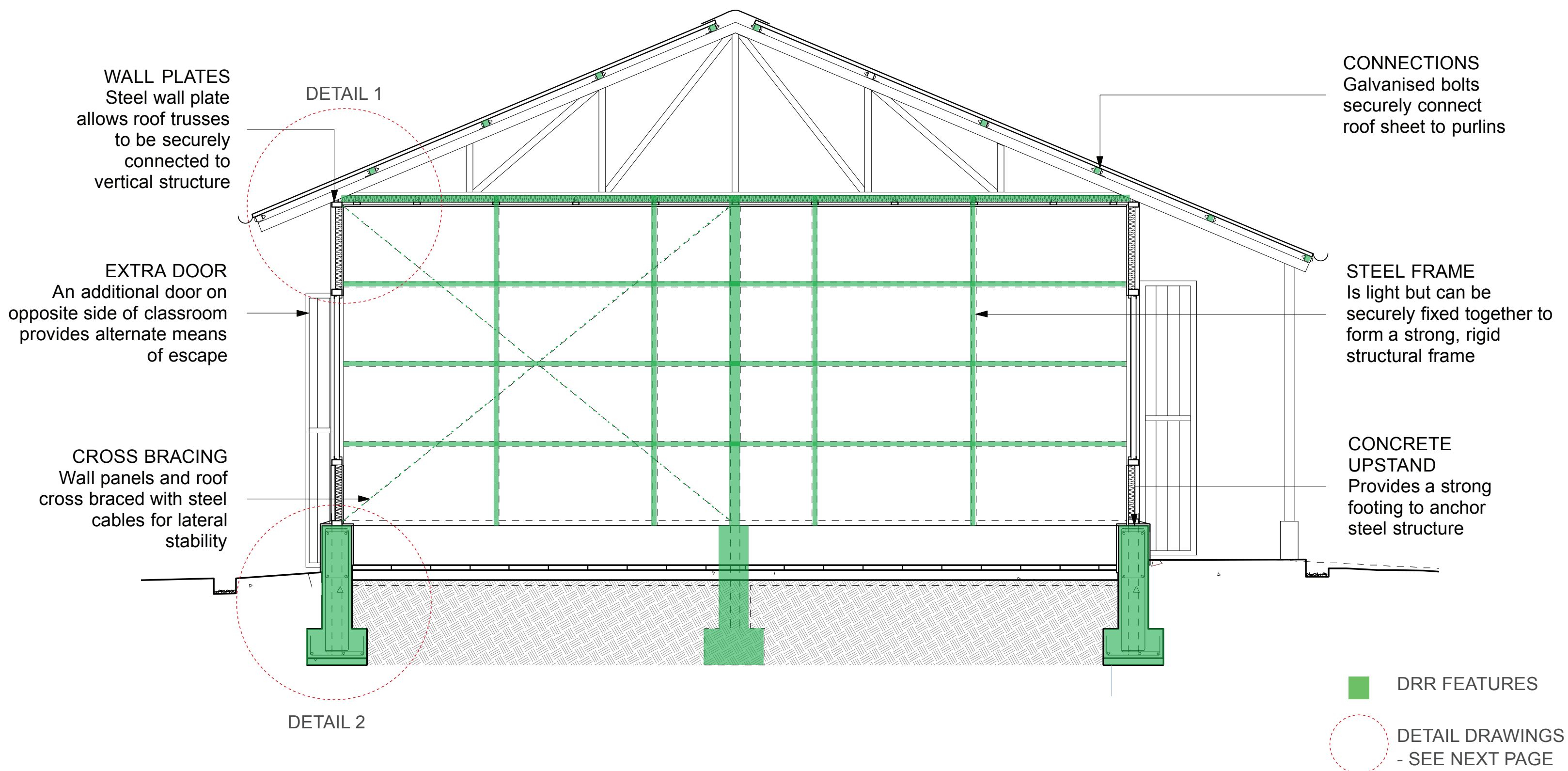
SHORT SECTION SCALE 1:100



ROOF PLAN SCALE 1:50



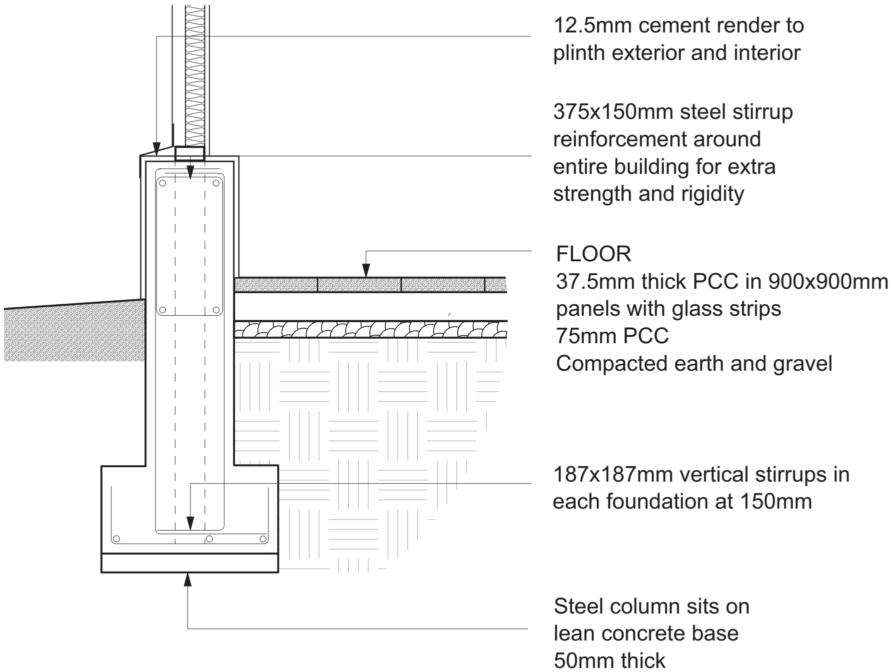
DRR FEATURES SCALE 1:50



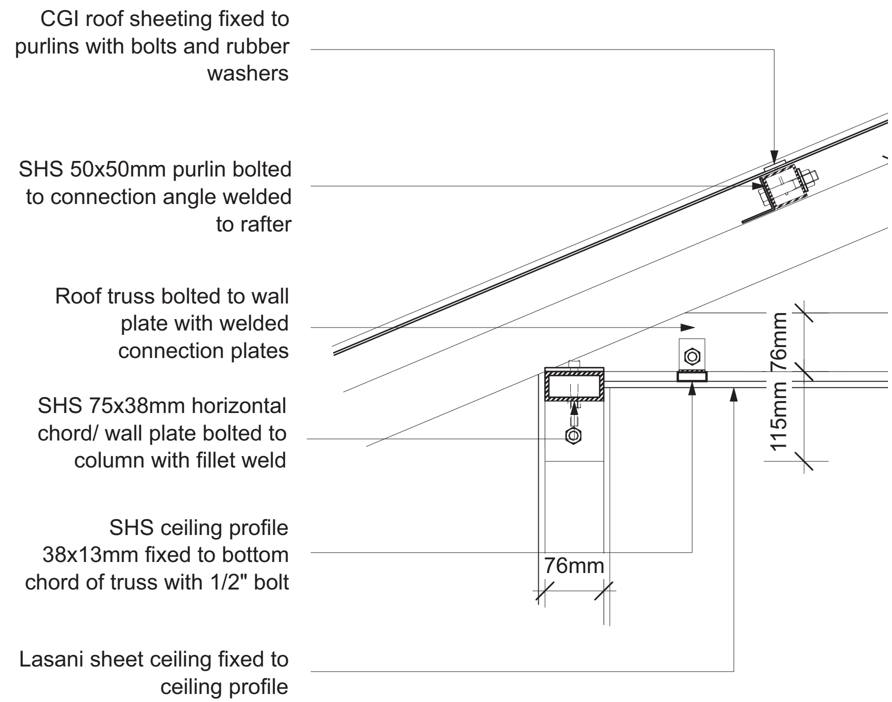
DETAIL 2 SCALE 1:20

DETAIL 1 SCALE 1:10

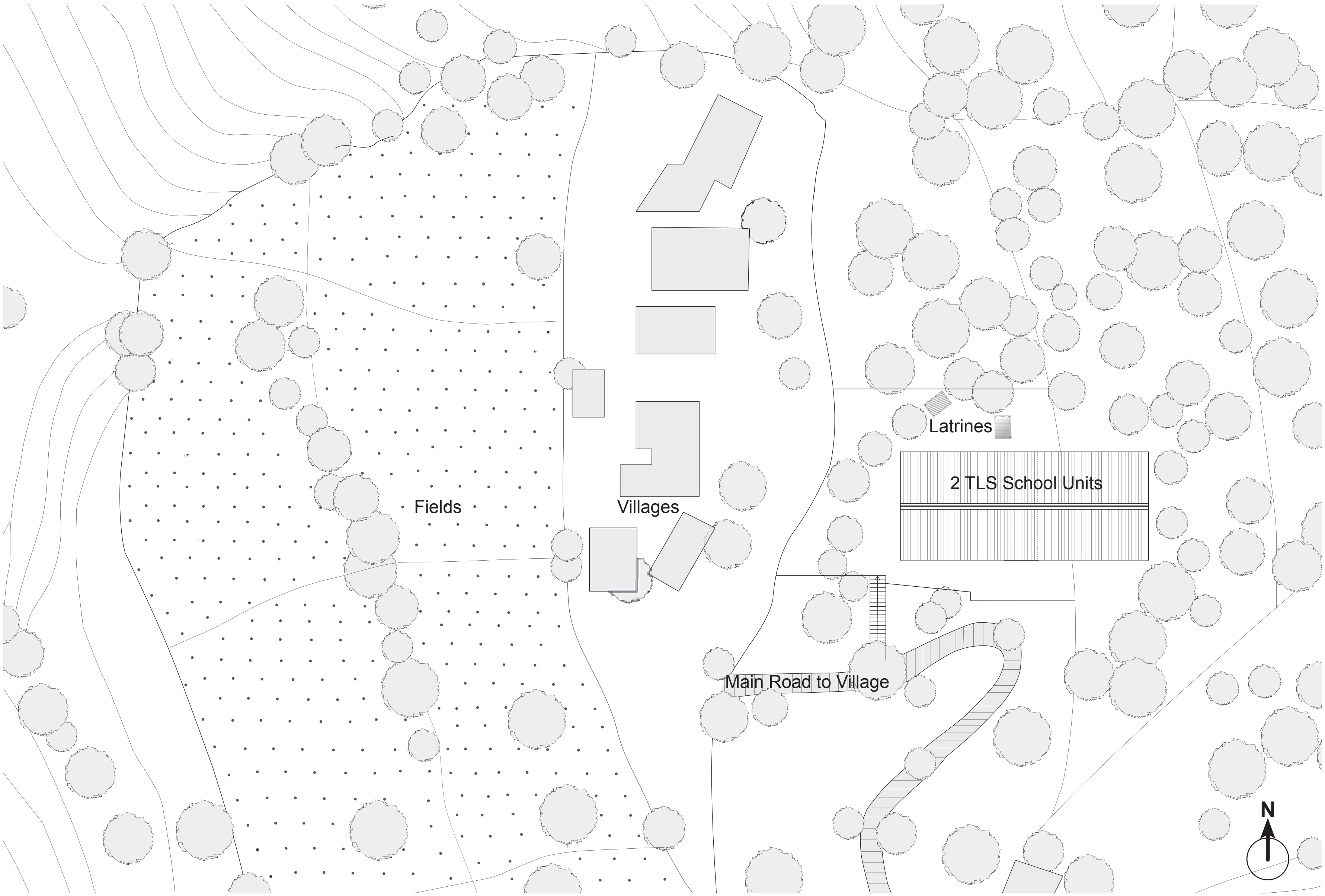
Detail 2 Through concrete footing and floor build up



Detail 1 Through eaves and wall plate



SITE PLAN SCALE 1:1000



QUANTITIES FOR SINGLE UNIT OF 44.5 m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATIONS			
Excavation for columns footing		m³	1.50
Lean concrete in foundations		m³	0.12
RC in foundation, columns and plinth beam		m³	3.20
PCC in topping and plinth protection		m³	3.70
Plaster in plinth protection		m³	0.33
GI plinth corner	Pre-bent, Length=250mm, Total width=220mm	pcs.	9
STEEL STRUCTURE:			
Column	Prefabricated	no.	12
Wall panel with bracing	Prefabricated	no.	6
Window element with grill+ mosquito net GI	Prefabricated	no.	4
Door element	Prefabricated	no.	2
Bottom chord	Prefabricated	no.	4
Truss	Prefabricated	no.	5
Purlins	Prefabricated	no.	10
Steel cables for bracing	6mm dia, 76mm long	no.	18
Spanners for bracing	6mm cable, galvanised	no.	18
Clamps for bracing	6mm cable, galvanised	no.	72
Connection angles for bracing	38x38x38mm, 3mm thick	no.	36
Bolts with nut, washer and snapring	12mm dia, galvanized	no.	210
WALLING:			
Lasani sheet for waterproofing	11200x2440mm, 7.5mm thick	no.	38
CGI wallsheet	2400x1150mm, Gauge 24, 25mm corrugation	no.	30
Thermopole(insulation)	1000x1000x50mm, 15-16 Kgs / m³	no.	105
Turpentine (thinner)		lt.	10
Emulsion Paint		lt.	8

ROOFING:			
CGI roofsheet	3660x1070mm, Gauge 24, 25mm corrugation	pcs.	20
GI ridge sheet		pcs.	3
(See also steel structure)			
FLOORING:			
Plastic foil	0.15mm thick	m²	46.00
Carpet / Floor mat	From market	m²	46.00
(See foundation)			
TOOLS:			
J-hooks with nut, steel cap and rubber washer		no.	250
Drill bits for steel use		no.	40
Blind rivet for fixing lassani		no.	3000
Rivit gun	2 large, 1 small	no.	3
SCHOOL FURNITURE			
Cupboard		no.	1
Chair for teacher		pcs.	2
Latrine cleaning kit		pcs.	1
Desk for teacher		pcs.	1
Blackboard		pcs.	1


Students outside completed ECD centre

Photo: Haiti ECD/ Save the children

2010 / SAVE THE CHILDREN

Agency:	Save the Children
Location:	Port au Prince, Leogane, Jacmel, Desalinnes, and Maissade
No. of users:	Average of 30 children per class
Anticipated lifespan:	5-10 years
Actual lifespan:	-
Facilities provided:	Retrofit of early learning centres, facilities depending on budget and space available
No. of facilities:	10 ECD retrofit projects in PAP, Herman Heraux ECD documented
Construction time:	Varied on the construction scope required
Main construction materials	Timber for roof structure, concrete, blocks
Material sources:	Various, locally sourced if available and right quality
Project cost/unit:	Average: USD 8,000
Material cost /unit:	Varied
Size of units:	ECD varied— site specific
Size of construction team:	Depends on the stage of the work
Construction Trades:	Stone masons, block layers, carpenters, roofers, and plumbers
Who built the facilities:	Local contractor
Site information:	Within urban areas, earthquake risk

Background

In 2010 an earthquake of magnitude 7.0 struck near Port au Prince, Haiti's capital, causing dramatic destruction. An estimated 3.5 million [1] people were directly affected by the earthquake. Over 300,000 were killed, a further 300,000 injured, and 1.6 million forced into displacement [2].
3,978 schools were damaged[3] , representing over 77% of the existing public education infrastructure[4] . The education cluster[5] estimates that 90% of schools in Port-au-Prince and Leogane and 60% of the schools in the south and west departments have been partially damaged or destroyed, affecting some 500,000 children aged five-14 (48% girls). Even before the earthquake, 49% of children were not enrolled in school.

Before the earthquake, access to improved drinking water (63% in 2008, up from 47% in 1990) was improving[6] , but was still not on track to meet the Millennium Development Goals (MDGs). Poor access to water was also the case in schools; even before the earthquake, 40% of schools didn't have access to drinking water. In respect to improved sanitation infrastructure access was extremely low and had actually been decreasing (17% in 2008, down from 26% in 1990[7]). Around 60% of schools didn't have a sanitation facility[8] . Combined with the lack of access to drinking water in schools, a total of over 873,000 children were being exposed to waterborne diseases at school[9] .

1 www.dec.org.uk/haiti-earthquake-facts-and-figures
2 Source: 12th January 2011 statement by Prime Minister of Haiti at the Interim Haiti Reconstruction Commission (http://www.reuters.com/article/idUSN1223196420110112). Statistics unverified.
3 Source: Children of Haiti: Three Months After the Earthquake, UNICEF, April 2010
4 Source: Operational Plan (Final Draft), MENFP, December 2010
5 co-lead by Save the Children
6 Source: Joint Monitoring Programme for Water Supply and Sanitation, WHO/UNICEF, 2010
7 Source: Ibid
8 Source: MENFP, 2003
9 Ibid

After the earthquake, 94% of schools were found to lack a water, sanitation and hygiene (WASH) facility or proper hygiene promotion practice, which is critical to ensure a healthy environment for students.

Project Description

The project's aim was to provide increased access to quality education for vulnerable children in Haiti, through development of community-based education and QEI (quality education initiative) holistic package of support. The objective was to increase access to safe child-friendly early learning environment to young children aged three to six years old. Existing early learning centers were retrofitted with safe earthquake-resistant spaces, gender-separated WASH facilities of latrines, hand washing points and water harvesting, and a protected external play area if the urban site restriction permitted. The retrofit works adopted earthquake- and hurricane-resistant construction principles that were adapted to the specific conditions of the existing ECD centers.

Maintenance training and disaster risk reduction (DRR) activities are undertaken with the Parent Teacher Association (PTA), teachers, children and community representatives.

The construction works were carried out by local contractors supervised by the Save technical team, who also conducted training in earthquake and hurricane-resistant construction and good quality concrete works.

Shelter Description

The retrofit works varied in scope and complexity according to the existing EaCD facilities and the damage they had sustained during the earthquake. The documented ECD facilities, Herman Heraux is located next to the primary school Herman Heraux in PAP, which was built by Save the Children's transitional school construction programme. The transitional school design was documented in last year's compendium 2011 and an update is given under C.14.

The retrofit work for Herman Heraux included several earthquake and hurricane resistant measures: hurricane strapping for the roof fixings, gusset plates at roof truss connections, a double 100x50mm (4"x2") wall plate, screws for fixing roof sheet material rather than the usual nails to protect the roof sheeting to be blown off in strong winds, and concrete to timber frame bolts to ensure good connections. In addition, training and quality control of materials and workmanship for RC columns was carried out, as the quality of RC concrete works was one of the key quality issues identified.

The ECD spaces were designed to suit the smaller size of the younger children aged three to six years. Age appropriate chairs, tables and shelves, as well as play and learning materials, were provided. The ECD teachers received different early learning specific training. Especially the WASH facilities and hygiene kit were adapted to suit the smaller children's needs.

DRR

DRR/DRP were very important components of the extensive retrofit/rehabilitation ECD program and DRR in schools program run over the academic year (Sept 2011-July 2012). Details are given in the UPDATE case study C.14.

Challenges

•The local carpentry craftsmen and concrete workers have no safer construction knowledge in respect to earthquake- or hurricane-resistant construction. Training in these techniques was required, as well as intensive quality control on site.

Improvements

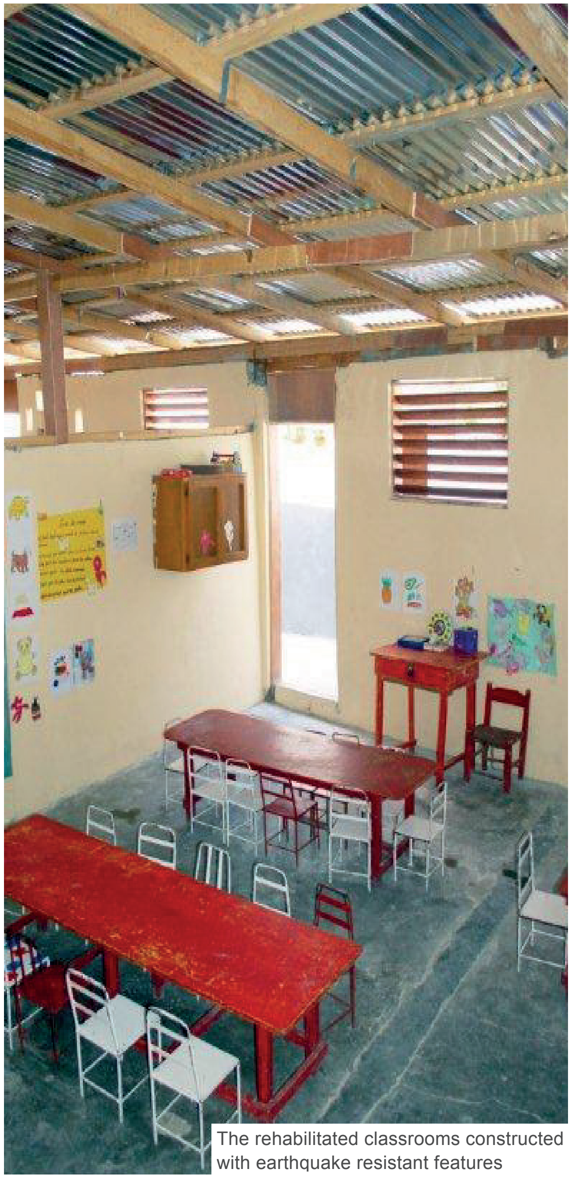
• Invite PTA to determine whether there are skilled parents in the association and living in the community that have their children in the schools,to participate in the retrofitting.

• Documenting the site, especially in urban areas, to capture as far as possible any required external works in mitigating contract addendums and increase in cost.

• Add contractor foreman/engineer to the BOQ and deduct penalty for absenteeism to mitigate the issue of no clear contractor focal point.

• Include a combined stair and ramp for access to classroom.

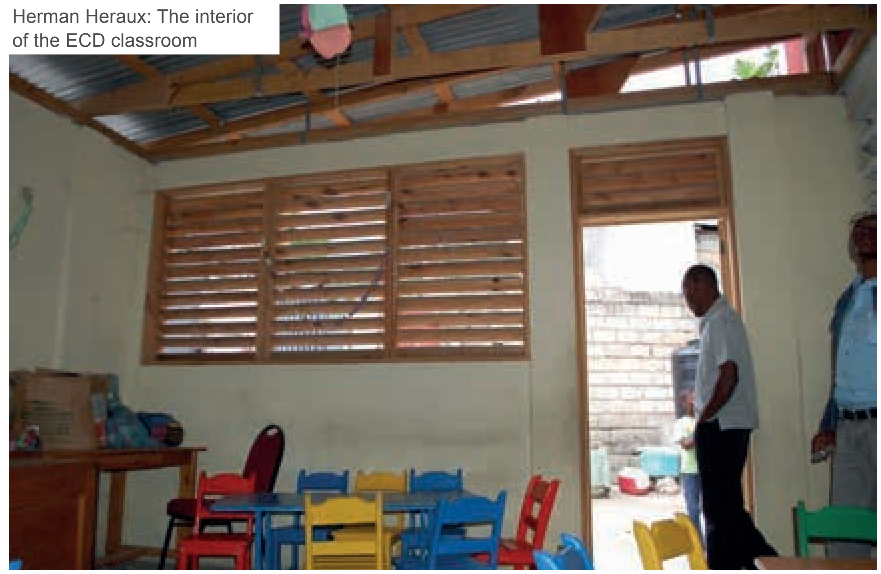
• In-fill gable end of roof with timber slats.



The rehabilitated classrooms constructed with earthquake resistant features

Photo credit: Haiti ECD/ Save the children

Herman Heraux site before the ECD was constructed on it



Herman Heraux: The interior of the ECD classroom

Herman Heraux: The ECD classrooms were also furnished with blackboards and furniture

ECD - Nid Douillet: school structure was re-constructed not rehabilitated

All photos: Save the Children/Haiti

3D VIEW

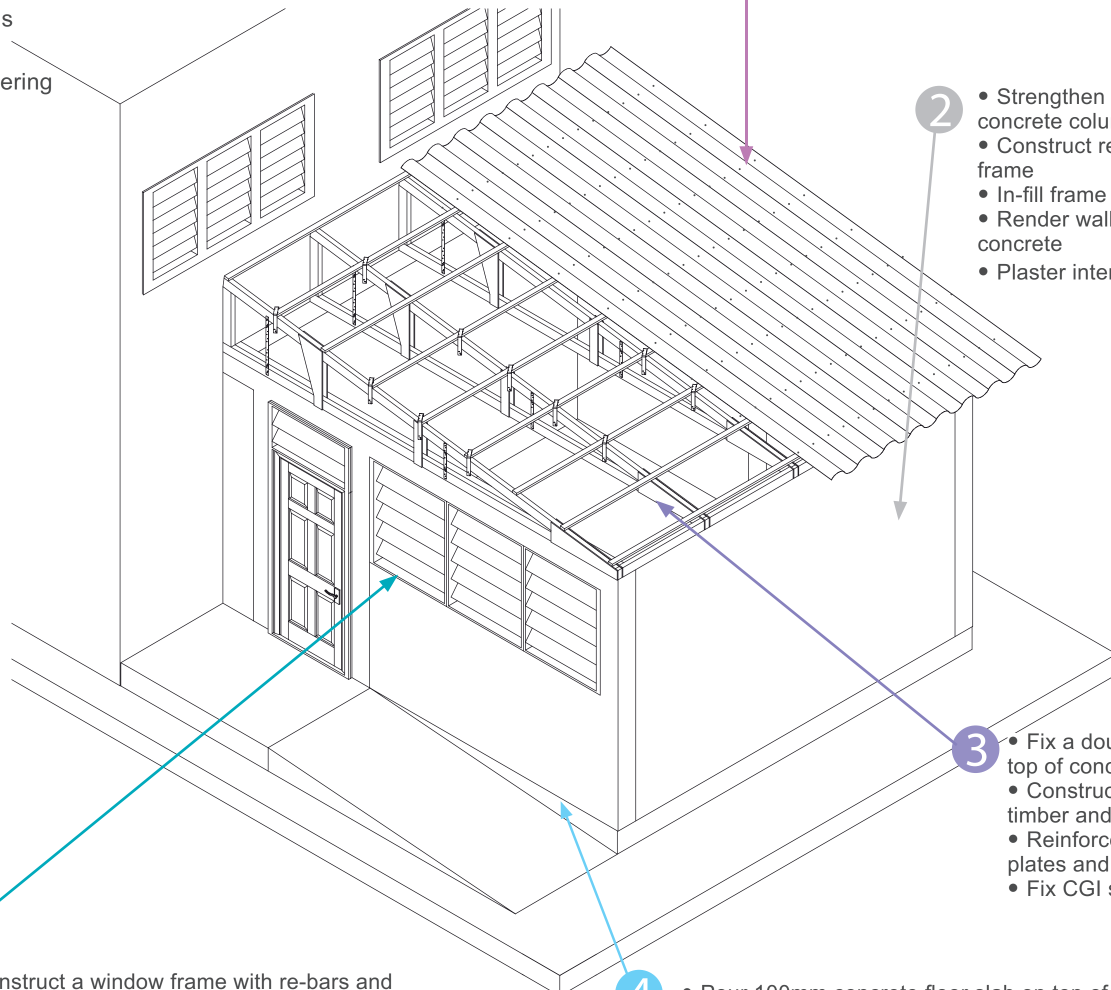
1 Demolition and site work

2 New structure and walls

3 Roof structure and covering

4 Flooring

5 Windows and doors



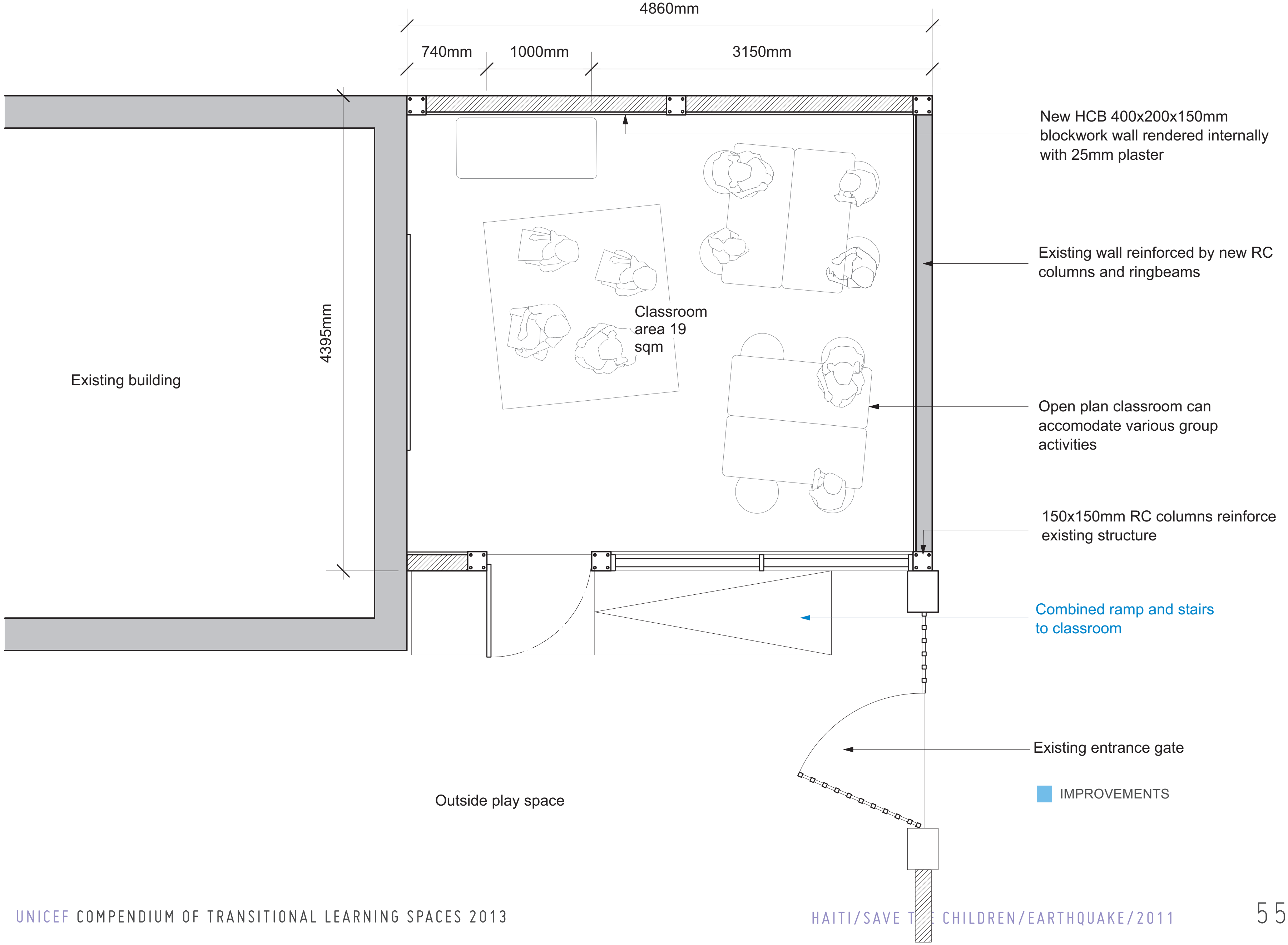
1
- Demolish rear existing wall and clear any debris from site

2
- Strengthen existing walls by constructing RC concrete columns cast on existing foundations
- Construct reinforced concrete ring beam and door frame
- In-fill frame with HC block work.
- Render walls externally with spray coated concrete
- Plaster internally and paint to finish

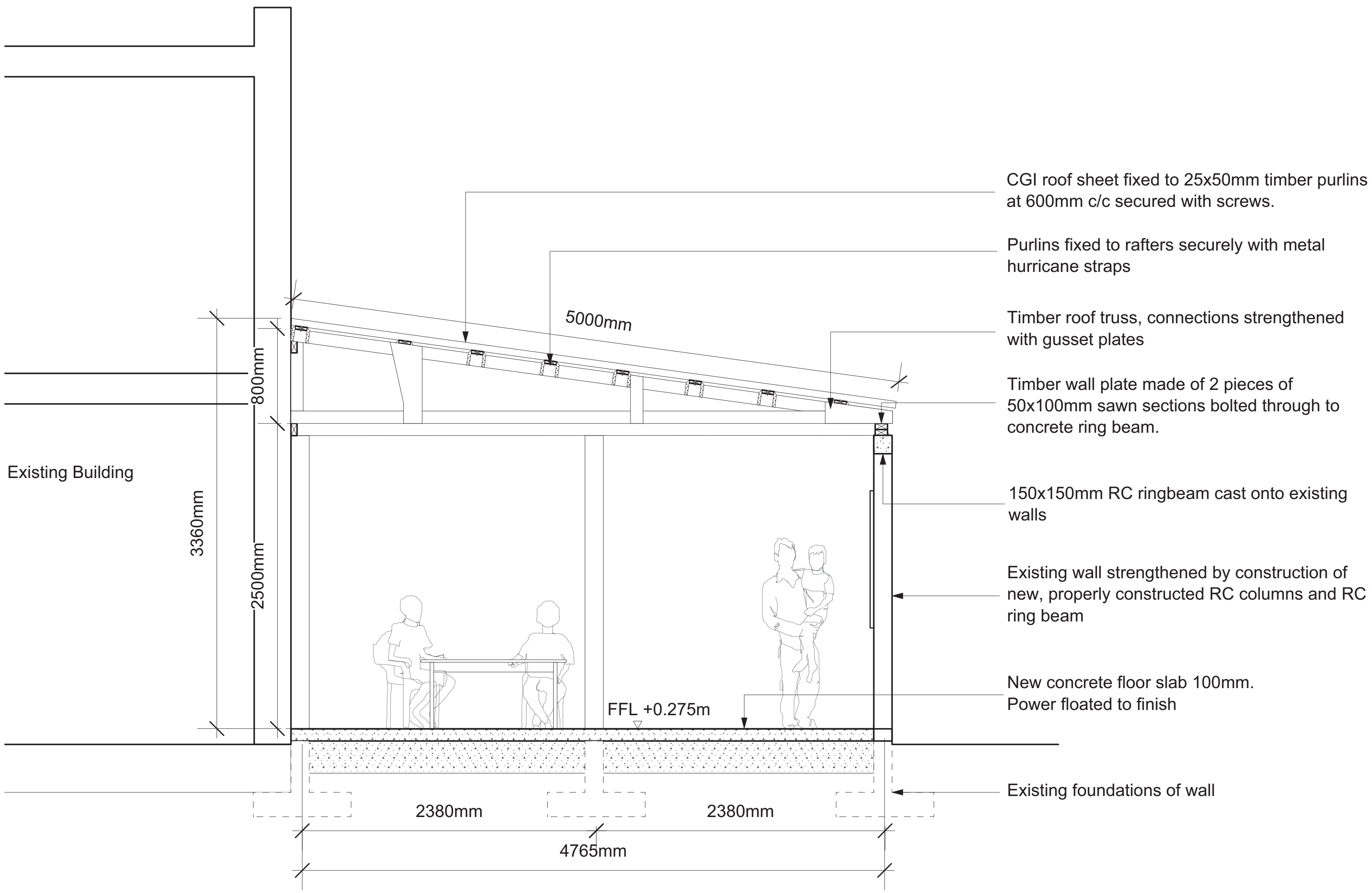
3
- Fix a double 50x100mm timber wall plate to top of concrete wall
- Construct roof trusses from 50x100mm sawn timber and fix to wall plate
- Reinforce all connections with metal gusset plates and hurricane straps
- Fix CGI sheeting to roof purlins with screws

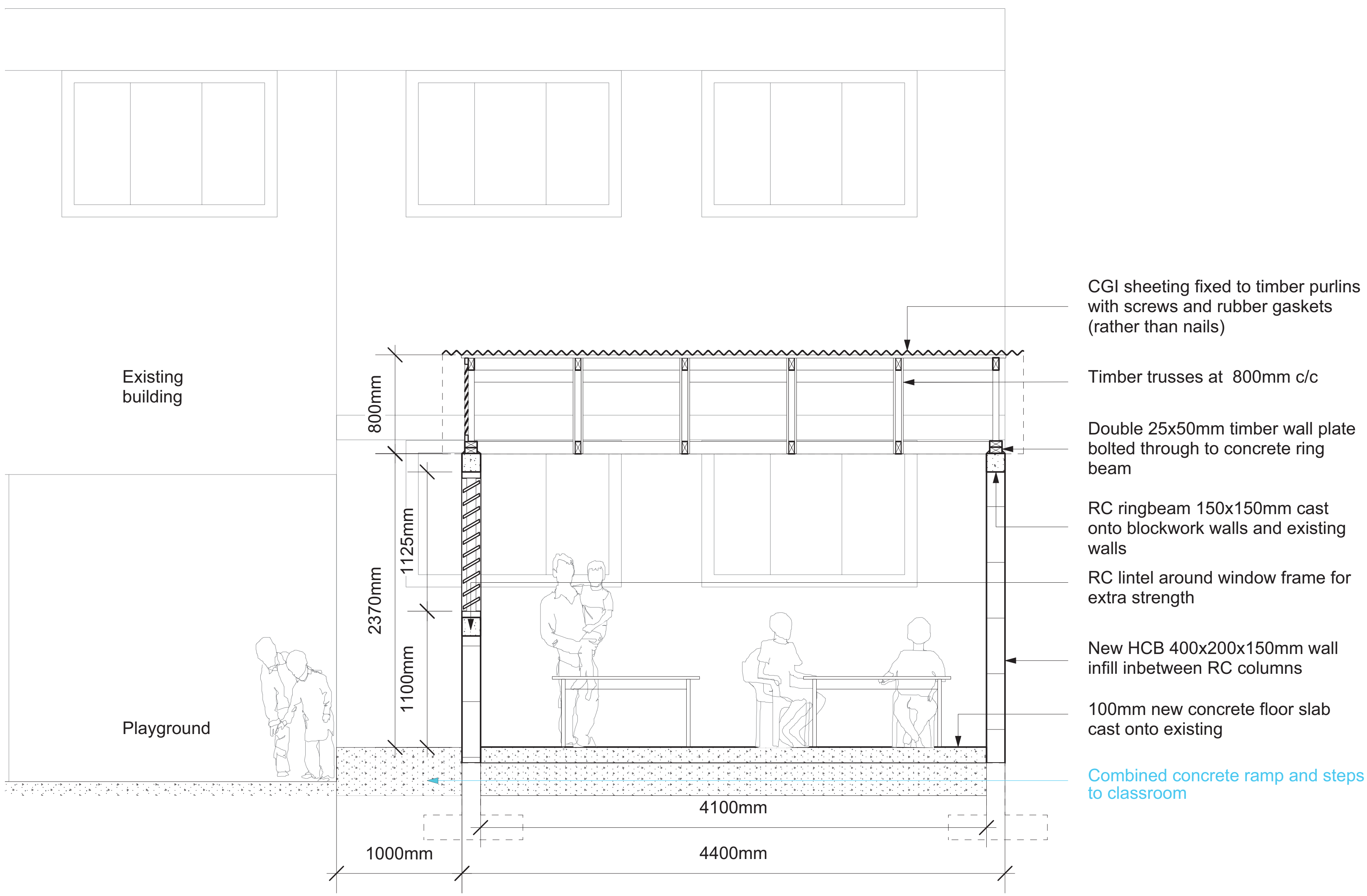
5
- Construct a window frame with re-bars and fix into window opening and cast in place with concrete
- Construct window frame with timber and infill with wooden slats to provide ventilation and shading
- Install flush timber door into rough opening

4
- Pour 100mm concrete floor slab on top of existing, finish with power floated screed
- Combined ramp and stair for universal access


4860mm
740mm
1000mm
3150mm
4395mm
Existing building
Classroom
area 19
sqm
New HCB 400x200x150mm
blockwork wall rendered internally
with 25mm plaster
Existing wall reinforced by new RC
columns and ringbeams
Open plan classroom can
accomodate various group
activities
150x150mm RC columns reinforce
existing structure
Combined ramp and stairs
to classroom
Existing entrance gate
IMPROVEMENTS
Outside play space

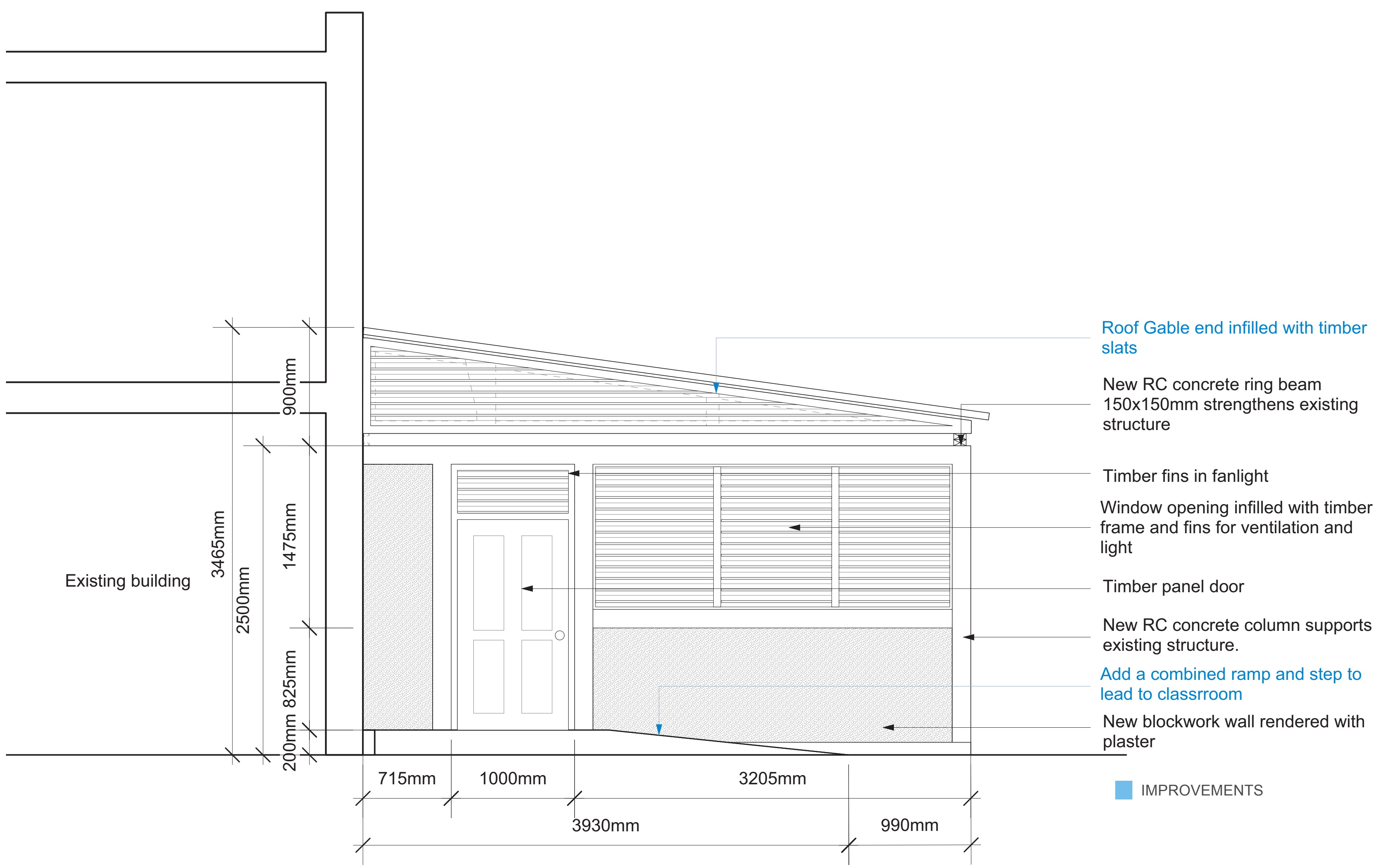
LONG SECTION

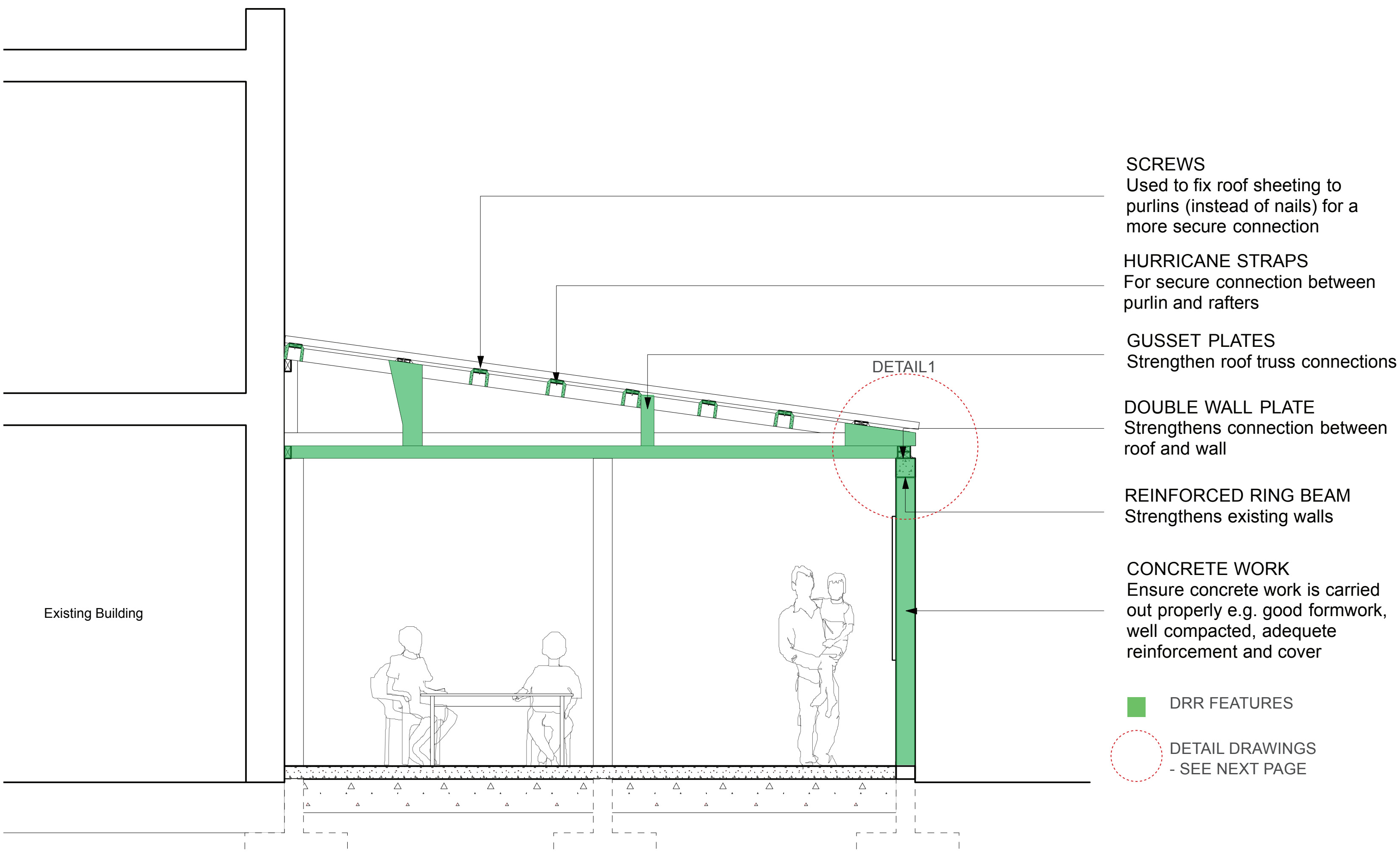


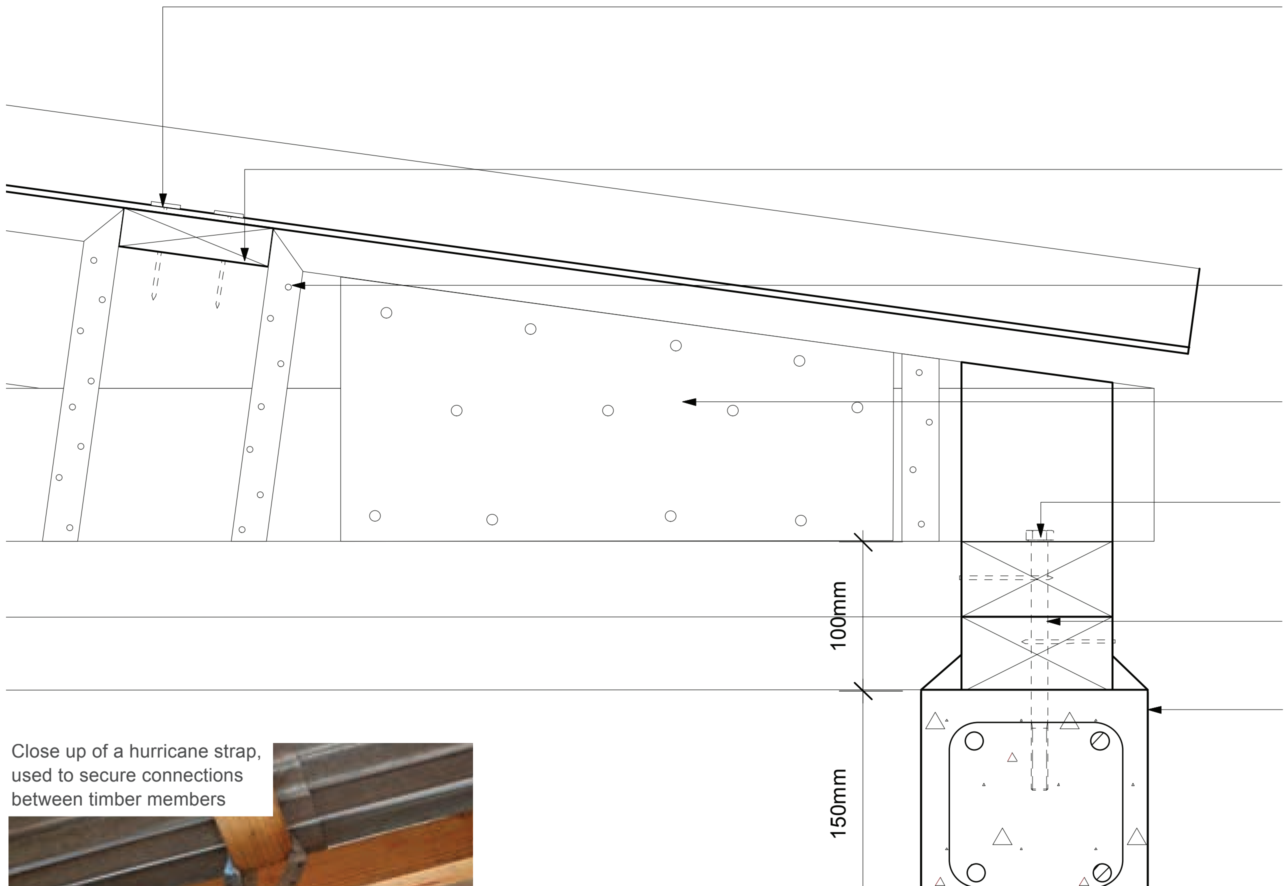


Existing building
Playground
800mm
2370mm
1125mm
1100mm
CGI sheeting fixed to timber purlins with screws and rubber gaskets (rather than nails)
Timber trusses at 800mm c/c
Double 25x50mm timber wall plate bolted through to concrete ring beam
RC ringbeam 150x150mm cast onto blockwork walls and existing walls
RC lintel around window frame for extra strength
New HCB 400x200x150mm wall infill inbetween RC columns
100mm new concrete floor slab cast onto existing
Combined concrete ramp and steps to classroom
4100mm
1000mm
4400mm

LONG ELEVATION SCALE 1:50




Existing Building
DETAIL1
SCREWS
Used to fix roof sheeting to purlins (instead of nails) for a more secure connection
HURRICANE STRAPS
For secure connection between purlin and rafters
GUSSET PLATES
Strengthen roof truss connections
DOUBLE WALL PLATE
Strengthens connection between roof and wall
REINFORCED RING BEAM
Strengthens existing walls
CONCRETE WORK
Ensure concrete work is carried out properly e.g. good formwork, well compacted, adequete reinforcement and cover
DRR FEATURES
DETAIL DRAWINGS
- SEE NEXT PAGE



Detail through eaves and ring beam:

CGI roof sheeting fixed to purlins below with woodgrip screws through top of rib and separated from sheet with rubber gasket

25x100mm treated timber purlins screwed through trussed rafters and strapped down with galvanised hurricane strap

Steel hurricane straps used to secure connections between timber members

100x50mm treated trussed rafter joined with screwed 12mm marine plywood gusset plates

Double timber wall plate composed of 2 50x100mm treated timber sections fixed together

Wall Plate bolted through to ring beam

150x150mm RC ringbeam cast onto existing wall

Close up of a hurricane strap, used to secure connections between timber members

QUANTITIES FOR SINGLE UNIT OF 19 m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATIONS:			
Existing foundation			
WALLING:			
Masonry block		m^2	8.25
Plastering		m^2	72.40
Masonry paint	Water based	m^2	72.40
Reinforced concrete ring beam	Cast onto existing wall	m^3	1.25
Reinforced concrete column	12.7mm thick of cement sand mortar	m^3	1.50
OPENING:			
Door	Timber	pcs.	1
Window	Metallic	pcs.	1
ROOFING:			
Timber	50x100mm	pcs.	18
Fixing pit	75mm dia.	pcs.	1
CGI sheet		pcs.	12
Gusset plate	Plywood 12.5mm	pcs.	5
Rainwater gutter		m	5
Protection mesh	For masonry	m^2	6.2
FLOORING:			
Concrete floor	100mm thick, cast onto existing floor, power floated finish	m^2	21.40
TOOLS:			
Screws	For CGI	box	1
Nails	50mm	box	1
Nails	60mm	box	1
Nails	75mm	box	1
Nails	25mm	box	1

Courtyard between two classrooms in PAP

Photo : Zara Järvinen /Finn Church Aid

2010/FINN CHURCH AID

Agency:	Finn Church Aid
Location:	Port au Prince (PAP), Leogane and surrounding areas
No. of users:	1650 students and 38 staff (5 schools)
Anticipated lifespan:	100 years
Actual lifespan:	-
Facilities provided:	Classrooms with wheelchair access, WASH facilities, external play area, kitchen, bio-gas collector system
No. of facilities:	38 classrooms in five schools
Construction time:	12 months per school (including removal of debris, cash-for-work project /landscaping)
Main construction materials	Concrete, recycled rubble from debris, timber
Material sources:	Rubble and concrete locally sourced (recycled), timber imported
Project cost/unit: *	USD 156,000 (typical unit of 3 classrooms)
Material cost /unit:*	Dependent on contractor
Size of units:	Classroom: 52m^2, basic school module: 3 classrooms together, 156m^2
Size of construction team:	Approx. 35 workmen
Construction Trades:	Unskilled, masons, concrete, carpenter and steel worker, electrician and supervisor
Who built the facilities:	Local contractor: load-bearing frame; cash-for-work programme: rubble infill/ancillary works infill/ancillary works
Site information:	Urban area, in seismic hazard and hurricane zones

Background

In 2010 an earthquake of magnitude 7.0 struck near Port au Prince, Haiti's capital, causing dramatic destruction. An estimated 3.5 million[1] people were directly affected by the earthquake. Over 300,000 were killed, a further 300,000 injured, and 1.6 million forced into displacement[2] .
There were 3,978 schools damaged[3] , which is more than 77% of the existing public education infrastructure[4] .After the earthquake, 94% of schools were found to lack water, sanitation and hygiene (WASH) facilities or proper hygiene promotion practice, which is critical to ensure a healthy environment for students.

The main destruction was within urban areas of the capital Port au Prince, a large metropolitan area with an approximate population of 3.7 million, nearly half of the country's national population[5] . A vast amount of debris from collapsed infrastructure and buildings, of which a large number were poorly constructed concrete structures, remained after the earthquake. The clearing of the debris posed a major challenge to the inhabitants and organizations working within reconstruction and transitional shelter. Psychologically, people are still wary of occupying concrete buildings after their devastating experiences with substandard constructed concrete structures.

1 www.dec.org.uk/haiti-earthquake-facts-and-figures
2 Source: 12th January 2011 statement by Prime Minister of Haiti at the Interim Haiti Reconstruction Commission (http://www.reuters.com/article/idUSN1223196420110112). Statistics unverified.
3 Source: Children of Haiti: Three Months After the Earthquake, UNICEF, April 2010
4 Source: Operational Plan (Final Draft), MENFP, December 2010
5 www.urbanres.net/docs/ToR-cityWidePlanning-Haiti_final.pdf

Project Description

There were five main cornerstones to the project setting out the main objectives. The learning spaces should be flexible in their use to facilitate multiple uses, the construction required to be durable and earthquake - as well as hurricane-resistant, the building is required to be inclusive and promote accessibility to all children and finally the construction activities should have a low impact on the local environment.

These key objectives translated in different ways into the project implementation. The simple space layout anticipates the possibilities of a change of use on a temporary basis in case of emergencies to be used as emergency shelter, clinic, etc, and the possibility of 'sharing space' for community activities and social gatherings, such as Sunday church meetings. The structures were designed to withstand hurricanes (class three) and earthquakes and assist the inhabitants to feel safe inside the buildings. The inclusive design concept included wheelchair accessible classrooms and latrines with ramps, wider doors and lower door handle heights, as well as good acoustics and even natural lighting, which assists children with seeing and hearing difficulties to equally participate in learning activities.

The considerations given to reducing the negative impact on the Haitian environment were very important. The challenge of clearing the large amount of debris was designed into the construction concept from the onset by using recycled rubble as one of the main building materials. This also encourages the setting up of cash-for-work programme for crushing and preparing the rubble infill for construction.The community furthermore participated in the selection of the site, layout and space arrangements.

Contacts: Finn Church Aid, Mr. David Korpela, country representative, Haiti david.korpela@kirkonulkomaanapu.fi, Ms. Sari Kaipainen, reconstruction manager, Haiti, sari.kaipainen@kirkonulkomaanapu.fi, Mr. Jouni Hemberg, head of international operations, jouni.hemberg@kirkonulkomaanapu.fi

Shelter Description

The simple and clear design of the basic model of three classrooms at 52m² each with a total of 170m² can be combined into larger school centres according to need and available space on the sites.

The design for a low environmental impact had four key components:

1) Using recycled or renewable materials. The building was constructed from recycled rubble as wall in-fill within a concrete frame structure and within the foundations. Roof trusses were made of renewable timber and treated with non-toxic borate preservatives.

2) Aiming at low carbon footprint. The selection of construction material was based on environmental assessments that were calculated during the design stage. The rubble masonry from recycled concrete performed best in respect to carbon footprint in comparison to brick masonry and concrete block constructions.

3) Renewable energy. A bio-gas system was installed for the school latrines to use the energy for cooking and lighting. In addition, the roofs were installed with connections for a solar panel to be installed.

4) Water efficiency. Rainwater was collected from the roofs through gutters and storage tanks to be used in latrines and irrigation.

INTRODUCTION

The building has a strip foundation that anchors securely the concrete main structure to the ground.
The masonry in-fill is from recycled rubble between the concrete columns and reinforced with steel mesh.
The timber roof trusses are securely fixed back to a top concrete ring beam that ties the structure together and is vital in an earthquake-resistant construction.

DRR

DRR/DRP were key components of the 'rubble school' concept. The structures were designed to withstand hurricanes and earthquakes. It was designed for wind loads of 130 mph (hurricane class three), earthquake loads based on the US Geological Survey and structural calculations are based on the Canadian Building Code and Euro Codes 5 and 8, which were approved for reconstruction in Haiti.

Challenges

• Knowledge of local construction customs, available materials and technology is essential. Most effective outcome has been achieved with local operative design and management team.

Improvements

• External drainage channel for managing surface water flow.

• Develop a standardised project model for building temporary and permanent schools in humanitarian context (currently under development).

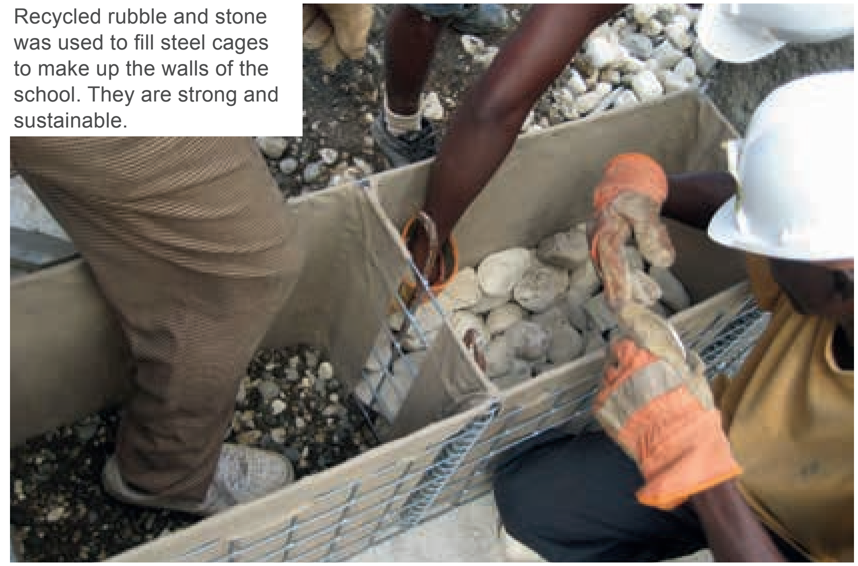
• Add concrete protection at perimiter of building to protect foundations below

The interior of a completed classroom

Photo credit : Zara Järvinen /Finn Church Aid

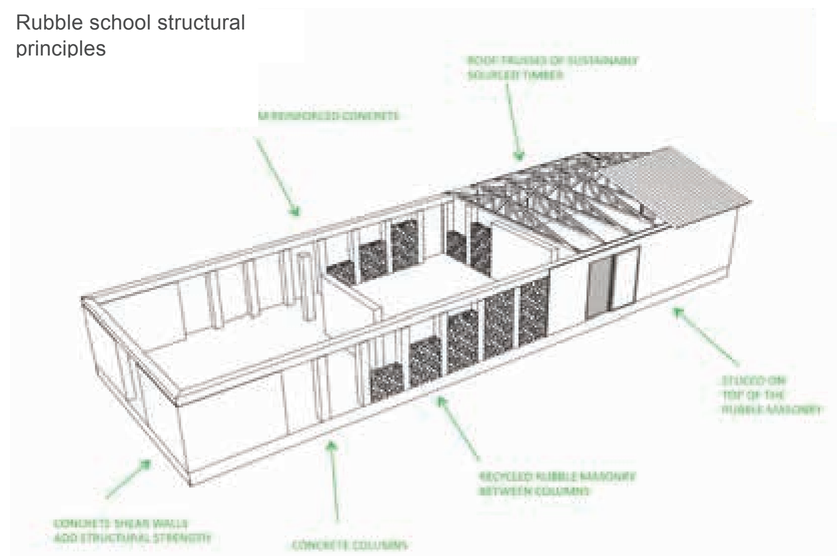
Tent classroom before construction of 'rubble school' in Matthieu

Recycled rubble and stone was used to fill steel cages to make up the walls of the school. They are strong and sustainable.



Concrete frame of school was designed to be robust and earthquake resistant

Rubble school structural principles



All photos : Haiti /Finn Church Aid

3D VIEW

1 Foundation and groundworks

2 Structural frame

3 Wall build up

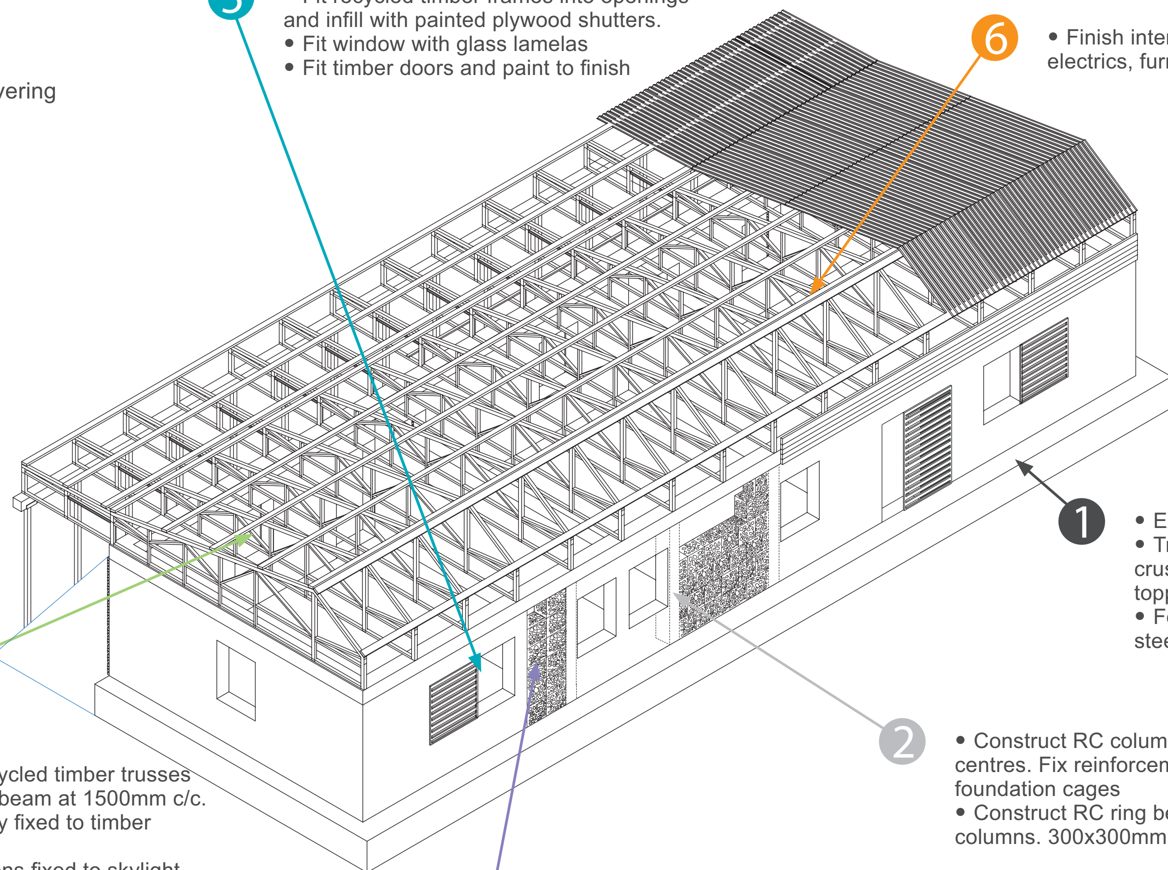
4 Roof structure and covering

5 Windows and doors

6 Internal finishes

5
- Fit recycled timber frames into openings and infill with painted plywood shutters.
- Fit window with glass lamelas
- Fit timber doors and paint to finish

6
- Finish internal walls with paint, install electrics, furniture and black boards

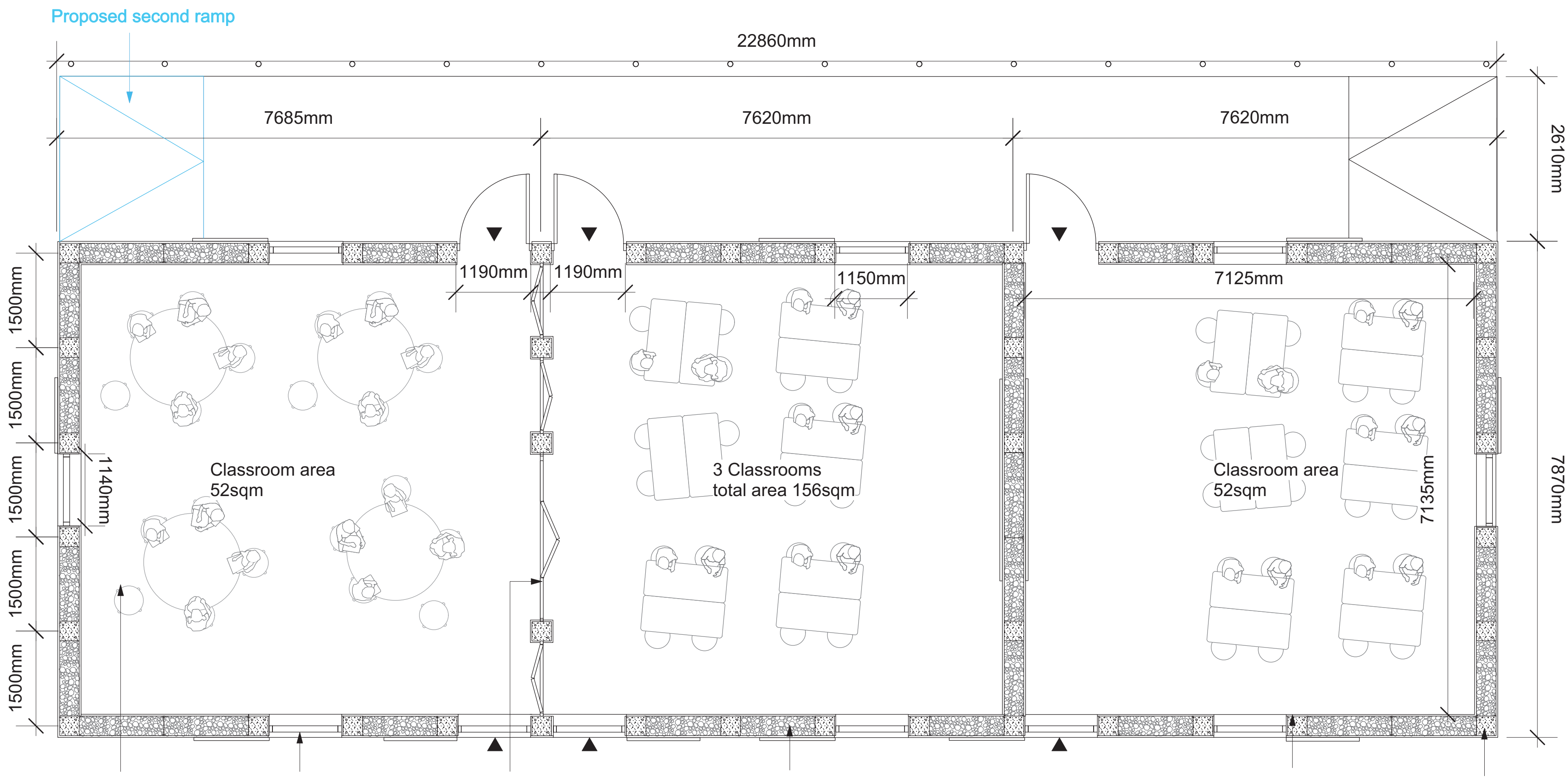


1
- Excavate to desired level
- Trench foundations constructed from crushed rubble in reinforcement cages topped with concrete
- Foundations connected to wall with steel stirrups

4
- Steel roof trusses/recycled timber trusses fixed into concrete ring beam at 1500mm c/c.
- Zinc sheeting securely fixed to timber purlins
- Recycled timber battens fixed to skylight openings to allow ventilation and light

2
- Construct RC columns at 1500mm centres. Fix reinforcement bar cages into foundation cages
- Construct RC ring beam around top of columns. 300x300mm

3
- Infill structural frame with recycled rubble and masonry in steel gabion cages
- Construct concrete blockwork shear walls on short sides of building for structural strength.
- Render walls with stucco and finish with paint



Classrooms have simple and clear form which permits creation of large or small schools

Timber frame windows with sliding shutter

Introduce moveable partititions in between classrooms to create flexible teaching spaces

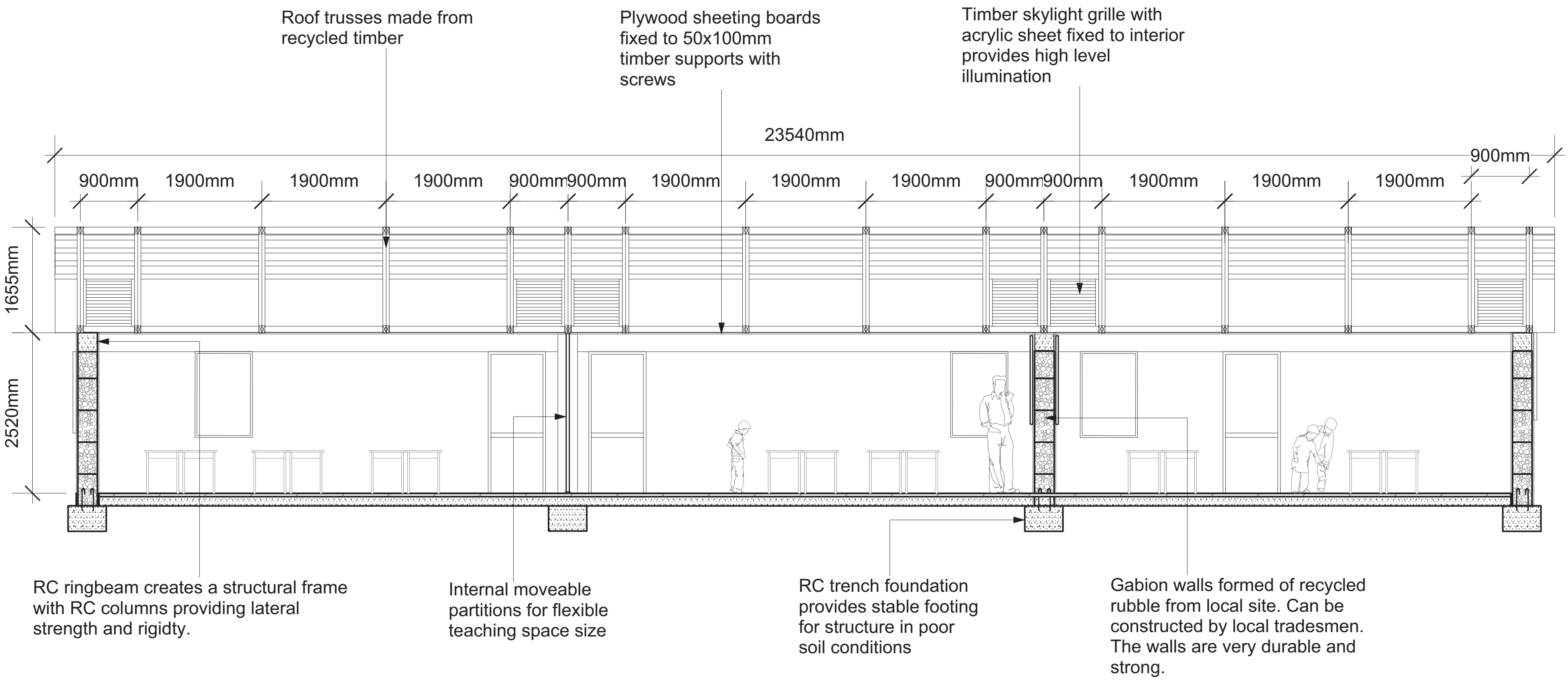
Gabion walls composed of small stones and gravel in mild steel cages 1200x300x500mm stacked and tied together with steel stirrups

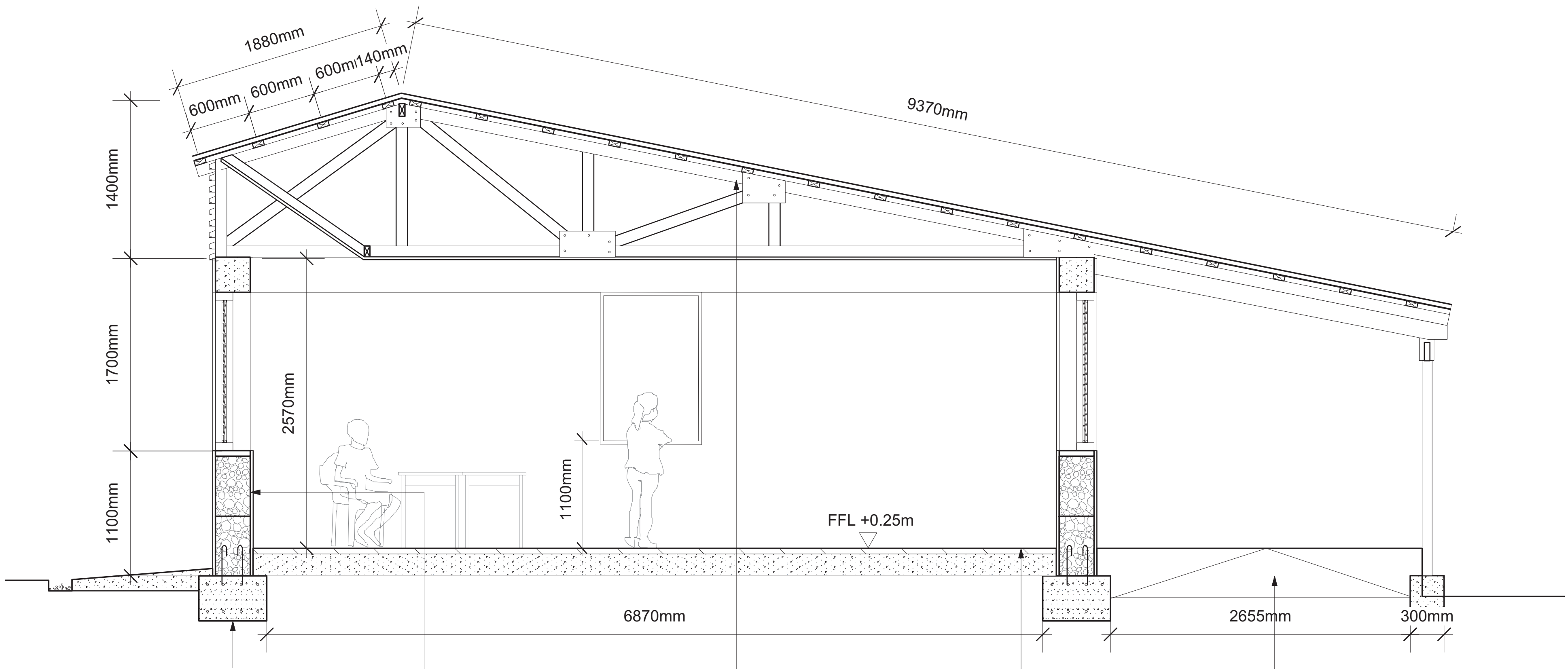
Entrances on both sides of room allow two means of escape

Walls rendered with 25mm plaster and finished with paint

300x300mm RC columns at 1500mm c/c

LONG SECTION SCALE 1:100





FOUNDATIONS
-500x600mm RC trench foundations on compacted earth

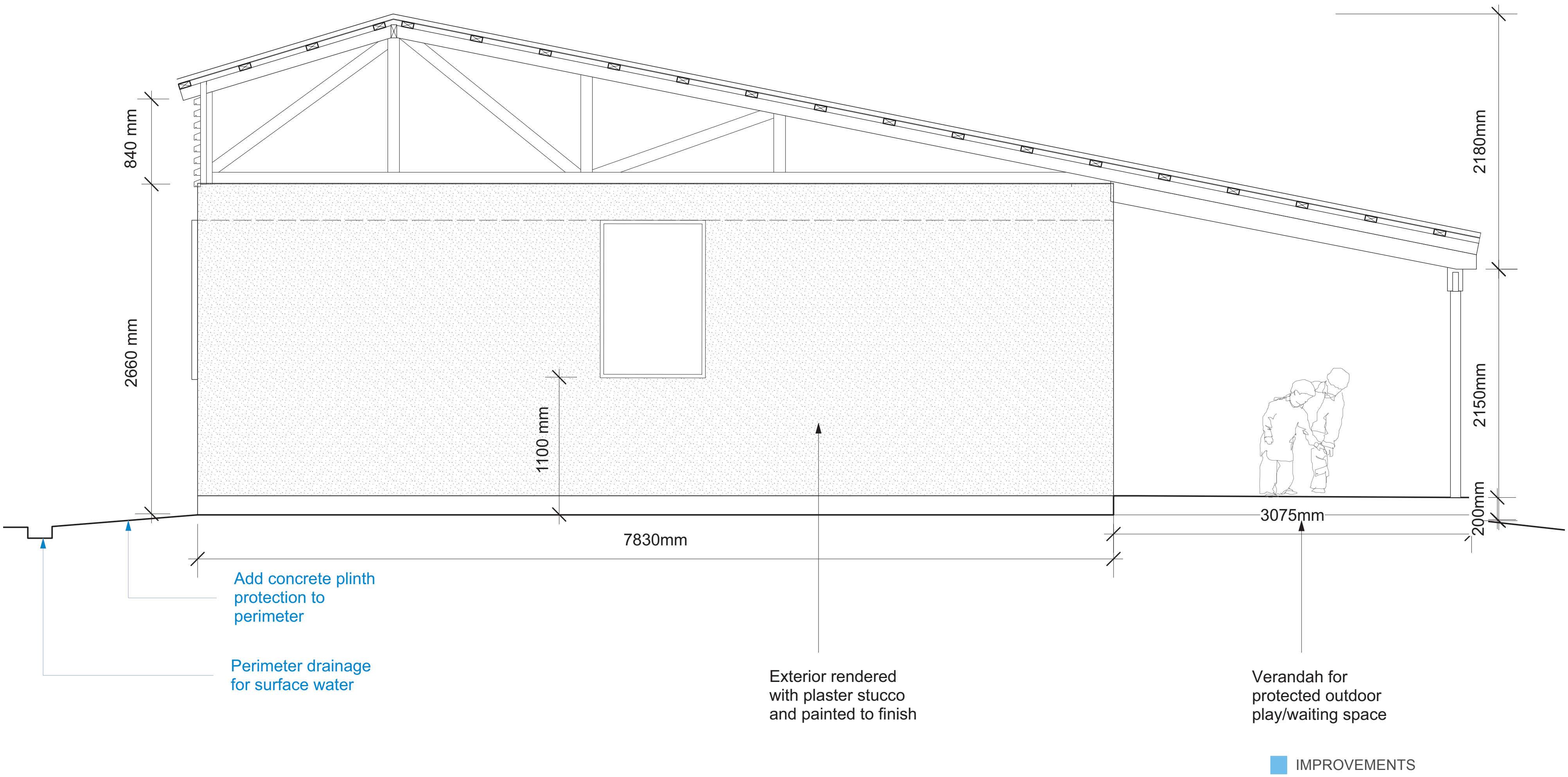
WALLS
-300x300mm RC columns
-Gabion walls, mild steel cages (1200x500x300mm) filled with small stones and gravel from site. Secured to strip foundation with steel stirrups

ROOF
-Sawn timber trusses 50x100mm sections
-Timber purlins at 600mm c/c
-plywood sheathing layer
-CGI roof sheeting secured to purlins with screws and rubber washers.
-Metal gusset plates used to reinforce connections between members.

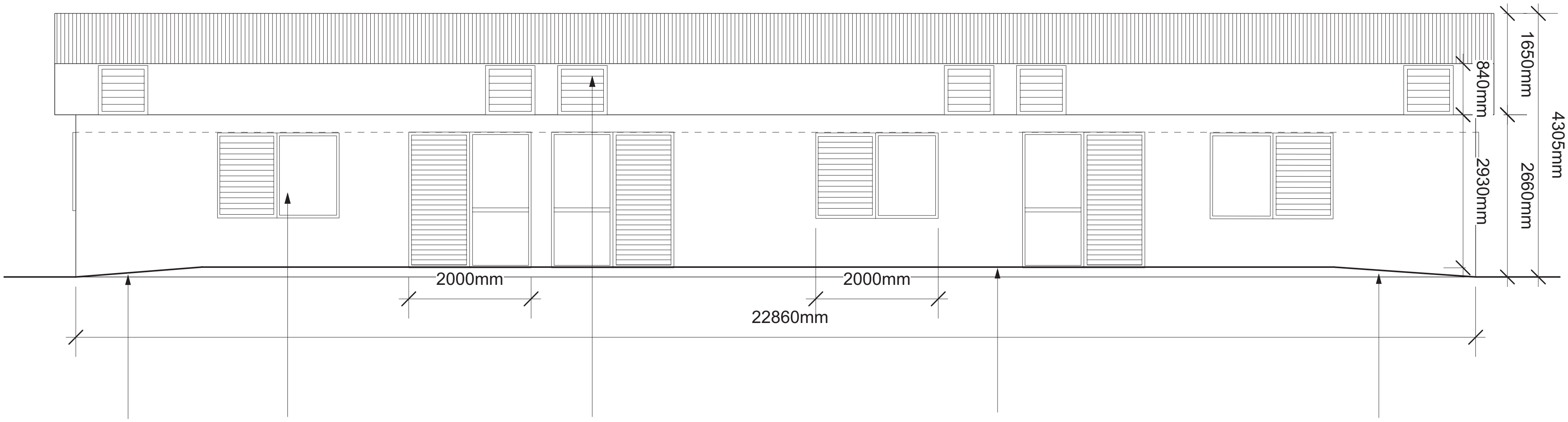
FLOOR
-50mm cement screed
-150mm concrete slab
-Well compacted earth

VERANDAH
Ramp provides access to classroom
-verandah provides protected outdoor space and shading

SHORT ELEVATION SCALE 1:50



LONG ELEVATION SCALE 1:100



Ramp

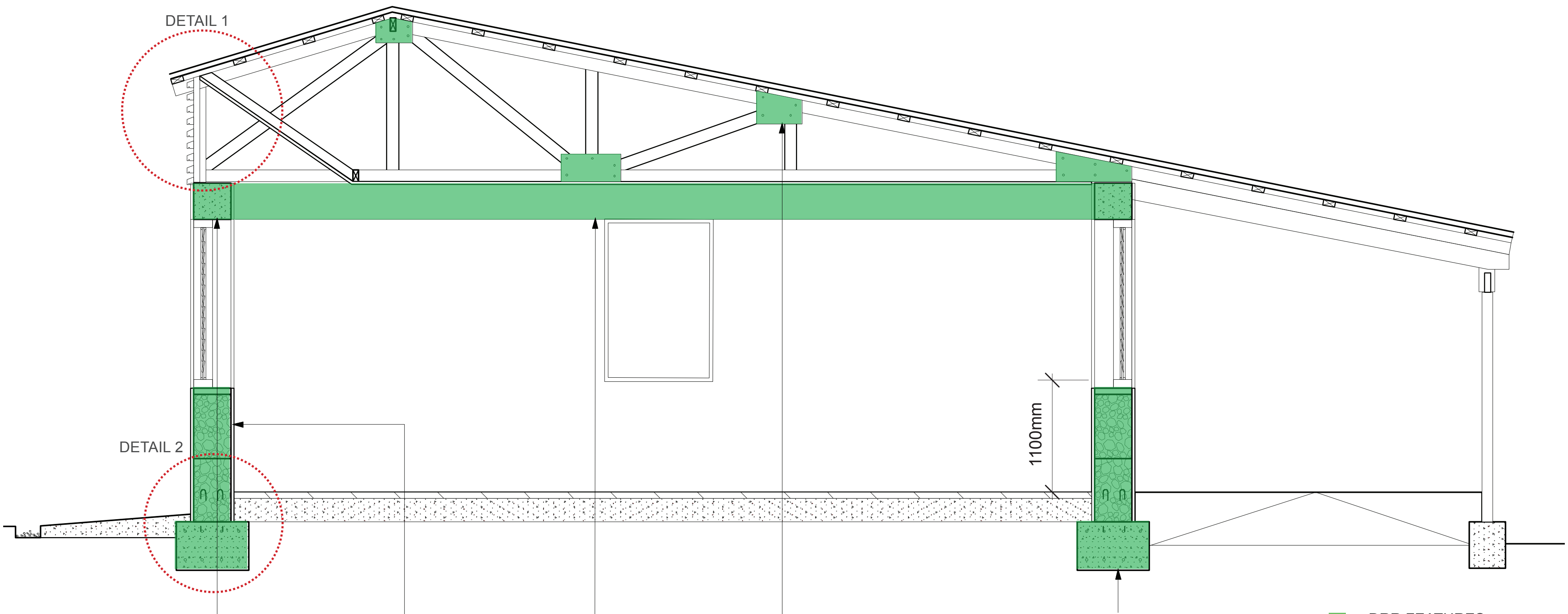
Timber frame sliding windows and doors provide cross ventilation to classrooms

High level skylights provide extra illumination

Simple, flexible, clear modular design. Any number of classrooms can be built with this system

Ramp

DRR FEATURES SCALE 1:50



FRAME
A strong RC frame provides rigidity against seismic movement

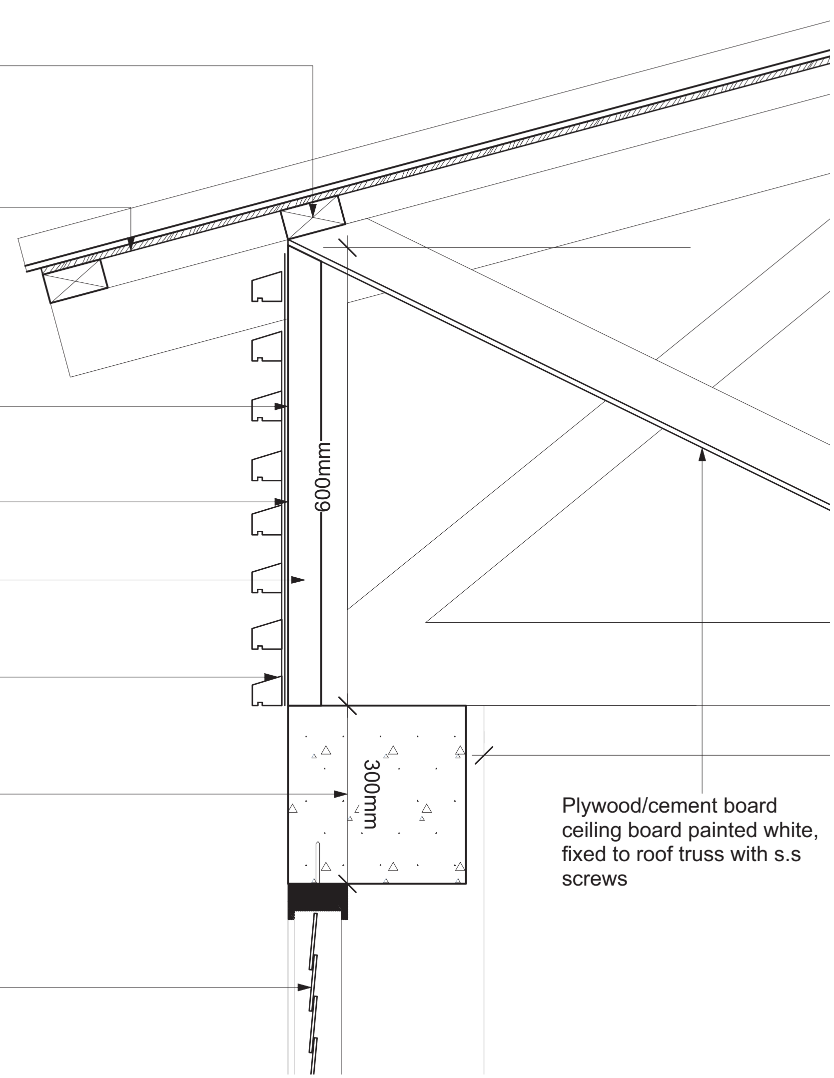
GABION WALL
Recycled stone and gravel gabion wall provides a robust, durable and safe wall

RING BEAM
RC ring beam ensures structure is rigid and roof can be strongly secured to columns

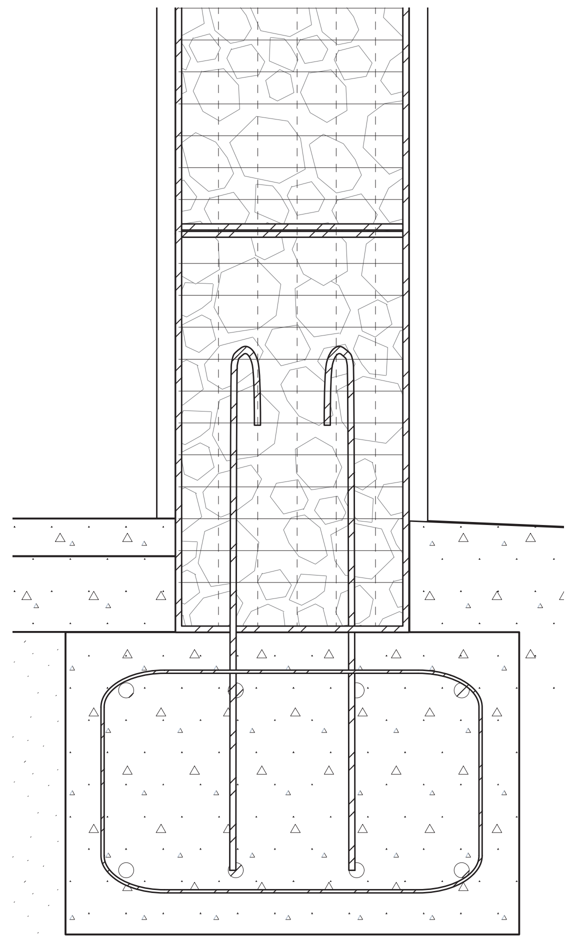
CONNECTIONS
Gusset plates strengthen connections between timber members

FOUNDATIONS
Reinforced foundations provide strong footing. Steel stirrups connect reinforcement to wall

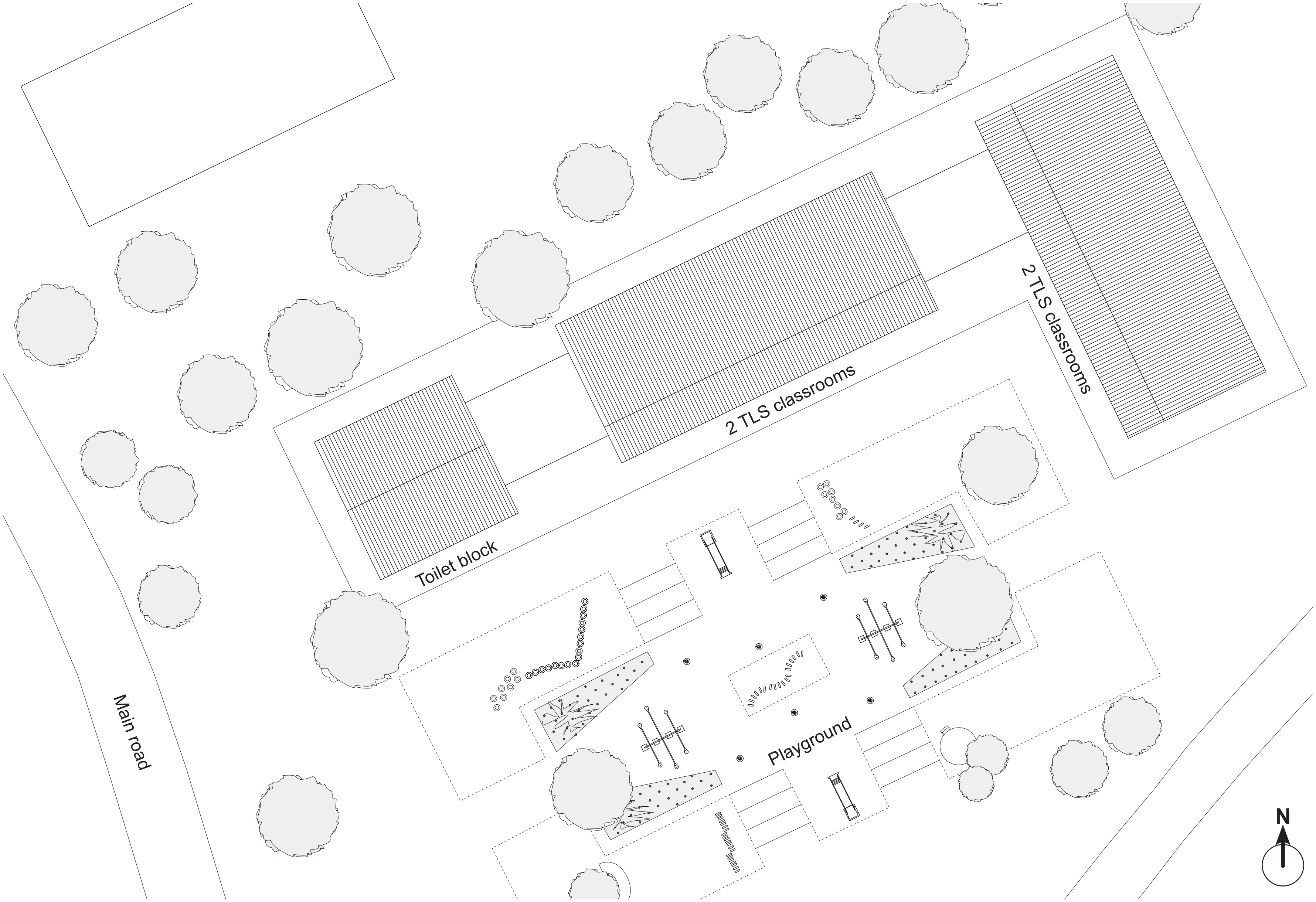
Detail 1 :Section through roof eaves and skylight



Detail 2: Through foundation and crushed rubble wall



SITE PLAN SCALE 1:500



QUANTITIES FOR SINGLE UNIT OF 52 m^2			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATION :			
Excavation	To 400mm below grade	m^3	1336.00
Geotextile	Compliant with Canadian building regs	m^2	190.00
Concrete	Compliant with Canadian building regs	m^3	216.00
STEEL STRUCTURE :			
Column	Compliant with Canadian building regs	m^3	150.00
Steel reinforcement	Trench foundations tied to walls with steel stirrups	kg.	13226.00
WALLING :			
Gravel or recycled rubble	To be sourced from local site	m^3	58.00
Reinforcement steel mesh	8mm dia, formed in cages 1200x500x300mm	m^2	422.00
Cement rendering	50mm internally and externally	no.	4
Emulsion Paint	White	lt.	8
ROOFING :			
CGI roofsheet	Galvanised 28-gauge	pcs.	20.00
Truss	25x50mm sawn timber sections, recycled if available	pcs.	3.00
Plywood	15mm thick marine ply sheathing, sheets 1200x2400mm	no.	46.00
Battens	25x25mm sections, recycled if available	no.	63.00
Suspended ceiling	12mm thick ply, sheets 1200x2400mm	no.	167.00
Acoustic ceiling			
FLOORING :			
Floor paint (epoxy)	0.15mm thick	m^2	46.00
Ceramic tiles	For kitchen	m^2	46.00
Mortar for ceramic tiles			
OPENING :			
Window	Timber	no.	250.00
SCHOOL FURNITURE			
Desk	Painted timber	no.	25
Table	Painted timber	pcs.	2
Chair	Painted timber	pcs.	50
Blackboard	Fixed securely to wall	pcs.	1
Shelf	Painted timber	pcs.	1
Coat rack	Timber	pcs.	1

Over 70% of houses were destroyed after the Bam earthquake
Photo: UNICEF/Iran

2012/UNICEF

Agency:	UNICEF, Iran
Location:	Bam
No. of users:	Modular typology: 75 – 250 students and 6 – 15 teachers
Anticipated lifespan:	5 years
Actual lifespan:	Depends on maintenance
Facilities provided:	Classrooms, office, WASH facilities, kitchen, play area, libraries and laboratories
No. of schools constructed:	Project is a preparedness measure
Construction time:	3 weeks (installation only)
Main construction materials	Steel structure with prefabricated cement panels (sandwich panels)
Material sources:	Locally sourced
Project cost/unit: *	Project is a preparedness measure
Material cost /unit:*	Project is a preparedness measure
Size of units:	Classroom: 7.2x6m, 43.2m^2 Office space: 7.2x3m or 6m (modular)
Size of construction team:	–
Construction Trades:	Fabricators/installers for steel structures and wall panels
Who built the facilities:	Local contractors & communities supervised by School Renovation Organization
Site information:	Designed for earthquake prone areas/ tropical & cold climates

Background

On 23 December 2003 a 6.5 earthquake hit Bam and surrounding areas with devastating effects. The epicentre of the quake was very close to Bam city and close to the surface, causing over 85% of the buildings in Bam to collapse. Approximately 80% of the piped water system was severely damaged, causing water contamination. The official number of deaths given by the Iranian Office of Statistics is more than 26,000. According to UNICEF some 75,000 people were made homeless. The educational infrastructure was almost entirely wiped out, with 131 schools totally destroyed and the remaining 64 rendered unusable. Almost one-third of all school children were killed (10,000 out of 32,433) as well as a third of their teachers (1,000 out of 3,400). Approximately 3,800 children lost one parent or caregiver and 726 lost both parents.

Project Description

In the framework of the Bam recovery programme, the School Renovation Organisation (SRO) of the Iranian Ministry and UNICEFagreed to design an emergency school typology as preparedness measure for future disasters. This emergency school structure was required to be easily constructed and provide a flexible and child-friendly solution for educational spaces required in emergency situations.

A consultancy firm was commissioned by UNICEF Iran Country Office to work in close collaboration with the School Renovation Organisation of MOE to develop an emergency school design. As a first step a market survey was conducted to identify reliable manufacturers of prefabricated construction elements. Following this, various initial design solutions were developed and shared with the SRO for approval. Upon preliminary approval of the designs by SRO, the finalised draft designs were shared with the Ministry of Housing and Urban Planning for verification of the technical designs' compliance with relevant national standards.

Following some final fine-tuning, SRO ultimately approved the Emergency Prefabricated Modular School designs in November 2006.

Shelter Description

The Emergency Prefabricated Modular School design concept has several important characteristics:

1. It is a modular design to facilitate flexibility in space design that caters for different educational needs, spaces and expansion

2. It is prefabricated to allow rapid and high quality construction

3. It is designed for locally-sourced construction materials and technology to ensure speedy delivery/ construction and independence from external expertise and markets

4. It is designed to be adaptable to the very extreme and diverse climatic conditions of Iran, including tropical, cold and dry climates

5. It is designed in a way that encourages the local community to assist in the construction activities

6. It conforms to all the national school construction codes and standards including earthquake-resistant construction

The modular design is based on a 7.2x6m or 3m grid, a single classroom or office. It is comprised of a steel box-frame structure with sandwich panel in-fill at a modular size of 1.2m. The sandwich panels are prefabricated cement panels with internal dry walls and external colour coating, which have good thermal properties to keep the inside space cool in hot season, as well as warm in cold season.

This modular principle allows context-specific design solutions. The emergency schools can vary in size and facilitates included, such as classrooms, teacher office spaces, WASH and recreational/sports facilities, as well as educational spaces such as libraries and laboratories required for secondary schools. In addition, it supports the flexibility of gender-specific design for WASH facilities on the modular principle. Schooling in Iran is gender segregated and boys and girls use different learning spaces, therefore gender-specific designs were only considered for WASH standards.

There has been no community participation in the design phase. However, one of the key characteristics of the Prefabricated Modular School is to encourage participation of communities in the construction process, as the installation procedures are repetitive and community members can be trained quickly.

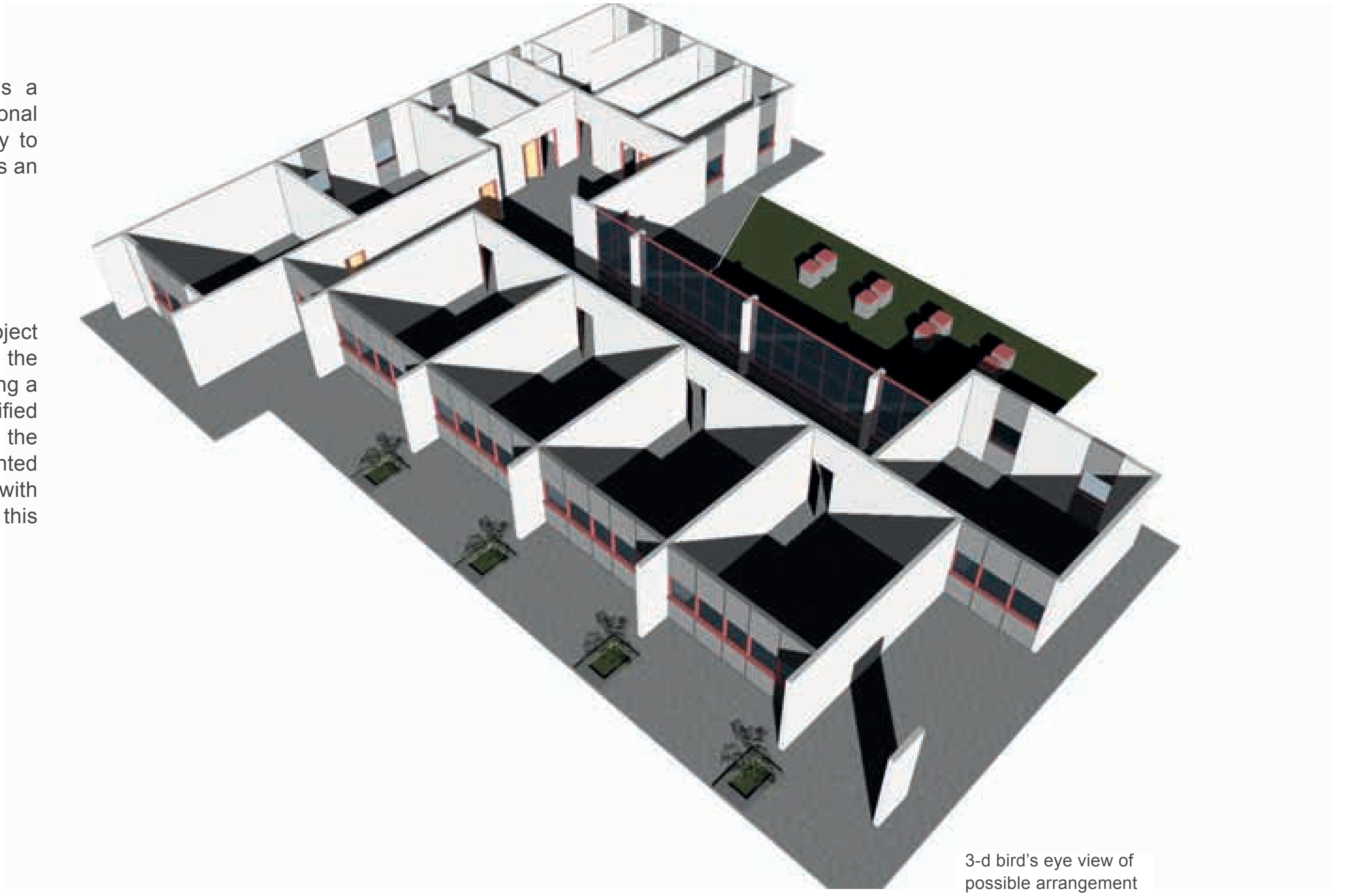
INTRODUCTION

DRR

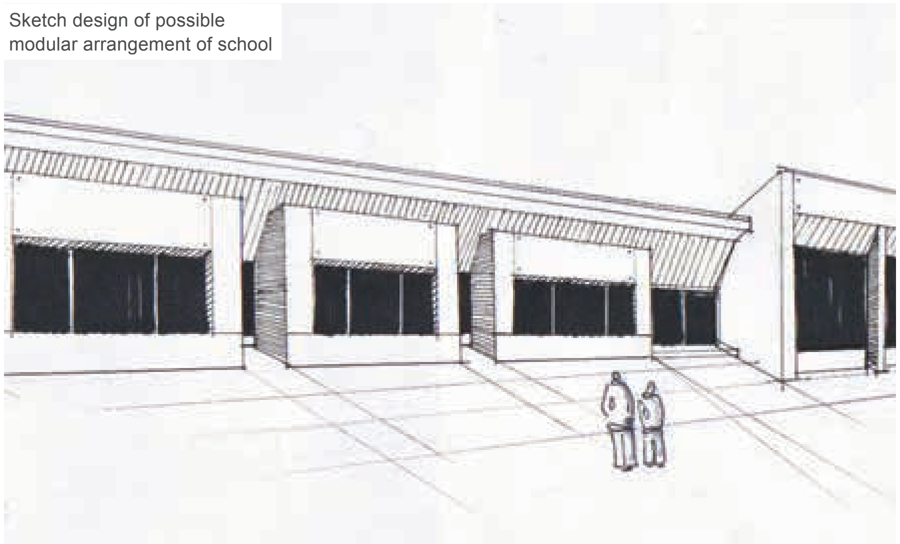
The Emergency Prefabricated Modular School is a preparedness measure that was developed on a national level to be able to respond rapidly and effectively to possible future disasters. The main steel structure is an earthquake-resistant structure.

Challenges

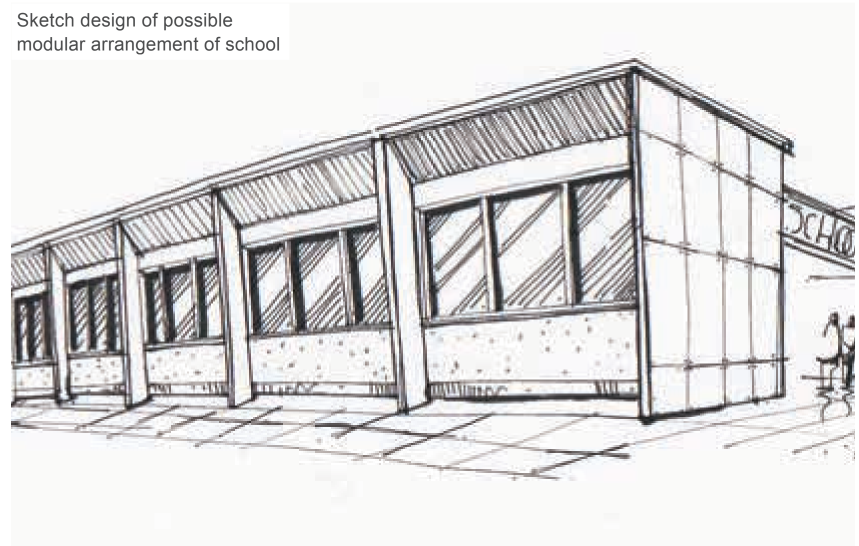
In an ideal situation, despite the fact that the project is a preparedness measure, a built prototype of the structure would have been very helpful. With building a prototype minor design faults could have been identified and remedied in the blueprints. Additionally, the construction process could have been well documented to make it easier to build several schools faster and with more efficiency. Due to lack of funding, however, this has never been accomplished.



3-d bird's eye view of possible arrangement of classroom modules



Sketch design of possible modular arrangement of school



Sketch design of possible modular arrangement of school

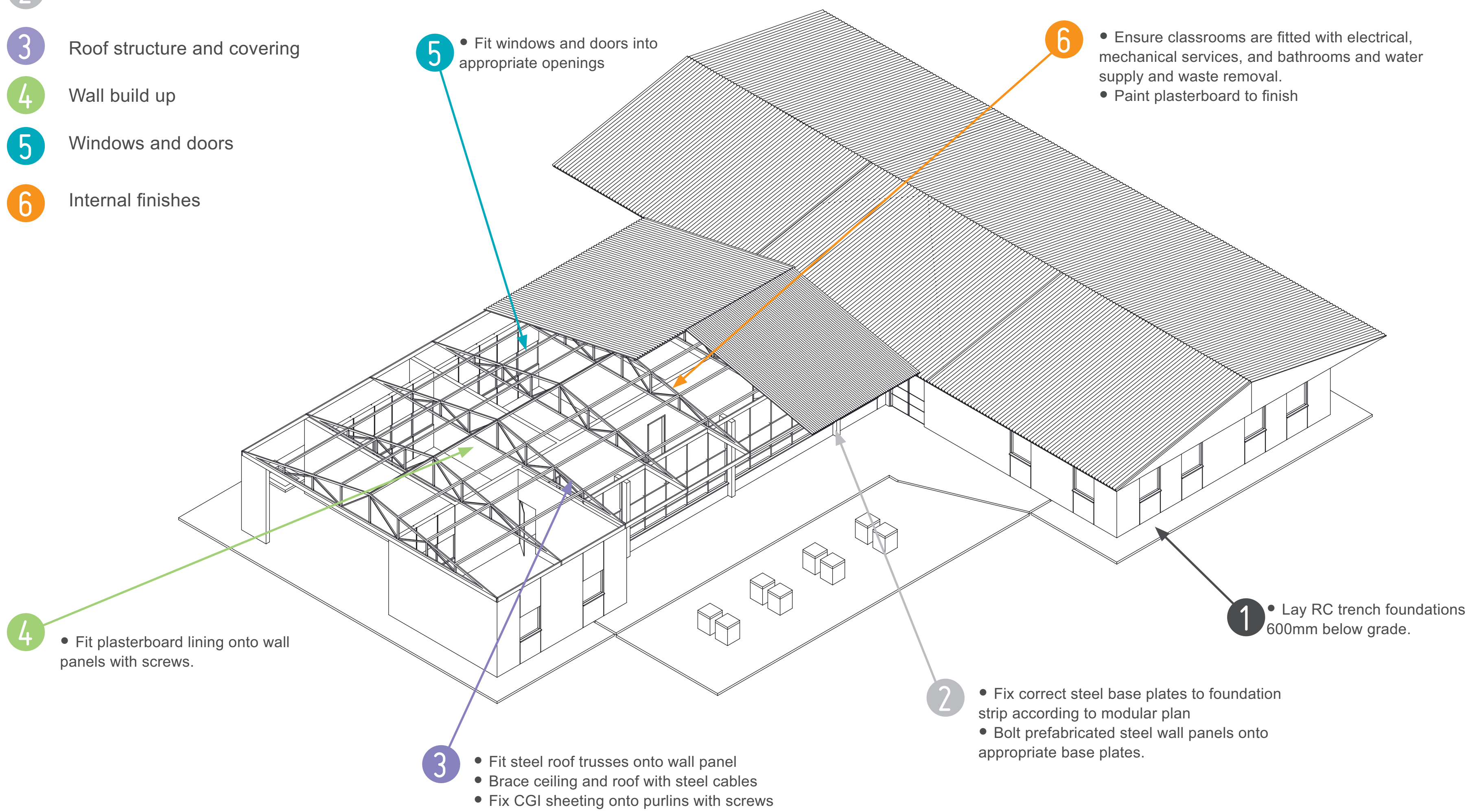
3D illustration of school design for hot/humid climates

3D illustration of school design for cool climate

All 3-d illustrations and sketches: UNICEF/Iran

3D VIEW

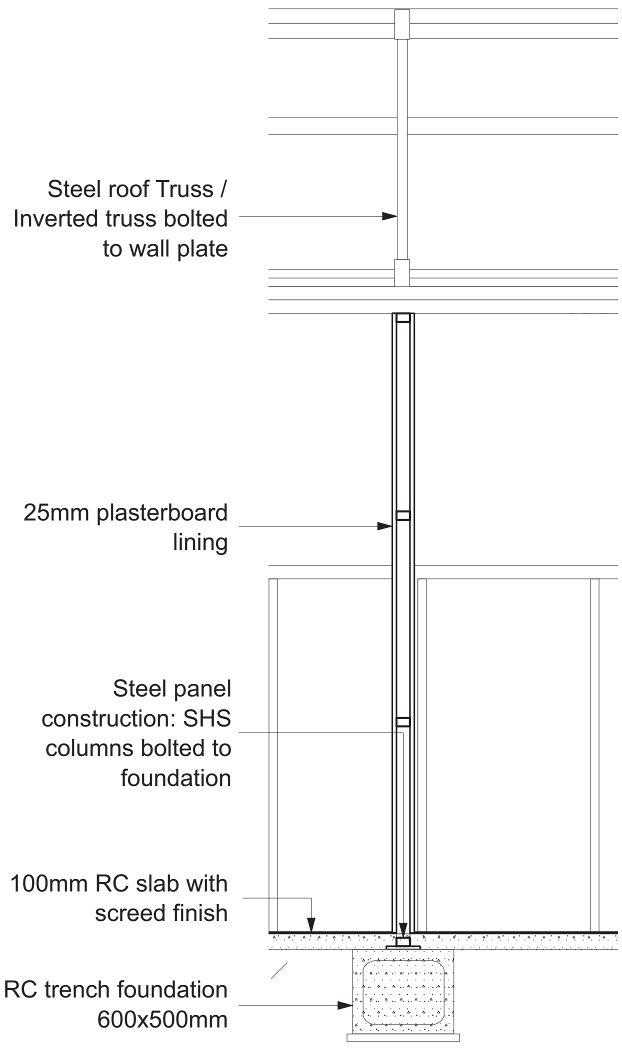
1 Foundation and groundworks
2 Structural frame
3 Roof structure and covering
4 Wall build up
5 Windows and doors
6 Internal finishes



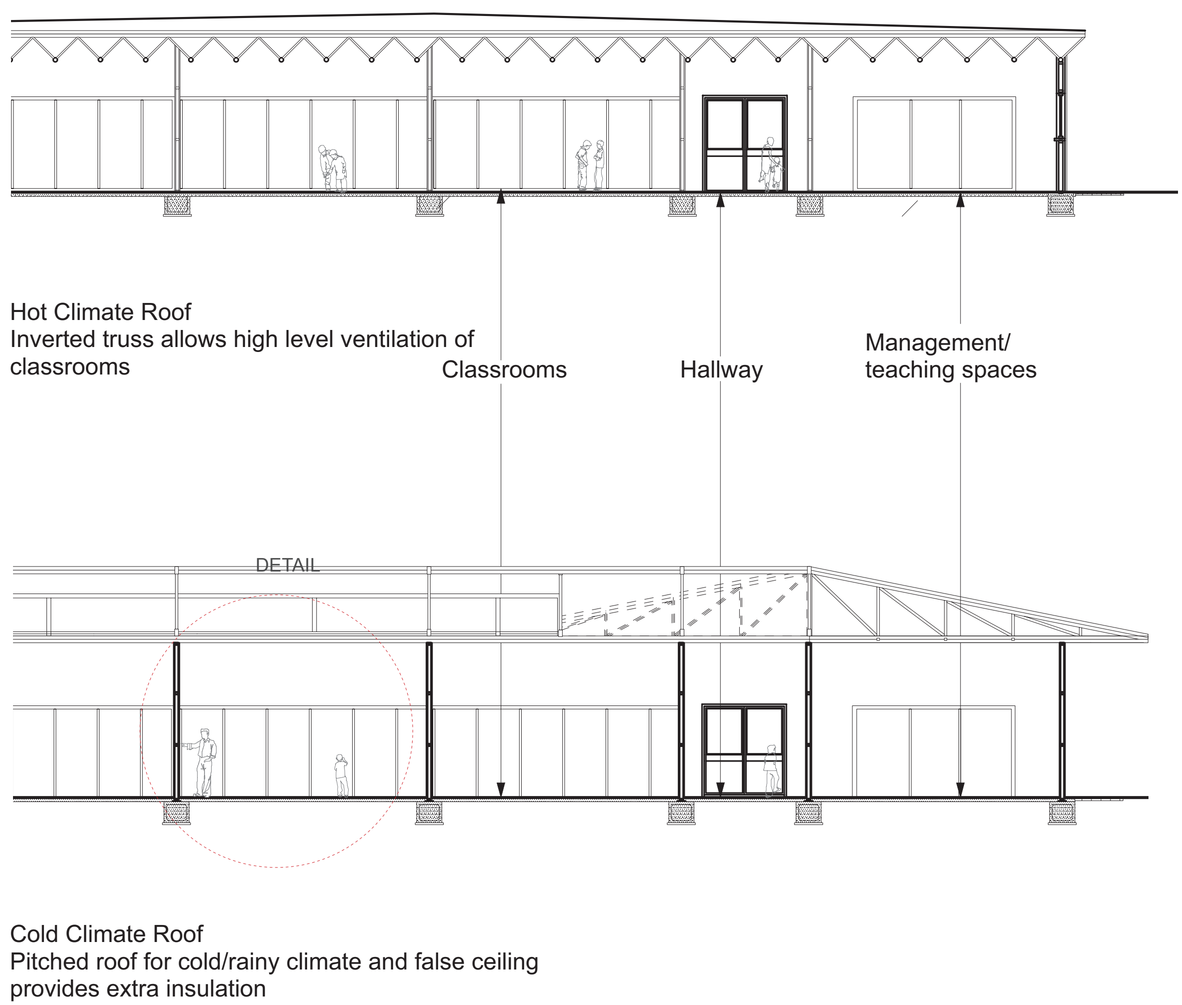
FLOOR PLAN 1:200

DETAIL NTS

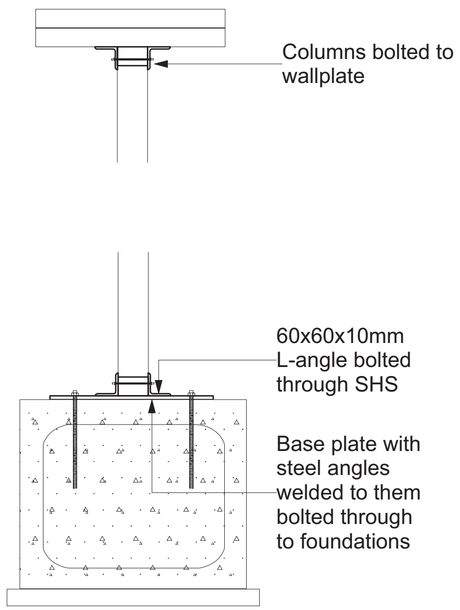
LONG SECTION NTS



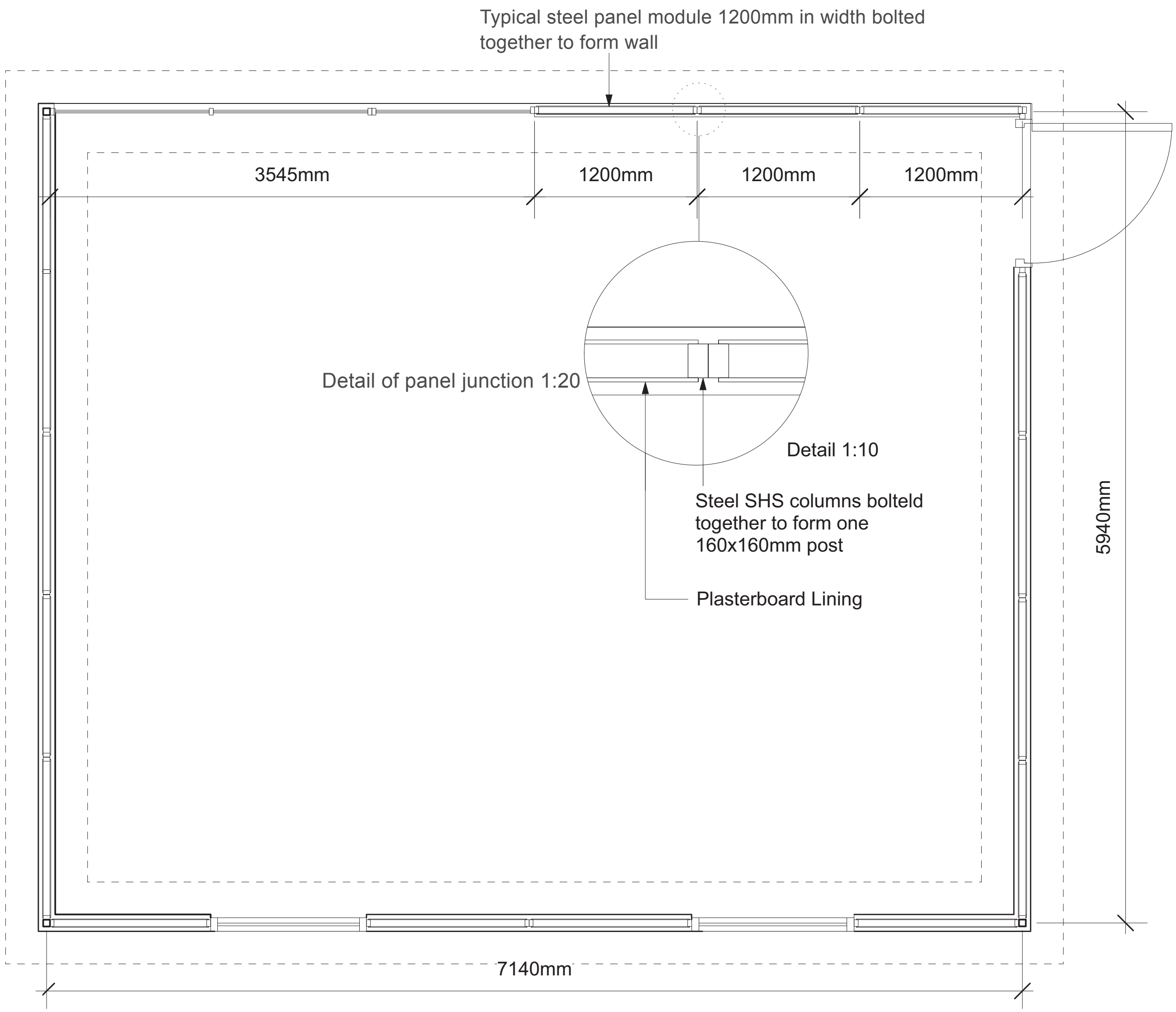
Detail through typical wall construction



Cross section through roof types for hot and cold climates

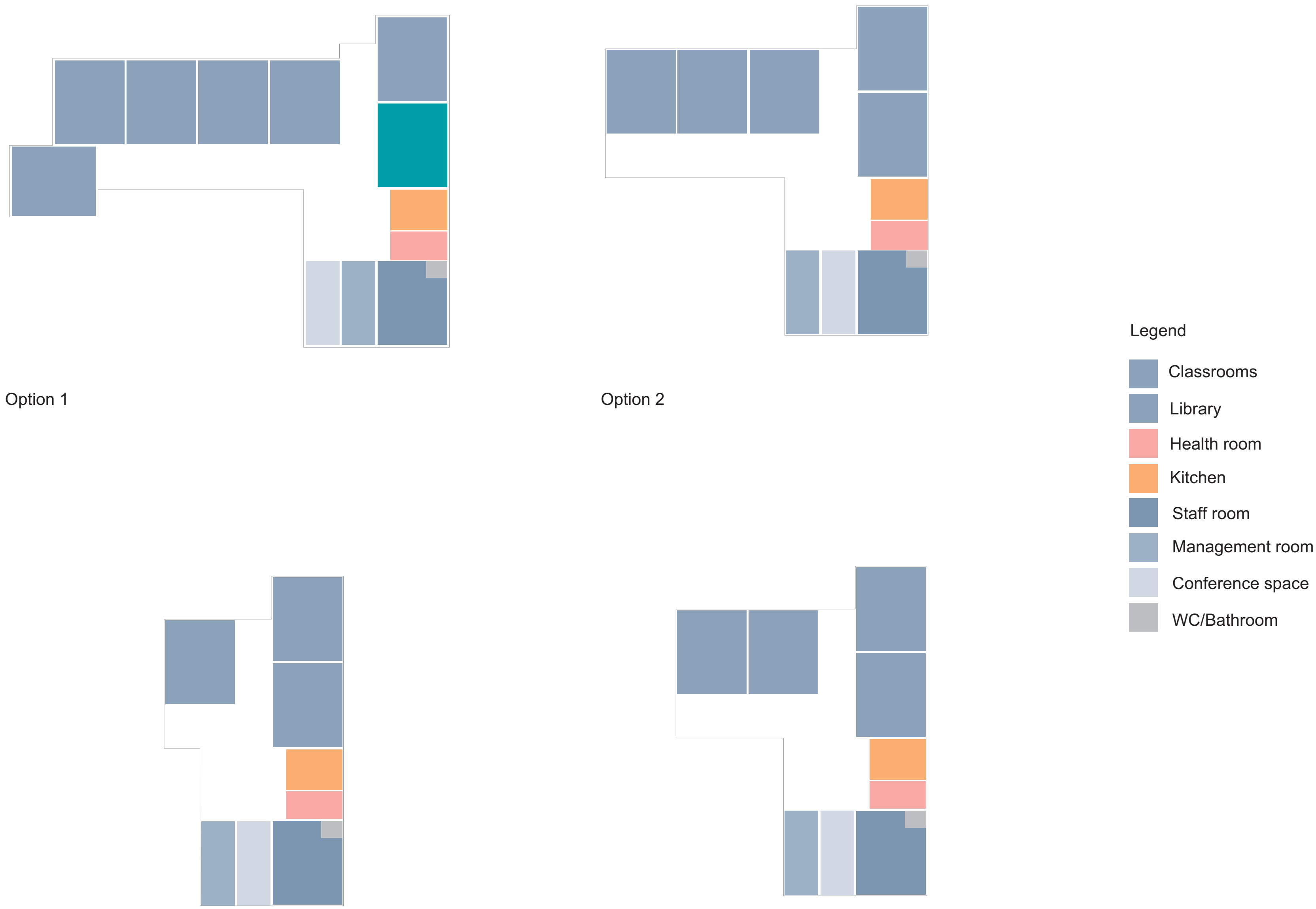


Typical detail through foundation and base plate



Typical classroom module composed of pre-fabricated modular steel panel system

LAYOUT DIAGRAMS



Four possible layouts of school using modular system

QUANTITIES FOR SINGLE UNIT OF 550 m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATIONS:			
Excavation		m²	550.00
RC	Pre-bent, Length=250mm, Total width=220mm	m²	100.00
STEEL STRUCTURE:			
Baseplates	11 types, bolted to foundation	no.	130.00
Prefabricated wall panels	3 types, bolted together to form posts	no.	130.00
WALLING:			
Plasterboard	25mm thick, bolted to wall panel	no.	260.00
ROOFING:			
Truss	Type A,type B	no.	7.00
Truss	Type B	no.	7.00
FLOORING:			
Concrete screed	d=100mm	m²	550.00
OPENINGS:			
Timber door	Double leaf	no.	12.00
Timber door	Single leaf		4.00
Steel frame window		no.	50.00

Brick TLS in Mirpur Khas

Photo: Save the Children /Pakistan

2011 / SAVE THE CHILDREN

Agency:	Save the Children
Location:	Mirpur Khas, Lower Sindh
No. of users:	2,249 children, 65 staff
Anticipated lifespan:	6 months
Actual lifespan:	-
Facilities provided:	Classrooms, sanitation/ hand washing facilities, drinking water points
No. of facilities:	24 TLCs (48 classrooms & 48 sanitation facilities)
Construction time:	1 month (2 classrooms & 2 sanitation facilities)
Main construction materials	Brick, cement, bamboo, local grass mats
Material sources:	Locally sourced
Project cost/unit:	USD 6,000
Material cost /unit:	USD 4,970
Size of units:	Classroom: 5.5x4.25m, 23.4m^2
Size of construction team:	2 skilled craftsmen & 4 Unskilled Labourers
Construction Trades:	Bricklaying, basic construction skills
Who built the facilities:	Local Contractor
Site information:	Away from flood prone area, higher ground

Background

Incessant rains and heavy flooding due to runoff and breeches in irrigation networks have been causing havoc in southern Sindh since August 2011. Overall, more than 5.3 million people have been affected across the province. A total of 579,169 houses have either been completely or partially damaged, and more than 2.5 million acres of cultivable land containing standing seasonal crops (banana, date, chilli, sugar cane and cotton) have been destroyed.

According to Provincial Disaster Management Authority (PDMA) figures, almost 300,000 people, including 139,000 children, are now staying in more than 2,100 relief camps, consisting primarily of government schools, buildings and makeshift tented settlements. The continuation of rain in southern Sindh further increases the vulnerability of the flood-affected population, particularly children and women. In Mirpurkhas district, flooding has spread across six talukas (tehsils) containing 41 union councils and 5,770 villages. Covering 819,833 acres, the flooding has affected 705,151 individuals[1] .

The displacement from homes and the exposure to weather and unfamiliar places and people all takes a tragic toll on children. The massive impact of the floods causes stress and uncertainty in children and requires support in the form of protective environments and psychosocial assistance to help children overcome their fears and recover.

1 Source of figures: PDMA Summary of Damages and Losses, 13 September 2011.

Project Description

Due to the large number of schools damaged and used as emergency shelters, there was a great need for safe and protected learning spaces. In many situations classes continued outside under trees without access to sanitation facilities. Children had to defecate openly. The lack of hygienic and gender-separated latrines further reduced girls' school attendance.

The purpose of this project was to support the severely weakened education system with safe, hygienic and child-friendly learning spaces until permanent schools can be reconstructed or rehabilitated. The TLSs were constructed with gender-separated latrines and were raised on a plinth to increase the flooding resistance. The TLSs aimed to ensure that children, including girls, have access to education, and create a sense of normality for children after the traumatic experience of the disaster.

Shelter Description

The main construction material is burned brick for the foundations and main walls. A vernacular grass type is used for the roofing on the steel structure. The TLS is a two-classroom building of 5.5x4.25m, 23.4sqm. Windows are located on both sides of the classroom to give even internal lighting and ventilation. The classroom has electricity and a ceiling fan.

Water, Sanitation and Hygiene (WASH) facilities are included within all the TLS grounds. One latrine for boys and one for girls is located close by with hand wash points and drinking water provision.

DRR

The magnitude of the disaster severely taxes the abilities and limited capacities of the communities and the District Disaster Management Authorities tasked with dealing with disasters. Support is needed not only directly to children, but in building the capacity of government and communities in emergency preparedness, risk assessment, contingency planning and effective early warning systems that provide a broader envelope of disaster risk reduction for children and their families.

Consequently, DRR/DRP was a very important component in this flood prone region of Pakistan.Site selection was carefully considered to avoid flood-prone areas. The TLS sites were selected in consultation with the School Management Committee, teachers and school children, as they have knowledge of the area and local hazards.

Strengthening community-based mechanisms was a key aspect. School Management Committees were re-activated through mobilisation activities, trainings and regular meetings including the extended community (Broad Based Community Meetings). As part of the preparedness measures Village Disaster Mitigation Plans and School safety plans were prepared.

Structurally the building and latrines are designed with a burned brick raised plinth level of approx. 450mm, to protect the inside space from both flooding and damage.

Challenges

• Due to the lack of funding for permanent reconstruction by the responsible authorities, the TLS may remain in use for an extended period of time.
• Cultural customs and traditions hinder girls attending schools.

Improvements

• Include an external ramp into classroom/sanitation facilities
• Consider external veranda space for children to be able to play outside during rainy/winter weather
• Include external surface water drainage to protect structure from water penetration
• It is recommended to have a minimum project life of one year to implement teachers' training
• Include boundary wall for protection and security, especially in regards to encouraging girls to attend school
• Water purification plant and external playground should be considered if funding permits

A group activity inside the classroom
Photo: Save the Children/Pakistan


Play activities outside the TLS


Internal view of TLS


Open air classroom


Labourers setting out and excavating for foundations

All photos: Save the Children Pakistan

3D VIEW

1 Groundwork and foundations

2 Wall construction

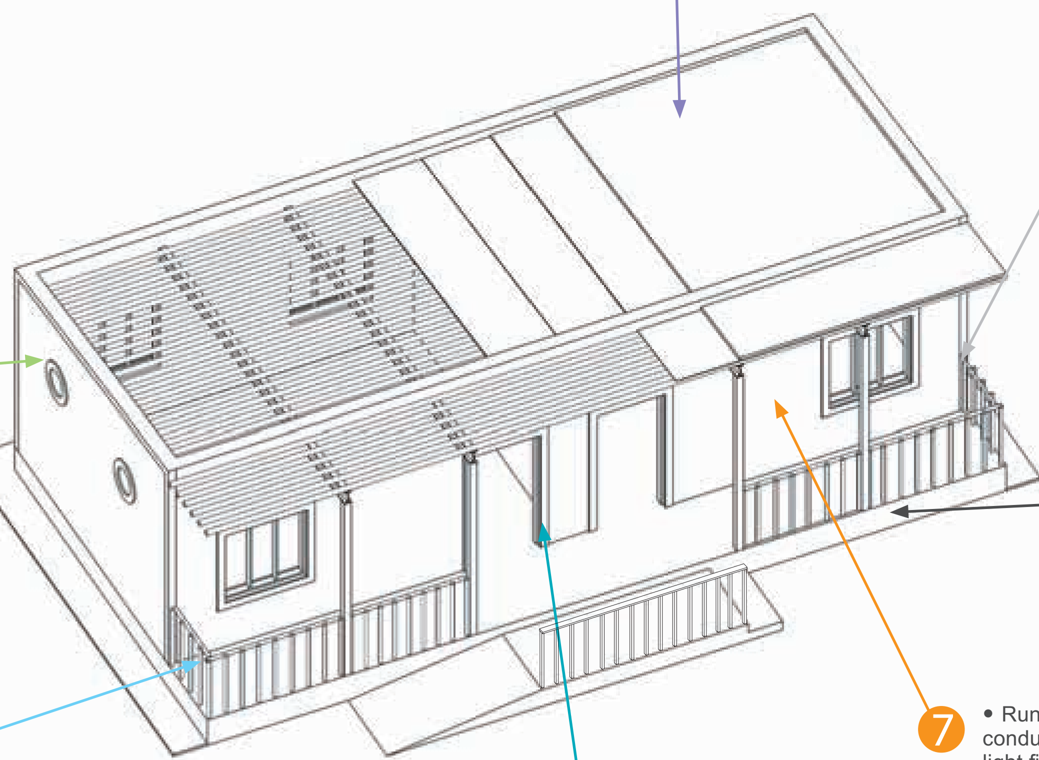
3 Roof structure and covering

4 Wall build up

5 Floor

6 Windows and doors

7 Finishes



3 • Lay 4 steel girders across walls to form structure for roof. Place bamboo joists across main beams at 225mm c/c
• Use local roof covering technique of a layer of ‘chick’/’sirki’, polythene sheeting, leaf layer and mud plaster topping

2 • Lay burnt brick walls in straight courses 225mm thick with adequate mortar joints on a DPC
• Lay PCC plinth protection panels and ensure they are properly placed, compacted are cured

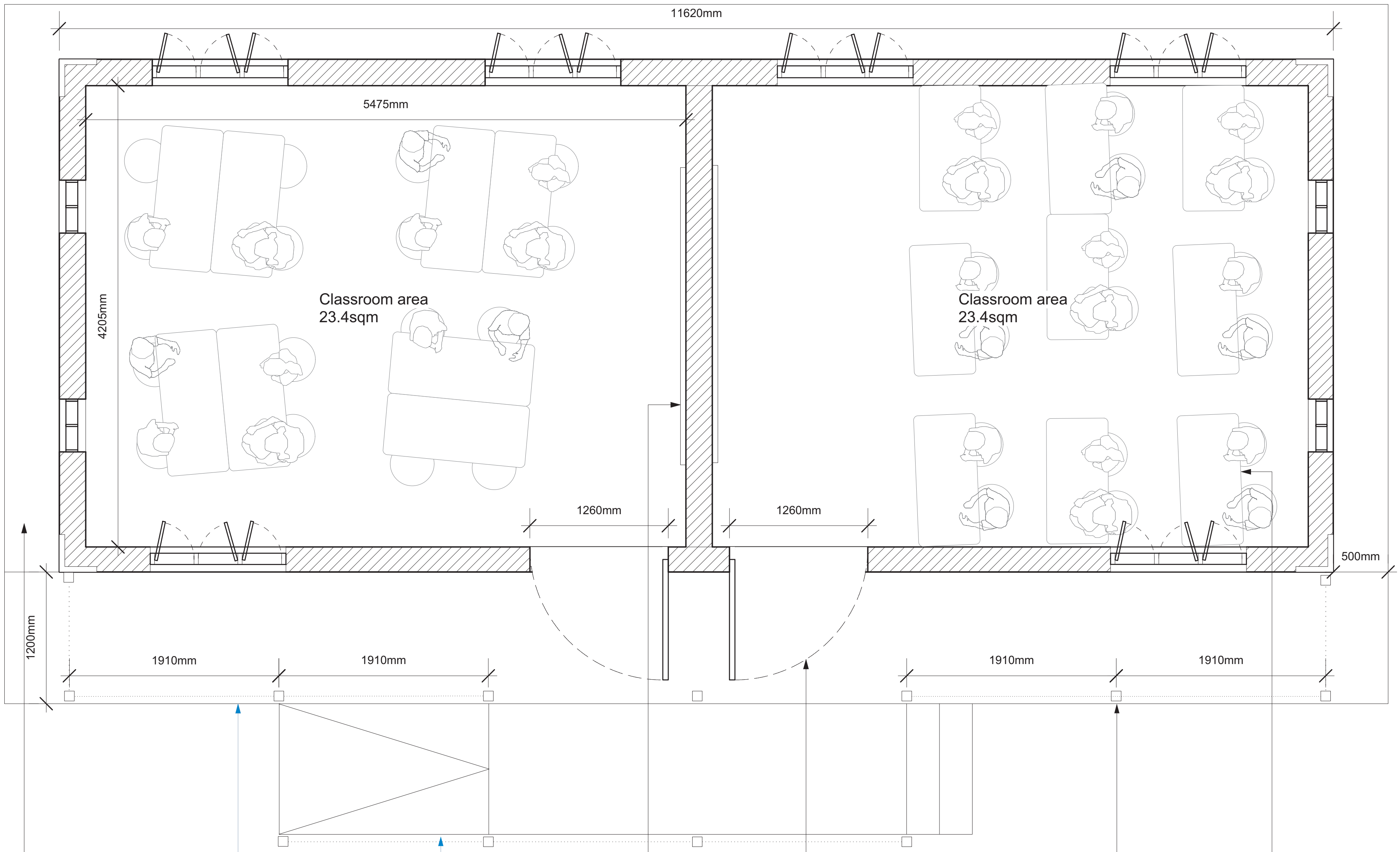
4 • Render internal walls with 25mm thick mud on wheat straw plastering. Finish with two coats of paint

1 • Excavate ground to required level
• Lay burnt brick stepped foundation on cement sand mortar bed. Ensure adequate curing time

7 • Run internal wiring inside PVC conduits. Safely fix energy saving light fittings, switches, ceiling pans to a fused switch board

5 • Provide and lay compacted earth filling under floor, topped with mud and straw plaster finish

6 • Supply and fix wooden doors and windows along with appropriate hinges, hooks, locks



Concrete plinth protection

1200mm deep verandah provides protected space for waiting between classes

Combined stair and access ramp (with a gradient of 1 in 12) with railing

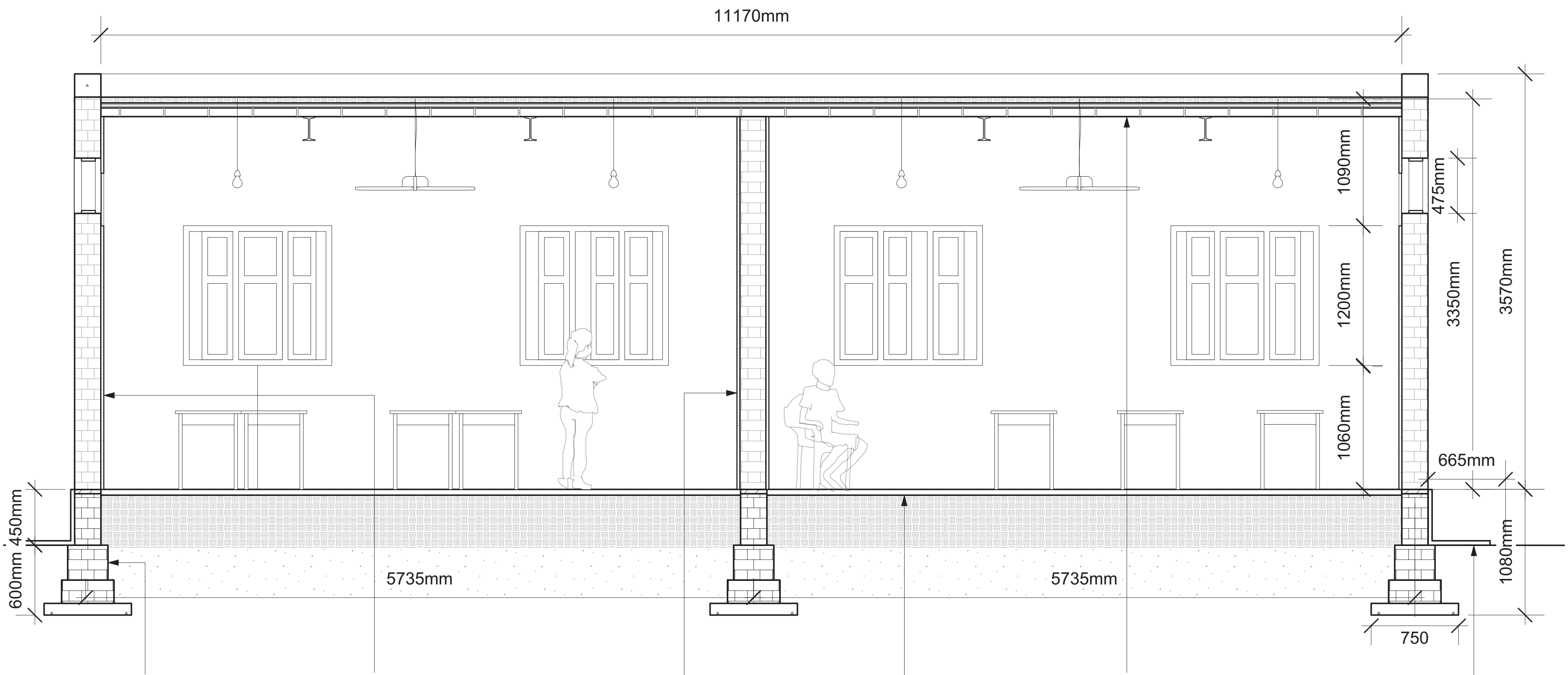
Blackboard securely fixed to wall structure

Outward opening solid timber doors

SHS columns at 1910mm c/c to support steel roof girders

Furniture can be flexibly arranged

LONG SECTION NOT TO SCALE



FOUNDATIONS
1050mm high stepped brick foundations (metallic sound burnt brick) laid in 12.5mm cement sand mortar.
-bedded on 150mm lean concrete (plain cement) base

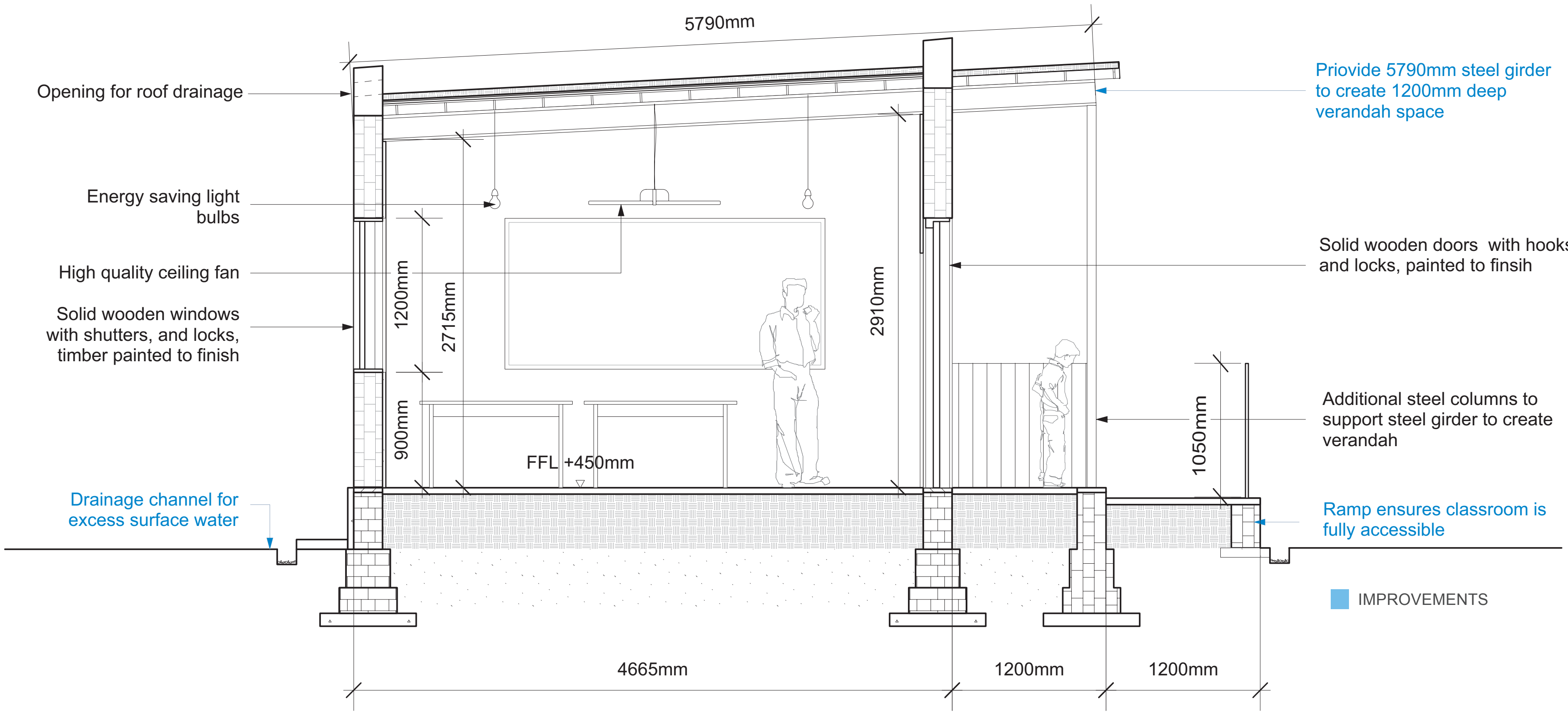
WALL STRUCTURE
-12mm thick cement sand plaster
-225mm thick burnt brick walls bedded in 12mm cement sand mortar
-Damp proof course (DPC) of PCC with 1 coat of bitumen and 1 layer of polyethene sheet laid on top of brick foundation

WALL LINING
-25mm thick mud on wheat straw plastering for internal walls

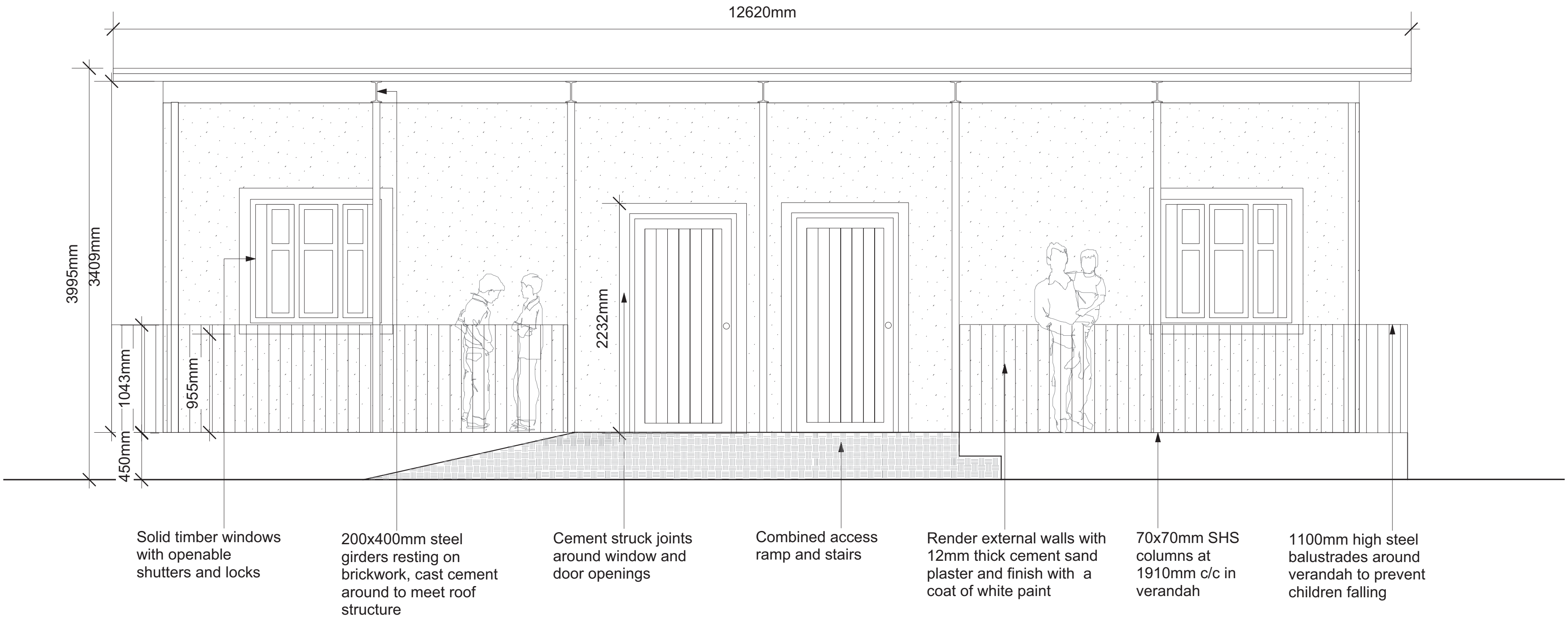
RAISED FLOOR
-25mm mud and straw plaster floor finish
-Compacted earth floor to bring FFL to 450mm + ground level

ROOF STRUCTURE
-100x200mm steel girders laid on brick walls
-75mm dia bamboo □oists laid at 225mm c□c
-chick□sirki matt layer
-pan pata (leaf)layer
-50mm mud and straw plastering

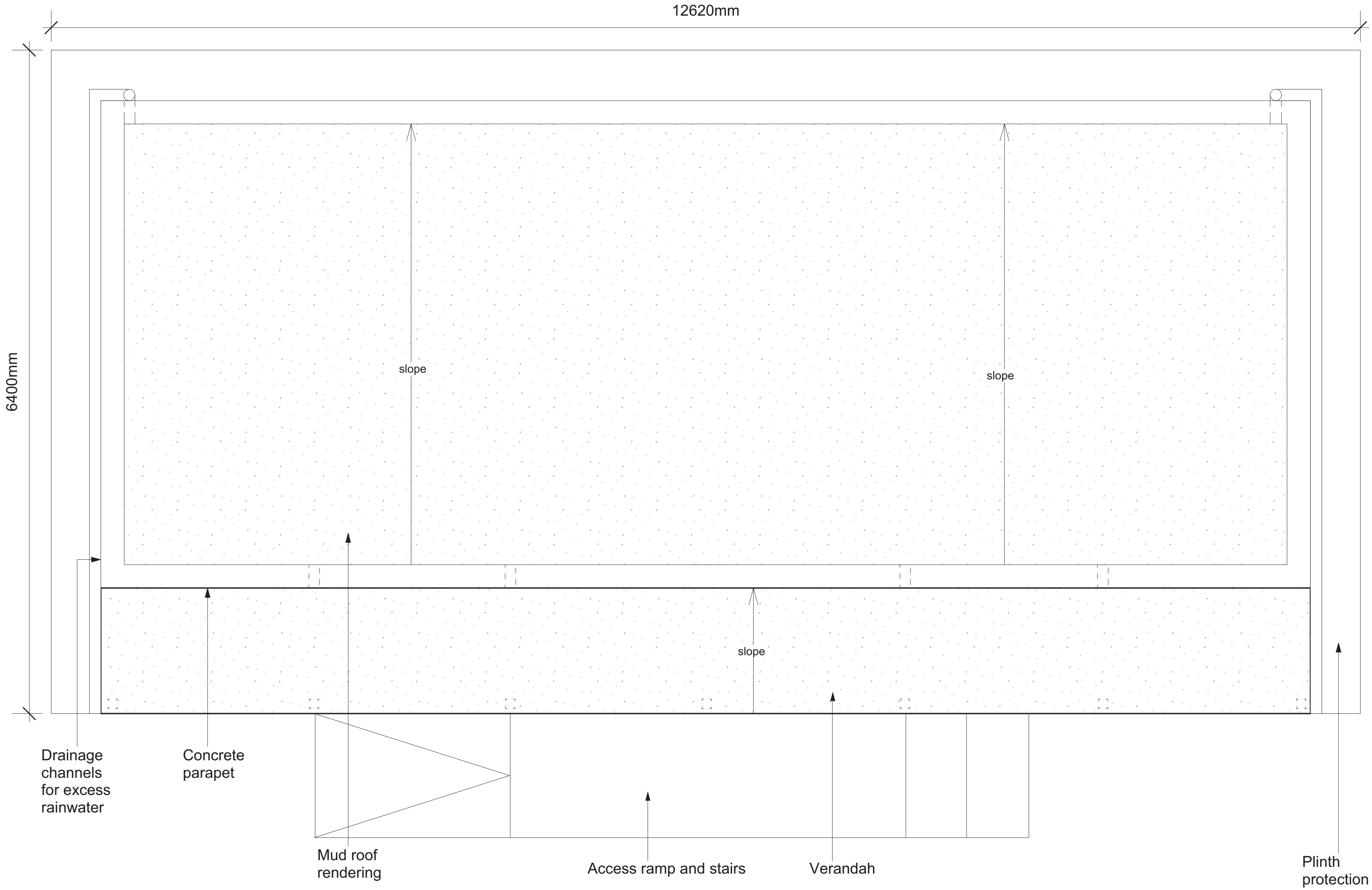
PLINTH PROTECTION
37.5mm thick plain cement concrete laid in panels using 10x40mm marble strips


5790mm
Opening for roof drainage
Energy saving light bulbs
High quality ceiling fan
Solid wooden windows with shutters, and locks, timber painted to finish
Drainage channel for excess surface water
1200mm
2715mm
900mm
FFL +450mm
2910mm
Priovide 5790mm steel girder to create 1200mm deep verandah space
Solid wooden doors with hooks and locks, painted to finsih
Additional steel columns to support steel girder to create verandah
1050mm
Ramp ensures classroom is fully accessible
IMPROVEMENTS
4665mm
1200mm
1200mm

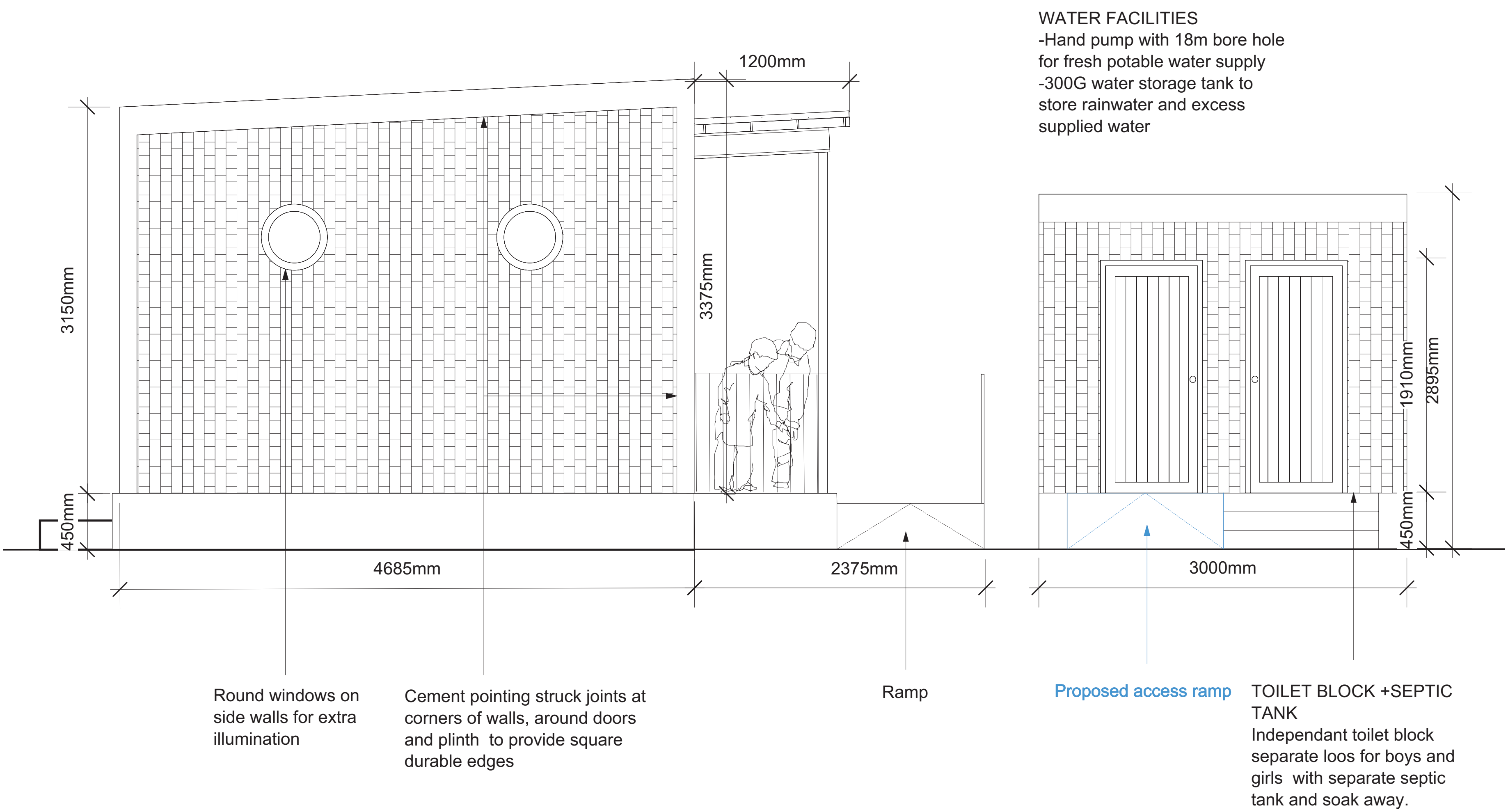
LONG ELEVATION NOT TO SCALE

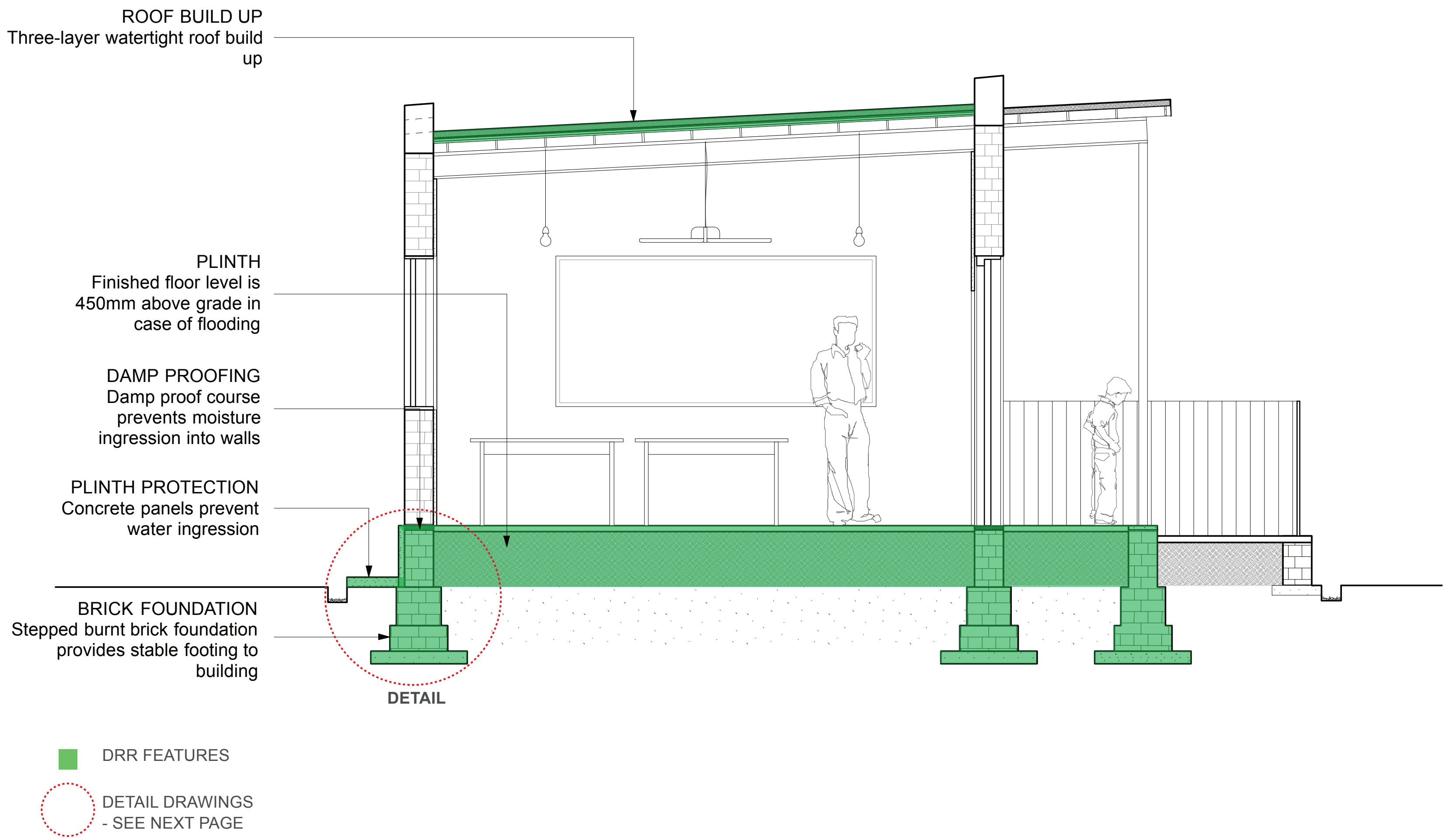


ROOF PLAN NOT TO SCALE

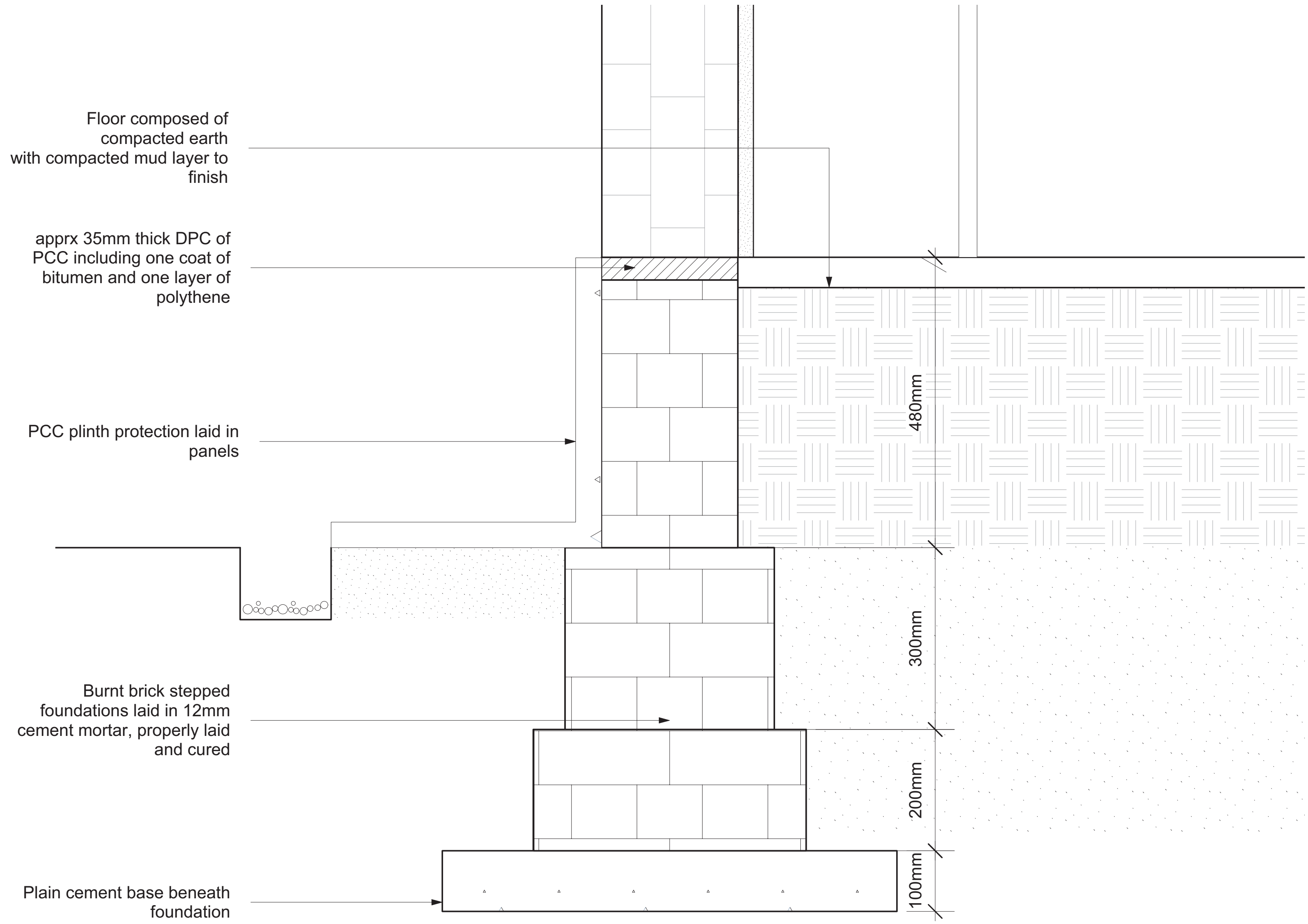


SHORT ELEVATION SCALE 1:50




ROOF BUILD UP
Three-layer watertight roof build up
PLINTH
Finished floor level is 450mm above grade in case of flooding
DAMP PROOFING
Damp proof course prevents moisture ingression into walls
PLINTH PROTECTION
Concrete panels prevent water ingression
BRICK FOUNDATION
Stepped burnt brick foundation provides stable footing to building
DETAIL
DRR FEATURES
DETAIL DRAWINGS
- SEE NEXT PAGE

DETAIL 1 SCALE 1:10



QUANTITIES FOR SINGLE UNIT OF 23.4m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATION :			
Excavation for foundation	Inc. rock, disposal of unsuitable materials	m^3	17.20
PCC in foundation	150mm, Class E, mix ratio 1:4:8	m^3	2.80
Brickwork	Metallic sound burnt brick, 12.5mm cement sand mortar	m^3	11.30
WALLING :			
Damp Proof Course (DPC)	37.5mm thick PCC, a coat of bitumen, a layer of polythene sheets	m^2	8.25
Brickwork for wall	225mm thick burnt brick walls, 12mm cement sand mortar	m^3	23.30
Brickwork for parapet wall	225mm thick burnt brick walls, 12mm cement sand mortar	m^3	3.10
Plinth protection	76mm thick PCC	m^3	1.10
Plaster	12.7mm thick of cement sand mortar	m^2	24.90
Mud	Mud plaster for Internal wall with wheat straw, 25 mm thick	m^2	118.90
Cemnet pointing	Cement pointing on joist	m^2	228.70
OPENING :			
Door, window shade	Angle iron and GI sheet incl. paint	m^2	7.40
Wooden door	Incl. hinges, hooks, locks, paint	m^2	4.50
Wooden window	Incl. hinges, hooks, locks, paint	m^2	9.00
ROOFING:			
Steel girder	4 girders, 100x200mm	pcs.	4
Bamboo joist	75mm dia.	pcs.	30
Flooring:			
Earth filling	38mm thick	m^2	21.40
Mud	Mud plaster for floor with wheat straw, 25mm thick	m^2	46.80
TOOLS :			
PCC ventilator		no.	4

ELECTRICAL WORK :			
PVC pipe	For wiring	m	21.00
Steel hooks	For hanging ceiling fans	pcs.	4
PVC wire	Single core copper conductor 240-440 V	m	46.00
Switch	Piano switch	pcs.	8
Brass holder		pcs.	4
Energy saver light bulb		pcs.	4
Main switch board	30 amp, 500 V	pcs.	1
Fuse	40 amp	pcs.	2
Ceiling fans	GI rod canopy, blades and regulator	pcs.	4
Bracket	Water tight reflector	pcs.	4
Copper conductor	Single core PVC, 240-440 V	pcs.	30.00

ETHIOPIA /REFUGEE CAMP

Looking into childrens' centre in Dollo Addo

All photos: Save the Children/Ethiopia

2010 / SAVE THE CHILDREN

Agency:	Save The Children
Location:	Dollo Ado Refugee camps, Ethiopia (Horn of Africa response)
No. of users:	Approx. 500-800 children & 8-10 staff per day
Anticipated lifespan:	35 years
Actual lifespan:	-
Facilities provided:	Child & Community Friendly School (CCFS), gender separates latrines, hand washing facilities & drinking water, kitchen, outdoor play area
No. of schools constructed:	3 CCFS
Construction time:	6 months
Main construction materials	Reinforced concrete (RC), block work, timber roof structure, CGI sheeting
Material sources:	Locally sourced (local supplier imported from Addis and other cities)
Project cost/unit: *	USD 111,178
Material cost /unit:*	USD 43,961
Size of units:	780m² (CCFS)
Size of construction team:	Monitoring: 2 engineers from Save the Children & 1 site supervisor
Construction skill required:	Carpentry, masonry, general construction, RC works
Who built the facilities:	Local contractor
Site information:	Hard rocky ground, harsh weather conditions (hot and dry)

Background

Since 2009 thousands of Somali refugees have crossed the border into Ethiopia, having been forced to flee their homes due to the on-going conflict and food insecurity within Somalia. In 2011, a devastating food crisis led to a massive influx of people from Somalia to Dollo Ado refugee camps and the opening of additional refugee camps. Dollo Ado is now one of the world's largest refugee camp complexes (source: UNHCR). The vast majority of these new arrivals were women and children in extremely poor health; children in particular were severely affected by acute malnutrition.

Sixty-nine per cent of all refugees are children under the age of 18 living in Dollo Ado's sprawling refugee camps, with very limited education opportunities. About 95% have never attended any type of formal education; therefore educational programmes play an important role in introducing children and communities to a formal education model. They provide children with the skills and knowledge that will keep them safe, as well as equipping them with skills for the present and a foundation to build on in future.

Project Description

Save the Children is scaling up its education response in Dollo Ado, in response not only to growing needs but also to the prioritisation of education by refugees in the camp. One of the biggest challenges is building the facilities themselves. Originally, the classes and play sessions were housed in large tents, constructed of plastic or corrugated iron sheeting. The existing temporary structures are now in bad condition due to the harsh climate and exceeding the stated lifespan. These structures are all designed in the form of traditional classroom layout and only give temporary solution to longer-term problems.

Consequently, Save the Children developed a new model for a Child & Community Friendly Schools (CCFS) in form of an open and flexible learning and community space to improve child protection activities in Dollo Ado refugee camps. It is specifically designed to address a number of challenges faced in implementing programmes in refugee camps and is part of Save the Children's holistic approach to education, including alternative- based education (ABE), technical, vocational education and training (TVET) for young people and Early Childhood Care and Development (ECCD).

Today, the construction of three CCFS structures has been completed and they are currently open for the refugee community and children. These include two CCFSs in Bokolmayo (Centres C and D) and one in Hiloweyen (Centre A).

The site selection was done in collaboration with the local camp authorities- Association for
Refugee and Returnee Affairs (ARRA)- and according to the location of the children, in order to be able to reach all children in different areas of the camp.
.

Shelter Description

The design concept of the CCFS is based on four smaller amphitheatre rooms surrounding a larger open shaded central space. The design offers protection for children from the sun, strong winds and heavy dust that are common to the camps and provides safe and protected space to play, learn and develop. The design of the new CCFS encourages a variety of simultaneous activities. Multiple classes and play activities can run parallel, such as CFS and ECCD, e.g. ECD classes are ongoing in the smaller spaces and older children play football outside.

Additionally, movement is essential to a child's physical and emotional development. Once children can crawl or walk, moving becomes a major focus of their day. It is thought that motor and emotional competence is closely linked in children. Feeding oneself, crawling or walking to a desired toy, picking it up, playing catch, kicking a ball, and/or going down a slide are all activities that help the child develop a sense of self.

Typically traditional classroom layouts are used for CCFS activities. This classroom follows a different spatial concept in which the smaller side spaces and the main central space is left open and flexible, giving better opportunity for multiple usage. By changing the layout and design, one can transform how the children, volunteers, teachers and parents interact in a space– and provide a space that encourages creativity, interaction and inspiration.

The structure is an in-situ reinforced concrete frame with block work walls and a large overhanging eucalyptus structure roof for shading. The typical dimensions of the outer smaller rooms are 11x4m. The central space is a large covered area of 18x12m.

All CCFS have gender-separated latrines, drinking water points and hand wash facilities, as well as cooking and dining spaces for school feeding programmes. The CCFSs have an external play space with play equipment and adjacent sport field.

DRR

The area is prone to wind and sandstorms. In response, the CCFC is surrounded by a series of corner “windbreaker” walls to protect the children from the effects of wind and sandstorms. In addition, trees and large scrubs could be planted to protect from the strong winds, create shading and cool spots.

Challenges

• Given the Dollo context within which we work, quality is always a concern. Save the Children follows the INEE Minimum Standards for Education in Emergencies and uses the Save the Children quality monitoring tool to monitor the quality of the learning environment.

Improvements

• External ramps for wheelchair users should be included in future constructions.

• Plant shrubs and trees around building to protect the space from dust and to provide shading.

The central space in the ECCD centre is ideal for large group activities and gatherings

Photo: Save the children/Ethiopia

External facing walls are in-filled to protect the space from strong winds

The central space is free of columns, spanning approx 11m

Conditions in Dollo Addo are dry, very hot and dusty

External play facilities are provided with each ECCD centre

All photos: Save the children/Ethiopia

3D VIEW

1 Groundwork and foundations

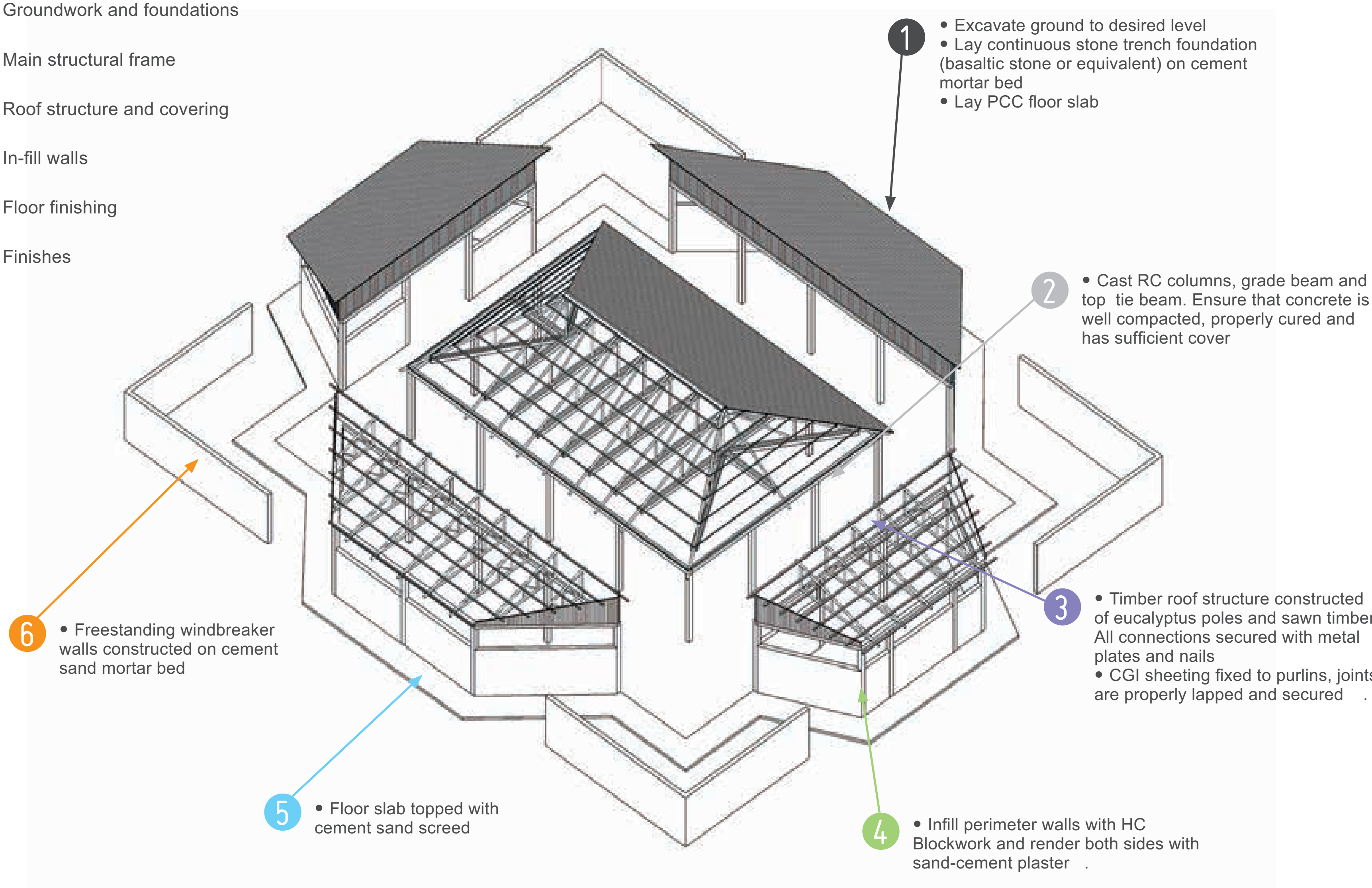
2 Main structural frame

3 Roof structure and covering

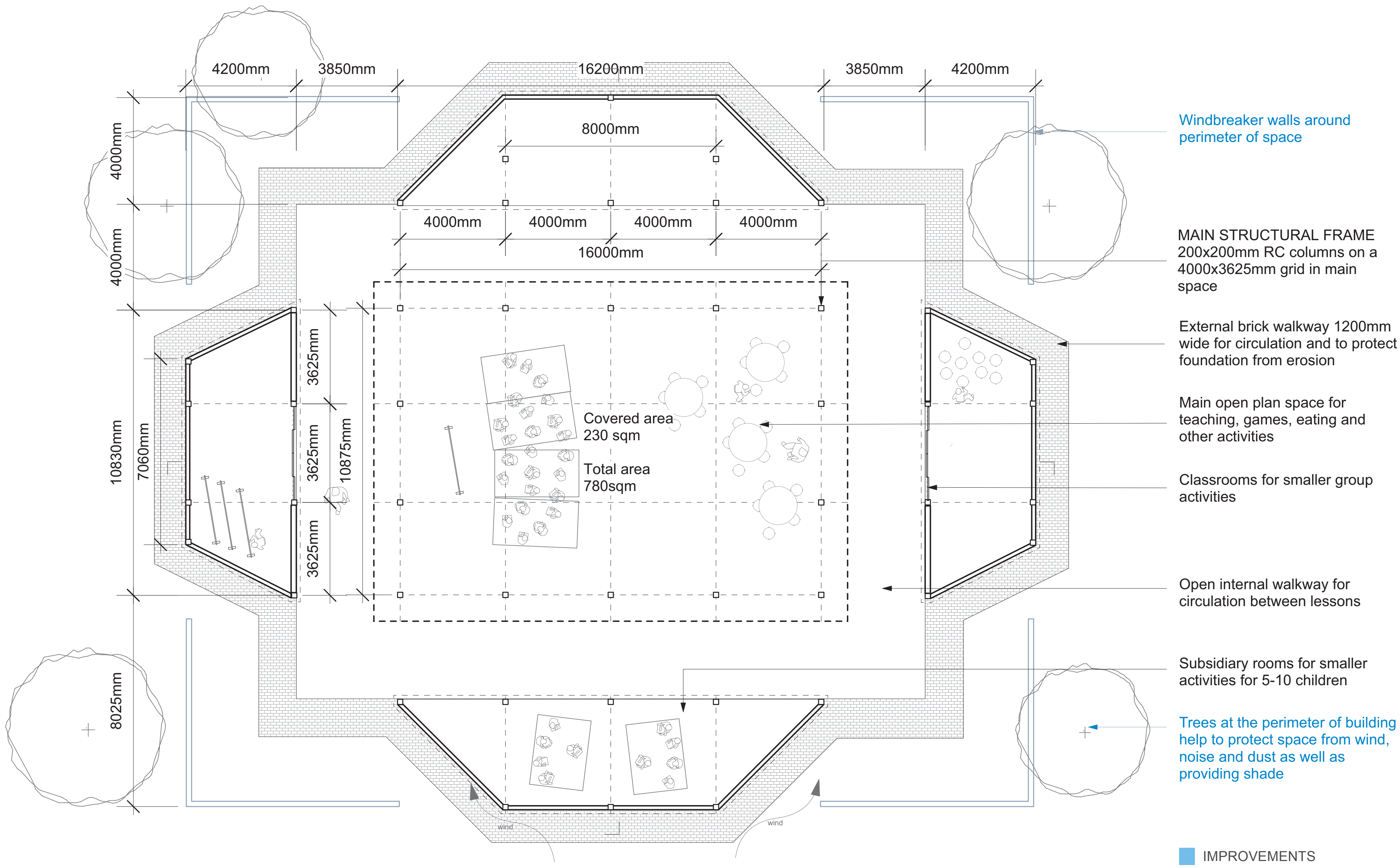
4 In-fill walls

5 Floor finishing

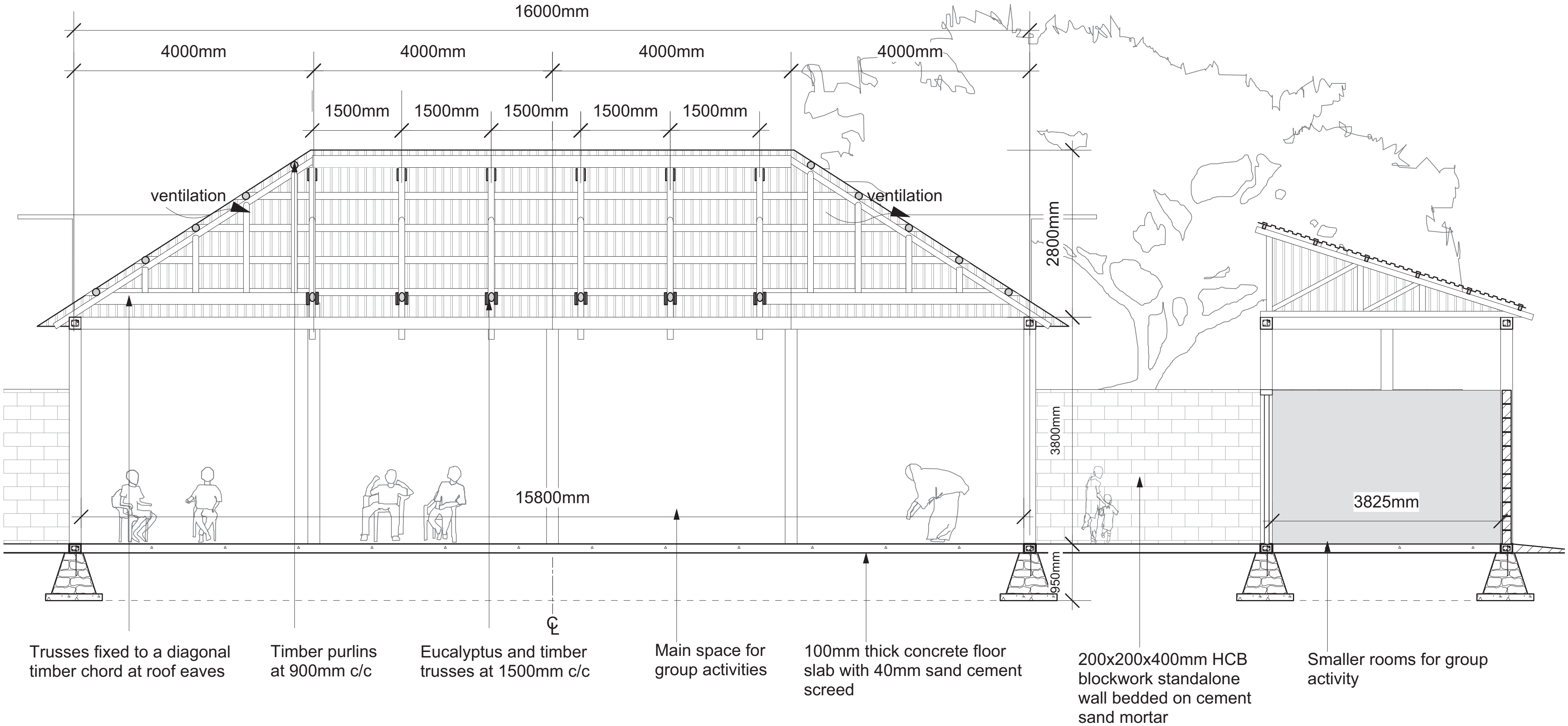
6 Finishes

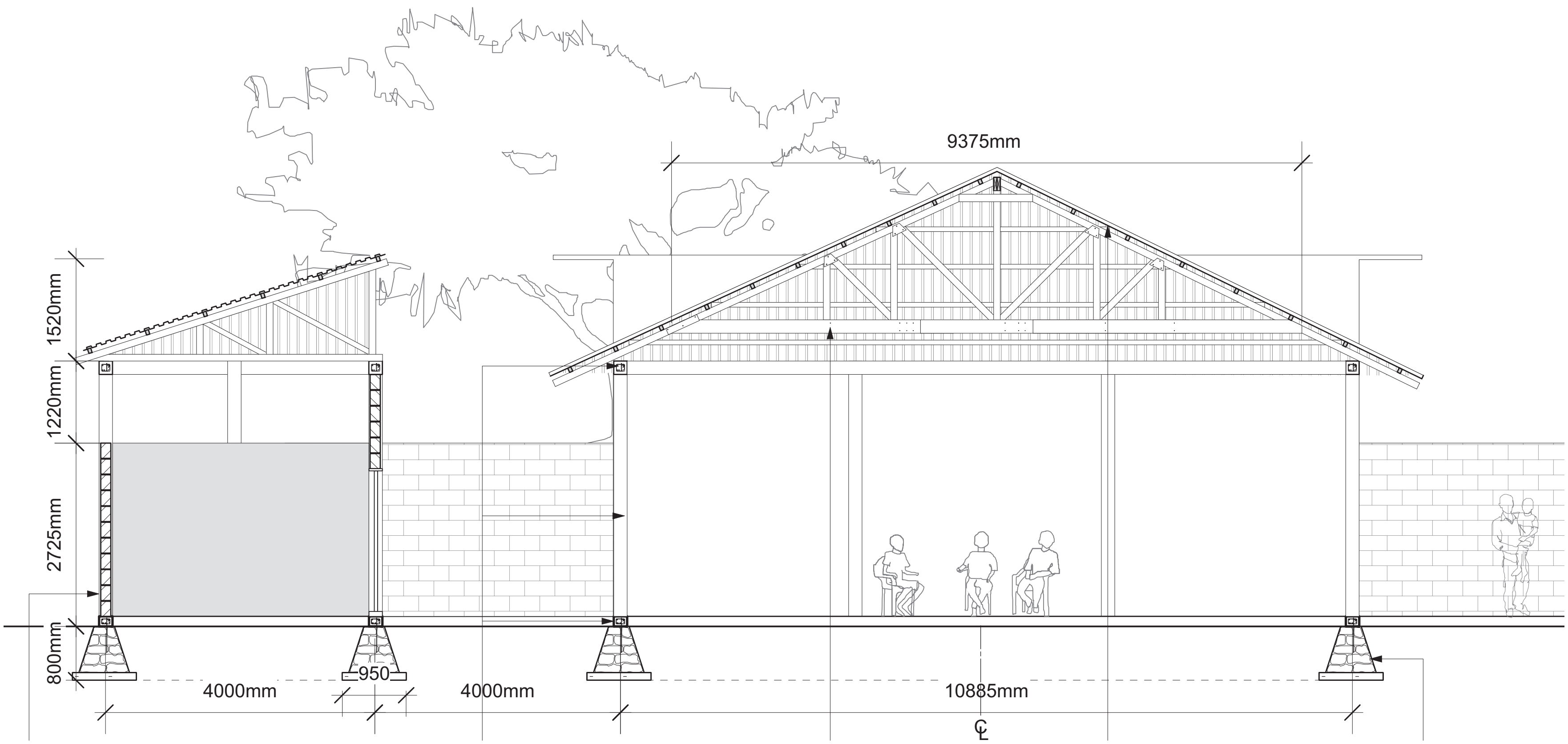


FLOOR PLAN SCALE 1:200



LONG SECTION SCALE 1:100





WALL STRUCTURE
-200x200x400mm HCB wall 2725mm high
-Render both sides of wall with 3 layers of sand-cement plaster
-Apply 3 coats of plastic emulsion paint to finish

STRUCTURAL FRAME
-Reinforced tie beam
-200x200mm RC columns 3950mm high
-Reinforced grade beam 150x200mm

note: all concrete to be C-25 with minimum cement content of 360kg/m^3 filled into form work in-situ and vibrated around re-bars to form a rigid structural framework

TIMBER CONNECTIONS
Sawn 50x200x4000mm timber bottom chord lapped over and fixed to make total length

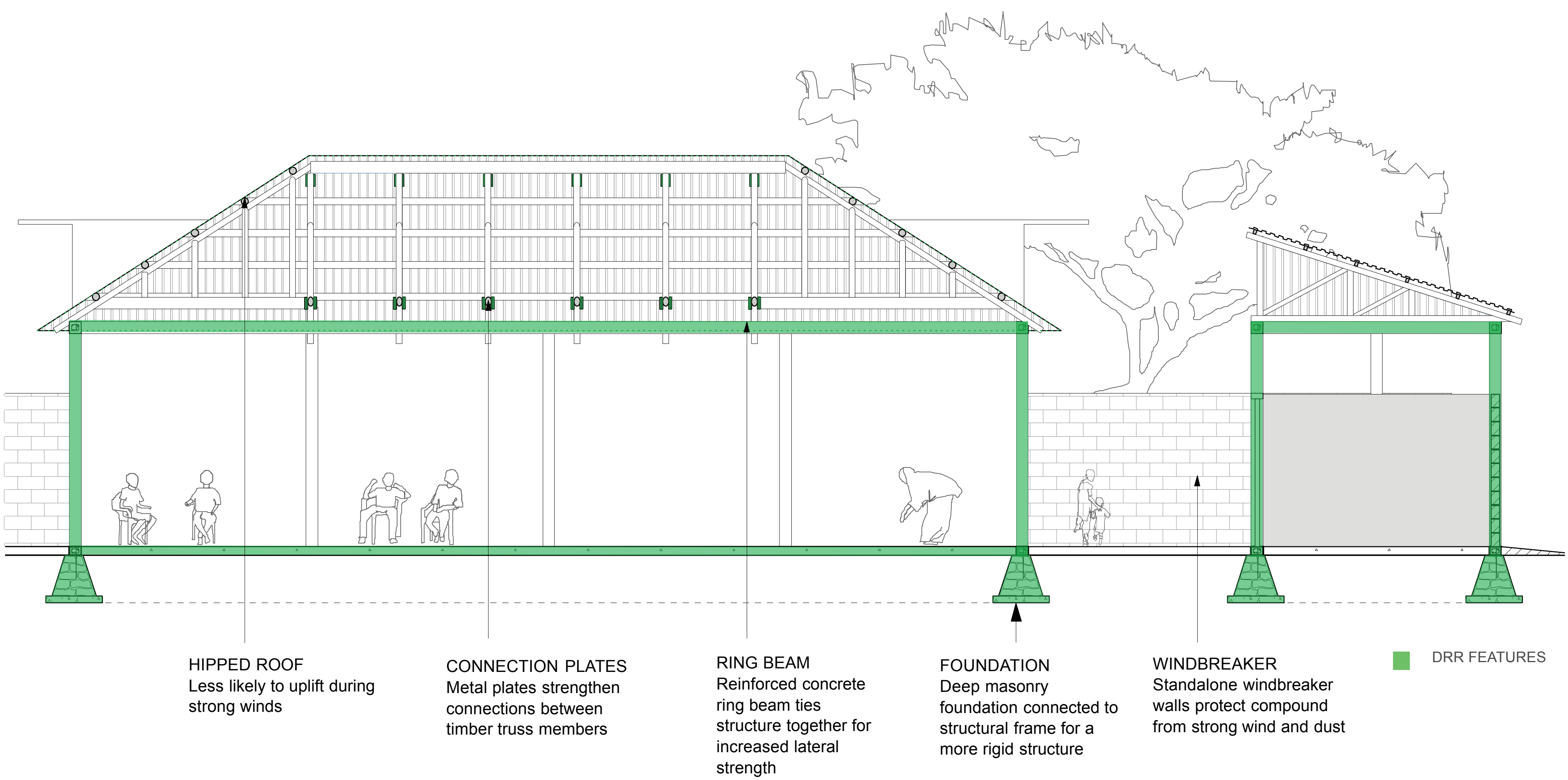
note: All timber joints held together and firmly fastened with hurricane straps and nails

ROOF STRUCTURE
-G28 galvanised corrugated iron sheets fixed to 50x70mm at 900mm c/c
-Eucalyptus truss members (100mm dia) placed every 1500mm

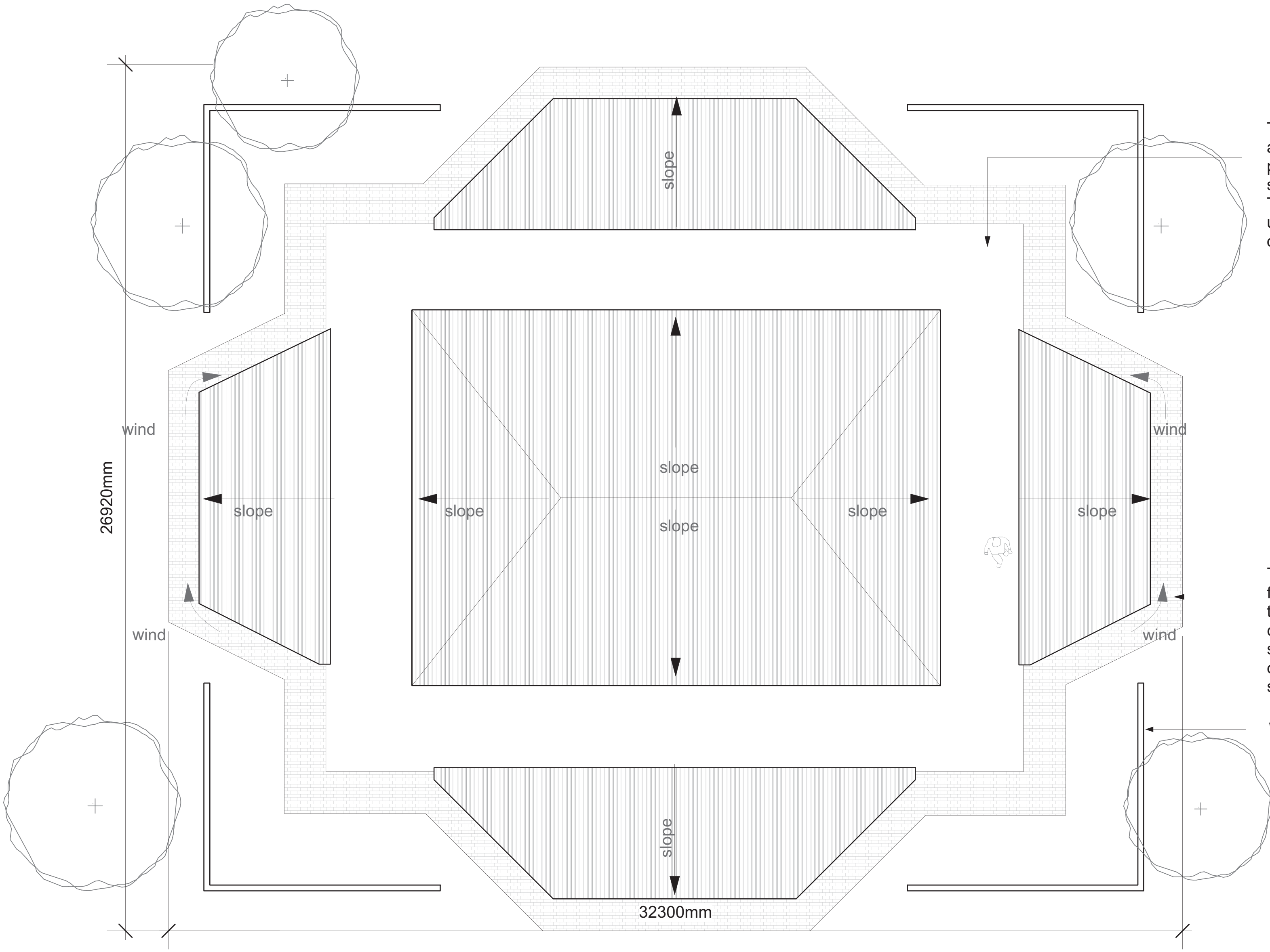
note: All timber members must be checked to be straight, free from defects and treated with anti-termite solution before construction

FOUNDATION
-Continuous stone trench foundation 400mm wide and 800mm deep on a 50mm thick cement mortar bed
-Hard Core around masonry foundation and beneath floor slab.

DRR FEATURES SCALE 1:100



ROOF PLAN SCALE 1:200

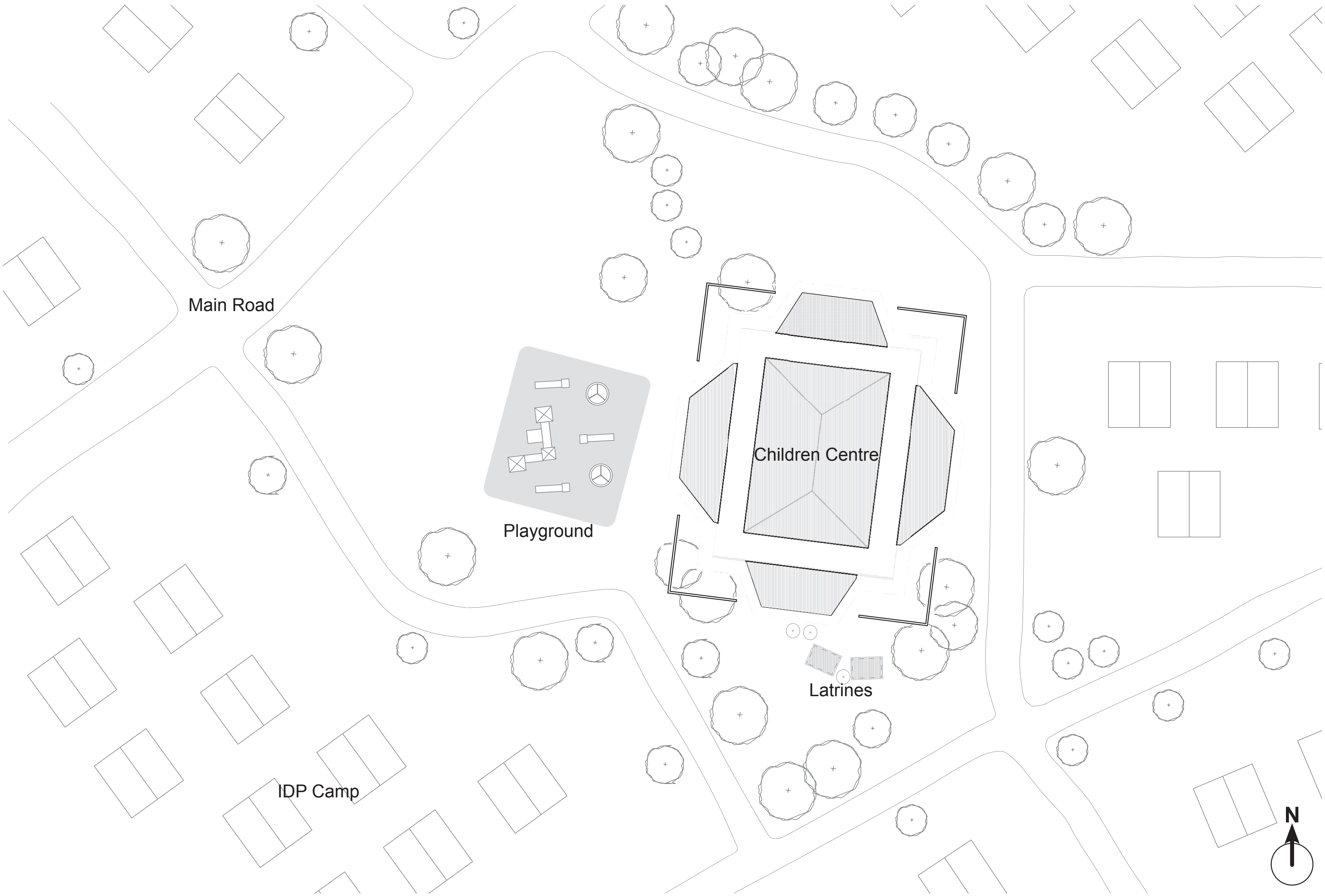


The inward looking courtyard arrangement of the structures provides a shaded protected space for children to play. This is crucial in the unbearably hot desert climate of ethiopia

The shape of the overall formation of the structure and the presence of external walls channels strong wind around the structure, reducing the amount of wind that blows through the space

Windbreaker wall

SITE PLAN SCALE 1:500



QUANTITIES FOR SINGLE UNIT OF 780 m²			
EILEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATION :			
Remove top soil	Depth not exceeding 200mm	m²	736.00
Excavate for trench foundation	Depth not exceeding 800mm	m³	65.80
Fill under hardcore with excavated material		m³	100.00
Basaltic or equivalent stone	250 thick, rolled, consolidated, and blinded	m³	100.00
Stone for hardcore	50mm thick beneath floor slab	m³	78.00
Stone for masonry foundation		m³	55.00
CONCRETE WORK :			
PCC (wall, beam, slab, ramp)	50mm thick concrete, min. content of 150kg/m3	m³	360.0
Cast-in-situ (Column, beam, floor slab, top tie beam)	Reinforced concrete with min. cement content of 360kg/m3	m³	60.00
Form work (beam, column, top tie beam)	Zigba wood	m²	300.00
Steel reinforcement	Mild and high yield reinforcing bars 6mm	kg	208.00
	Mild and high yield reinforcing bars 12mm	kg	825.00
WALLING :			
Stone	400mm thick hard trachytic stone or equivalent masonry wall	m³	45.00
Blockwork	HCB (Hollow Concrete Block) of class C with 28 days minimum crushing strength of 18kg/cm2, 200x200x400mm	m²	256.00
Plaster	Three coats of cement and sand mortar mix @ 1:3	m²	573.00
Emulsion Paint		m²	573.00
ROOFING :			
Truss members	2000x40x12mm treated timber sections	m²	1500.00
Bottom chord	12mm dia treated with two coats of paint		350.00
Vertical member	10mm dia treated with two coats of paint	m	300.00
Horizontal member	10mm dia treated with two coats of paint	m	720.00
Purlin	30x40mm Zigba wood	m	450.00
CIS (corrugated iron sheet)	G28 galvanised	m²	486.00
CEILING :			
Timber ceiling	8mm thick chip wood	m²	259.00
Batten	40x50mm zigba wood battens		
FLOORING :			
Screed	40mm thick smooth finished cement and sand mortar mix @ 1:3	m²	46.00
TOOLS :			
Roofing nails	Cement and sand mortar mix @ 1:3	no.	250.00
Washers		no.	250.00
Orginary nails		no.	40.00
Brush		no.	5.00
OTHERS :			
Antitermite solution		lt	23.00

Completed TLS, external view

Photo: Enock Chinyenze

2010 / PLAN INTERNATIONAL

Agency:	Plan International
Location:	3 Payams within Pibor County, Jonglei State, South Sudan
No. of users:	Total of 1,750 children in 7 schools
Anticipated lifespan:	3 – 5 years, plan to improve walls with cement plastering so that can serve beyond 5 years
Actual lifespan:	Depends on maintenance
Facilities provided:	Temporary Learning Spaces –classrooms
No. of schools constructed:	21 classrooms
Construction time:	14 days (5 classrooms)
Main construction materials	Eucalyptus poles, bamboo, timbers, CGI roof sheeting
Material sources:	Various (Juba / locally sourced)
Project cost/unit: *	USD 6,000 (incl. transport, labour)
Material cost /unit:*	USD 3,000
Size of units:	Classroom: 6x8m, 48m^2
Size of construction team:	1 building contractor, 5 carpenters and several community helpers
Construction Trades:	Basic building and carpentry skills, mud walling skills
Who built the facilities:	Local contractor built the main structure, community members mudded the walls
Site information:	Flooding risk, high risk of recurring inter-communal conflicts

Background

In December 2011, an inter-communal conflict in the Jonglei State between armed youth Lou Nuer and an armed Murle youth created a cycle of tit-for-tat attacks on each other's civilian populations, destroying their livelihoods and social/economic infrastructure. The violence took a severe toll on all the affected communities: Murle, Lou Nuer and Dinka. During that conflict, hundreds were killed or injured, tens of thousands were displaced and many homes and livelihoods were destroyed. Several primary schoolsand community facilities were burned down or severely damaged, making recovery extremely difficult in communities already suffering extreme poverty, struggling for food and lacking clean drinking water or shelter[1].

Project Description

The purpose of this project was to support the local communities with rebuilding the damaged and destroyed school infrastructure, to ensure that children, including girls, have continued access to education, and to create a sense of normality for children after the traumatic experience during the conflict.

The Plan International construction programme of transitional learning spaces is in response to the urgent needs for a community that is trying to recover after more than two decades of devastating war. These TLSs will meet the immediate needs while allowing time to repair or construct more permanent structures. In addition to the construction of TLS, Plan International focused on addressing issues such as emotional support, child protection in emergencies and feeding programmes for children and communities in strife-torn Jonglei state.

In Lakes State, the Plan International team experienced that most children lacked access to adequate and child-friendly learning spaces and most teaching activities take place under trees, exemplifying the desperate shortages of school infrastructure, books and learning aids. South Sudan is at the bottom of the international league for basic education according to UNESCO. Around one million children - which is half of the primary school age population - are out of school. The net enrolment rate for girls is just 37%, with fewer than 400 girls making it to the last grade of secondary school.

Shelter Description

The new classroom buildings are located within the existing school grounds. The number of newly constructed TLS depended on the need of the individual school. The TLSs are being constructed from eucalyptus poles as the main structural frame with split bamboo as the wall in-fill. The external and internal walls are plastered with a local mud mixture. The roof is constructed from timber roof trusses and CGI sheeting. Local contractors built the main pool structure, and the mudding of the walls was done by the community on a "Food for Asset" ration complementary programme.
As the mud walls dry, large cracks appear on the external facade. As an improvement the plastering of the external walls is envisaged to upgrade the structure to a semi-permanent building.

DRR

Rain and seasonal flooding make more than 60% of the country inaccessible for over half of the year and seasonal flooding is a major hazard risk in the Jonglei state area. The TLSs were located away from flood prone areas to protect the mud structure from deteriorating.

Challenges

• There is a high risk of reoccurring inter-communal conflict in the area.

• The transport of construction material from Juba is expensive

Improvements

• Plastering of the external walls with lime based render to make it more durable.

• Consider a raised floor level to protect from flooding.

• Consider rainwater harvesting and external drainage.

• Cross-bracing to structural frame.

• Consider including a tarpaulin blind/curtain, fixed to external wall to protect classroom from rain.

• Consider increasing window size to two structural bays wide to increase illumination of room

1 INCIDENTS OF INTER-COMMUNAL VIOLENCE IN JONGLEI STATE June 2012,United Nations Mission in South Sudan (UNMISS)

IMAGES

The roof cladding is fixed to protect the rest of the structure during construction

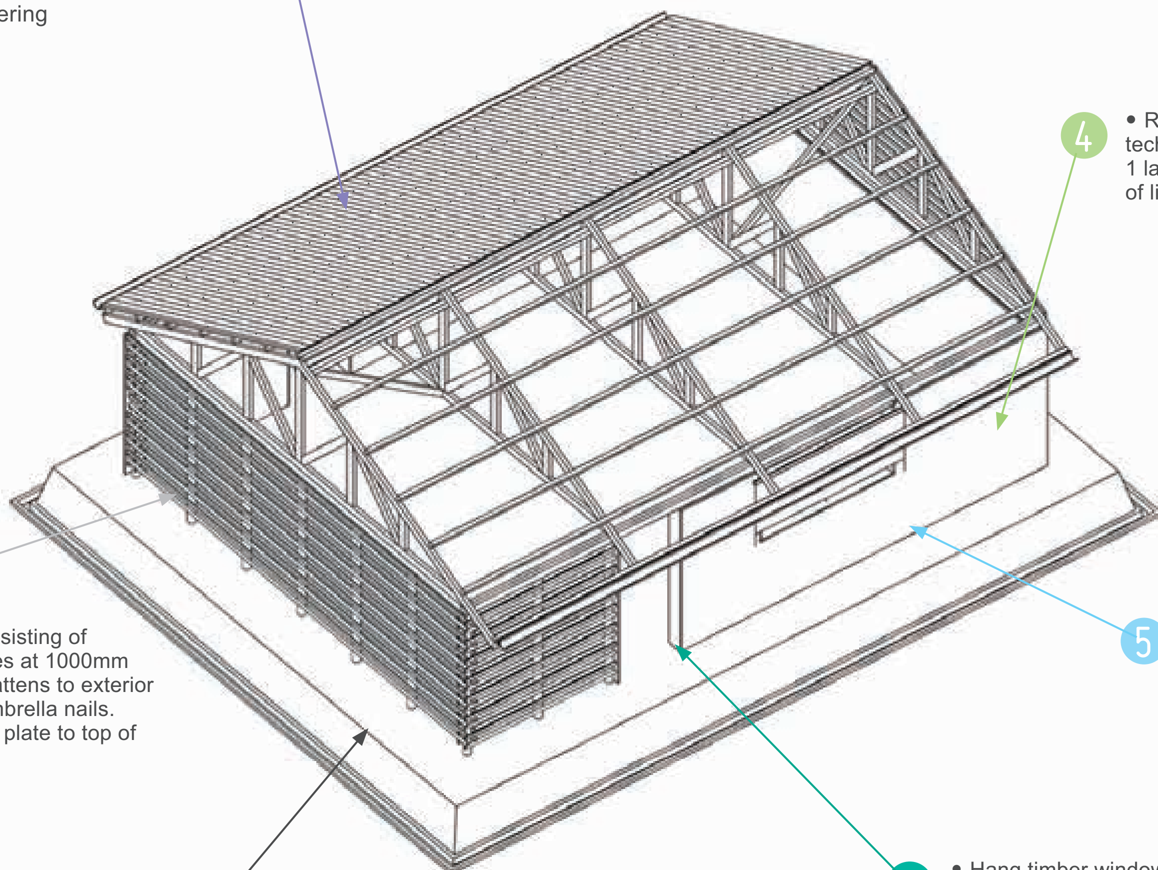
The external walls are rendered with mud/ sand/lime mortar

Eucalyptus poles are fixed with split bamboo counter battens

External view of two classroom under construction

Photos: Celeste Staley, Enock Chinyenze, Plan International

1 Groundwork foundations and plinth
2 Structural frame
3 Roof structure and covering
4 Wall build up
5 Floor finishing
6 Windows and doors



3
• Construct roof trusses from sawn timber. Secure joints with metal plates and straps.
• Fix trusses to wall plate at 1500mm c/c
• Attach CGI roof covering securely to purlins

4
• Render walls with local mud technique: 1 layer of mud/sand, 1 layer lime/earth/sand, 1 layer of lime/sand

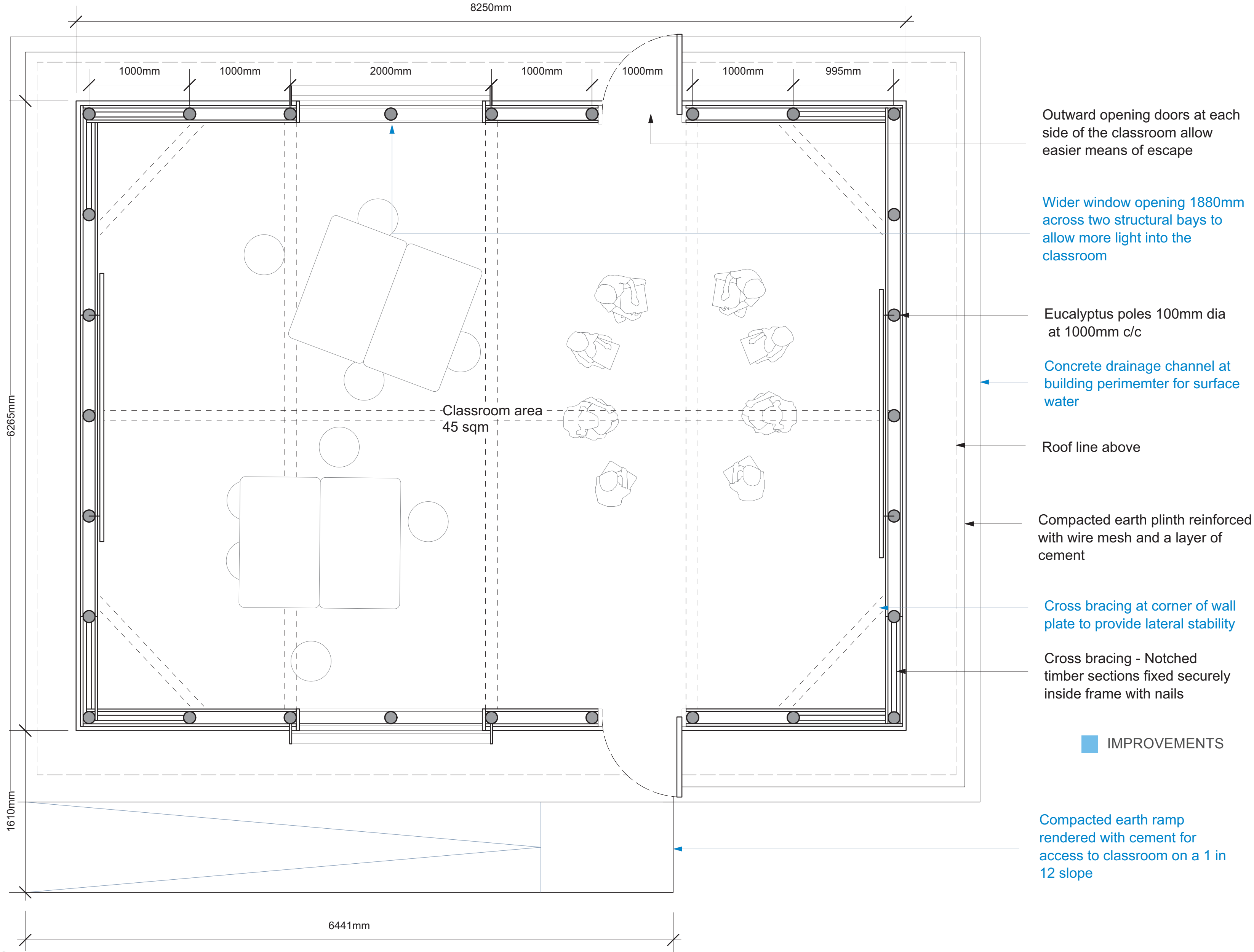
2
• Erect Wall frame, consisting of 100mm eucalyptus poles at 1000mm c/c. Fix split bamboo battens to exterior of upright poles with umbrella nails.
• Nail sawn timber wall plate to top of columns

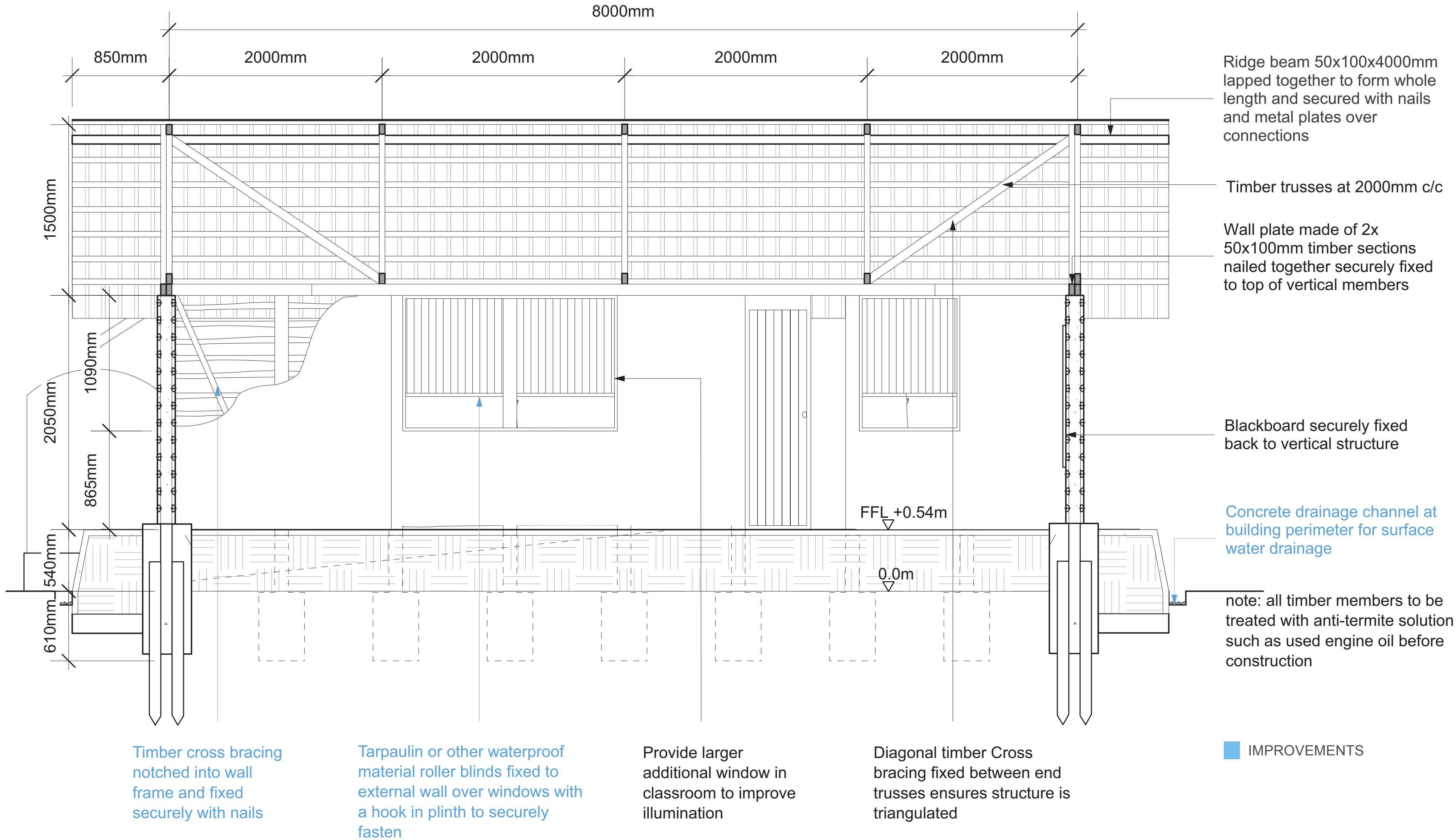
5
• Finish floor with a layer of cement/sand screed on top of blinding and hardcore bed

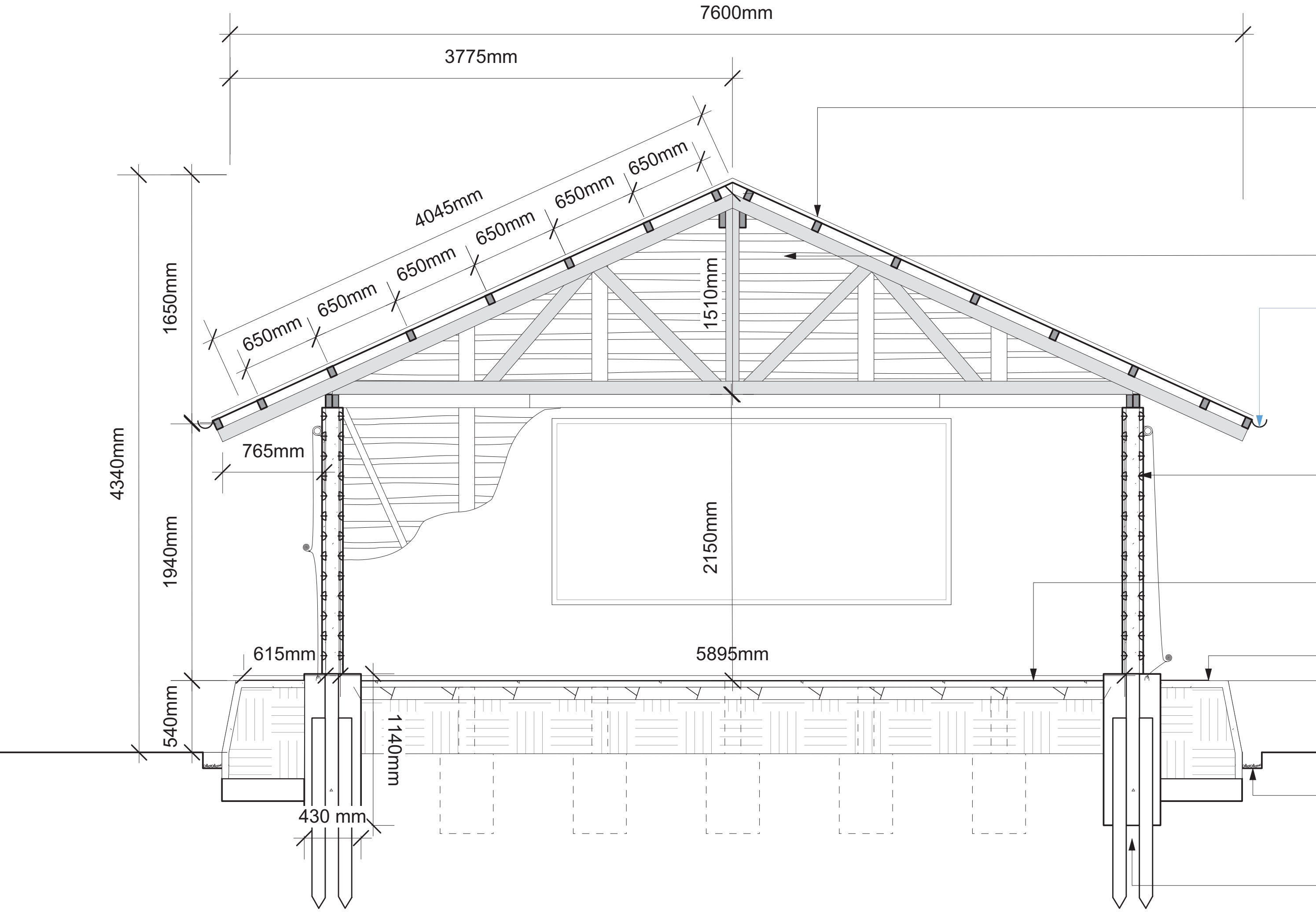
1
• Excavate to desired level below grade.
• Construct pile foundations using bundled eucalyptus poles with concrete capping.
• Construct mud plinth around foundations and render with wire mesh and cement if available

6
• Hang timber windows and doors into openings and fix external tarpaulin blinds into place

FLOOR PLAN SCALE 1:50




8000mm
850mm
2000mm
2000mm
2000mm
2000mm
1500mm
1090mm
2050mm
865mm
540mm
610mm
FFL +0.54m
0.0m
Ridge beam 50x100x4000mm lapped together to form whole length and secured with nails and metal plates over connections
Timber trusses at 2000mm c/c
Wall plate made of 2x 50x100mm timber sections nailed together securely fixed to top of vertical members
Blackboard securely fixed back to vertical structure
Concrete drainage channel at building perimeter for surface water drainage
note: all timber members to be treated with anti-termite solution such as used engine oil before construction
Timber cross bracing notched into wall frame and fixed securely with nails
Tarpaulin or other waterproof material roller blinds fixed to external wall over windows with a hook in plinth to securely fasten
Provide larger additional window in classroom to improve illumination
Diagonal timber Cross bracing fixed between end trusses ensures structure is triangulated
IMPROVEMENTS



ROOF CONSTRUCTION
-CGI Iron Sheets fixed to
-timber purlins 50x75mm at 650m c/c secured with nails and rubber washers
-Timber roof truss composed of 50x100mm members. Secure joints with timber gusset plates

At gable walls Eucalyptus poles 100mm dia at 1000mm c/c securely fixed to roof truss with nails

Drainpipe fixed to roof eaves to collect rainwater

WALL CONSTRUCTION
-100mm dia eucalyptus poles at 1000mm c/c
-50mm dia split bamboo battens fixed to vertical members with j hooks.
-Wall structure infilled with local mud technique: 1 layer - mud/sand, 2 layer-lime/earth/sand, 3 layer - lime/sand

Floor finished with a cement sand screed on sand blinding and 100mm hardcore on compacted earth

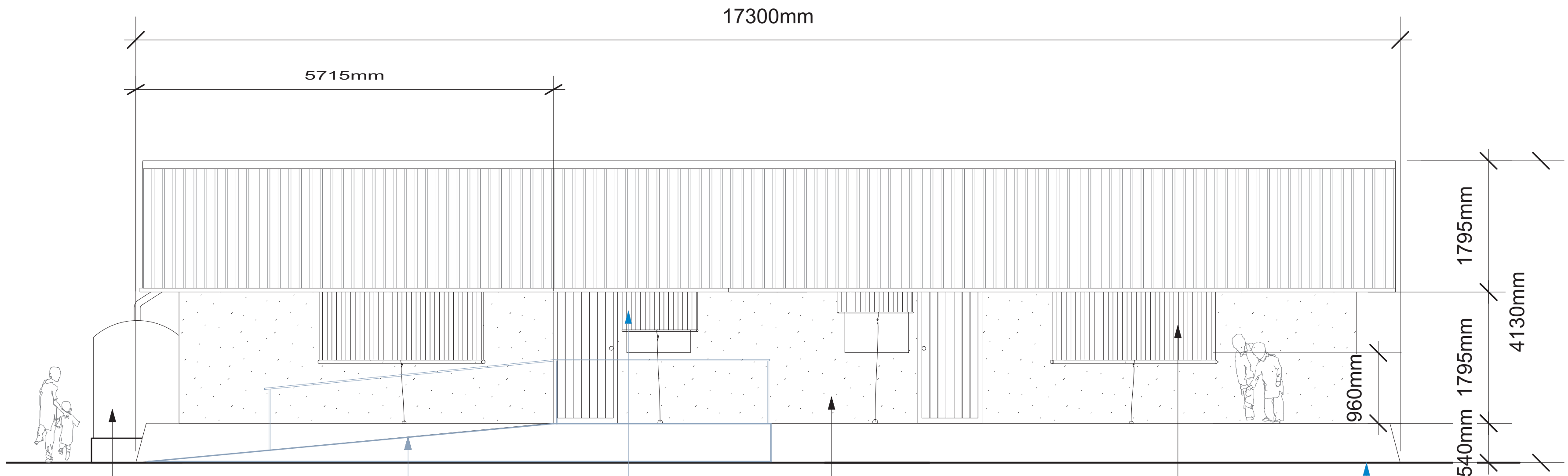
PLINTH
-50mm layer of cement on wire mesh reinforcement
-layer of hardcore apprx 100mm
-Well compacted earth plinth 450mm high

Surface water drainage channel

FOUNDATION
Pile foundation made from three eucalyptus poles bundled and secured together , embedded into a compacted earth base and surrounded with concrete capping

IMPROVEMENTS

LONG ELEVATION SCALE 1:100



Rainwater harvesting tank to store water collected from roof, potentially utilised for hand washing or flushing toilets

Ramp built into mud plinth to allow access to raised classroom level

External tarpaulin blinds protect classroom from rain/sun

Two or more units can be constructed next to another to create a linear sequence of classrooms

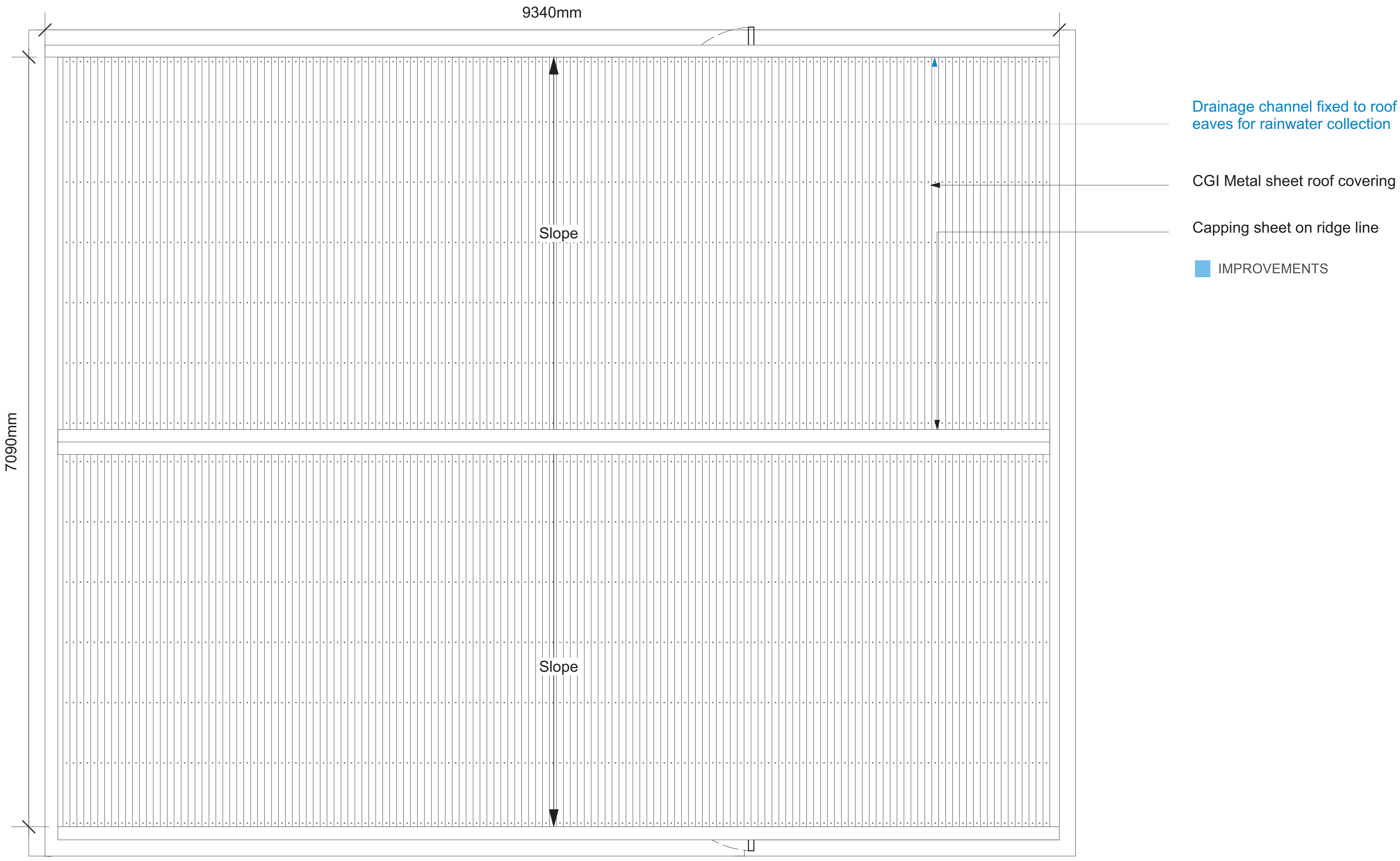
Increase size of windows to 1880x1185mm (up to wall plate) to allow more light into the room

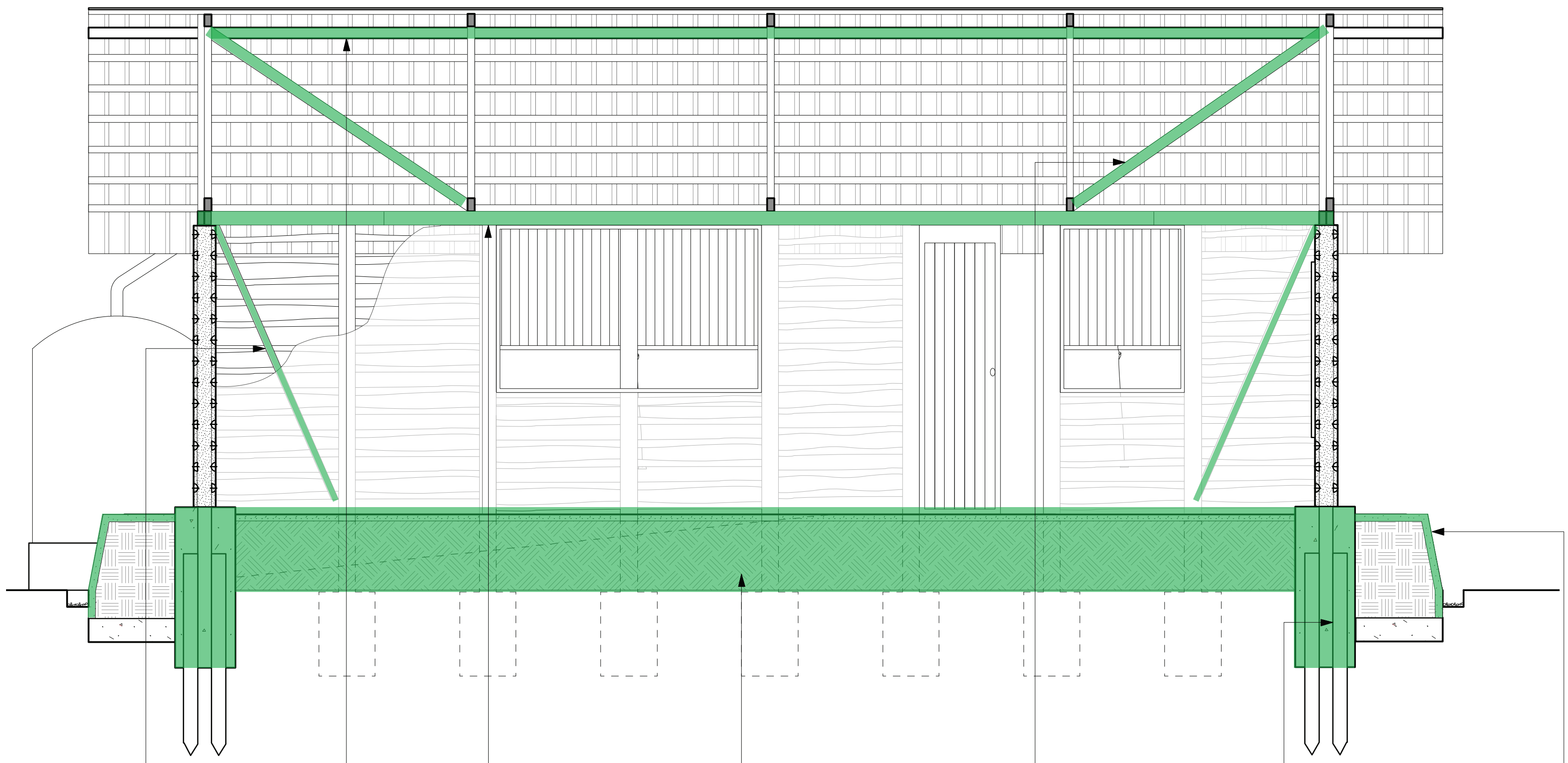
note: window area should be no less than 12% of total surface area of facade

Raised plinth allows clasroom to be accessed in instance of flooding or standing water

IMPROVEMENTS

ROOF PLAN SCALE 1:50



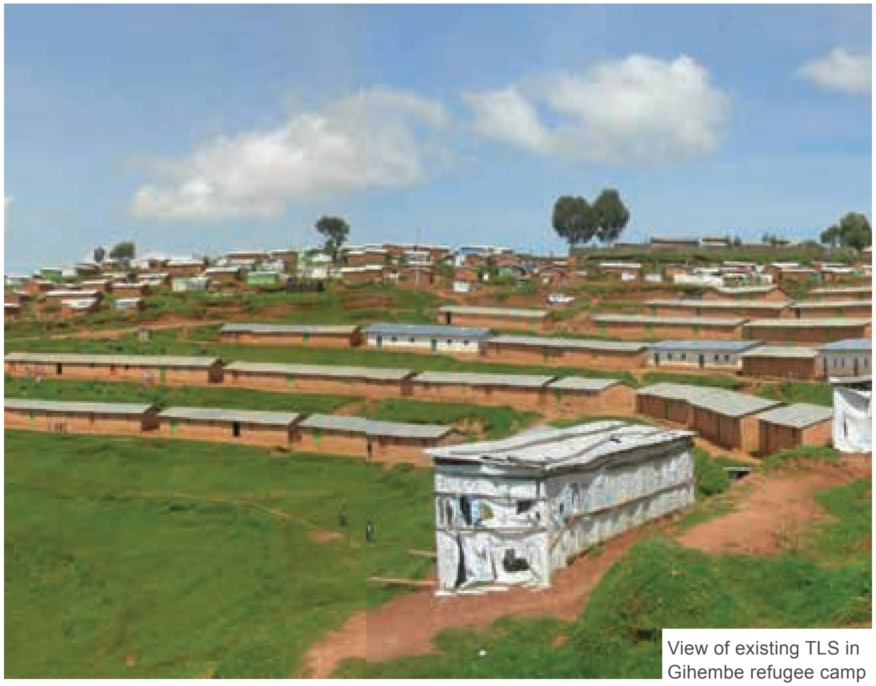

CROSS BRACING
At the corners of the frame to provide lateral stability
RIDGE BEAM
Provides lateral stability for roof
WALL PLATE
Securely connects roof trusses and columns
PLINTH
Finished floor level is raised 450mm above ground to protect from flooding
STRUTS
Diagonal struts between trusses for extra rigidity
FOUNDATIONS
Deep pile foundations prevent building moving in strong flooding
PLINTH PROTECTION
The plinth is rendered with a layer of lime-cement to prevent erosion from rain
DRR FEATURES

BILL OF QUANTITIES

QUANTITIES FOR SINGLE UNIT OF 48m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATIONS:			
Pile foundation	3 Eucalyptus poles bundled	no.	4
Compacted earth and concrete capping		m^3	5
WALLING :			
Eucalyptus pole	100mm	no.	28
Bamboo		no.	20
Mud plaster	Mud, lime and sand	m^3	10
ROOFING:			
CGI roofsheet	3660x1070mm, Gauge 24, 25mm corrugation	pcs.	28
Rige beam, purlin, truss, ridge beam, wall plate	Timber 50x75mm	pcs.	42
	Timber 50x100mm	pcs.	30
	Timber 50x150mm	pcs.	20
FLOORING:			
TOOLS:			
Nails		no.	250
Hoop iron		no.	40

FIELD NOTES

This is space for individual observations



View of existing TLS in Gihembe refugee camp

2011 / UNHCR

Agency:	UNHCR
Location:	Kiziba and Gihembe refugee camps
No. of users:	Kiziba: 3,700 students, Gihembe: 3,653 students (primary schools)
Anticipated lifespan:	5 years (with maintenance)
Actual lifespan:	-
Facilities provided:	Classrooms, WASH facilities, separate boys/girls compost toilets, washing points, external play and recreational spaces
No. of schools constructed:	Designed: 180 classrooms, 109 latrines
Construction time:	Estimated: 1 month for block of 4 classrooms, infrastructure: 2-3 months
Main construction materials	Sandbags filled with gravel and earth, timber poles, CGI sheeting
Material sources:	Locally sourced except CGI sheeting
Project cost/unit:	Estimation: USD 6,650 per classroom
Material cost /unit:	Estimation: USD 5,124 per classroom
Size of units:	Classroom size 8x6m, 48m^2
Size of construction team:	-
Construction Trades:	Basic construction skills
Who built the facilities:	-
Site information:	Sites on steep slopes, earthquake and soil erosion risk, land ownership issues

Background

Due to the continuing conflict over land and violent clashes in the Democratic Republic of the Congo (DRC) North and South Kivu provinces bordering with Rwanda, a large amount of refugees have fled to Rwanda's western region over recent years. The last wave of new refugees was pushed into Rwanda in the beginning of 2012.

Rwanda hosts 43,000 refugees, and over 99%are from the DRC. The majority of these refugees live in three camps, in Gihembe, Kiziba and Nyabiheke, with a small number residing in the capital, Kigali. This brings the total of refugees and asylum seekers in Rwanda to more than 57,600.

The living conditions in the refugee camps are harsh, with crowded living conditions, crowded shelter and serious problems with poor soil, inclement weather and erosion on the steep hills. There is a lack of access to cultivable land around the camps, making it impossible for refugees to supplement their food rations by growing their own food. The lack of land including for food growing and income-generating activities, limits on access to education and low skill levels all hinder the self-reliance of the refugees.

Project Description

The project was designed by a group of architects, Nerea Amoros Elorduy, Tomà Berlanda and Killian Doherty, for UNHCR. The objective was to propose a sustainable strategy to upgrade the existing learning environment in the refugee camp including the built classroom structures, external play area as well as propose a sustainable solution for the pressing issue of land erosion.

Rwanda's topography is very mountainous and earthquake prone. The issues of soil erosion, water management and general lack of land are some of the main challenges faced throughout Rwanda.

The existing learning spaces in the refugee camps are in poor condition with external walls collapsed due to un managed surface water eroding the hillsides, as well as general low quality.

In response to the challenged location of the refugee camp, an incremental approach was proposed to respond to the great need for child-friendly learning spaces and landscape interventions that protect the learning spaces from future land erosion and flood water. In its first phase new retaining walls, surface water drainage, terracing and compost toilets are proposed. This is followed by the partly rebuilding and adding additional classrooms to the existing school environment, as well as including space for food growing and plays areas.

The ownership of the refugee camp land is disputed between locals and local government and therefore any permanent construction techniques involving more durable materials are not possible.

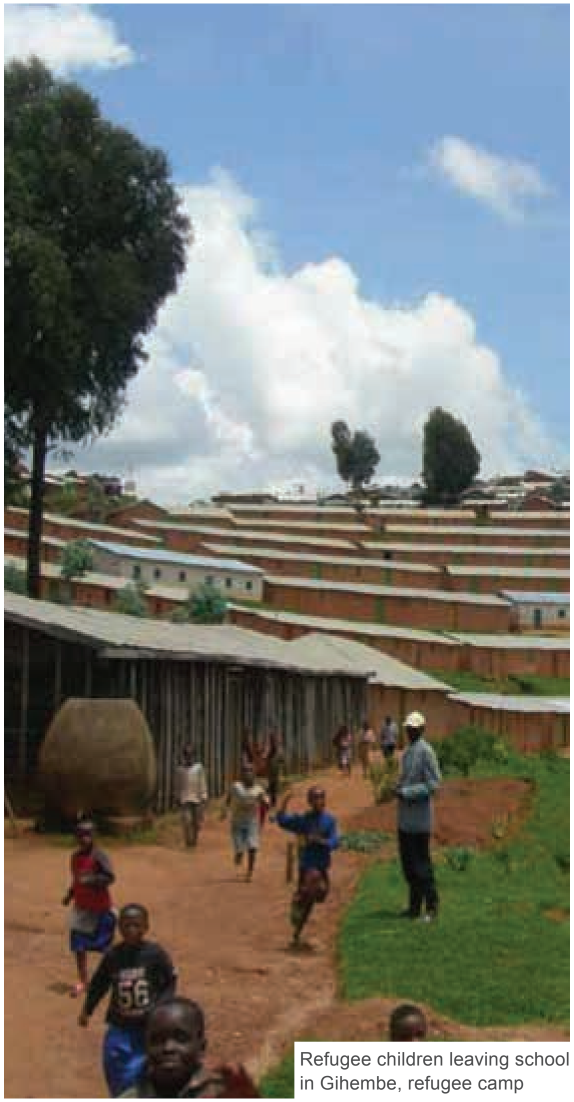
TLS SUMMARY

The proposal for the new classrooms aims to take advantage of the steeped landscape, by clustering four classrooms and using the natural fall of the hill to collect the rain water in storage tanks. This strategy contributes to collect washing and drinking water, as well as manages the surface water effectively.

The main construction technique for the new classrooms is a 'sandbag construction'. It is a very effective construction method to build low-cost load-bearing walls with very good thermal properties. It is a very simple method that can be easily learned by unskilled workers and is perceived as a non-permanent construction technique. The load-bearing, dense quality of the sandbag construction allows the retaining walls to be part of the classroom walls, making it cost-effective and providing a constant temperature inside the classroom, thus assisting children to learn during the hot season.

DRR

The DRR component is well integrated into the overall design concept. The sandbag walls are earthquake resistant through their elastic nature, bracing within a timber structure and anchored firmly into the ground. Another advantage is its minimal use of timber or burned bricks, and therefore does not contribute to further deforestation in Rwanda, which is one of the main environmental challenges. The training of the local refugee community and host community in these construction techniques aimed to contribute to pilot good practice and introduce alternative construction methods.



Refugee children leaving school in Gihembe, refugee camp


Example of sandbag construction technique


Vernacular techniques of retaining steep slopes in Rwanda


External wall of TLS collapsing,due to subsidence and lack of surface water drainage


Terraced TLS within Gihembe refugee camp

All photos: UNCHR PO/KIG/11/21

3D VIEW

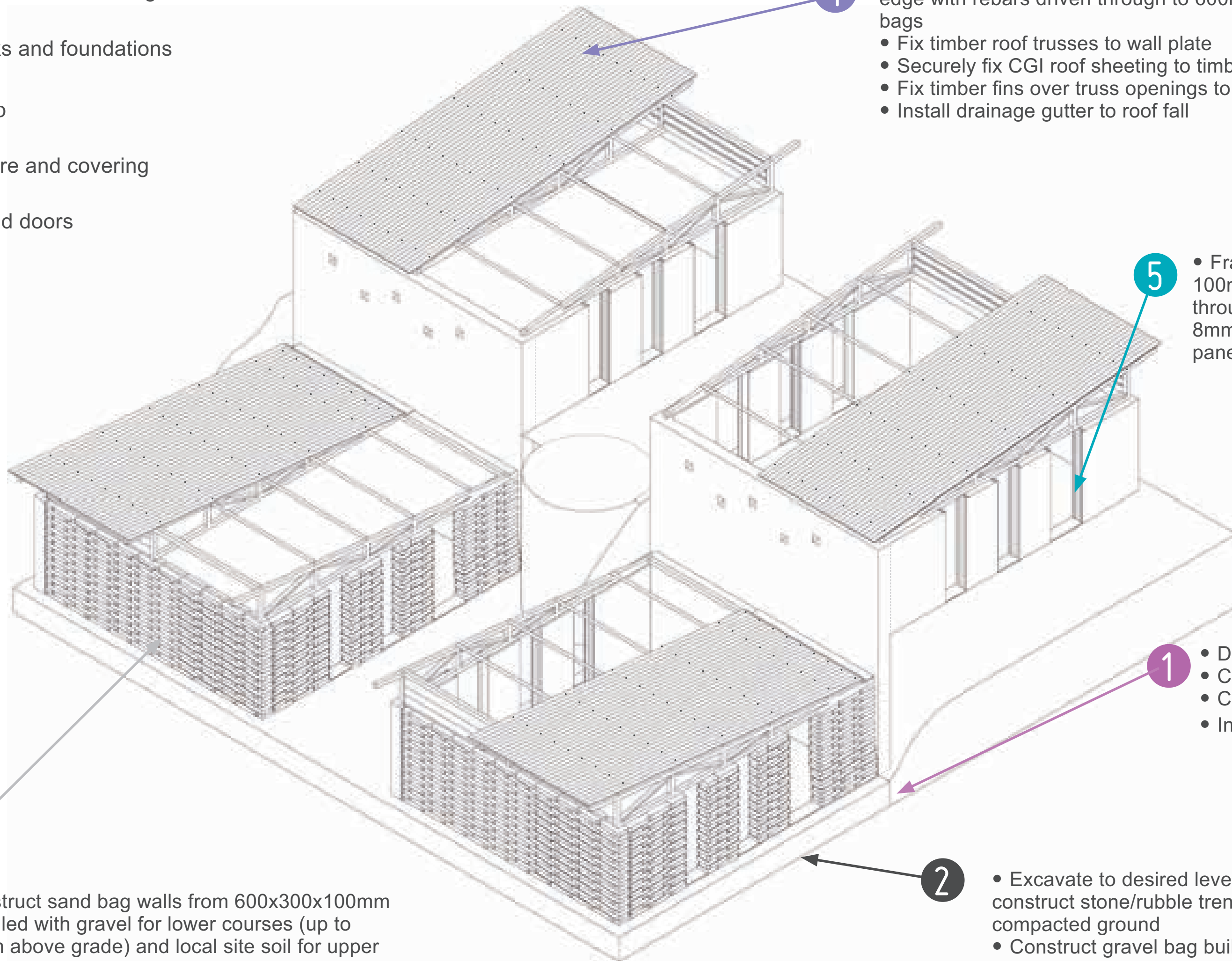
1 Site works and water management

2 Groundworks and foundations

3 Wall build up

4 Roof structure and covering

5 Windows and doors



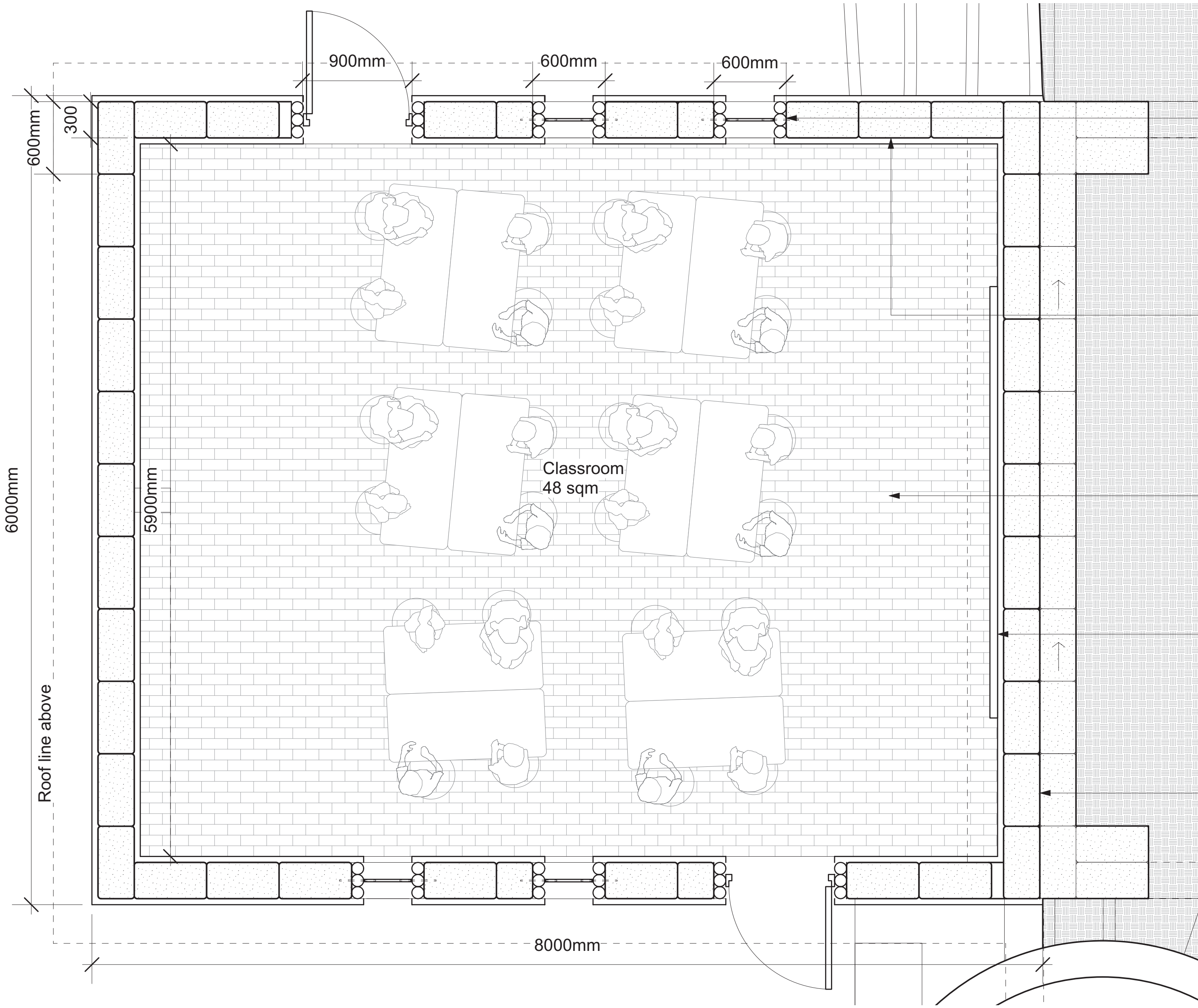
4
- Fix 100mm structural timber wall plate on top of wall edge with rebars driven through to 600mm into earth bags
- Fix timber roof trusses to wall plate
- Securely fix CGI roof sheeting to timber purlins
- Fix timber fins over truss openings to allow ventilation.
- Install drainage gutter to roof fall

5
- Frame window openings with 100mm dia bamboo secured through to earth bag walls with 8mm re-bars. Construct door panels with bamboo panels

1
- Demolition of existing building
- Cut and fill of site and grading of land
- Construct retaining walls on slopes
- Install stone water tanks

3
- Construct sand bag walls from 600x300x100mm bags filled with gravel for lower courses (up to 150mm above grade) and local site soil for upper courses. Ensure bags are laid straight, butted against one another and maintain a running bond
- Render walls internally and externally with 50mm of earth plaster

2
- Excavate to desired level below grade and construct stone/rubble trench foundation on well compacted ground
- Construct gravel bag building retaining wall and drainage trench laid to falls. Tank with approved geo-textile



DOORS AND WINDOWS
Opening in wall framed with 100mm dia bamboo. Frame fixed through earthbags with 8mm rebars.

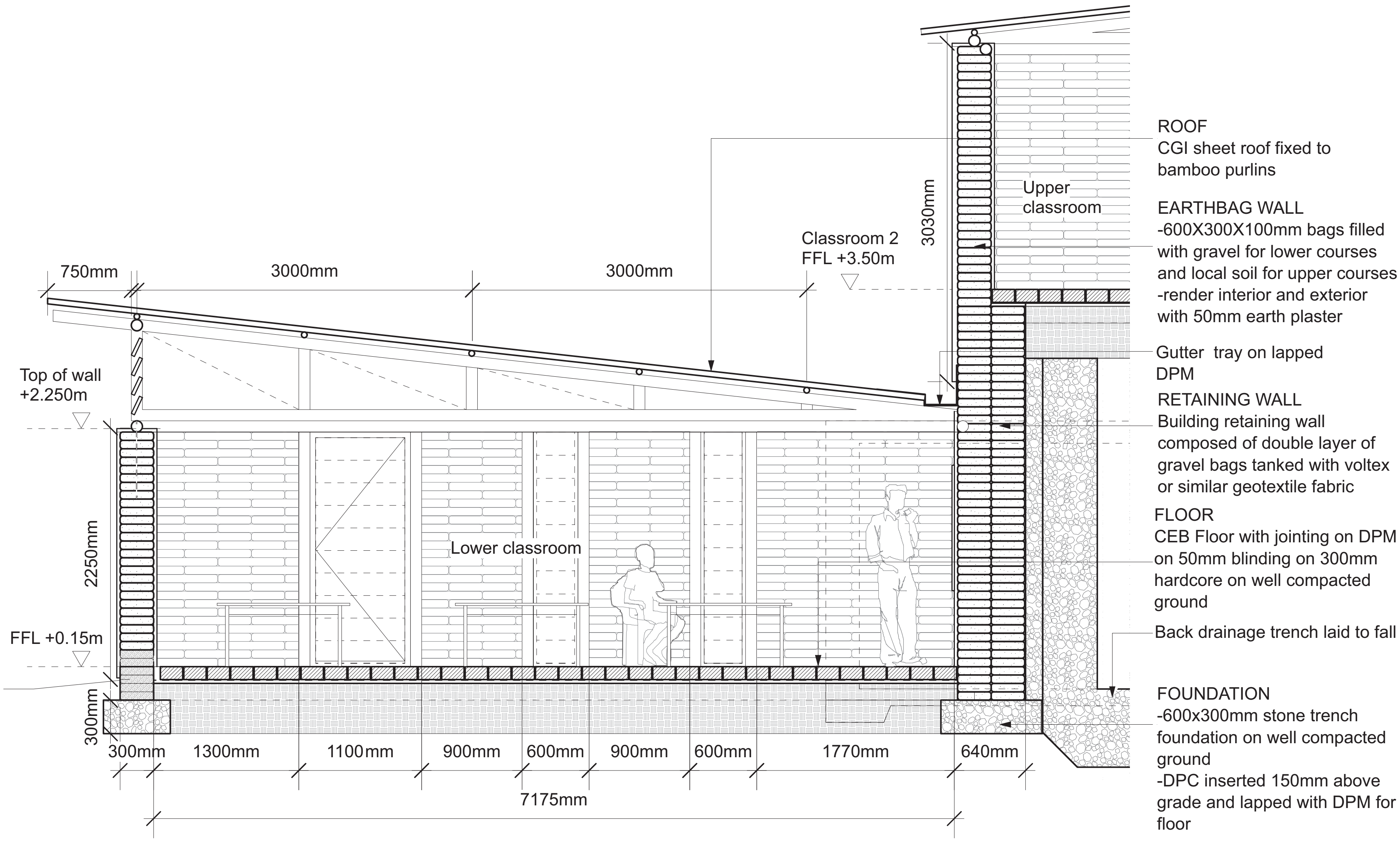
EARTHBAG WALL
Walls composed of 600x300x100mm bags filled with loose aggregate/gravel or local site soil
-Render both sides of wall with earth plaster 50mm thick

FLOOR
Compressed earth block floor with jointing on 50mm blinding on 300mm hardcore on well compacted ground

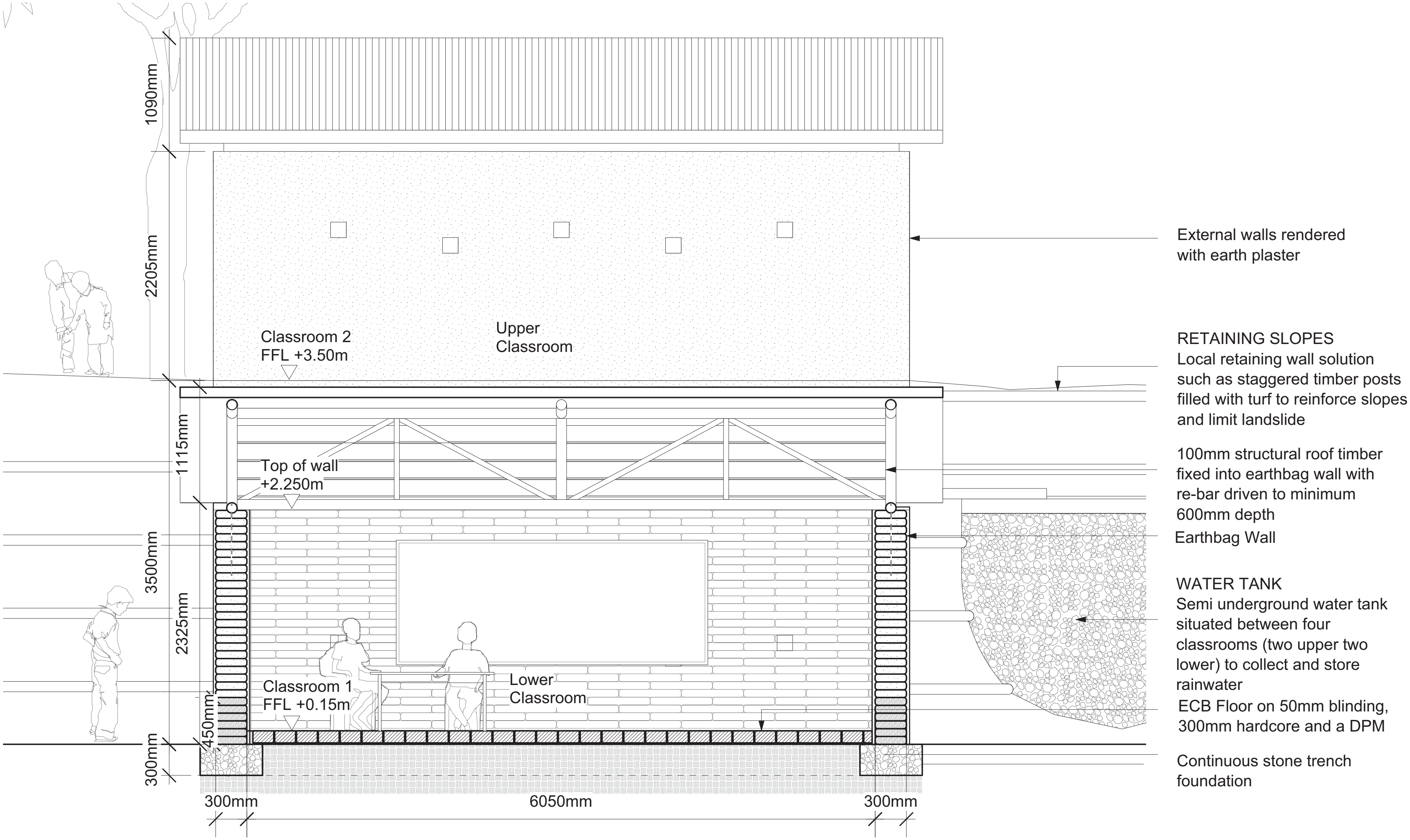
Blackboard fixed securely to earthbag wall

RETAINING WALL
Double thickness gravel bag wall tanked with voltex or similar geotextile fabric

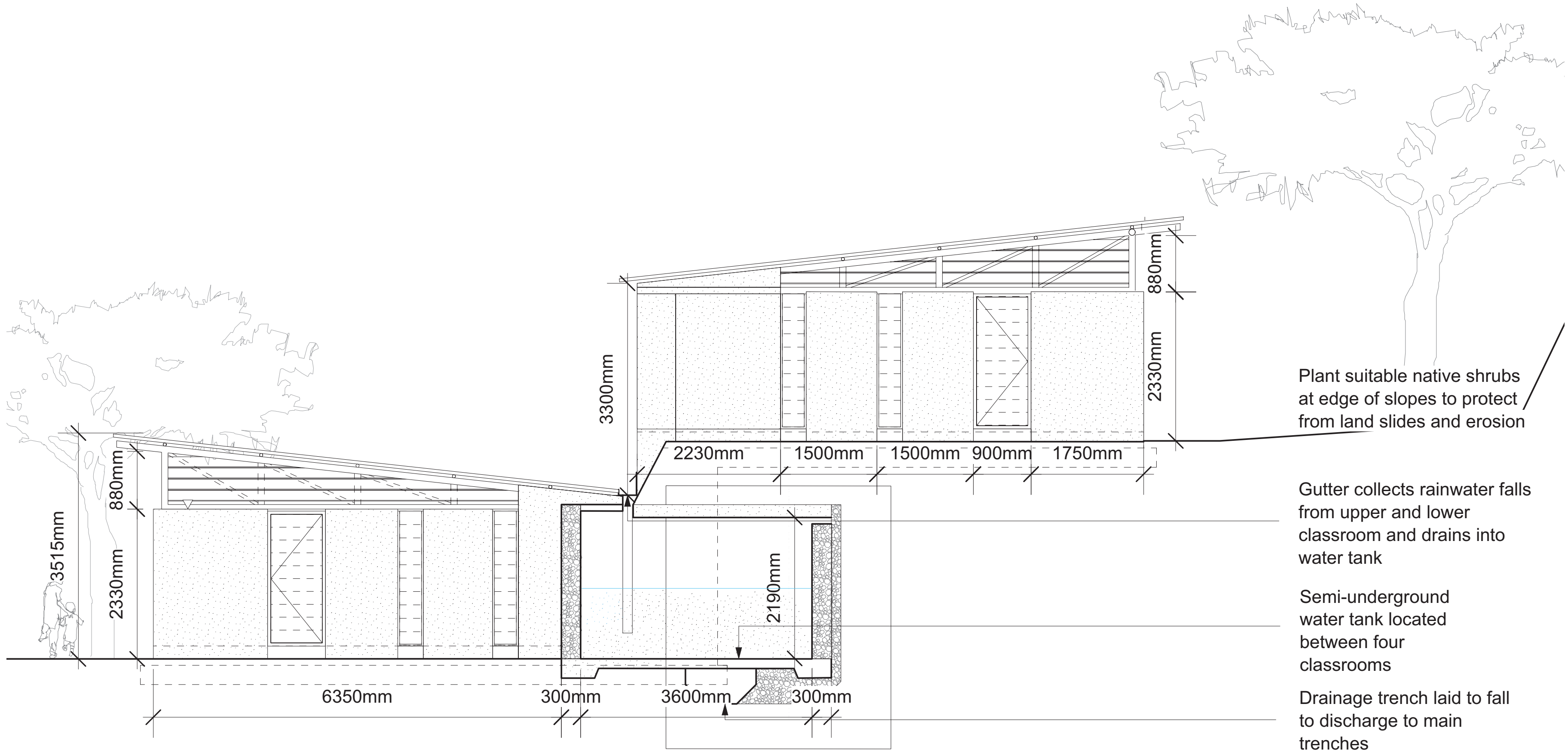
LONG SECTION NOT TO SCALE



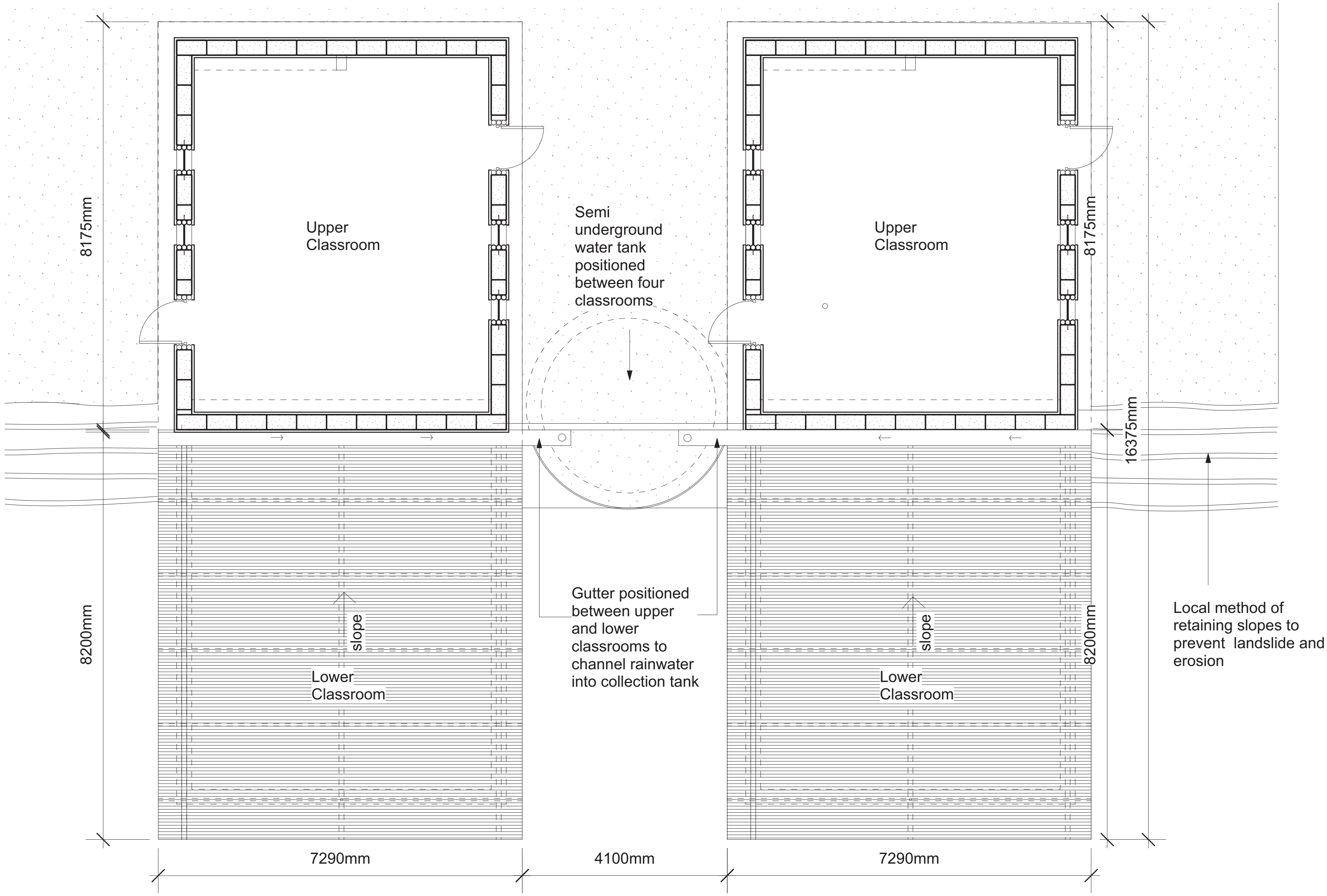
SHORT SECTION NOT TO SCALE



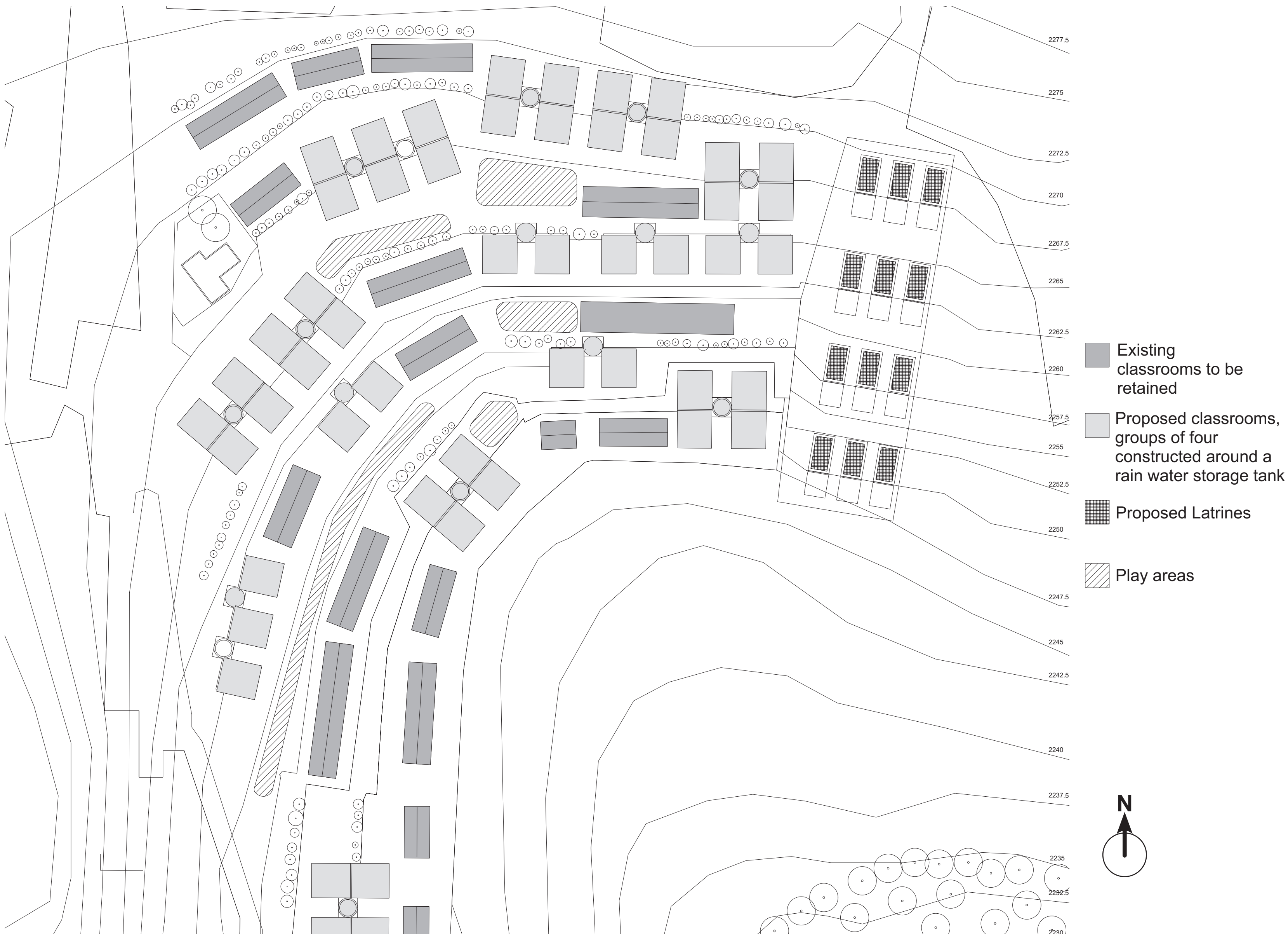
LONG ELEVATION SCALE 1:100

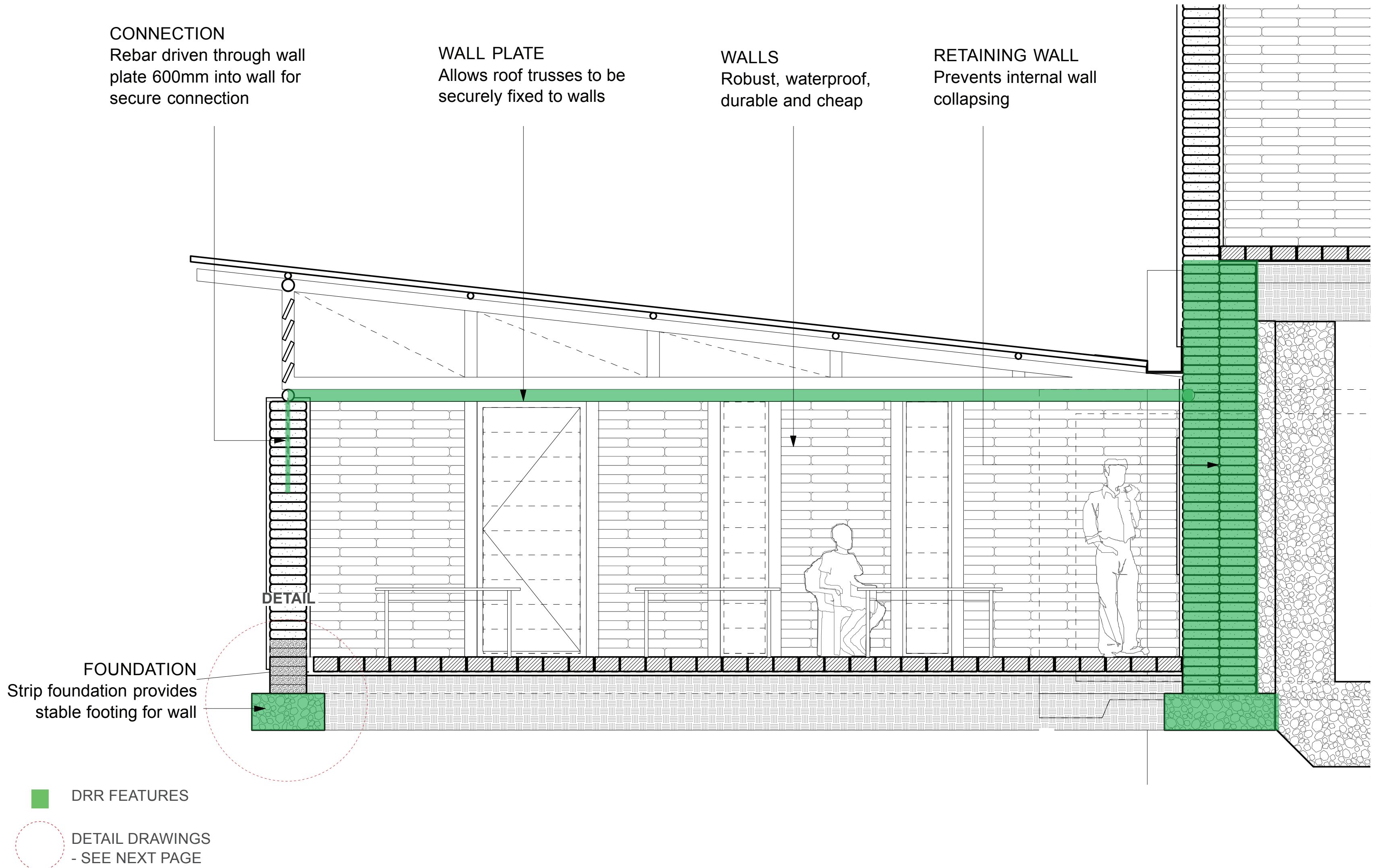


ROOF PLAN NOT TO SCALE

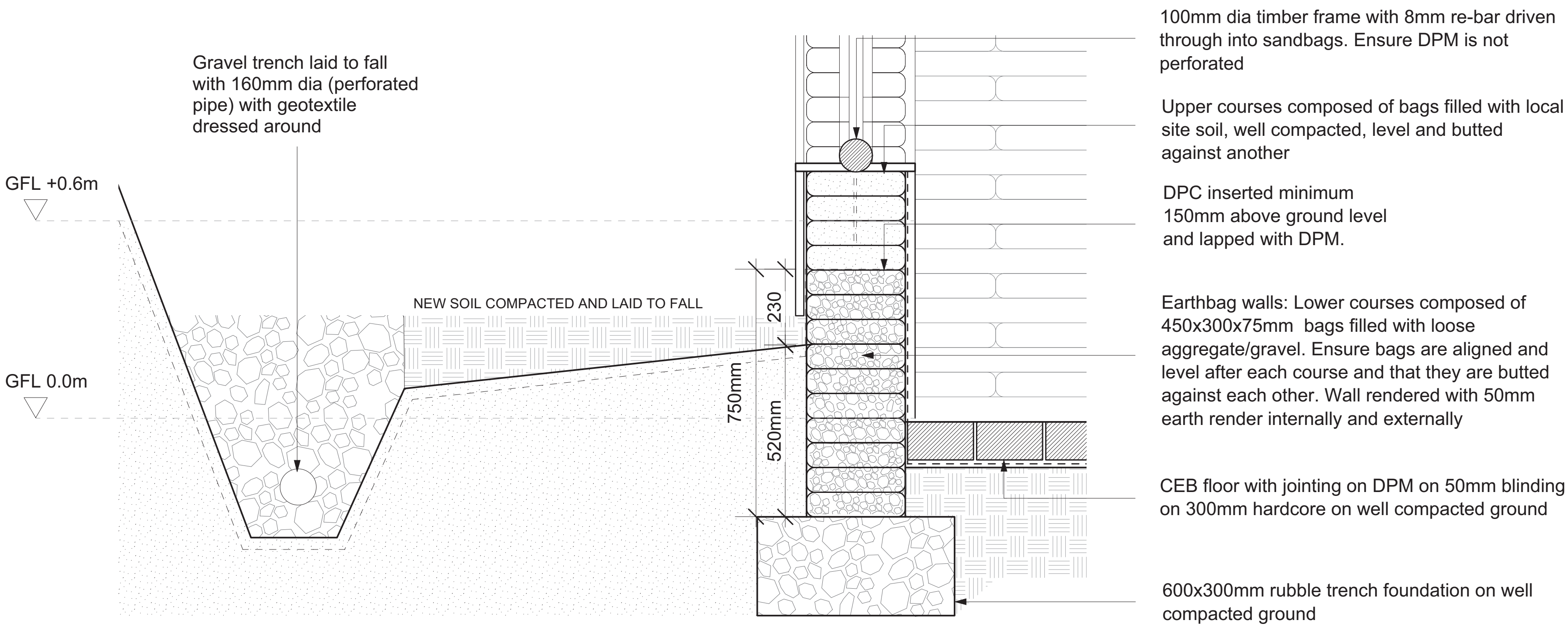


SITE PLAN SCALE 1:1250




CONNECTION
Rebar driven through wall plate 600mm into wall for secure connection
WALL PLATE
Allows roof trusses to be securely fixed to walls
WALLS
Robust, waterproof, durable and cheap
RETAINING WALL
Prevents internal wall collapsing
DETAIL
FOUNDATION
Strip foundation provides stable footing for wall
DRR FEATURES
DETAIL DRAWINGS
- SEE NEXT PAGE

DETAIL SCALE 1:20



Detail through foundation and drainage channel 1:20

QUANTITIES FOR SINGLE UNIT OF 48m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATION :			
Excavation	To 600mm below grade	m^2	31.00
Compacted earth	Well compacted earth	m^3	31.00
Stone	Recycled local rubble, strip foundation d=300mm	m^3	5.25
RETAINING WALL :			
Gravel bag	600x300x100mm, loose gravel	no.	360.0
Tanking	'Voltex' or similar geotextile fabric	m	60.0
WALLING :			
Earth bag	600x300x100mm, loose aggregate/gravel	no.	45.00
Gravel bag	600x300x100mm loose gravel	no.	256.00
Plaster	Earth plaster 50mm thick	m^2	573.00
ROOFING :			
Truss	Timber poles 100mm dia	no.	46.00
Purlin	Timber poles 50mm dia	no.	
Louvre	Timber poles 30mm dia	no.	38
CGI wall sheet	2400x1150mm, Gauge 24, 25mm corrugation	no.	30
FLOORING :			
Earth compacted block	d=150mm	m^2	48.00
DPM		m^2	48.00
OPENINGS :			
Door frame	Bamboo 100mm dia	no.	2
Timber door		no.	2
Timber louvres	For all openings	no.	
WATER TANK :			
Compacted stone		m^2	10.00
Concrete render		m^2	10.00

Child-freindly space in Zamzam IDP camp

Photo: Plan International /Darfur

2011 / PLAN INTERNATIONAL

Agency:	Plan International
Location:	North Darfur, Sudan
No. of users:	Total: 13,775 children and approx. 225 volunteer staff, classroom: 40m^2 @ approx. 84 children
Anticipated lifespan:	Max. 18 month
Actual lifespan:	Max. 12 month
Facilities provided:	Classrooms, large feeding shelter, WASH facilities, drinking water & hand washing point, office, security fence
No. of schools constructed:	41 schools (incl. 2 classrooms, feeding shelter, 82 latrines)
Construction time:	15 days per classroom, 60 days per school
Main construction materials	Bamboo, plastic sheets, steel pipe, bricks, local grass thatch
Material sources:	Locally sourced
Project cost/unit:	USD 4,500 (per school)
Material cost /unit:	USD 563 (per unit)
Size of units:	Classroom: 8x5m, 40m^2, office size: 4x5m
Size of construction team:	5 craftsmen and 15 labourers, 1 engineer
Construction Trades:	Basic local construction skills
Who built the facilities:	Local craftsmen and contractors with local community
Site information:	Land ownership issues/ security issues

Background

Before the current Darfur conflict, Zamzam was a village located 15 km southwest of El Fasher town with a population estimated to be not more than 400 households. As a result of the conflict in Darfur, people began to move to Zamzam in 2004 and IDP population grew to an estimated 43,000 people. Since then continuous waves of displaced people have arrived in the IDP camps.

In December 2010, a large number of IDPs began arriving in Zamzam camp as a result of renewed fighting in the south of Darfur and East Jabel Mara. According to figures provided by local leaders, between mid-December 2010 and late March 2011, 47,460 new individual IDPs settled south of the camp making up the 'new' Zamzam C. According to Plan's Camp Management Assessment Report from October 2011, the total caseload for Zamzam camp is approximately 147,000 IDPs approximately (29,400 households).

226 classrooms, latrines and water storage facilities were damaged in recent violence, increasing the risk of water born diseases. Classrooms were also damaged by flooding. Local materials are used in the school constructions, which are in need of rehabilitation every year and are susceptible to fire. In addition, many schools did not have security fences attracting animals to eat the grass of the structures as there is a lack of animal foot available.

Project Description

Plan International has been working in Darfur since 2005 in three IDPs camps and in 2011 extend its operation to Tawila locality west of southwest of El Fasher. The nature of the operation in North Darfur is emergency response. Plan International is providing psychosocial support for vulnerable and affected children through trained community animators in 41 child-friendly centres (CFSs) that have been built by Plan International. About 13,775 children attend the CFSs and benefit from psychosocial response and educational services. Now the situation is moving towards the early recovery phase, which requires continued funds for rehabilitation and development to support vulnerable children and affected IDPs.

Together with the State Council of Child Welfare Dept (SCCW), UNICEF and Ministry of Education, Plan International is providing psychosocial support trainings for community animators/community child protection network and partners, trainings on family tracing report, management of CFSs, trainings on child rights and child protection issues and provision of psychosocial repose for children. Moreover, Plan International has initiated and trained some community volunteers to become community work assistants supporting children with special needs who are not covered by CFS services, identified and supported children who were denied access to CFS due to domestic and other responsibilities within their households, and provided additional support for separated and traumatised children.

The CFSs are serving as community centres where the community leaders, youth, women and parents gather to discuss different issues related to child protection and child rights ensuring participation of the community in the affairs of the centre. Child Friendly Spaces are also serving as registration points for separated children as a step to facilitate family reunification. The trained staff make the centres available and accessible for all children by primarily offering psychosocial response, guaranteeing children the opportunity to return to some normality in their lives and provision of safer environments, protecting children from exposure to abuse, exploitation and violence in the area.

Shelter Description

The classroom structure is an 8x5m rectangular space. The main structure is a steel structure with secondary bamboo poles, tarpaulin sheeting wall covering and a local grass thatching for roof covering. The thatching is a very effective technique to keep the inside of the space cool in the very hot and dry climate. The steel poles are dug 600 mm deep into the ground on pad foundations to give sufficient anchoring into the ground. A concrete foundation would be beneficial, especially in areas that are prone to flooding to protect the structure from collapse.

DRR/DRP

So far IDPs are using their own cultural and traditional knowledge for disaster preparedness. This includes for example their vernacular construction techniques. Training local people on DRR and DRP is very important, but the required funds are currently not available.

Challenges

Since we are working in an emergency situation we are using local materials and techniques to construct the structures. These vernacular construction techniques require regular maintenance and rehabilitation and an allocated maintenance budget.

Improvements

• Consider including a compacted earth floor to protect children from vector borne diseases, especially younger children sitting on the floor.

• Include cross-bracing to the main structure to give more strength and durability to the main frame.

• Consider including enlarged roof overhang to protect from direct sun entering the room

• Structure to be located on higher ground with perimeter drainage to protect from flooding

Lesson learned

Working with community leaders and local CBOs is very much appreciated and an essential component. In our experience it has led to strengthen the capacity of people, plus encourages empowerment and sustainability when families return to their village of origin.

Zamzam IDP camp

Photo: dfait_maeci/flickr

Community leaders attend training on child rights and protection

Damaged structure after flooding

Activities inside child-friendly space in Zamzam camp

Non-food items for IDP children in Zamzam IDP camp

Photos: Plan International / Darfur

3D VIEW

1 Foundation and groundworks

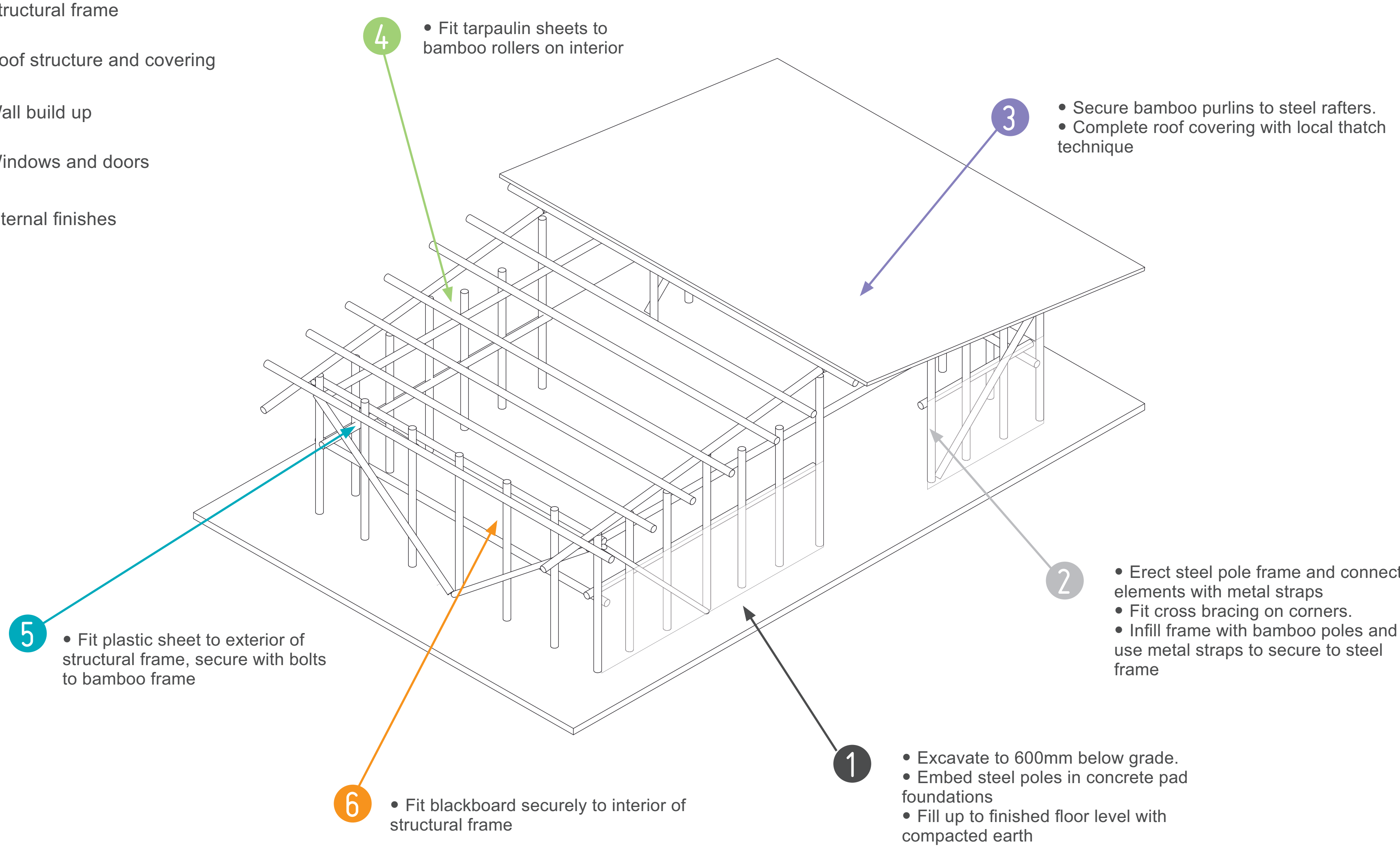
2 Structural frame

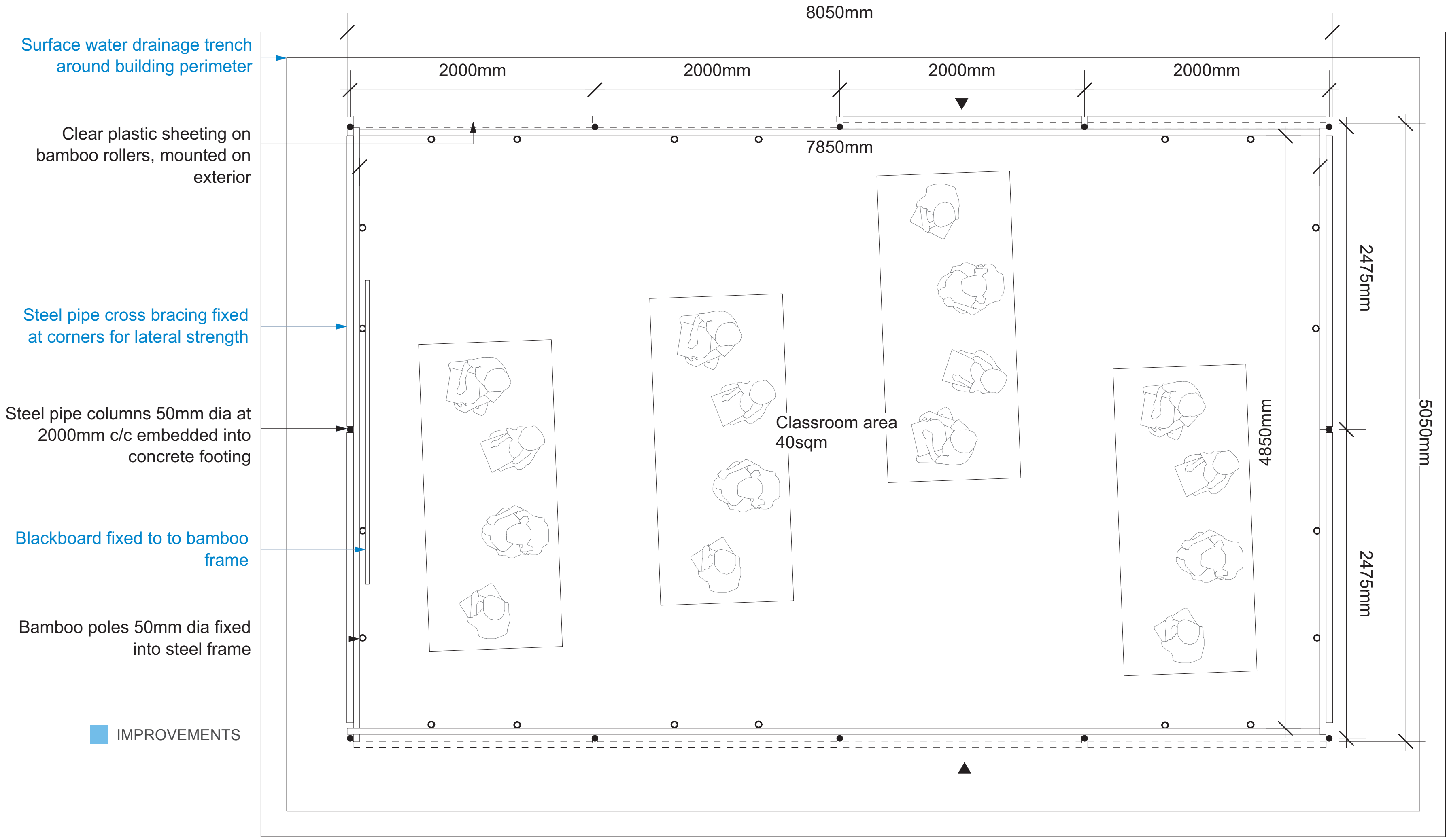
3 Roof structure and covering

4 Wall build up

5 Windows and doors

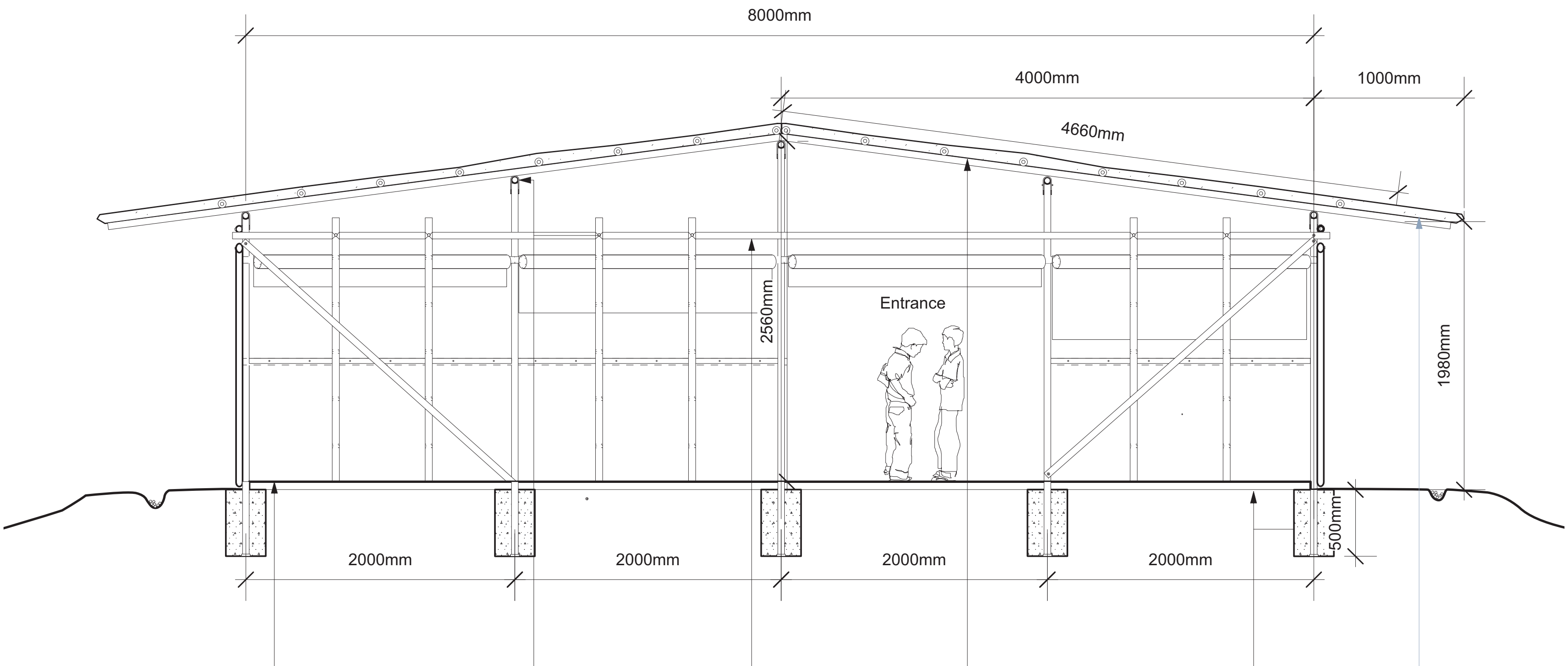
6 Internal finishes





8050mm
2000mm
2000mm
2000mm
2000mm
7850mm
Surface water drainage trench around building perimeter
Clear plastic sheeting on bamboo rollers, mounted on exterior
Steel pipe cross bracing fixed at corners for lateral strength
Steel pipe columns 50mm dia at 2000mm c/c embedded into concrete footing
Blackboard fixed to to bamboo frame
Bamboo poles 50mm dia fixed into steel frame
IMPROVEMENTS
Classroom area 40sqm
4850mm
2475mm
2475mm
5050mm

LONG SECTION SCALE 1:50



FLOOR
Compacted mud floor 60mm constructed on level ground

CONNECTIONS
-Metal straps used at junctions to secure connections.
-Cables wrapped over pin joints to restrict movement

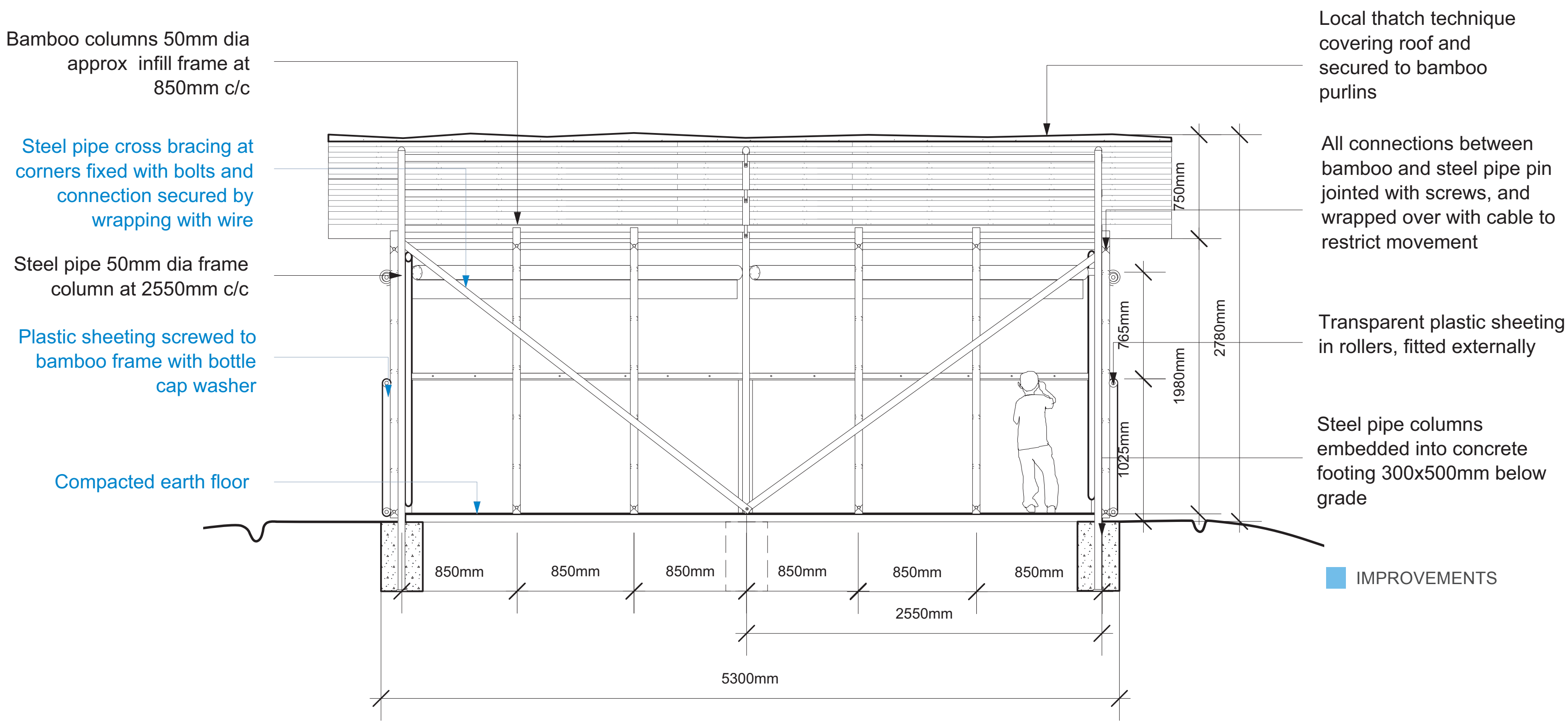
STRUCTURAL FRAME
-Steel pipes 50mm dia, various lengths fixed into concrete footing.
-Bamboo poles 50mm dia fixed into steel main frame
-Steel cross bracing fixed internally at corners for lateral resistance

ROOF
-Local thatch technique used for roof covering, Bamboo purlins at 600mm c/c
-Steel pole rafters at 2000mm c/c fixed to vertical poles

FOUNDATIONS & FLOOR
-Compacted mud floor 60mm
-Steel poles embedded into concrete footing 500mm below grade

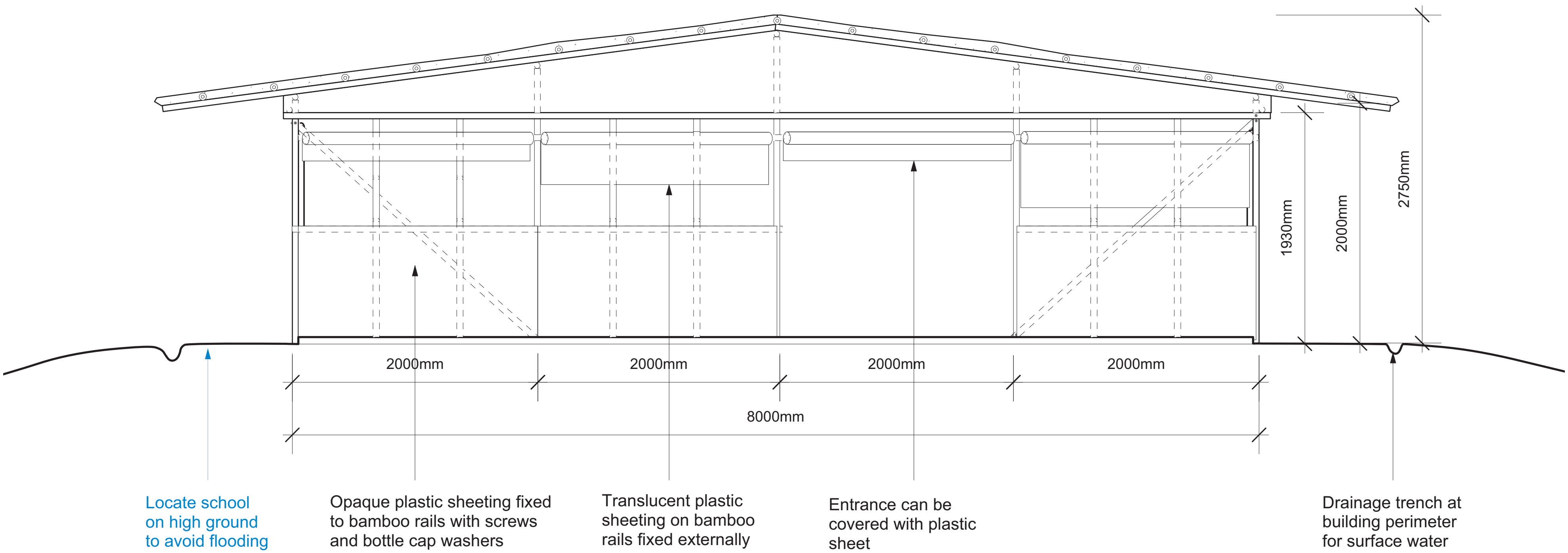
Extend roof overhang to 1000mm to protect walls against rain

IMPROVEMENTS

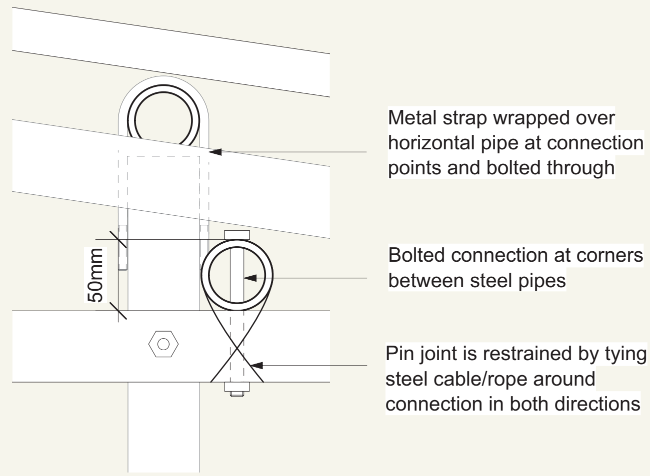


Bamboo columns 50mm dia approx infill frame at 850mm c/c
Steel pipe cross bracing at corners fixed with bolts and connection secured by wrapping with wire
Steel pipe 50mm dia frame column at 2550mm c/c
Plastic sheeting screwed to bamboo frame with bottle cap washer
Compacted earth floor
Local thatch technique covering roof and secured to bamboo purlins
All connections between bamboo and steel pipe pin jointed with screws, and wrapped over with cable to restrict movement
Transparent plastic sheeting in rollers, fitted externally
Steel pipe columns embedded into concrete footing 300x500mm below grade
IMPROVEMENTS
750mm
765mm
1980mm
2780mm
1025mm
850mm
850mm
850mm
850mm
850mm
850mm
2550mm
5300mm

LONG ELEVATION SCALE 1:50



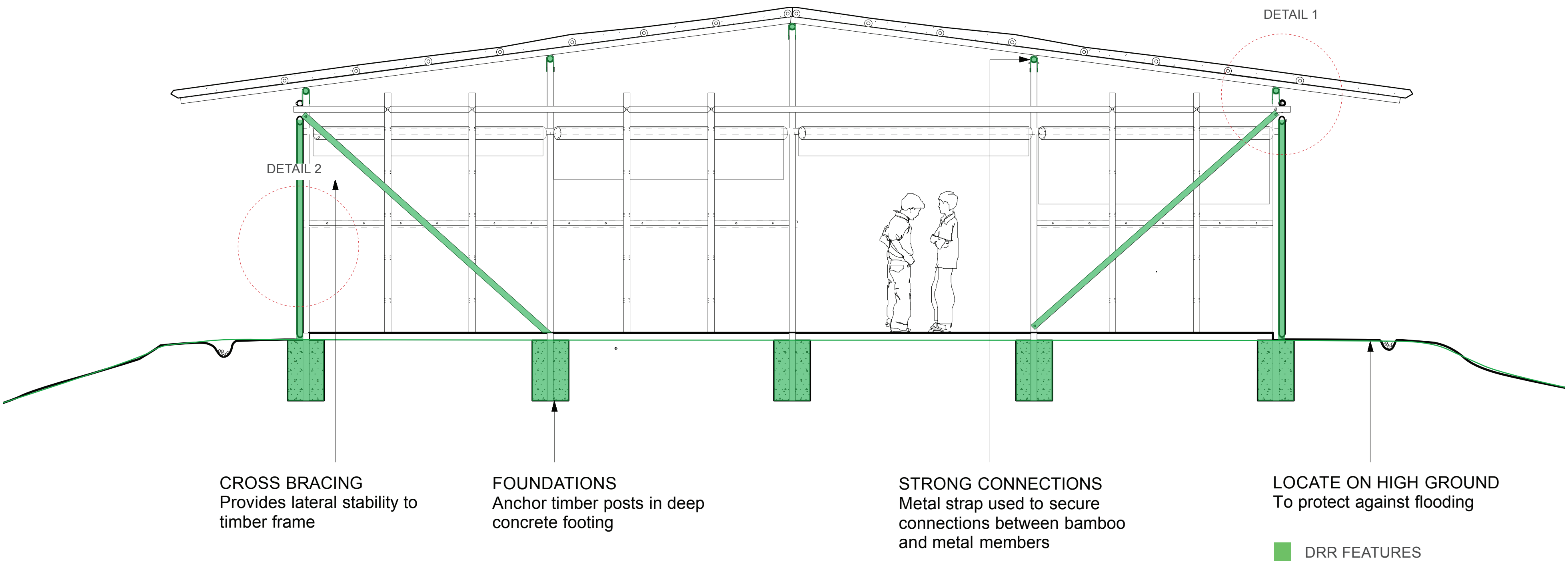
QUANTITIES FOR SINGLE UNIT OF 40m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATIONS :			
Excavation	600mm below grade	m^3	0.56
RC	Pad foundation 600mm below grade	m^3	0.56
STRUCTURE :			
Beam A	Steel hollow pipe, 2000mm length, 100mm dia	no.	4.00
Beam B	Steel hollow ppe, 2475mm length, 100mm dia	no.	8.00
Pole A	Steel hollow pipe, 2500mm length, 50mm dia	no.	6.00
Pole B	Steel hollow pipe, 2850mm length, 50mm dia	no.	4.00
Pole C	Steel hollow pipe, 3000mm length, 50mm dia	no.	2.00
Poles	Bamboo poles, 50mm dia	no.	28.00
Cross bracing	Bamboo polese 50mm dia	no.	6.00
WALLING :			
Plastic sheet (flexible)	Flexible translucent plastic 4000x5000mm	no.	45.00
Plastic sheet (Rigid)	Rigid translucent plastic	m^2	7.00
ROOFING :			
Roof covering	Local thatch	m^2	41.00
Purlin	50mm dia	no.	16.00
Rafter	50mm dia	no.	6.00
Connection	Metal straps, bolts	packs	10.00
FLOORING :			
Compacted mud floor	d=60mm	m^2	41



DETAIL 1 : Connection between steel pipes

DETAIL 2: Connection between bamboo window frame

DRR FEATURES SCALE 1:50



FIELD NOTES

This is space for individual observations

Photo credit: UNICEF/DRC

2011 / ECD UNICEF

Agency:	UNICEF
Location:	North Kivu, South Kivu, and Orientale provinces
No. of users:	Total program: 70,000 conflict-affected children ,classroom: 56m^2 @ 50 children
Anticipated lifespan:	-
Actual lifespan:	-
Facilities provided:	Classrooms for ECD/primary school, gender-separated sanitation facilities, hand washing point, security fence, ECD learning kit
No. of facilities:	3,000 protective learning spaces (adapted/ set-up)
Construction time:	-
Main construction materials	Local timber poles, plywood boards/ plastic sheeting, CGI sheeting
Material sources:	Locally sourced
Project cost/unit:	USD 2,565 (incl. material, labour, transport cost)
Material cost /unit:	USD 1,900
Size of units:	Classroom/ ECD space: 8mx7m, 56m^2
Size of construction team:	-
Construction Trades:	Basic construction skills
Who built the facilities:	Local craftsmen and community labour
Site information:	Sites within IDP camps, security risks

Background

An estimated 5.4 million people have perished in the latest conflict that has devastated the DRC over the last 10 years. A large majority have died from disease and famine and it is believed that over half of the human casualties of the war have been children. In late 2010, the displaced population was an estimated 1.7 million, more than half of them children[1]. Large numbers of children are growing up in camps for displaced persons facing insecurity, illnesses, poverty and, in some cases, continued violence.

In addition to conflict-related emergencies in the east (North Kivu, South Kivu and Orientale provinces) and north¬west (Equateur), the near-collapse of social services and decades of neglect of basic infrastructure have plunged some of the country's more remote areas into emergency levels of acute malnutrition and maternal and child mortality. In addition, flooding of the Congo River and its tributaries, epidemic-level outbreaks of cholera and isolated conflicts between rival groups resulted in acute emergencies[2] .

The under-five child mortality rate is 158 per 1,000 live births. The entire country hovers near the emergency threshold for global acute malnutrition of 10%. Less than half of the population has access to improved drinking-water sources, and only 14% have adequate sanitation facilities[3].

1 United Nations High Commissioner for Refugees, 'Internally Displaced Persons (IDP) – Fact Sheet: Democratic Republic of Congo', UNHCR, Geneva, April 2010, p. 1.

2 http://www.unicef.org/spanish/hac2011/files/HAC2011_4pager_DRC_4pager.pdf

3 http://www.unicef.org/spanish/hac2011/files/HAC2011_4pager_DRC_4pager.pdf/ Multiple Indicator Cluster Survey 2010.

Project Description

The emergency education is embedded within the Rapid Response to Movements of Population (RRMP) initiative – the largest humanitarian response mechanism in eastern DRC –UNICEF and partners[4] provided access to essential household and personal non-food items, emergency shelter materials, minimum WASH package, and 47,000 children benefited from better access to primary education.

The RRMP takes a holistic and integrated approach to education and child protection with strong community participation. It aims to ensure access to inclusive quality education for boys and girls affected by displacement. The RRMP education interventions aim to 'build back better', where in the context of emergency opportunities arise to strengthen the capacities of children, teenagers and teachers to build resilience. Community resilience is critical to helping children quickly resume schooling when their communities are affected by armed conflict.

In 2011, the RRMP emergency education provided access to quality education in safe and protective and child-friendly environments for vulnerable children and youths. Along with its partners, UNICEF provided assistance to up to 70,000 conflict-affected children and women through child-friendly spaces, psychosocial and medical support for survivors of sexual violence, family reunification of unaccompanied children, and reintegration of children released from armed groups.

Included in the emergency education interventions were Early Childhood Development (ECD) activities for younger children. Bringing these activities to children living in conflict is a tremendous challenge but vital to the emotional development and protection of children who are victims to the traumas of conflict[5].

4 AVSI , the International Rescue Committee, Norwegian Refugee Council, Danish Refugee Council, Save the Children/UK and Solidarités International

5 UNICEF, ECD in emergencies

ECD in Emergencies:

UNICEF, together with its partners, began promoting ECD programmes for healing and protecting young children in emergencies recognising the long-lasting effect conflict and displacement have on a young child's cognitive, social and emotional development.

As part of UNICEF's ECD strategy efforts are made to organise partners and local authorities to put safe and supportive spaces for young children in place. The locations for the child-friendly spaces were determined in consultation with community and children to analyse different potential risks and vulnerabilities.

UNICEF's ECD centres provide hygiene, health and nutrition services. These programmes aim to achieve gender parity and reach out to vulnerable groups. The centres help prepare children for primary school, leading to better performance and higher enrolment. Moreover, in a country still healing from decades of conflict, young children feel protected and safe in these early learning spaces – helping remove long-lasting obstacles to their cognitive, social and emotional development, as well as contributing to overall stabilisation and the promotion of peace.

The Early Childhood Development Kit and Facilitators' Guide were supplied to the ECD spaces. Local volunteers and parents were trained on how best to use them, and on how best to support young children in their challenging lives. The kits consist of 37 items including brightly coloured paper and pencils, dominoes, construction blocks, hand puppets, puzzle blocks and memory games to stimulate cognitive learning, social and emotional competency, creativity and problem-solving skills.

Shelter Description

The transitional learning spaces are 56m^2 in size and are used for both primary school and early learning activities. The structure is a simple timber pole structure with timber board cladding or plastic sheeting depending on the availability of materials. The roof is corrugated iron roof sheeting, which is locally available. The ECD space would benefit from a sealed raised floor, such as screed/compacted earth, to allow younger children to play and sit on floor mats. It would prevent children from sitting on the dirt floor with the risk of vector born diseases. In addition, low level movable internal partitions would allow the space to be split up into smaller activity zones for the younger children, such as resting, reading or playing corners. The low level of the internal partition helps carers to be able to look over the walls for protection and supervision of the younger children engaging in various activities simultaneously.

DRR

Risk Reduction Plan/School Protection Plan were developed for each transitional school to strengthen the resilience of communities and children facing various risks. The community, teachers and children conducted workshops in which hazards and vulnerabilities were identified and prevention and preparedness activities discussed and listed to be included into the Risk Reduction Plan/School Protection Plan.

Improvements

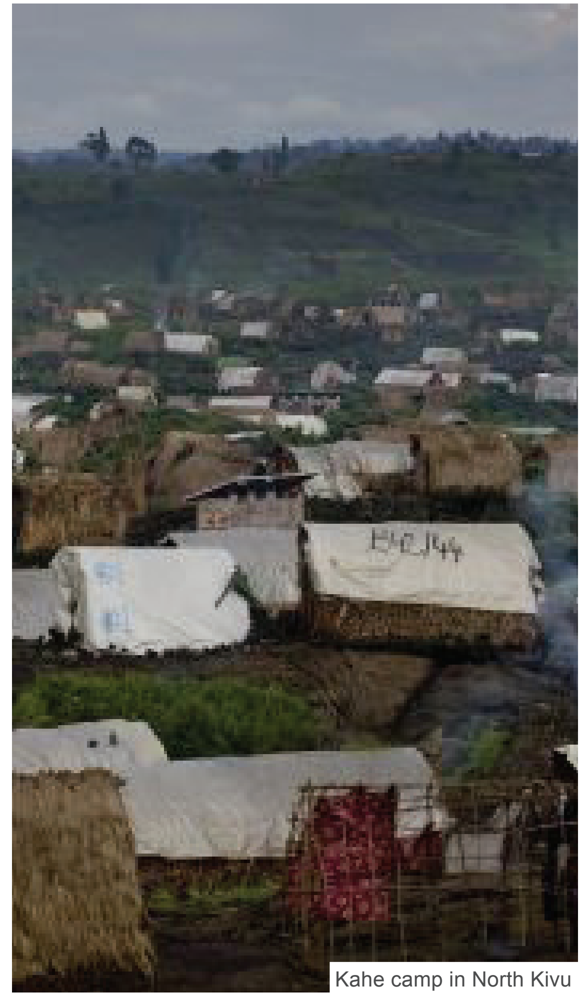
• Raised sealed flooring for young children to sit and play on the floor and avoid vector born diseases.

• Extended small external veranda with balustrade and ramp for accessibility and ease of access for small children.

• Half height internal flexible partitions to facilitate different activity zones to be created within the space, such as resting or quiet corners.

• Cross bracing to main timber structure.

• Tarpaulin roller blinds fixed to exterior of classroom to protect from rain, bright sun and dust.

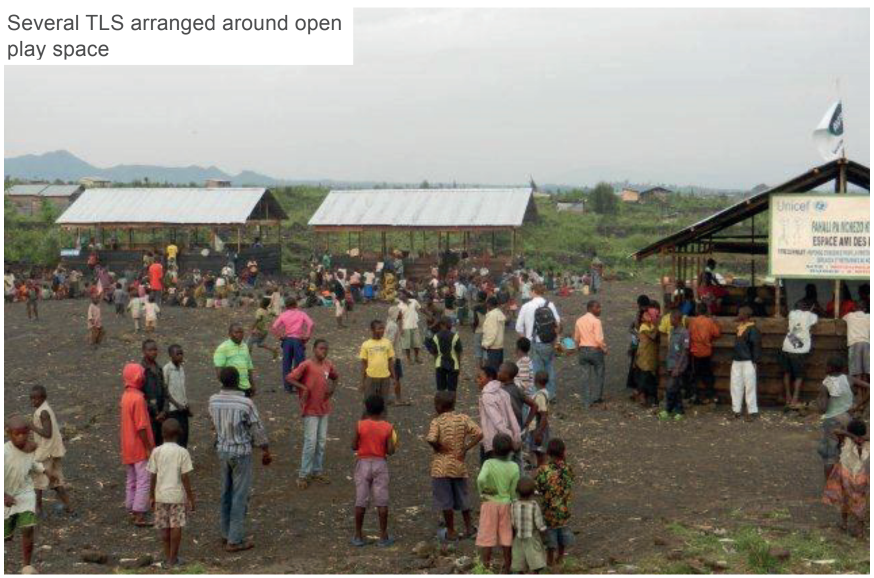


Kahe camp in North Kivu

Photo credit: M.Goldfarb/MSF


ECD activities in IDP camp, DRC


Children playing with ECD kit toys

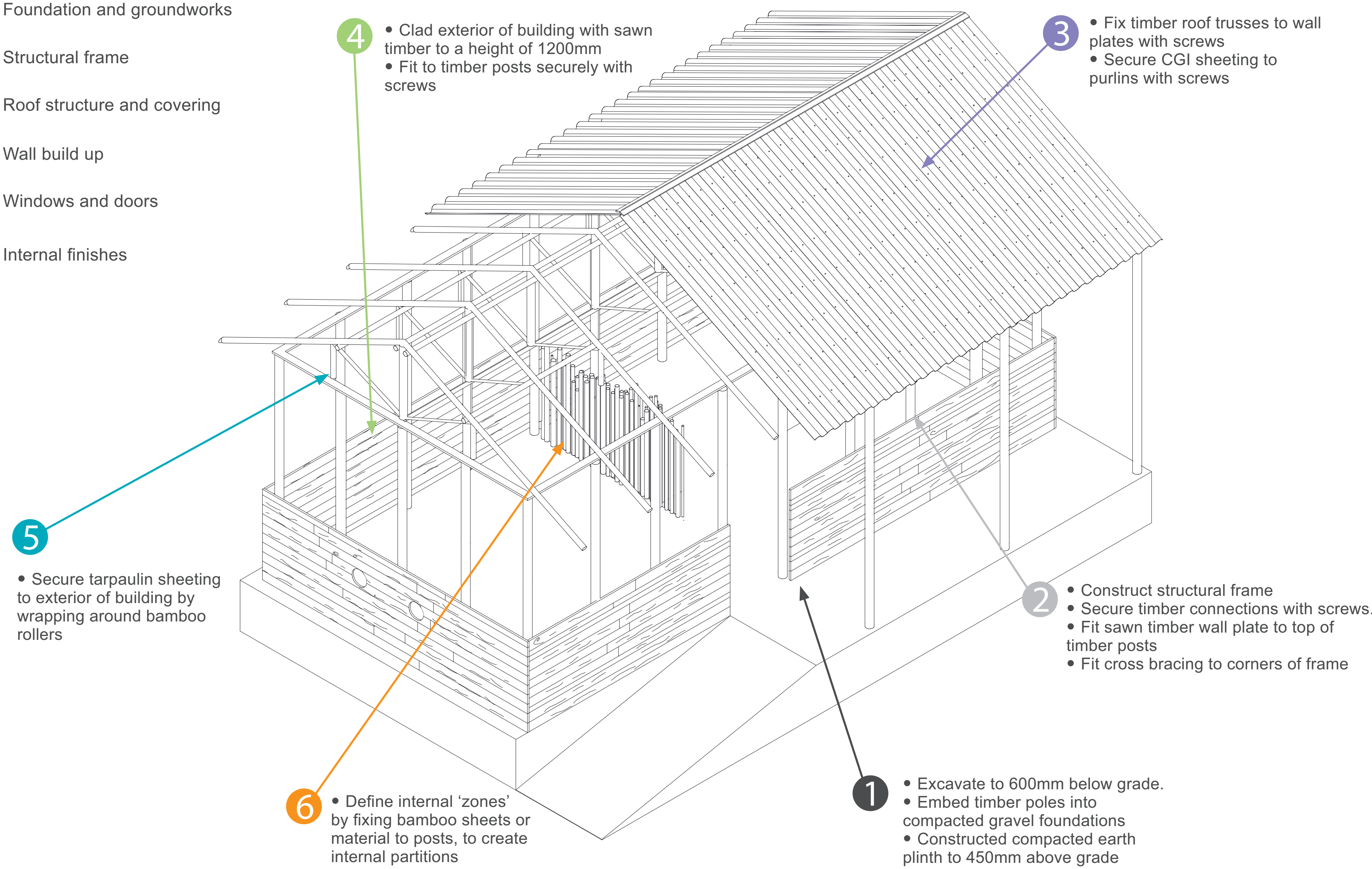

Several TLS arranged around open play space

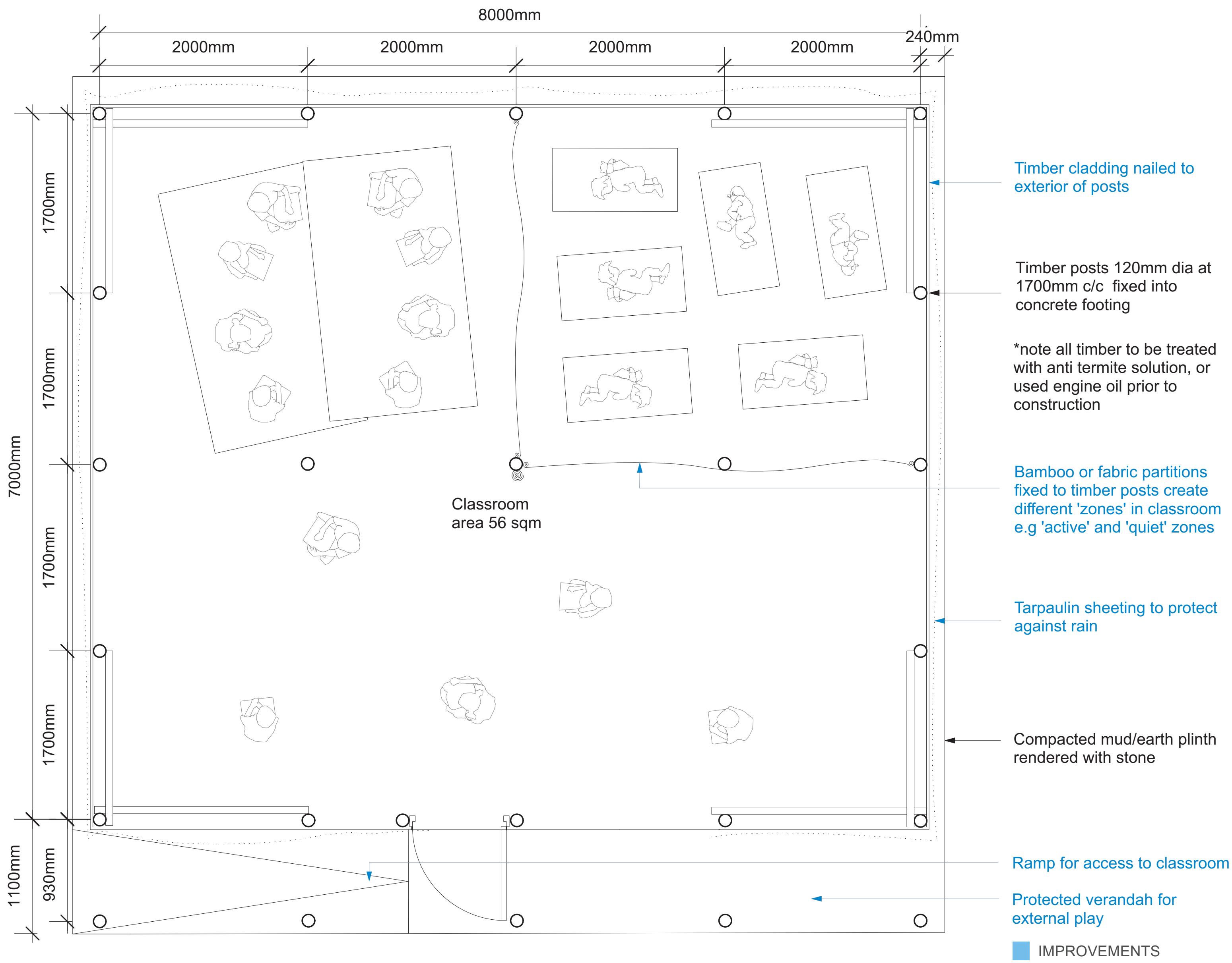

Young girl playing with hand puppet from ECD kit

All photo credits: UNICEF/DRC

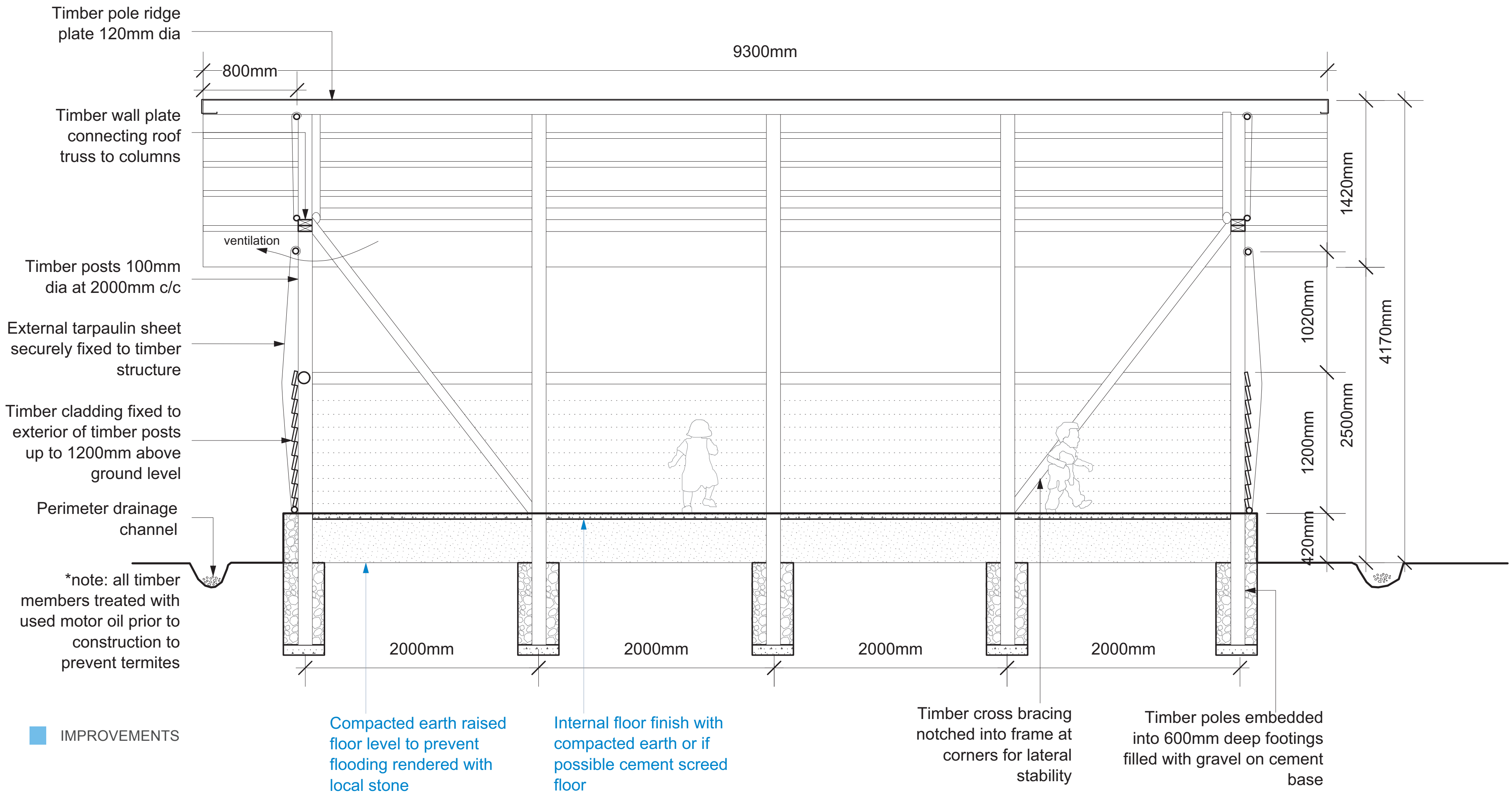
3D VIEW

1. Foundation and groundworks
2. Structural frame
3. Roof structure and covering
4. Wall build up
5. Windows and doors
6. Internal finishes

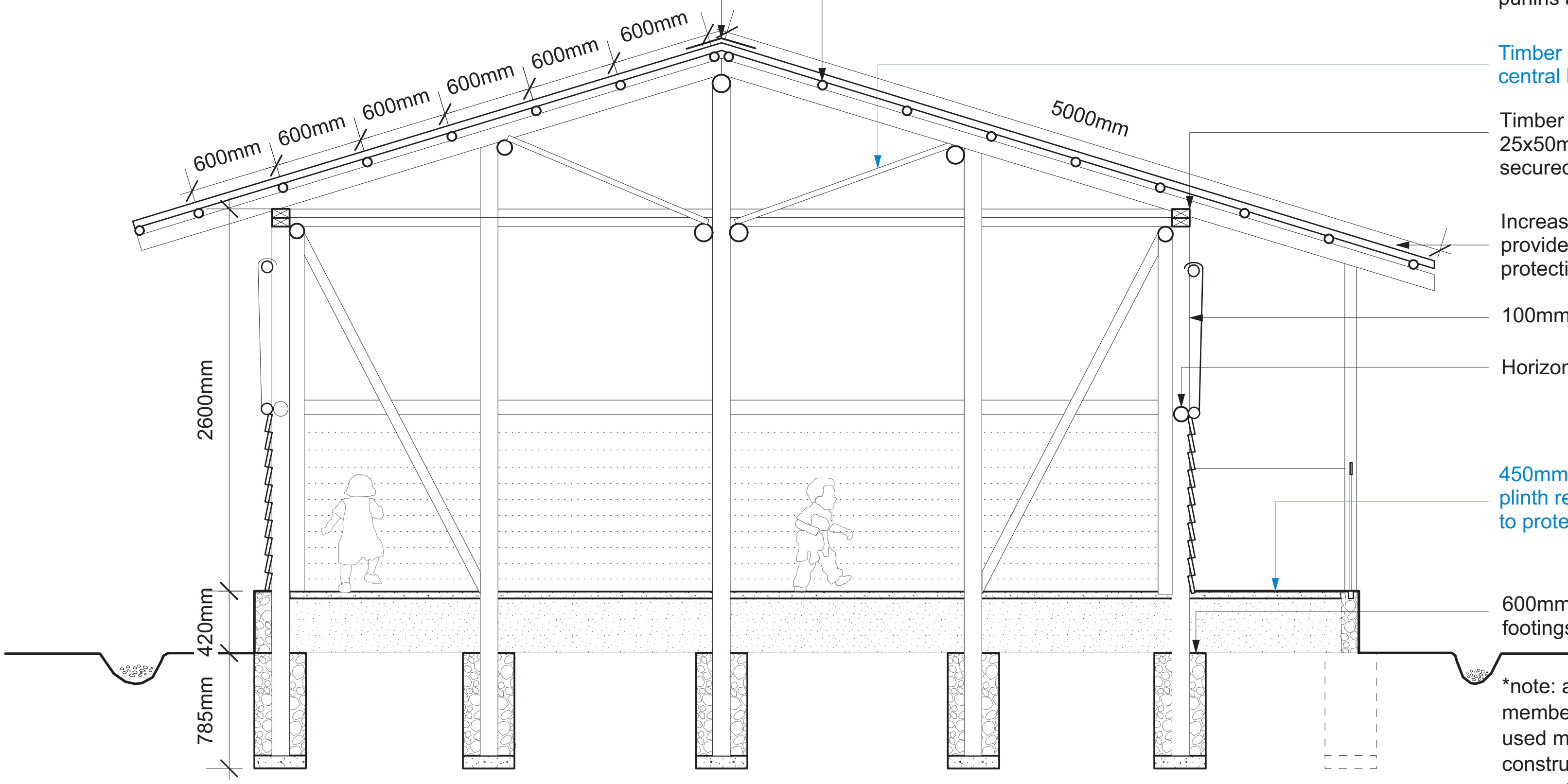



8000mm
2000mm
2000mm
2000mm
2000mm
240mm
7000mm
1700mm
1700mm
1700mm
1700mm
1100mm
930mm
Classroom
area 56 sqm
Timber cladding nailed to exterior of posts
Timber posts 120mm dia at 1700mm c/c fixed into concrete footing
*note all timber to be treated with anti termite solution, or used engine oil prior to construction
Bamboo or fabric partitions fixed to timber posts create different 'zones' in classroom e.g 'active' and 'quiet' zones
Tarpaulin sheeting to protect against rain
Compacted mud/earth plinth rendered with stone
Ramp for access to classroom
Protected verandah for external play
IMPROVEMENTS

LONG SECTION SCALE 1:50



SHORT SECTION SCALE 1:50



Tarpaulin ridge sheet secured to CGI roof sheeting

CGI roof sheeting fixed to timber purlins at 600mm c/c

Timber cross bracing fixed to central horizontal pole

Timber wall plate composed of 25x50mm timber sections secured together

Increase roof overhang to provide verandah with rain protection

100mm dia timber posts

Horizontal strutting 80mm dia

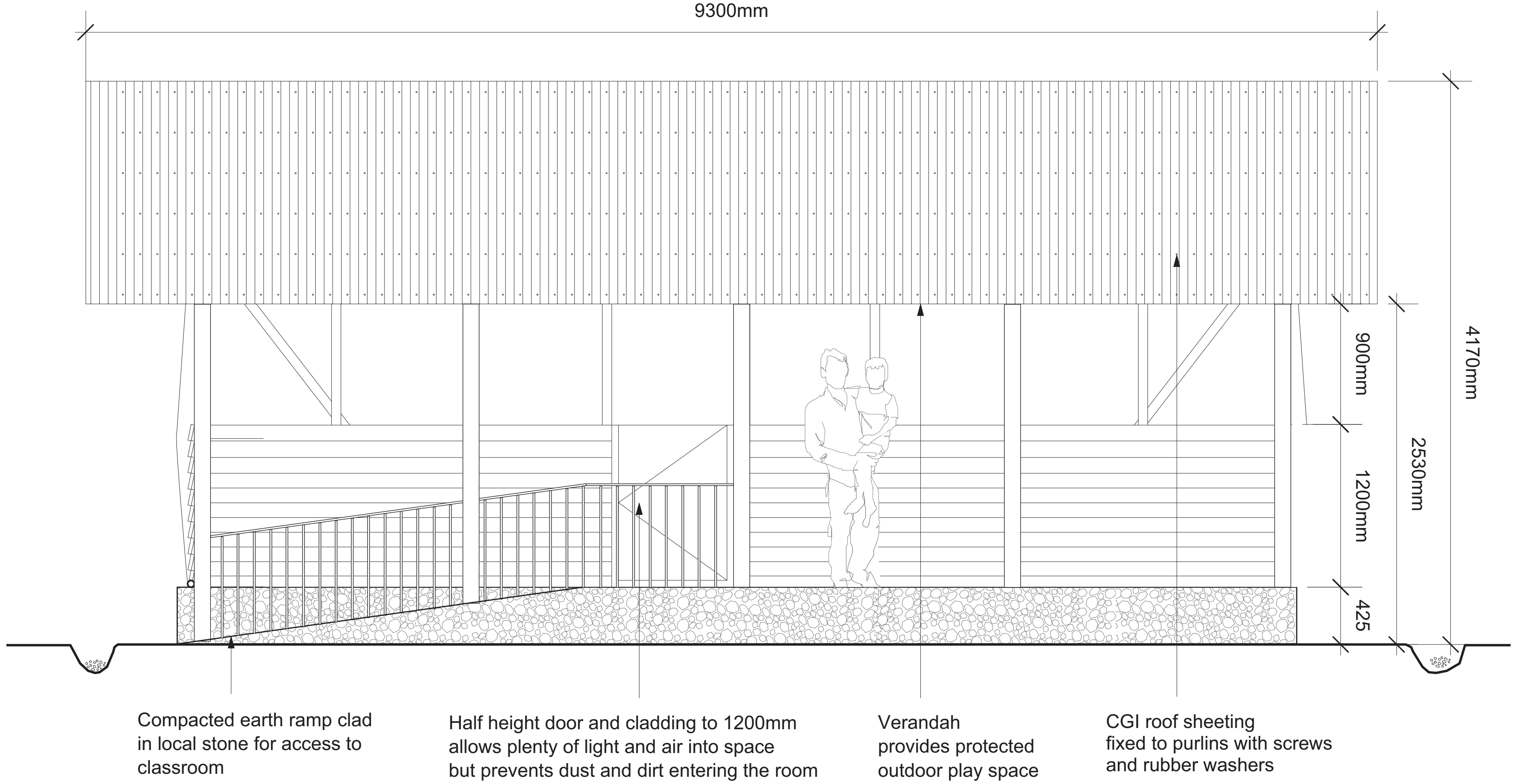
450mm thick compacted earth plinth rendered with local stone to protect floor against flooding

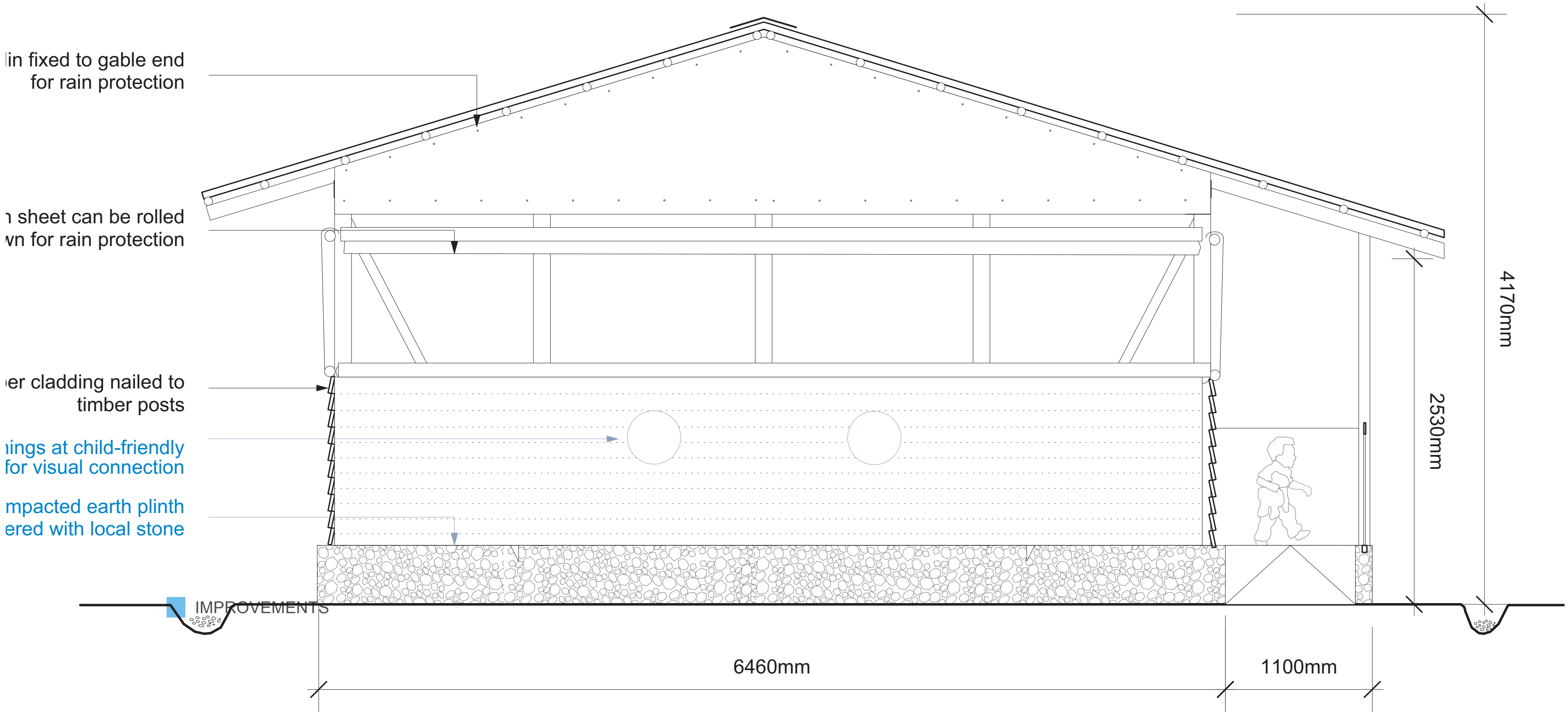
600mm deep gravel footings on cement base

*note: all timber members treated with used motor oil prior to construction to prevent termites

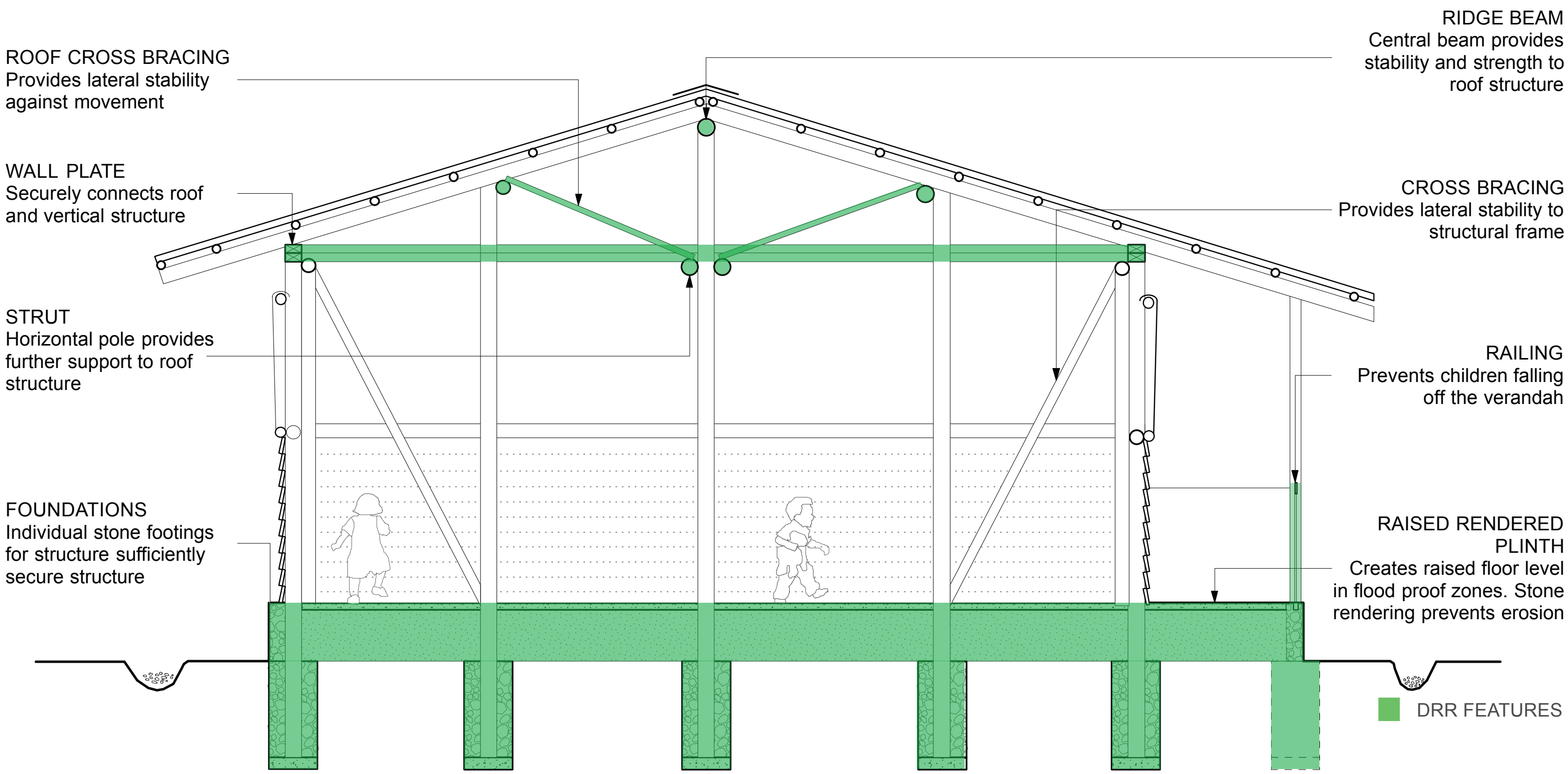
IMPROVEMENTS

LONG ELEVATION SCALE 1:50




lin fixed to gable end
for rain protection
ı sheet can be rolled
vn for rain protection
ıer cladding nailed to
timber posts
ıings at child-friendly
for visual connection
mpacted earth plinth
ered with local stone
IMPROVEMENTS
4170mm
2530mm
6460mm
1100mm

DRR FEATURES SCALE 1:50



QUANTITIES FOR SINGLE UNIT OF 56 m^2			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATION :			
Excavation for foundation	Removing soil and potential shrubs and trees	m^2	70.00
Site clearing		m^2	70.00
Poles excavation		m^2	2.00
WALLING :			
Pole	120mm dia.	pcs.	17
Pole	100mm dia.	pcs.	20
Plywood		m^2	100.00
Motor oil	For treatment	lt.	13.00
Plastic sheet		m^2	100.00
OPENING:			
Door	Timber frame	pcs.	1
ROOFING:			
Truss	150mm dia.	pcs.	20
Purlin	Round section	pcs.	30
CGI	3000x850mm	pcs.	46
FLOORING:			
Compacted earth		m^2	70.00
TOOLS:			
Nail	120mm	kg	10
Nail	100mm	kg	10
Nail	80mm	kg	10
Nail	60mm	kg	10
TOOLS:			
Blackboard		pcs.	1

Children playing in the open space between TLS inside the IDP camp

Photo: North Yemen/UNICEF

2012 / UNICEF

Agency:	UNICEF
Location:	Al-Mazraq IDP Camp 3, Haradh District, Hajjah Governorate
No. of users:	862 students (513 boys + 349 girls), 50 children per classroom
Anticipated lifespan:	10 years
Actual lifespan:	6 years
Facilities provided:	Classrooms, WASH facilities, separate boys/ girls latrines, hand washing points, drinking water and security fence
No. of facilities:	16 classrooms, 16 latrines, 4 hand washing facilities, 4,000 water litres per day
Construction time:	5 days
Main construction materials	Steel mainframe, blocks, CGI sheeting, cement
Material sources:	Locally sourced
Project cost/unit:	USD 4,000 per classroom
Material cost /unit:	USD 2,300 per classroom
Size of units:	Classroom size 8x6m, 48m^2
Size of construction team:	30 workers
Construction Trades:	Skilled construction workers
Who built the facilities:	Local contractor, local craftsmen
Site information:	Within IDP camp, exposed to strong winds and storms

Background

In the past Yemen has suffered civil unrest and continued localised conflicts that have caused several waves of displacement. Civil unrest and armed conflict throughout the country have exposed both the displaced and the general population to violence, injury and death. In August 2012, there were an estimated 324,000 IDPs in the north of the country and around 200,000 IDPs in the south. [1]

Only a minority of IDPs are living in IDP camps, principally in the northern governorate of Hajjah, whereas the rest have found shelter with host communities, renting overcrowded housing, makeshift shelters, schools, clinics and informal settlements. There are around 600 informal settlements outside IDP camps in Hajjah.

Lack of access to education remains a significant problem throughout the country for both IDPs and the general population. Large numbers of children have no access at all as armed factions or IDPs have taken refuge in their schools. A further 100,000 are unable to go to school as their facilities have been damaged or destroyed. More than 150 schools and 25 hospitals and clinics were reportedly attacked across the country during 2011. A Ministry of Education report published in March 2012 revealed that an estimated 902 schools in 12 governorates were damaged as a result of the 2011 conflict.[2]

Project Description

The construction of transitional learning spaces in the Al-Mazraq IDP Camp 3 is part of UNICEF's holistic approach to education in emergency and child protection in North Yemen.

1 IDMC, report Dec 2012
2 IDMC, report Dec 2012

The original UNICEF classroom tents required replacement every year, due to the strong winds and storms in the area and general wear and tear. The TLS are in many respects a more sustainable solution, more durable, climatically more appropriate and allow a safer and more protected learning environment. The school community including school principle, teachers, children and fathers council were consulted on the location and layout of the TLS.

Water and sanitation provision, construction of latrines for boys and girls and hygiene education as well as security fences were also very essential components of the project. The schools were furthermore provided with furniture, teaching and learning materials, ECD kits and teacher training to ensure education for more than 52,000 conflict-affected children including IDPs.[3]

TLS summary

The basic classroom unit is a 42m^2 simple rectangular room accommodating approx. 50 children. The structure has a steel mainframe, a hanger structure with blockwork in-fill and a corrugated iron sheeting roof. The gable ends are full height blockwork for the blackboard and free wall space. The other external walls are half height with ventilation gaps designed into the blockwork. The half height walls allow for good ventilation in the hot climate and a more comfortable internal temperature. It would be recommended to have some form of curtain or tarpaulin binds to protect the children from very heavy wind and storm.

Improvements

- Include additional entrance into the space as emergency exit and more flexibility in organising the over school layout.
- Extend the roof overhand to give more shading to the openings and protect from direct sunlight
- Include tarpaulin blinds or curtains to the opening to protect the inside from heavy winds or storms

3 Situation report UNICEF Dec 2012

A group activity inside the classroom

IMAGES

Water point in the IDP camp


Children inside TLS, North Yemen

Children infront of school tents in IDP Camp


Internal view of classroom

All photos: North Yemen/UNICEF or Facebook

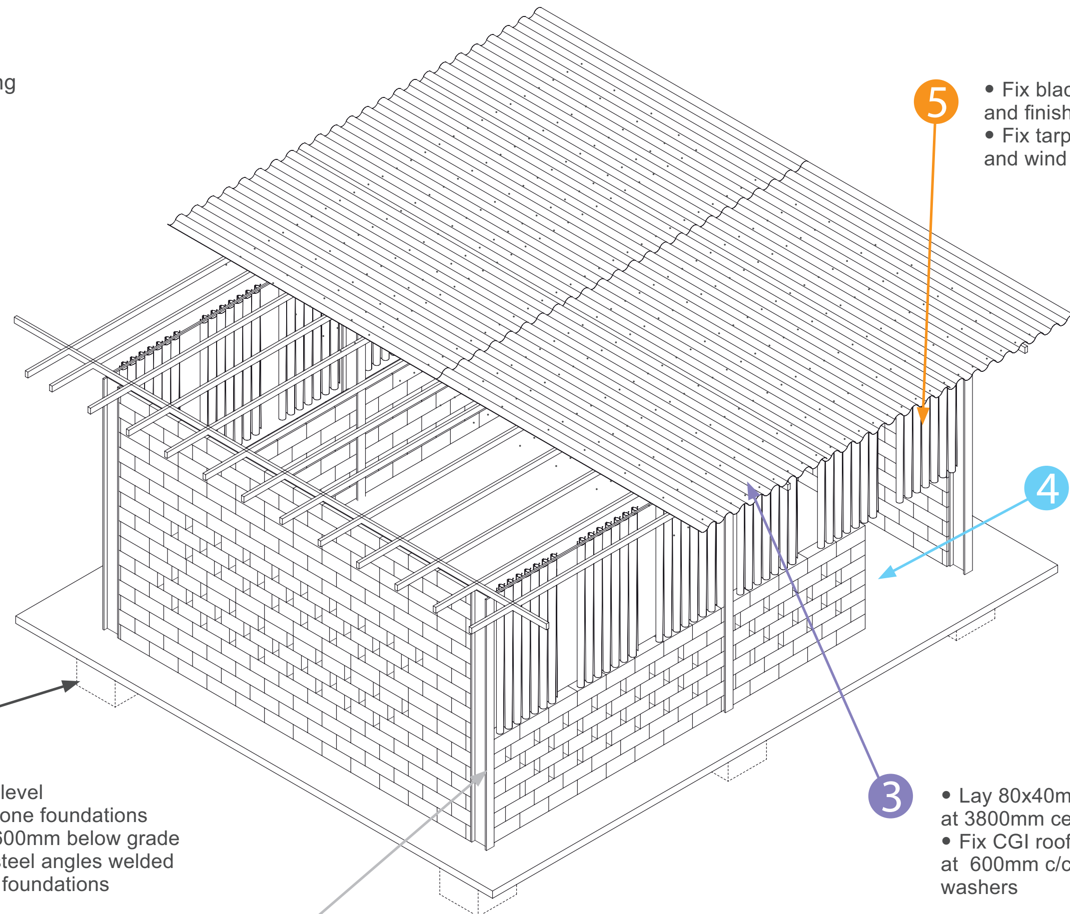
1 Foundation and groundworks

2 Structural frame and walls

3 Roof structure and covering

4 Flooring

5 Internal finishes



5
- Fix blackboard securely onto block work walls and finish interior with white paint to walls.
- Fix tarpaulin curtains to internal poles for sun and wind protection

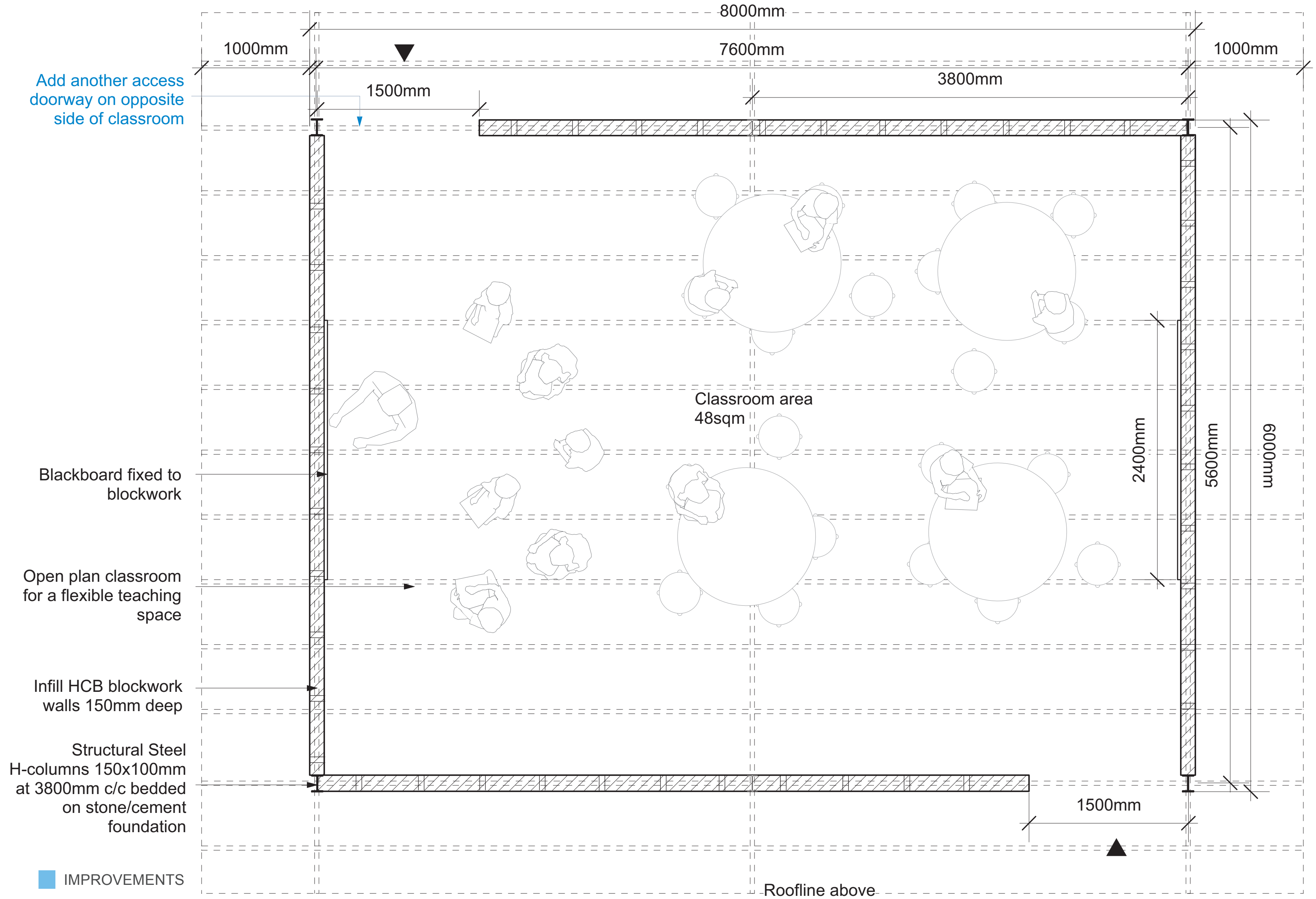
4
- Pour plain concrete floor 100mm on a layer of compact broken stone

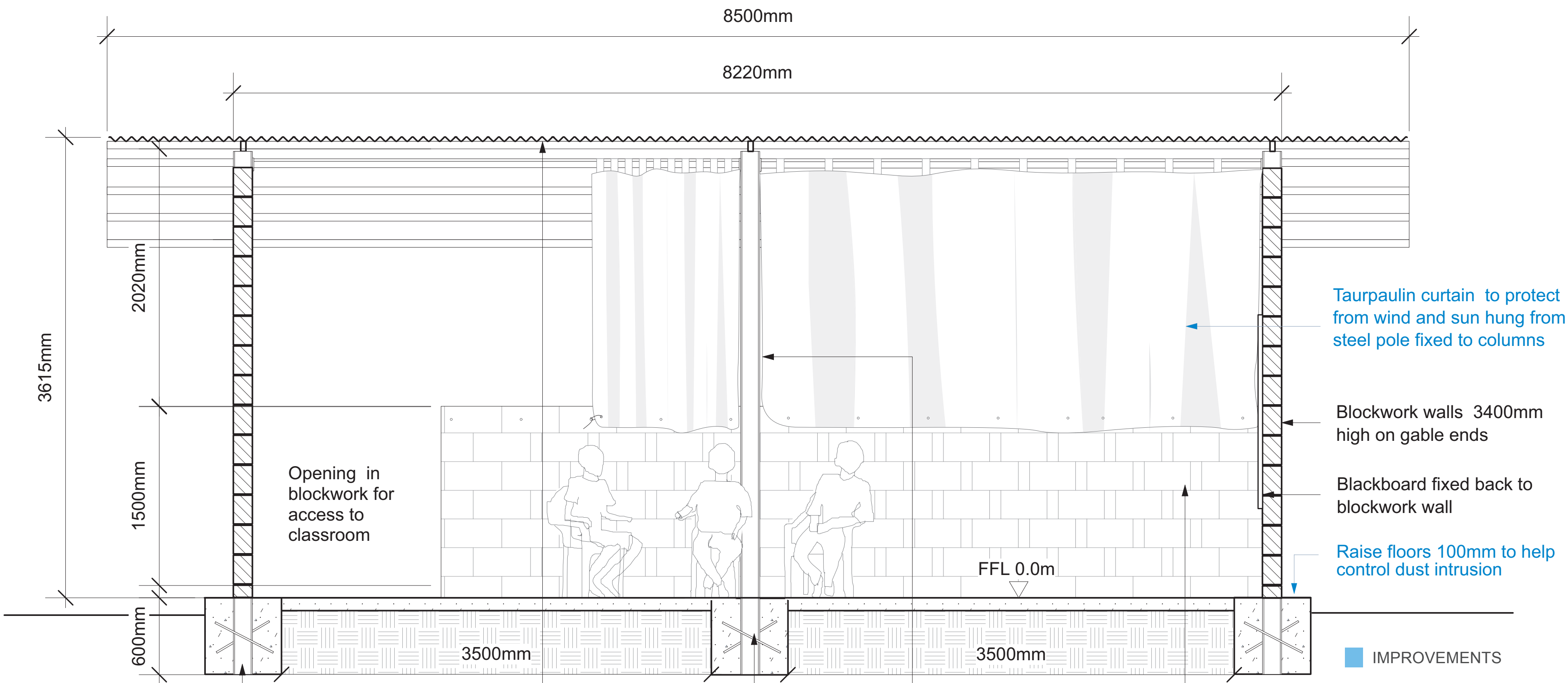
1
- Excavate to desired level
- Construct basaltic stone foundations topped with concrete 600mm below grade
- Steel columns with steel angles welded on are embedded into foundations

3
- Lay 80x40mm SHS beams on steel columns at 3800mm centres
- Fix CGI roof sheeting onto 60x30mm purlins at 600mm c/c with bolts, screws and rubber washers

2
- Erect steel structural frame, 150x100mm H-columns at 3800mm centres embedded into foundation.
- Infill steel frame with HC blockwork 400x200x150mm
- 1500mm walls high on side walls, to roof slope on gable ends
- Layer bricks with openings to allow for extra light and visual connection

FLOOR PLAN NOT TO SCALE





FOUNDATIONS
-Black stone (Basalt) foundations with concrete topping 600mm below grade.
-Steel columns with iron angles welded to column base and bedded in foundation

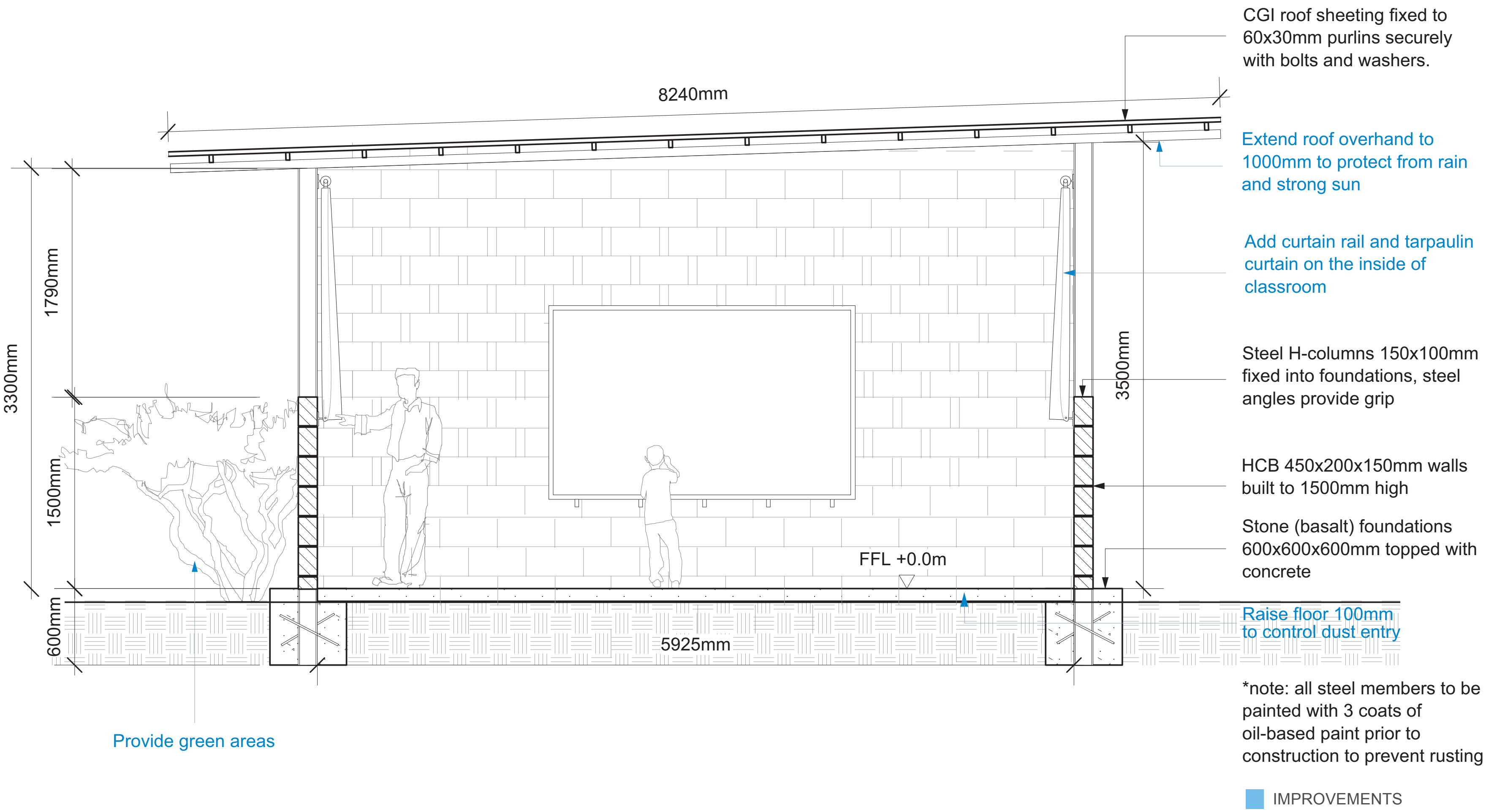
ROOF
-CGI zinc roof sheeting bolted to SHS purlins 30x60mm at 600mm c/c with rubber gaskets

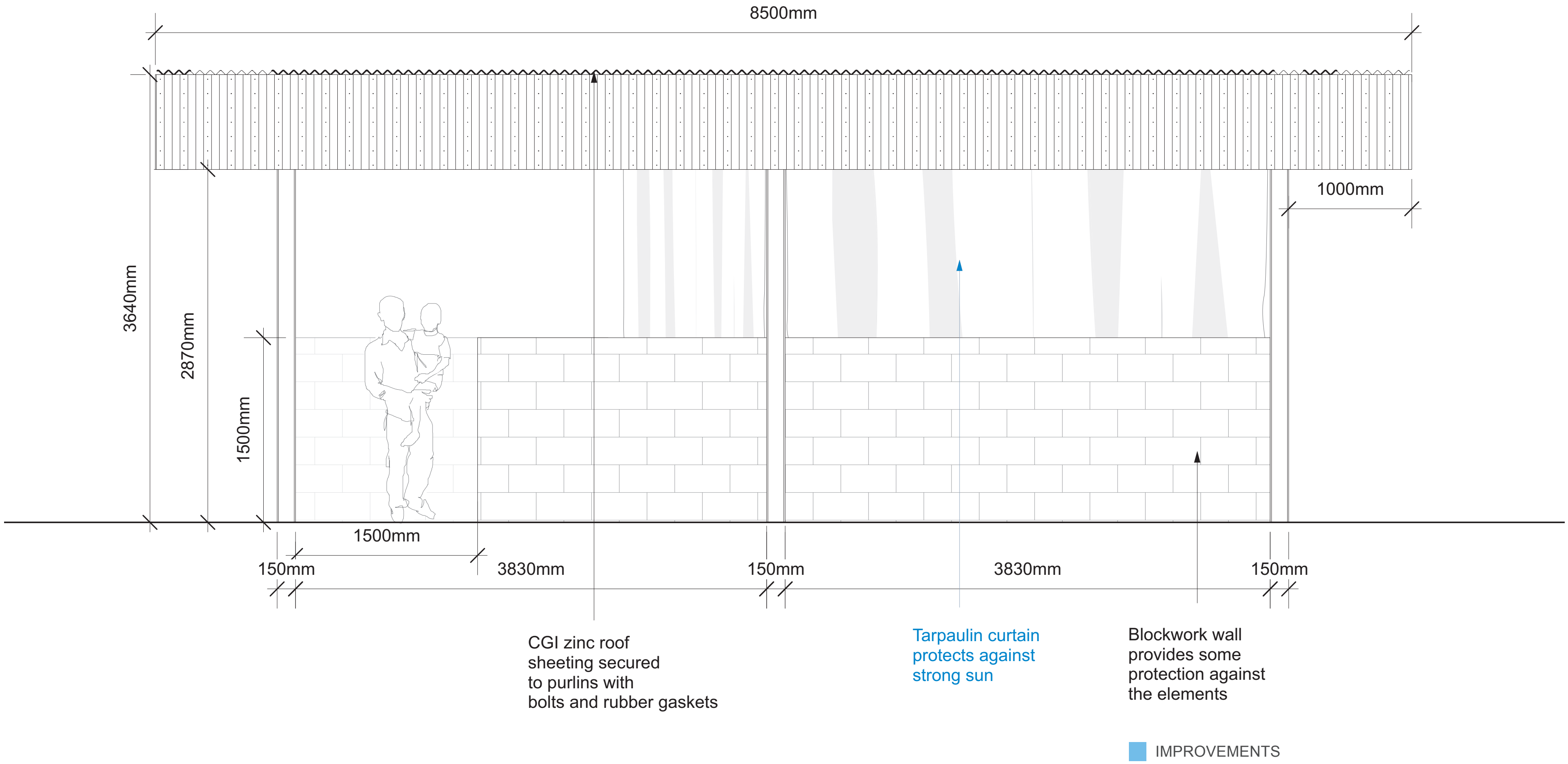
STRUCTURAL FRAME
-Steel hangar composed of H-Columns 150x100mm with SHS beams 40x80mm bolted to uprights

*note: steel members treated with 3 coats of oil-based paint prior to construction to prevent corrosion

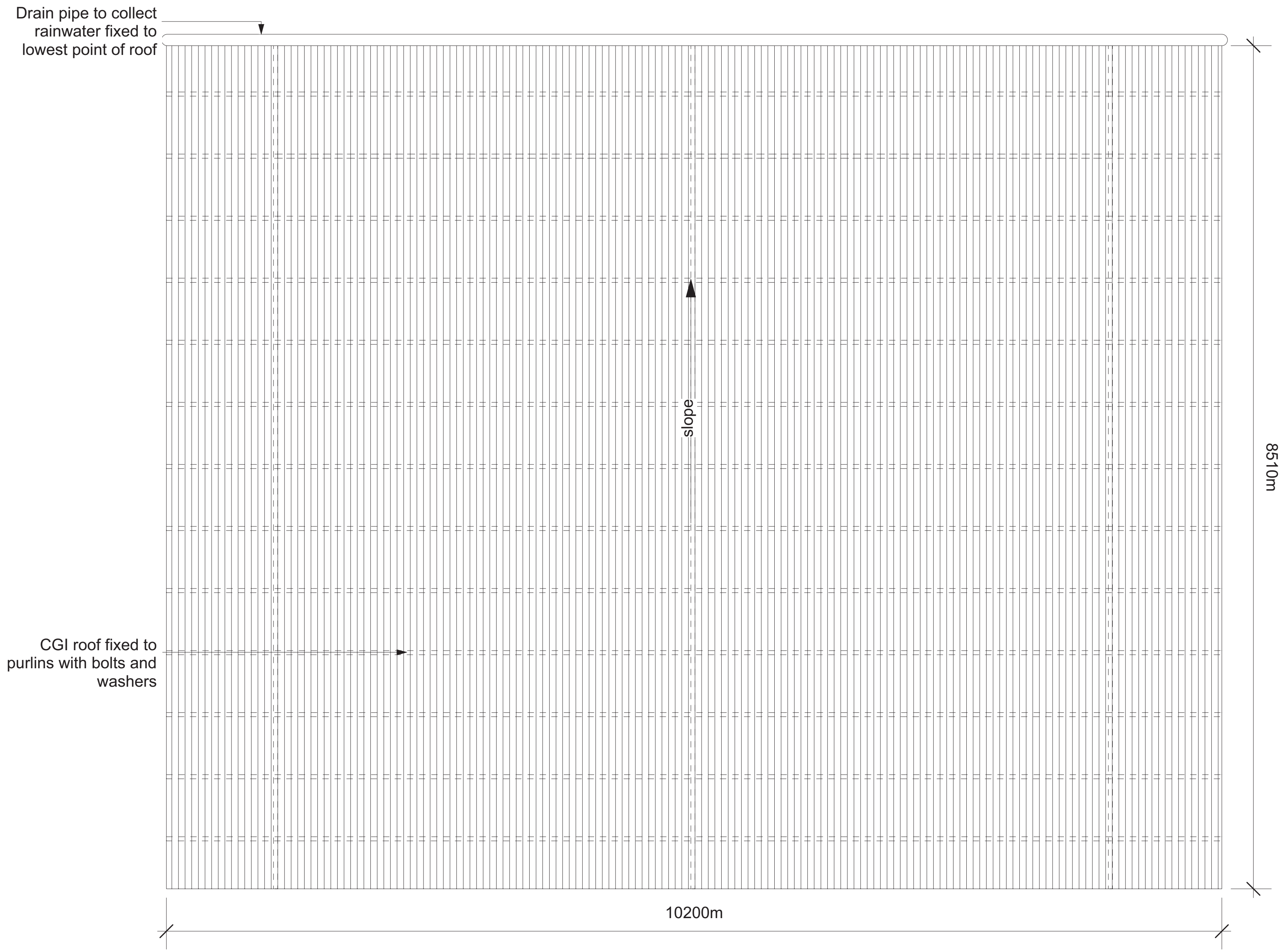
WALLS
-Block work wall 1500mm high composed of HCBs 450x200x150mm laid with good mortar

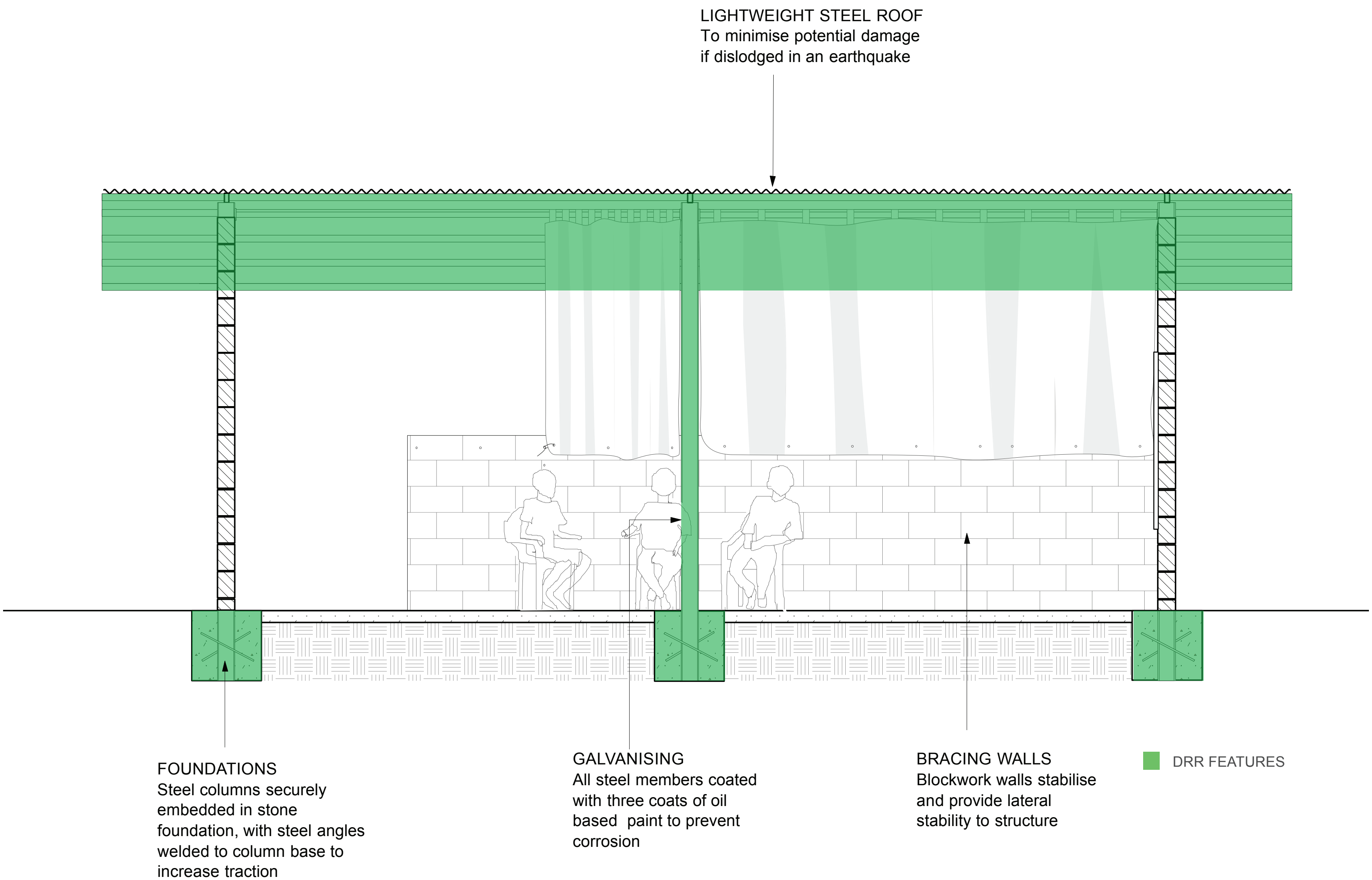
SHORT SECTION SCALE 1:50



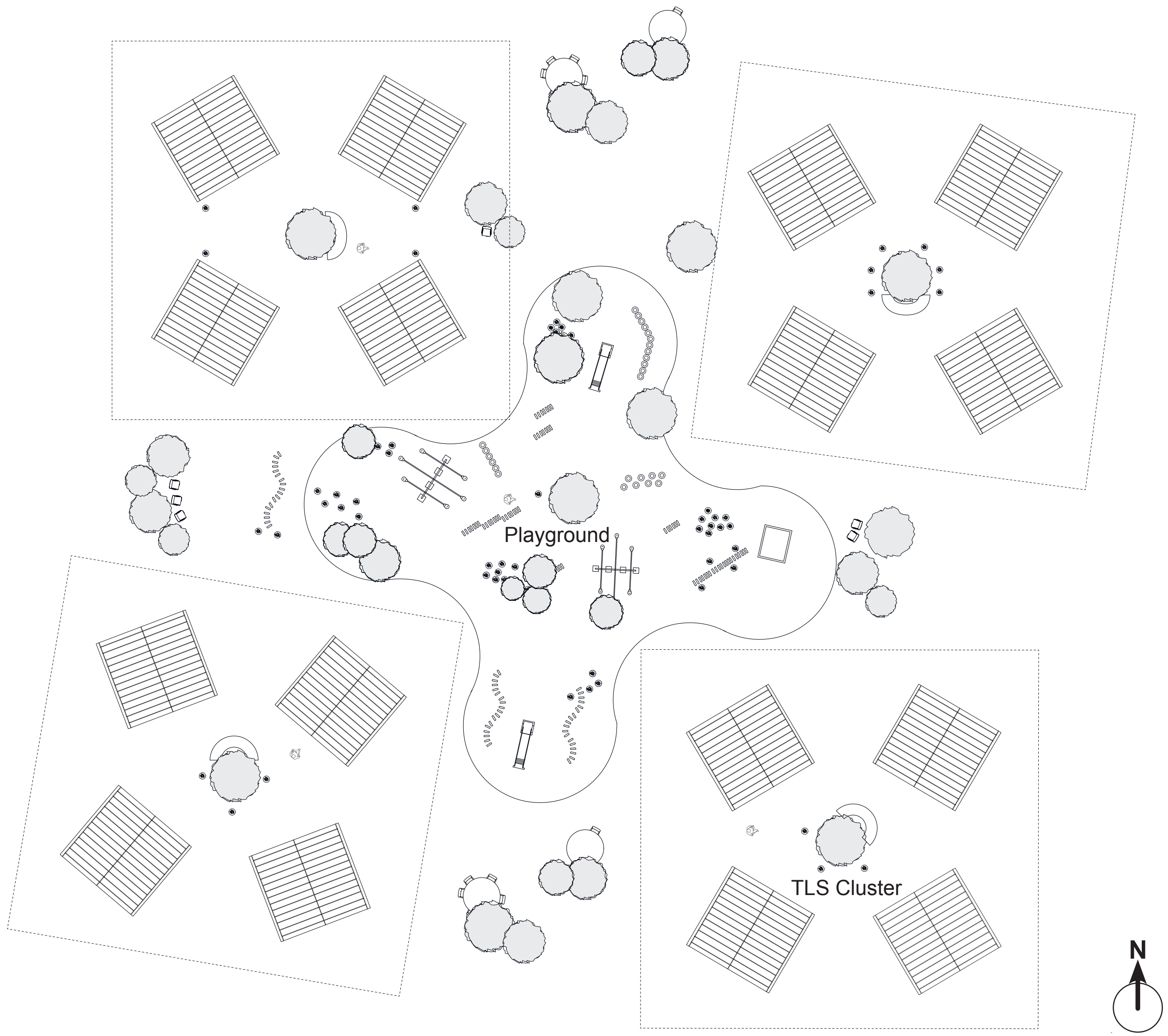

8500mm
1000mm
3640mm
2870mm
1500mm
1500mm
150mm
3830mm
150mm
3830mm
150mm
CGI zinc roof sheeting secured to purlins with bolts and rubber gaskets
Tarpaulin curtain protects against strong sun
Blockwork wall provides some protection against the elements
IMPROVEMENTS

ROOF PLAN NOT TO SCALE




LIGHTWEIGHT STEEL ROOF
To minimise potential damage
if dislodged in an earthquake
FOUNDATIONS
Steel columns securely
embedded in stone
foundation, with steel angles
welded to column base to
increase traction
GALVANISING
All steel members coated
with three coats of oil
based paint to prevent
corrosion
BRACING WALLS
Blockwork walls stabilise
and provide lateral
stability to structure
DRR FEATURES

SITE PLAN NOT TO SCALE



QUANTITIES FOR SINGLE UNIT OF 48m²			
ELEMENTS	**SPECIFICATION**	**UNIT**	**QUANTITY**
FOUNDATION :			
Excavation for foundation	Inc. rock, disposal of unsuitable materials	m²	48.00
Basalt stone	With concrete topping 600mm below grade	m²	48.00
STEEL STRUCTURE :			
Angle	Steel columns with iron angles welded in ‘x’ shape	pcs.	6
Column	Steel columns with H-section 150x100mm	pcs.	6
Beam	SHS beams 40x80mm bolted to uprights	pcs.	4.00
Purlins	60x30mm fixed with bolts and washers	pcs.	14.00
WALLING :			
Hollow Concrete Block (HCB)	450x200x150mm	m²	57.00
ROOFING :			
CGI		pcs.	10
FLOORING :			
Plain concrete	10mm thick	m²	41.00
TOOLS :			
Nails and bolts		box	4
FURNITURE :			
Blackboard		pcs.	1
FENCE :			
Foundation		m²	45.00
Fence	Steel	m²	285.00
Entrance	Steel	m²	8.00

Girls continue to go to school during the flooding

Photo: UNICEF/ Pakistan

2010-11 / UNICEF

Agency:	UNICEF
Location:	Flood affected provinces of Khyber, Pukhtunkhawa, Sindh, Punjab and Baluchistan
No. of users:	11,120 in 139 TSS, classroom 40m^2 with 40 children
Anticipated lifespan:	10-15 years
Actual lifespan:	Depends on timely minimal maintenance
Facilities provided:	Classrooms, furniture, WASH facilities, (separate for girls, boys, disable children/teacher, Hand pump, overhead water tank, water supply lines, playground materials, main gate ,ablution area and ramps ,stairs, railing for physically challenged children
No. of facilities:	TSS (2011-2012): 139@3 classrooms, 4 latrines
Construction time:	30 days- 90 days (max.)
Main construction materials	65% of the school is pre-fabricated insulated steel wall panels on steel substructure, 35% is in-situ work
Material sources:	Local produced
Project cost/unit: *	USD 30,000 for TSS, (furniture and play materials USD 13,000)
Material cost /unit:*	USD 20,000-25,000
Size of units:	Classroom: 8.25x4.85m wide, 40m^2
Size of construction team:	Contractor with 5 - 10 workers
Construction Trades:	Carpenters, masons, fabricators, welders, installation technicians
Who built the facilities:	Local contractors and suppliers
Site information:	Detail assessment of local hazards, environmental aspects prior final site selection

Background

Pakistan is extremely prone to a variety of natural disasters including floods, earthquakes, landslides, cyclones and insecurity. In the last five years alone, Pakistan has faced major disasters and emergency situations including the 2005 earthquake, the 2007 cyclone/floods, the 2008 Balochistan earthquake, the 2009 instability and ensuing displacement in the north-west, and 2010 and 2011 floods. UNICEF's Emergency Operations section has ranked Pakistan within the highest level of exposure to various disasters, which means it is severely prone to emergencies because of a combination of disaster types, very high vulnerability and low response capacity. It is ranked as one of the 15 most at-risk countries in the world. Wide scale disaster preparedness and disaster risk reduction activities are key components to building resilience.

From July through mid-September 2010, Pakistan experienced the worst floods in its 80-year history and this was further compounded by the 2011 flood, which affected nearly 20 million people, of whom over half were children and women. According to World Bank estimates, the floods damaged the infrastructures up to US$ 9.7 billion with approximately 1.9 million homes and basic facilities including water supply, sanitation, health and education damaged.

The floods damaged approximately 10,000 schools, and with displacement affecting students and teachers, the education system is under severe strain. School enrolment and completion of education are likely to drop, especially for girls, as families keep their children at homes due to economic reasons. Girls' enrolment before and after the emergencies is low due to lack of parents' education, poverty, lack of female teachers and inadequate sanitation facilities in the schools.

Update

This update from last year's TLS compendium 2011 focuses on the DRR/DRP component of the project and its positive effect on the continuation of education during the recurring floods in 2012. A complete set of drawings, BOQ and project description can be found in the 2011 TLS compendium.

In 2011 a total of 109 TSSs were built and in 2012 an additional 20 TSSs were completed; a further 10 are under construction[1] in the regions of Punjab, Sindh and Baluchistan.

DRR/DRP

Within the context of Pakistan's high risk to of various disasters, DRR is an essential component in the projects. The design concept of the TSS has several DRR aspects, such as the raised plinth level, the earthquake resistant steel construction, and the sandwich panels of polystyrene material used for walls resist water for several days and are also fire resistant. In addition, the TSS can be dismantled without any appreciable damage due to its prefabricated nature and can be moved and re-used.

Site training is being conducted for dismantling and re-installing the TSS involving various stakeholders. The TSS are equipped with some basic DRR supplies, such asfire extinguishers, spades, ropes, megaphone and whistle.

Furthermore,assessment of local hazards, vulnerabilities in respect to buildings and site conditions are conducted. School safety plans are developed and implemented, DRR training for teachers,education managers, staff, community members and children and disaster risk reduction education from schools to communities through sensitisation activities by school management committees are implemented. The inclusion of DRR into the learning curriculum and accompanying trainings is advocated at federal and provincial levels.

1 Information from September 2012

Challenges

The experience gained from implementation has highlighted several challenges encountered during construction, despite the simple and prefabricated nature of the TSS.

1. On a majority of TSS sites the water table is close to the surface, requiring the floor level to be raised by up to three feet, resulting in cost increases and problems with the soak pits for the latrines.

2. Due to the high water table, high humidity and salinization (near coastal areas), metal parts easily rust and high duty galvanisation is required, which increases costs.

3. Due to insecurities in some regions UNICEF staff are unable to conduct site inspections on a regular basis.

4. Contractors complain that their construction materials are stolen from the sites and they have to purchase new materials.

5. Many sites that were already awarded TSS construction had to be dropped due to land and property issues.

Education continued during floods in 2012

The 2010 and 2011 floods destroyed thousands of schools. Children continue to learn in makeshift schools under trees and in poorly constructed temporary learning centres, crossing miles of floodwater to get to school.

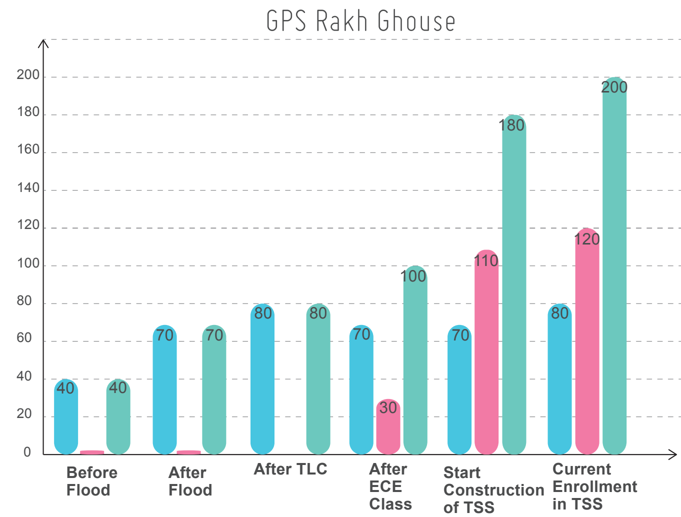
During the flooding in 2012 many of the completed TSS schools remained in use and education continued. The buildings were standing within the flood waters for weeks, but due to the raised plinth for the classroom and latrines, education was not disrupted. The floodwater did not reach the upper level of the raised plinth and the classrooms remained dry and inhabitable.

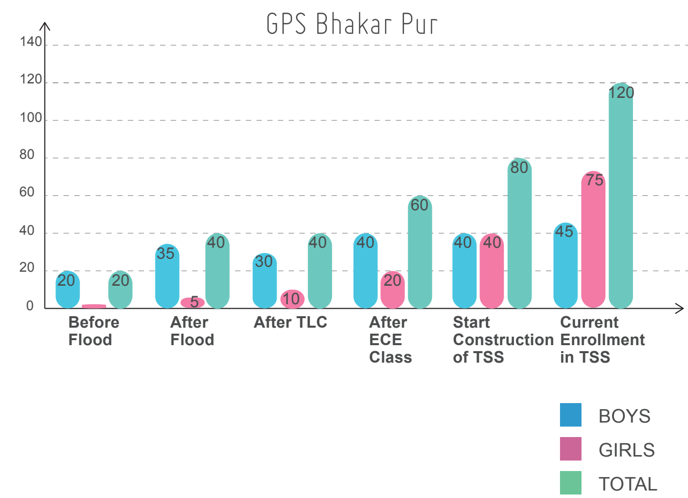
A major achievement is the increase in overall enrolment since completion of the TSS schools and specifically the significant increase in girls' enrolment rate into primary school. As the graphs illustrate, girls'enrolment was very low before and right after the disaster but has steadily increased.In the two TSS schools illustrated here,GPS Bakhar Purand GPS Rakh Ghouse,there are now more girls than boys attending. This positive trend indicates that a child-friendly school environment with safe and friendly learning spaces, gender-separated hygienic latrines and protected school grounds can contribute significantly to girls' school attendance.


Rakh Ghouse school before TSS


Bhakar Pur school before TSS


Bhakar Pur school after TSS





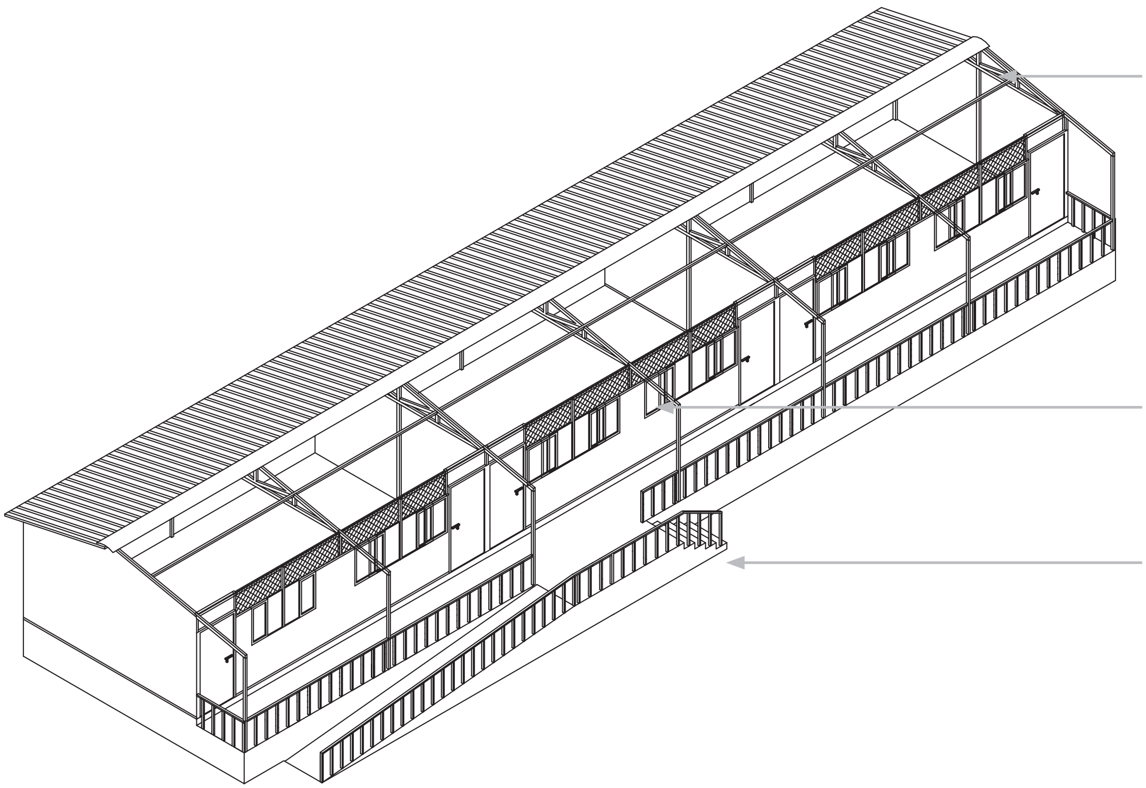
These graphs illustrate that after the TLS school was constructed, despite continued flooding, children kept going to school. In most cases, enrollment actually increased.

Children continued to go to Tehsil Kot Addu school during flooding

Children learning outside prior to TSS being built in Malook Khan

All photos: UNICEF/ Pakistan

LESSONS LEARNED DIAGRAM



Galvanisation
• Due to high salinity, the heavy galvanisation is needed to protect metal parts from rusting.

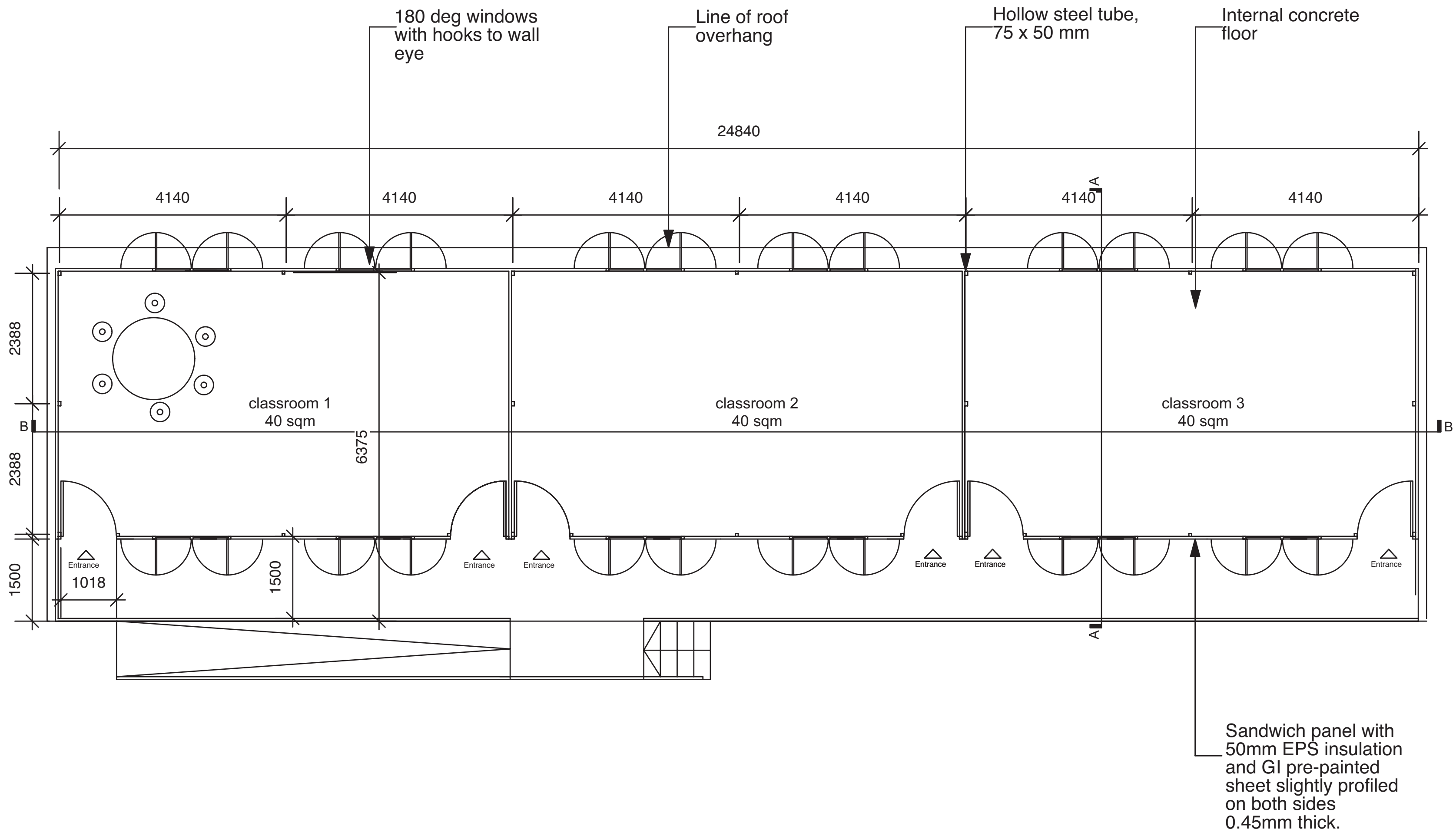
Water hand pumps
• Some improvements in hand pump design needed as the hand pumps often malfunction
• In TSS we introduce double function hand pumps pumping water to overhead tanks without electricity to supply water to all toilets in order to avoid dependency on electric power

Ventilation
• More/larger openings needed for ventilation in hot summer and for light as most of the schools do not have electricity.

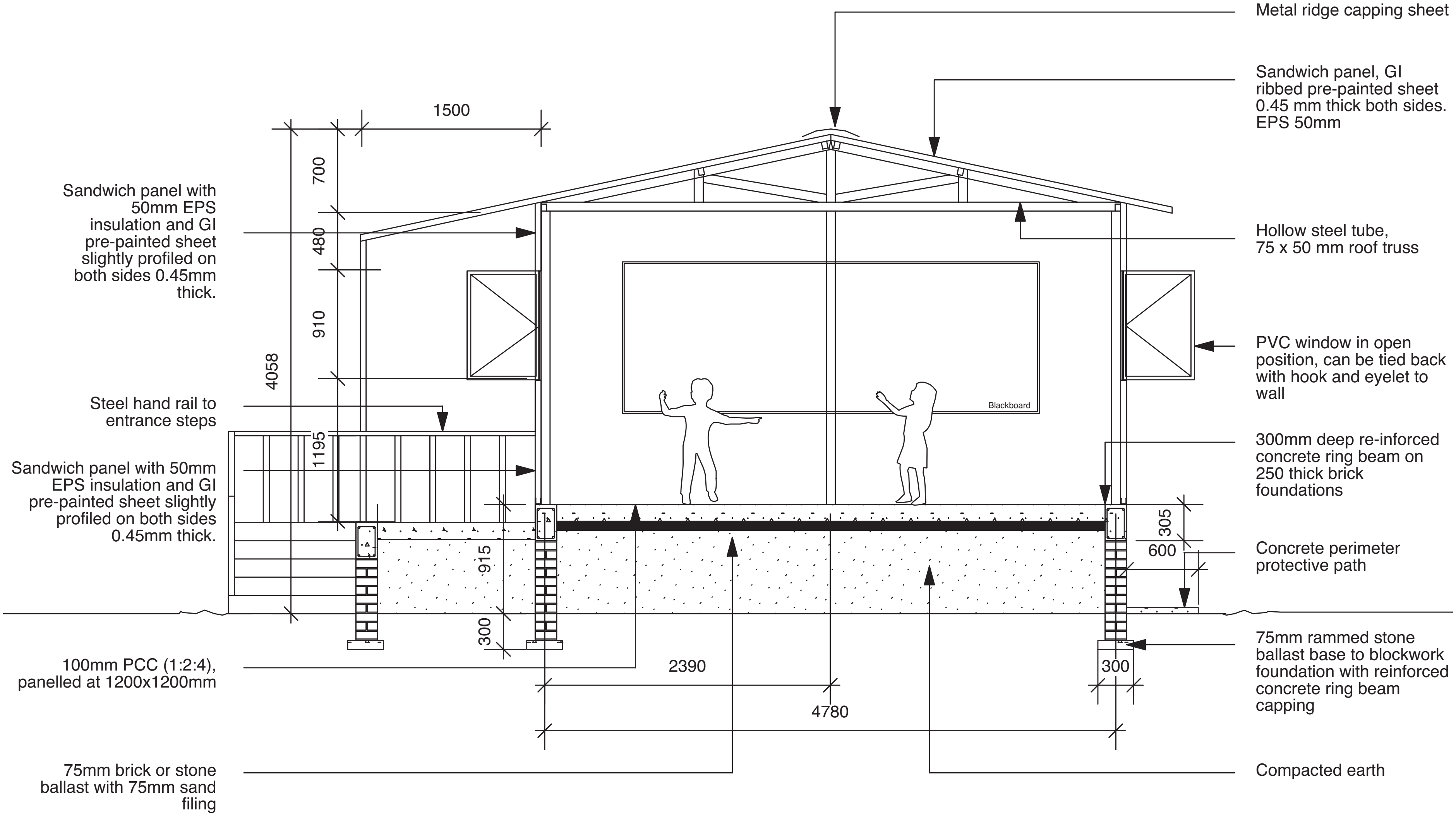
Raised Plot
• The plot for TSS schools should be raised before building TSS for flood protection.

Alternative water source
• An alternative water source is needed for many schools where the ground water is not available at 50-foot depth. The deeper the boring, the more expensive it is.

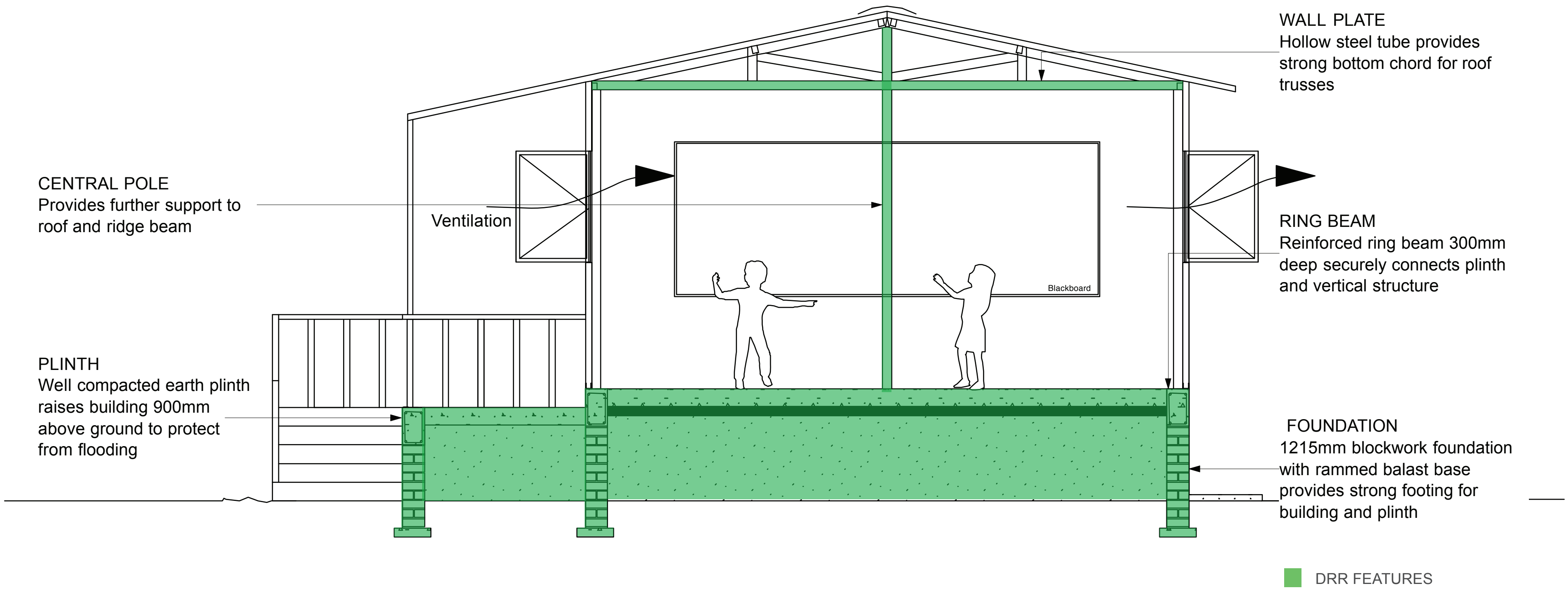
FLOOR PLAN NOT TO SCALE



SECTION SCALE 1:50



DRR FEATURES



2010 / UNICEF

Agency:	UNICEF / Haiti
Location:	Earthquake-affected areas
No. of users:	Over 70,000 children, 50 children per classroom (double shift)
Anticipated lifespan:	Semi-permanent: 10-15 years; permanent (not built yet): more than 40 years
Actual lifespan:	-
Facilities provided:	Classrooms, office, gender-separated sanitation facilities, hand washing, drinking water point, security fence and school furniture
No. of schools facilities:	Sept. 2010-Oct. 2012: 196 semi permanent schools
Construction time:	Semi-permanent: average 3 months (3 month defects liability period).
Main construction materials	Reinforced steel structure of tents, concrete for foundations, cement blocks or stone, fibre cement sheets for partitioning, insulated galvanised sheets for roof
Material sources:	Mostly imported
Project cost/unit: *	Approx. USD 515 average sqm/cost, USD 26,360 per classroom. Approx.
Material cost /unit:*	-
Size of units:	Classroom: 42m^2, admin office: 30m^2
Size of construction team:	Approx. 10 skilled workers + 20 unskilled
Construction skill required:	Concrete, masonry, steel works, plastering, plumbing
Who built the facilities:	Local contractors, local community site preparation/ accessibility improvements
Site information:	Sites accessed according to compliance to the minimal geographical and topographical standards

Background

In 2010 an earthquake of magnitude 7.0 struck near Port au Prince, Haiti's capital, causing dramatic destruction. An estimated 3.5 million[1] people were directly affected by the earthquake. About 3,978 schools were damaged [2],which is more than 77 per cent of the existing public education infrastructure[3]. The education cluster [4]estimates that 90% of schools in Port-au-Prince and Leogane and 60% of the schools in the south and west departments have been partially damaged or destroyed, affecting some 500,000 children aged five to 14 (48% girls). Prior to the earthquake, only 51%of children were enrolled in school.

There was poor access to water in schools; even before the earthquake, 40% of schools didn't have access to drinking water. In respect to improved sanitation, infrastructure access was extremely low and had actually been decreasing (17% in 2008, down from 26% in 1990 [5]), and 60% of schools didn't have a sanitation facility[6] . After the earthquake, 94% of schools were found to lack water, sanitation and hygiene (WASH) facilities, as well as proper hygiene promotion practice, which is critical to ensure a healthy environment for students.

Update

During a two-year period from 2010 to 2012, 196 semi-permanent schools were constructed. Of those, 170 were built in the departments directly affected by the 2010 earthquake. In 2012, three final semi-permanent schools were completed and the architectural and engineering concept design for the Phase 3 permanent schools were developed.

The technical drawings and Boqs for Phase 1, temporary tent structures, and Phase 2, semi-permanent schools, are documented in the 2011 compendium, which can be download from:

http://www.educationandtransition.org/wp-content/uploads/2007/04/TLS_compendium.pdf

From semi-permanent to permanent schools

Based on the high impact of school construction that contributes to restoring normalcy, increasing access and improving quality of education, UNICEF Haiti is in a transition to support the Ministry of Education to construct permanent schools. This includes the reconstruction of up to 15 schools based on the concept of "Building Back Better", applying design standards to improve the buildings seismic and cyclone force resistance and incorporating child-friendly standards such as a constant water supply, separate sanitation facilities for boys and girls, a library, teachers' facilities and easy access for children with disabilities, etc. UNICEF is a key player in the "Bati Scolaire", a sub-group of the Sector Working Group for Education (led by the Ministry) which has been established to coordinate the construction process and propose school prototypes in order to finalise and disseminate architectural standards, enhance the validation procedures for construction, and support the Ministry to fulfil its responsibility for implementation of the National Action Plan for Safer Schools.

Site hazard assessment

UNICEF developed, in partnership with the Ministry of Education, a site assessment form to map site-specific hazards. It includes questions regarding general context, site vulnerabilities and type and condition of existing buildings on site. Important issues, such as ground condition, soil type, exposure to wind, percentage of site on slope, presence of rivers nearby and other secondary hazards (e.g. factories, previously collapsed buildings, etc) are being mapped.

UNICEF carried out several site assessments jointly with the WASH section to assess the suitability of proposed school construction sites. This assessment led to several sites being refused for school construction and in other cases mitigating site works were proposed, such as terracing, retaining walls and external drainage routes.The form can be downloaded in the appendix.

In addition, the government has developed the "Normes de construction scolaires", DGS,November 2010. The document gives guidance on important site planning issues and minimum standards to mitigate risk factors. Included are:

• Minimum distances from hazardous areas (e.g. river, main road), noise (e.g. market, factories, public places, busy roads) or pollutants (e.g. slaughterhouse, poultry, piggery, garage, garbage dumps, gas station, water ponds) at 250m minimum

• Non-building zones are defined as: areas near rivers, areas subject to heavy flooding, 800m zone from the coast, areas near tectonic faults, areas exposed to wind, near the edges of cliffs and at the foot of steep and high slopes of mountains

• Minimum plot size required for size of catchment area and calculation methods

• Basic minimum facility standards for pre-school, mnnprimary school and secondary school, setting out minimum area per child at 1.2sqm and a maximum class size of 40 children

• Minimum equipment and furniture provision

1 www.dec.org.uk/haiti-earthquake-facts-and-figures
2 Source: Children of Haiti: Three Months After the Earthquake, UNICEF, April 2010
3 Source: Operational Plan (Final Draft), MENFP, December 2010
4 co-lead by Save the Children
5 Source: Ibid
6 Source: MENFP, 2003

EXTRACT FROM UNICEF SITE HAZARD ASSESSMENT

A. Context evaluation and site vulnerability

Space available (m2)		
Context	yes	no
If there is a river in the city, is it possible to cross over	yes	no
What is the average distance (in relation to the catchment area) from the area covered by the future school to the site?	<2km 2-3km	3-6km >6km

B. What makes the site more or less vulnerable?

Is the underground dense enough to prevent water infiltration after earthquake?	yes	no
Is the ground water level deep enough to prevent flood and allow natural drainage?	yes	no
Is there a natural wind barrier (trees) to protect the future school from strong wind?	yes	no
Has the site (if on a slope) been deforested or used for agricultural activities that make it more vulnerable to landslides ?	yes	no

C. Future or secondary hazards

Are there any factories or any industrial activities in its surrounding that can accidently expose the site to contamination?	yes	no
Are there any other buildings nearby that could collapse during an earthquake?	yes	no
Has the site have been already flooded by tide caused by strong winds coming from the coast?	yes	no

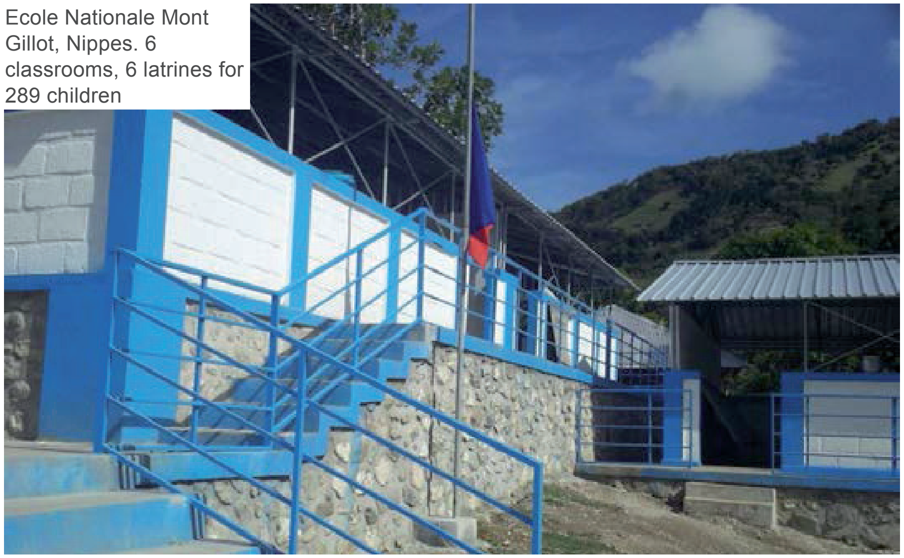
2. Existing Building

Construction type of existing building/shelter:

- Timber ☐
- Corrugated sheet ☐
- Canvas sheet/Tarpaulin ☐
- Barrel ☐
- Re-used materials ☐
- Tent structure ☐
- Industrial shelter ☐
- Concrete structure ☐

Please contact UNICEF Haiti office, dventurini@unicef.org for the complete document, “Normes de construction scolaires” and the WASH document “Questionnaire Suivi-Evaluation WASH dans les ecoles”

Ecole Nationale Mont Gillot, Nippes. 6 classrooms, 6 latrines for 289 children



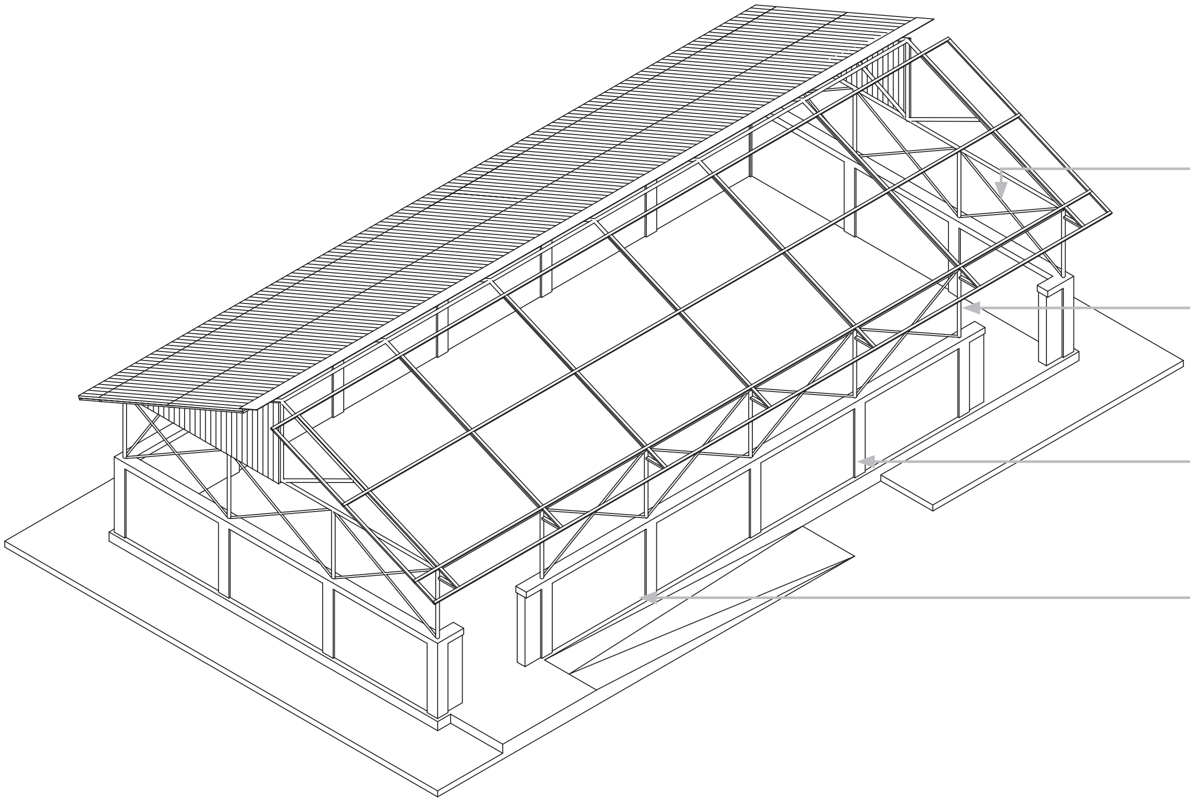
Ecole Nationale Haut Grandou, South east. 4 classrooms, 6 latrines for 276 childen

Ecole du fond du Lianes, 6 classrooms, 6 latrines for 204 children

Ecole nationale de Baquet, 9 classrooms, 8 latrines, 219 children

All photos: UNICEF/ Haiti

LESSONS LEARNED DIAGRAM



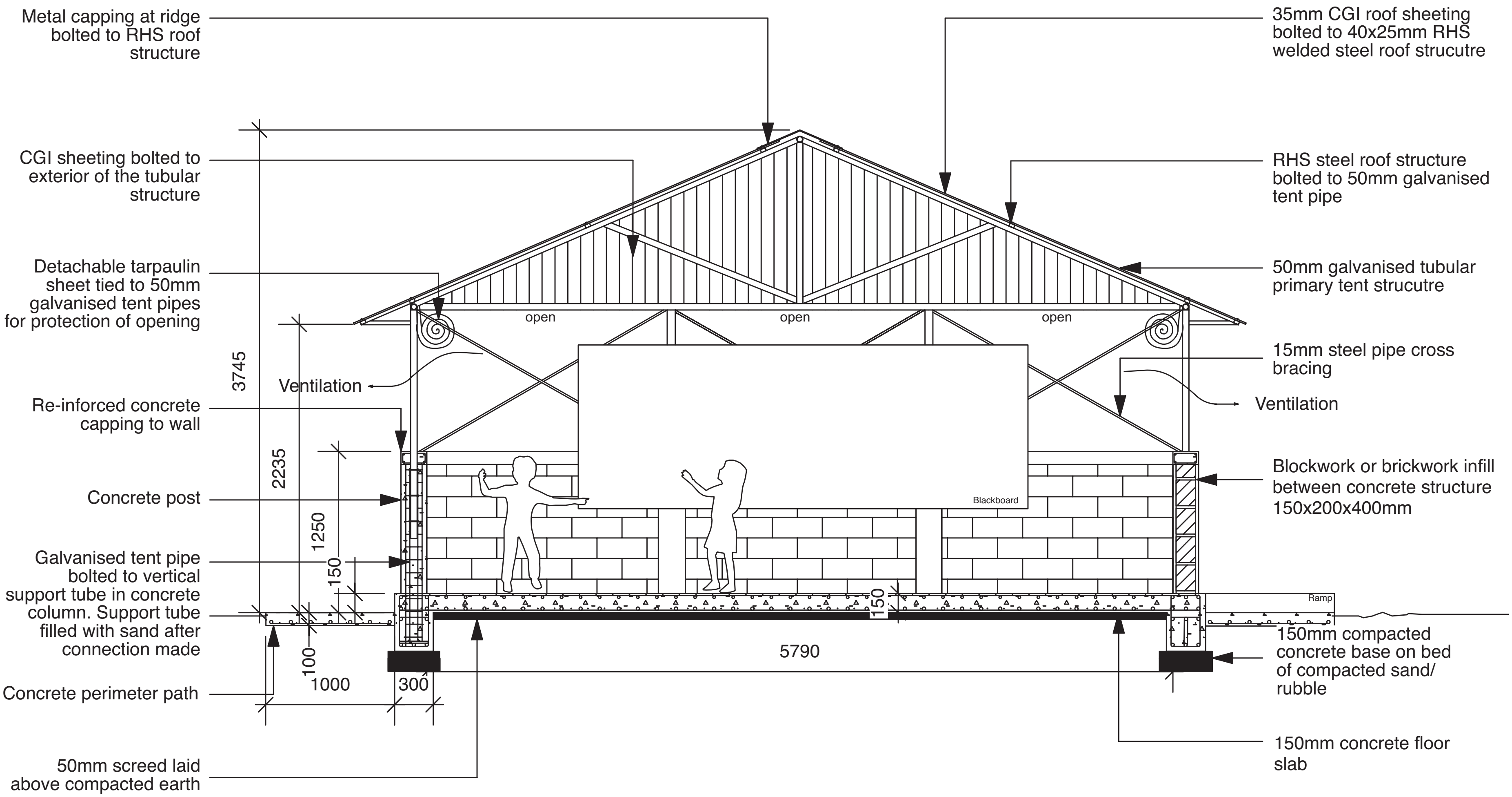
Cross bracing
- Upper part of structure is cross braced with steel angles for lateral rigidity

Vertical reinforcement
- Continuous vertical reinforcement connects foundation and concrete piers for structural strength

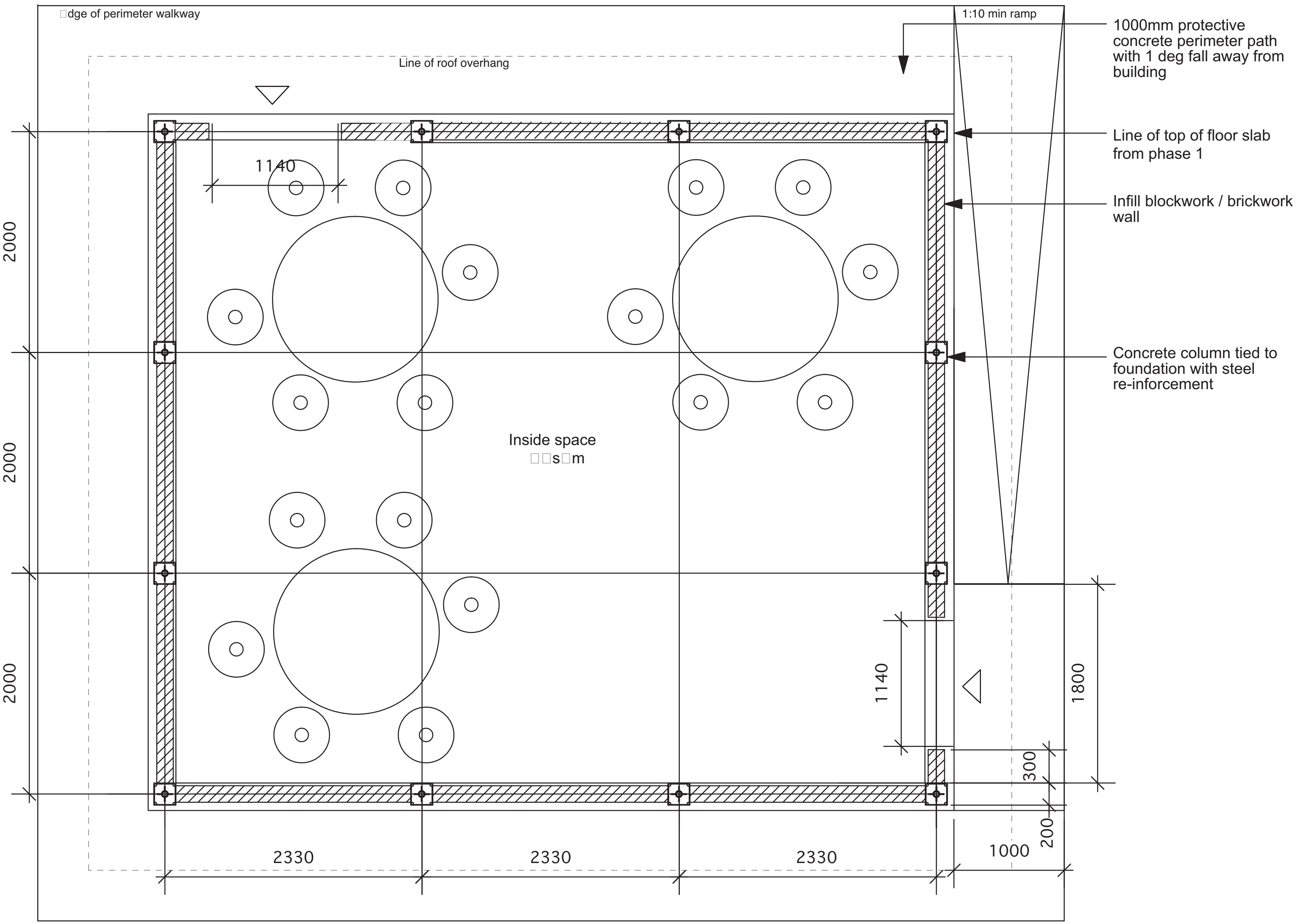
Concrete piers
- Reinforced concrete piers/columns at 1200mm centres in filled with blockwork for a robust wall

Grade beam
- Continuous reinforced concrete grade beam and foundations provide better resistance to seismic forces

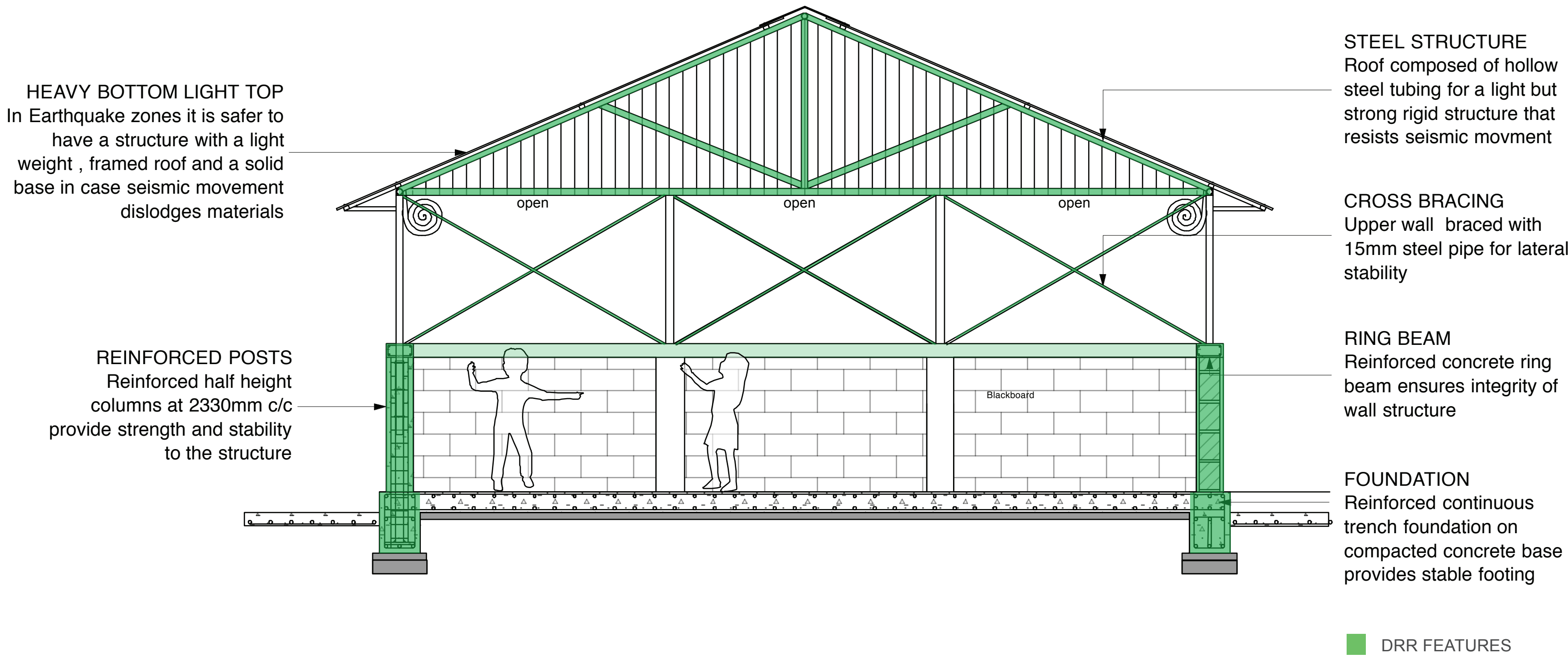
SECTION SCALE 1:50



FLOOR PLAN SCALE 1:50



DRR SECTION


HEAVY BOTTOM LIGHT TOP
In Earthquake zones it is safer to have a structure with a light weight , framed roof and a solid base in case seismic movement dislodges materials
REINFORCED POSTS
Reinforced half height columns at 2330mm c/c provide strength and stability to the structure
open
open
open
Blackboard
STEEL STRUCTURE
Roof composed of hollow steel tubing for a light but strong rigid structure that resists seismic movment
CROSS BRACING
Upper wall braced with 15mm steel pipe for lateral stability
RING BEAM
Reinforced concrete ring beam ensures integrity of wall structure
FOUNDATION
Reinforced continuous trench foundation on compacted concrete base provides stable footing
DRR FEATURES

View of a cluster of classrooms in Jacmel
Photo: Andrew Powell/Save the Children

2010 / SAVE THE CHILDREN

Agency:	Save The Children
Location:	Port au Prince (PAP), Leogane, Jacmel, Desalinnes, Maissade
No. of users:	40 children per classroom
Anticipated lifespan:	5-10 years
Actual lifespan:	Currently in good working order
Facilities provided:	Classrooms, sanitation/ hand washing facilities, drinking water, external play area, fence if required
No. of facilities:	15 schools (since 2011)
Construction time:	12 weeks per school
Main construction materials	Stone foundations, Cement blocks, timber super structure
Material sources:	Various, locally sourced if available and right quality
Project cost/unit: *	USD 18,000
Approx. material cost/unit:	Dependant on contractor
Size of units:	Classroom: 52m^2
Size of construction team:	Varied by contractor, supervised by engineer/ DRR staff from Save
Construction skill required:	Stone masons, block layers, carpenters, roofers, and plumbers
Who built the facilities:	Local contractor
Site information:	Urban and rural locations, varied by site, risk assessment and hazard mapping undertaken

Lessons learned

This update from the last year's documented case study from Haiti focuses on the 'lessons learned' constructing transitional learning spaces and the Disaster Risk Reduction and Preparedness activities that were implemented during the academic year Sept 2011-July 2012.

The challenges and issues raised here have been experienced during the construction of the pilot project "Institue Abellard". The 'lessons learned' have been put into four categories addressing different aspects of the understanding gained:

1) Construction skill and capacity

2) Perception of the school community

3) Safe construction techniques

4) Construction material

1. Construction skill and capacity

I. Local carpenters do not have the skill and knowledge in safer construction techniques, such as earthquake- and hurricane-resistant construction.

II. The local builders have a lack of technical understanding and knowledge of concrete mixture and testing methods.

III. Technical expertise for safe concrete steel reinforcement works is lacking within the construction industry, such as good ways for bending and connecting steel bars and right ways to make stirrups.

A focus on building skill and understanding within the carpenters and concrete workers in safer construction techniques through training, pilot projects and regular site inspection is a key factor. The construction process can be used for integrating education programs and DRR programs to strengthen the local construction capacities.

2. Perception of the school community

I. The wood construction concept proved to have high acceptance by the local community.

II. The school construction has encouraged local people and other NGOs to copy the techniques into their constructions.

III. The education cluster encouraged NGOs implementing school constructions to visit the site and learn about safer construction techniques.

The local acceptance of the new school was high both from the school management and the local community. After experiencing the devastating effects of the earthquake on many concrete structures, most children and parents have psychological problems about occupying a concrete building. It should be noted that people still compare the high efficiency and resistance that old wooden houses showed in the earthquake in comparison with the modern concrete structure.

3. Safe construction techniques

Please refer to the 3-D drawing which illustrates the lessons learned in respect to safer construction techniques

4. Construction material

I. Metal: metal joints could not be locally sourced. It may be necessary to import.

II. Cement: Haiti has cement bags of 42kg and not 50kg as is the worldwide standard. It is recommended to take this into consideration when preparing BOQs.

III. Gravel: Haiti mainly has round chap river gravel. The gravel is strong by nature, but its shape makes a weak concrete mixture. It is recommended to crush the river gravel.

IV. Sand: Haiti has river dark agricultural sand and the mines white calcareous sand. Neither is suitable for concrete, but the agricultural sand proved to be better than calcareous sand. Importing good quality sand may be necessary.

V. Wood: Wood types imported to Haiti are not pressure treated and with law quality. Treatment is necessary prior to use and maintenance should be done yearly.

VI. Roofing: Corrugated metal sheeting used in Haiti proved too thin (2ml) for good quality construction, may need to be imported (3.5ml min. thickness).

To prevent delays in project schedule it may be necessary to procure some construction materials from outside Haiti before any construction commences.

IMAGES


TLS classroom in Etzer Vilaire, showing timber shuttering detail


Whole school involved in emergency evacuation activities in Ecole Splendour


Internal view of TLS classroom for Ecole Silow in Jacmel. Heavy masonry base with timber walls and roof is recommended for seismic zones


Children and teachers practicing emergency response activities in Ecole Splendour.

All photos: Andrew Powell/Save the Children

DRR/DRP

The DRR and DRP programs included working with 40 supported schools in a wide range of activities:

I. Conducting risk assessment and hazard mapping in all 40 schools.

II. Training of 240 teachers and 80 principals in basic DRR principles and activities.

III. Formation of emergency committees and supporting committees' identification of school-specific risks.

IV. Supporting teachers and principals to educate children in Hazard Vulnerability Capacity Assessment (HVCA).

V. Major effort was given to prepare individual school Emergency Preparedness Plan (EPP).

VI. Conducting emergency evacuations simulations and simulation in HVCA at all 40 schools.

VII. Creation of emergency response teams (SERT) and assigning key rolesand responsibilities.

VIII. Implementing of 40 basic early warning systems in the schools, which included megaphone and whistles.

IX. Installing of community awareness boards at each school.

X. Implementing 10 small mitigation projects in some of the supported schools.

These activities were conducted through using various participation techniques, such as focus group workshops, hazard/risk mapping, developing learning material and games. It engaged the whole school community including the teachers, students, parents and local community and received very positive response from the supported school communities.

The program resulted in some basic early warning systems, community awareness boards, some small mitigation projects and individual schools' emergency response teams. The program has now been handed over to the schools with some very light touch support and refresh training provided periodically by Save the Children team.

After hurricanes Sandy and Isaac the SERTs were Save the Children's first point of contact. The communications were established by phone and vital information on damage and extent of flooding assessed to organise the emergency response.


Construction of a TLS

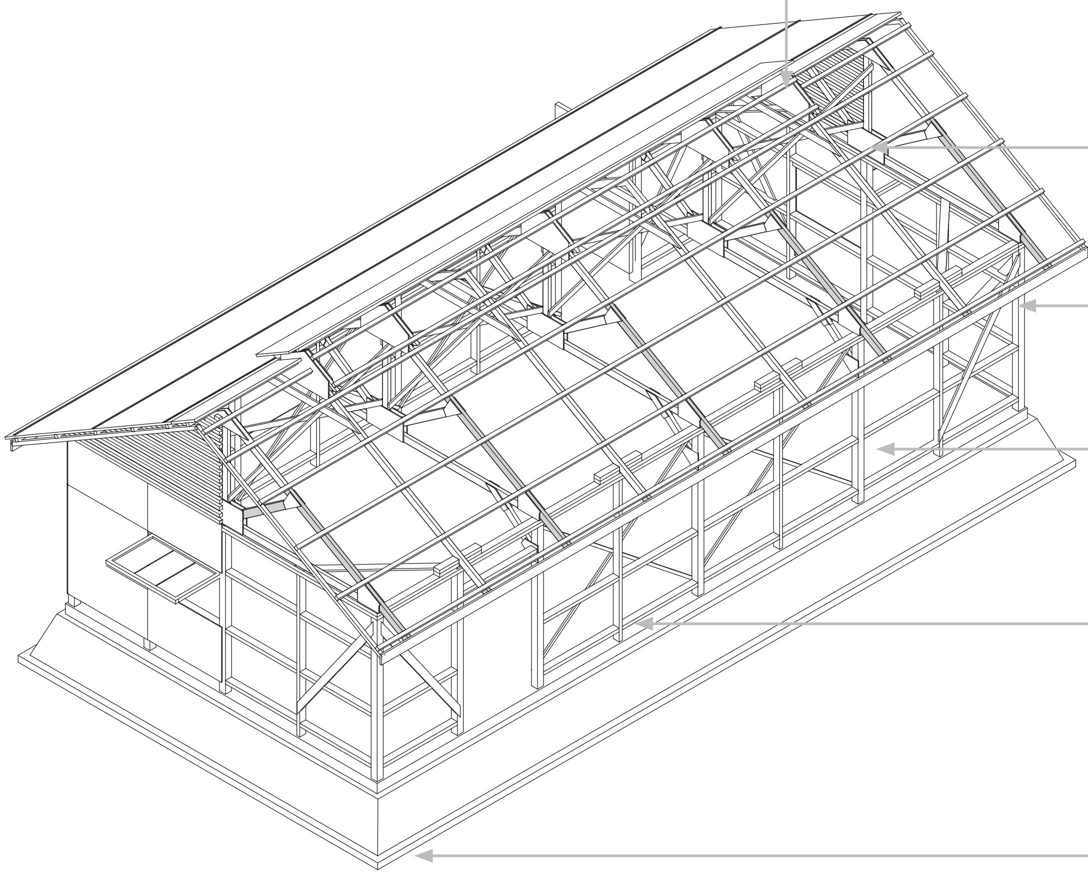

Children identifying risks and hazards


Creating an emergency evacuation plan


Emergency evacuation drill in action

All photos: Andrew Powell/Save the Children

LESSONS LEARNED DIAGRAM



• Raised Ridge Plate
• A raised ridge plate allows adequate ventilation of the structure, keeping the interior temperature lower than the exterior.

Rainwater Harvesting
• Drainage pipes and tanks recommended to store rainwater

DRR construction techniques
• Cross bracing, hurricane straps, wall plates, nail plates and gusset planes should be used to strengthen connections and make structure resistant to seismic movement and other forces.
• Nails should be galvanised, and rubber gaskets used when fixing to roof purlins.

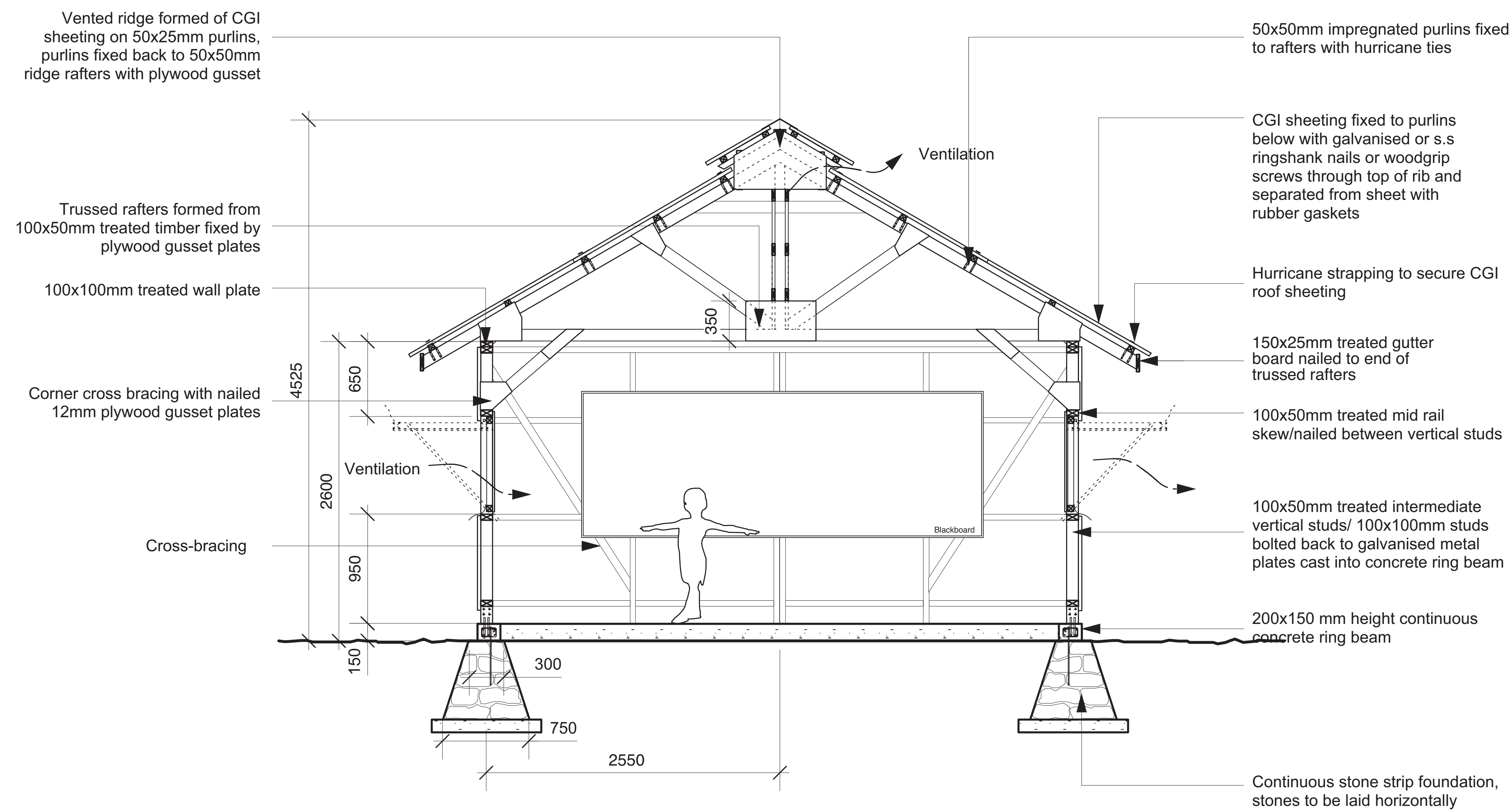
Treated Timber
• The timber is of low quality in Haiti. It must be treated prior to construction with paint, anti-termite solution or used engine oil to prevent rapid deterioration.

Concrete Work
• Mechanical concrete compactors could not easily be sourced in Haiti. Hand made compactors, composed of a bucket weighted down with concrete are used instead.

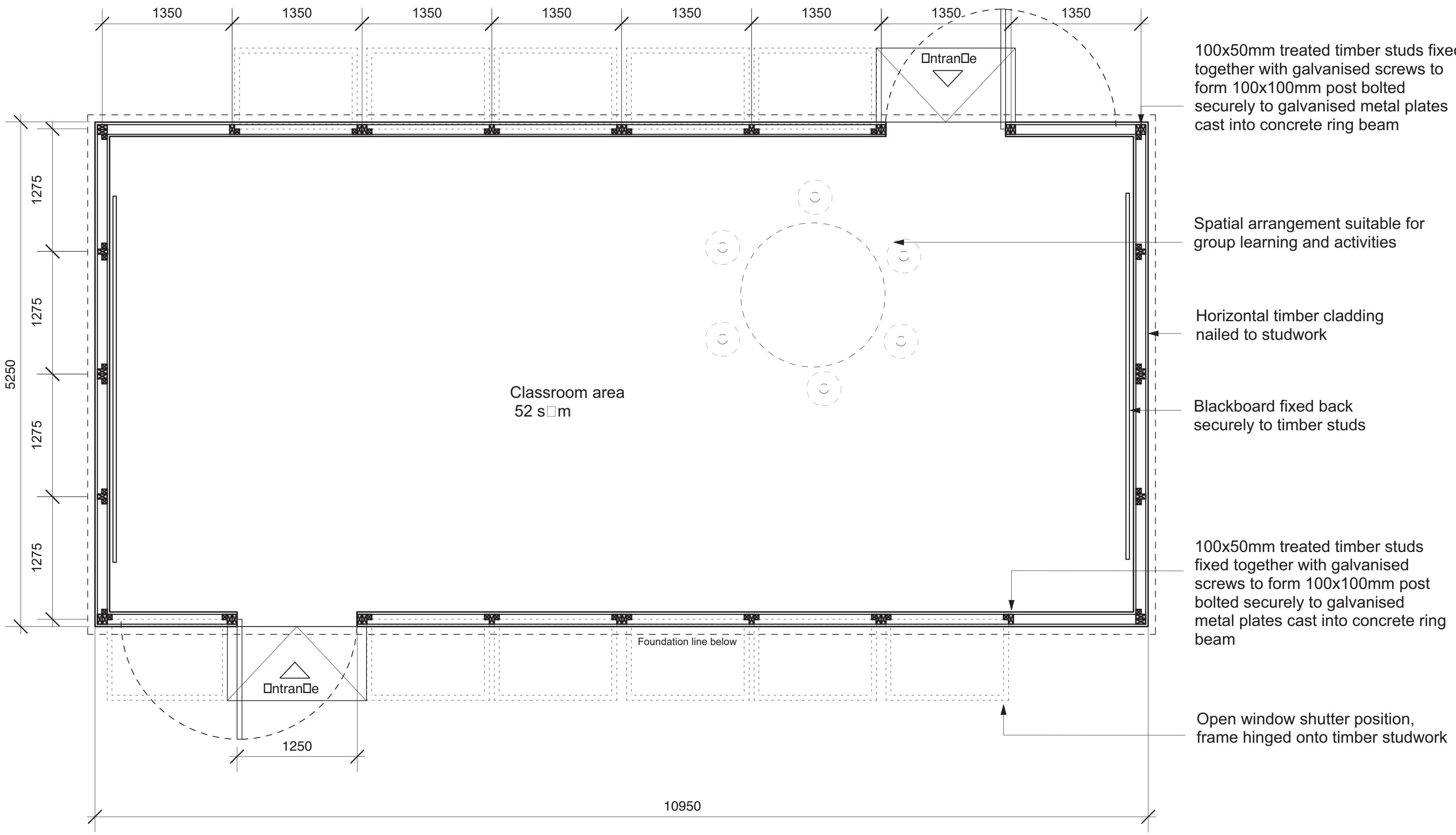
Concrete Slab
• A concrete slab floor is the cheapest and safest construction method for the floor.
• The slab and strip foundations together form a counterweight against uplift from strong winds/hurricane.
• A large concrete slab helps structure have even weight and equal settlement

Strip Foundations
• Natural soil in Haiti is too weak for isolated footings, such as pad foundations
• A continuous strip/trench foundation is recommended to distribute load and prevent differential settlement.

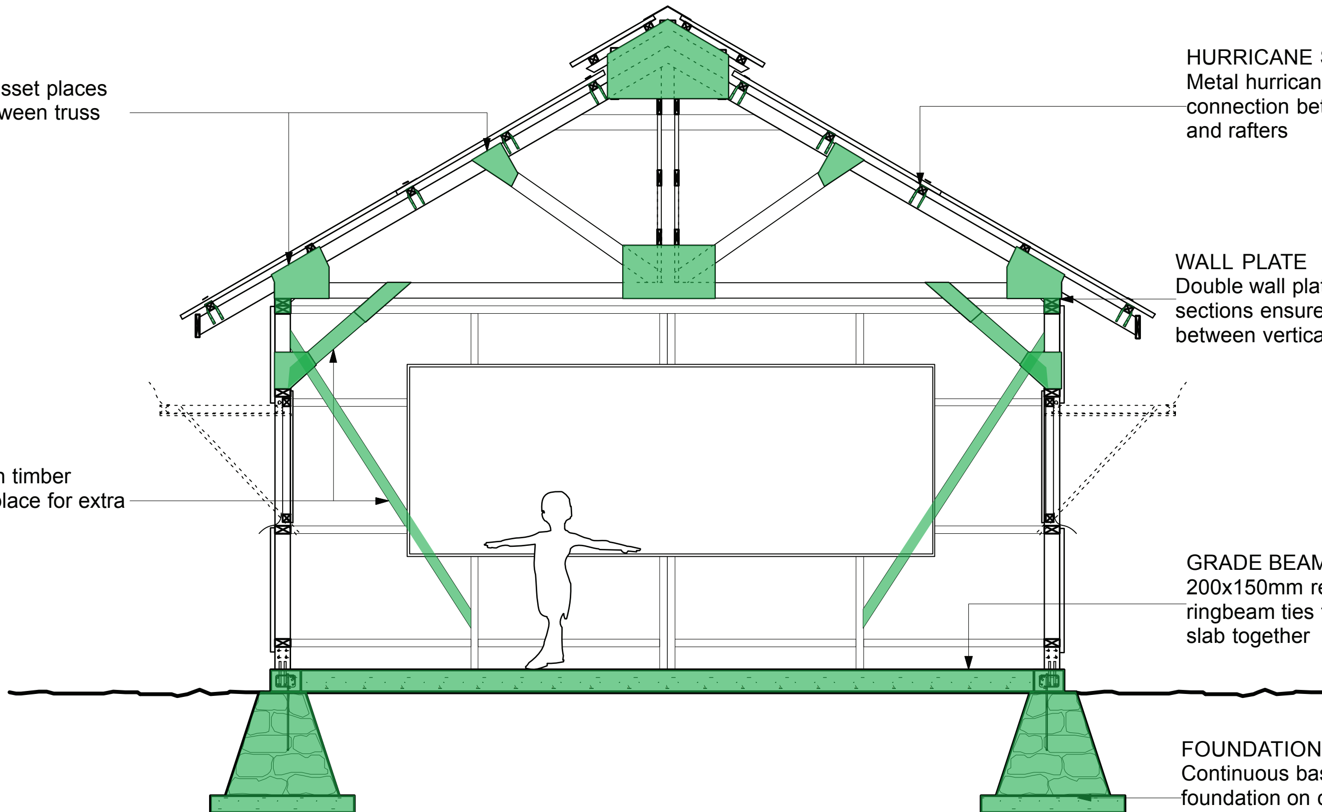
SECTION SCALE :150



PLAN NOT TO SCALE



DRR SECTION SCALE 1:50



GUSSET PLATES
12mm thick plywood gusset places secure connections between truss members in roof

BRACING
Corners are braced with timber sections, notched into place for extra lateral stability.

HURRICANE STRAPS
Metal hurricane straps secure connection between timber purlins and rafters

WALL PLATE
Double wall plate made of 25x50mm sections ensures strong connection between vertical members and roof

GRADE BEAM
200x150mm reinforced concrete ringbeam ties foundation and ground slab together

FOUNDATION
Continuous basaltic stone trench foundation on compacted concrete for stable footing in poor soil conditions

DRR FEATURES

2010 / NORWEGIEN REFUGEE COUNCIL

Agency:	Norwegian Refugee Council — NRC
Location:	Mogadishu and Afgooye Coridor, Somalia
No. of users:	40–50 students per classroom.Used in shifts where demand is high
Anticipated lifespan:	4–5 years
Actual lifespan:	Those constructed Feb 2010 still intact
Facilities provided:	Classrooms, head teacher's office and stores, latrines and drinking water
No. of schools constructed:	Rehabilitation of schools,improvements to TLS
Construction time:	1 week
Main construction materials	CGI sheets, timber, nails, cement, gravel and sand
Material sources:	All locally sourced from local suppliers/ businessmen
Project cost/unit: *	USD 2,500
Material cost /unit:*	USD 1,750
Size of units:	Classroom: 8.0x6.0m wide, office and store: 2.0x6.0m
Size of construction team:	6 construction workers
Construction Trades:	Basic construction knowledge of carpentry, corrugated iron sheets and concrete works
Who built the facilities:	NRC, using local craftsmen and labour from the beneficiary IDPs community
Site information:	Secure land tenure is the main challenge

Background

Following gains in security and stability in Mogadishu and most of South and Central Somali regions in 2012, there have been evictions of Internally Displaced Persons (IDPs) occupying former public facilities and buildings as the Transitional Authorities embarked on reconstruction. Consequently, NRC provided help to three of the evicted communities to relocate their learning facilities to new locations. The communities were able to dismantle, relocate with the salvaged materials and reuse them to erect new learning centres in various locations in Mogadishu. Midway through 2012, evictions and displacements eased after the transitional government mandate ended following an election largely held to be democratic and peaceful. Consequently, this allowed for other activities targeting improvements and repairs to existing learning centres.

Going forward, in line with the improving stability and a strengthened government, emphasis is expected to shift from temporary learning centres to rehabilitation and upgrading of older, existing permanent learning facilities(schools), especially inside Mogadishu and other urban centres, and the construction of new permanent facilities. Increasingly, the new authorities are showing bigger interest in the provision of a modern education infrastructure.

Relocation

In 2012, NRC has mainly undertaken repairs and improvements to the existing centres as well as provided help to three of the displaced communities to relocate their schools within Mogadishu. The communities were able to dismantle, relocate with the salvaged materials and reuse them to erect new learning centres. By the middle of the year, most displacement and evictions had eased following the improvements in stability.

Shift to Rehabilitation

The increase in stability that coincided with the end of the transitional government mandate and an election largely held to be democratic and peaceful helped to shift focus to the rehabilitation of former schools. This will assist in improving the learning environments of displaced and host community children alike. One rehabilitation project of the 21st October was a school located in Mogadishu's Waberi district has been completed and it is expected that this trend will continue in 2013.

Improvement to design

Certain improvements were made to the design. Steel meshes to the window openings were installed to increase security, which was an improvement requested by the community education committees. The mesh allows for uninterrupted ventilation for the hot and humid climate and even natural lighting. In addition, ramps were added to provide children with disabilities easier access into classrooms.

DRR/DRP

The two main materials, corrugated galvanised iron sheets and timber, are handled and utilised in a way that they can be pulled down and reused following relocation caused by new displacement or evictions. While the steel mesh added to the openings during recent improvements was aimed at improving protection of the furniture against theft, it has further helped strengthen the structures against strong winds blowing from the Indian Ocean.

The Community Education Committees, who represent the community's interest, are well briefed on maintenance of the structures once handed over, with NRC thereafter providing limited support for major upgrades and repair, and relocation of the structures in times of displacement.

The use of the rooms as community centres/meeting halls promotes their maintenance, protection and ownership by the larger community, which ensures that they are kept in fairly good condition.

Challenges

- The lack of electric power for lighting and other learning equipment limits their use to daytime hours only.

- Protection of the facilities against vandalism remains a challenge, even as the overall security situation and stability of Mogadishu improve.

- As the structures are built on land without security of tenure, there is the ever-present threat of eviction and relocation, and the occasional diversion of materials.

Rehabilitated school

Photo: NRC/Somalia

IMAGES

Internal view of boys and girls inside TLS in Bondere

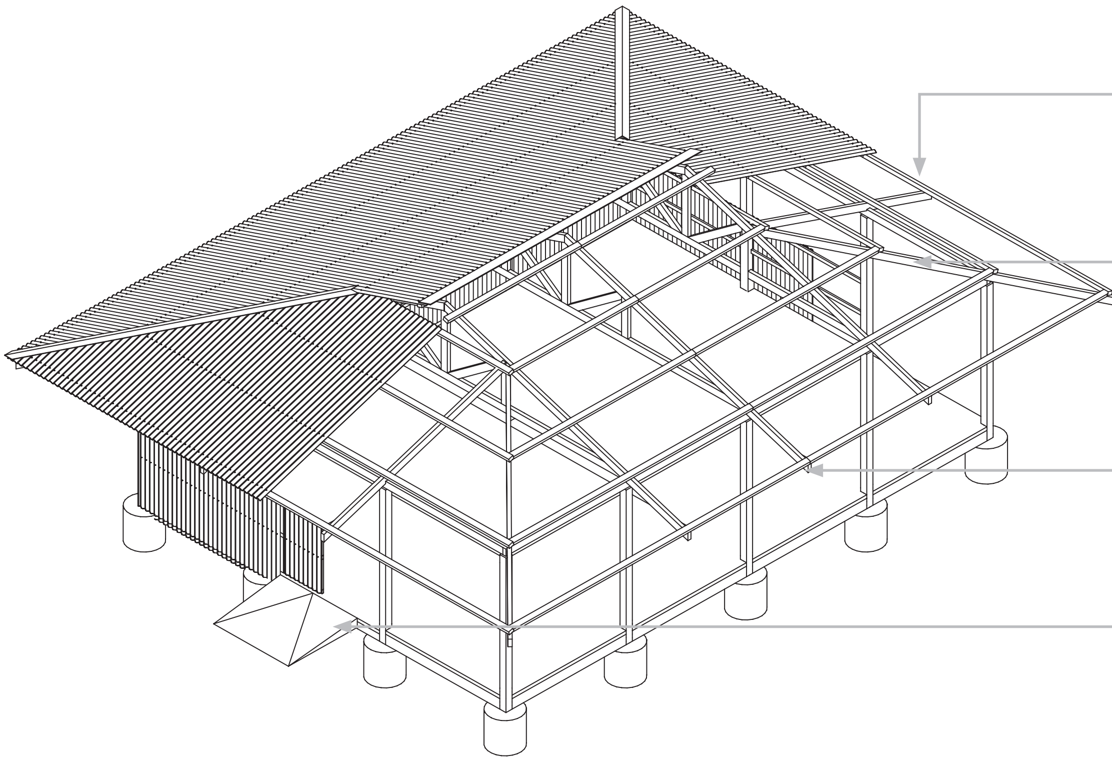
Improvements were made to the schools including the addition of steel mesh to the windows, for security reasons. The mesh allowed adequate light and ventilation

The structure can be dismantled and in the past year 3 TLS centres were relocated

A number of existing schools were rehabilitated. For example, adequate furniture was supplied.

All photos: NRC/Somalia

DRR 3D VIEW



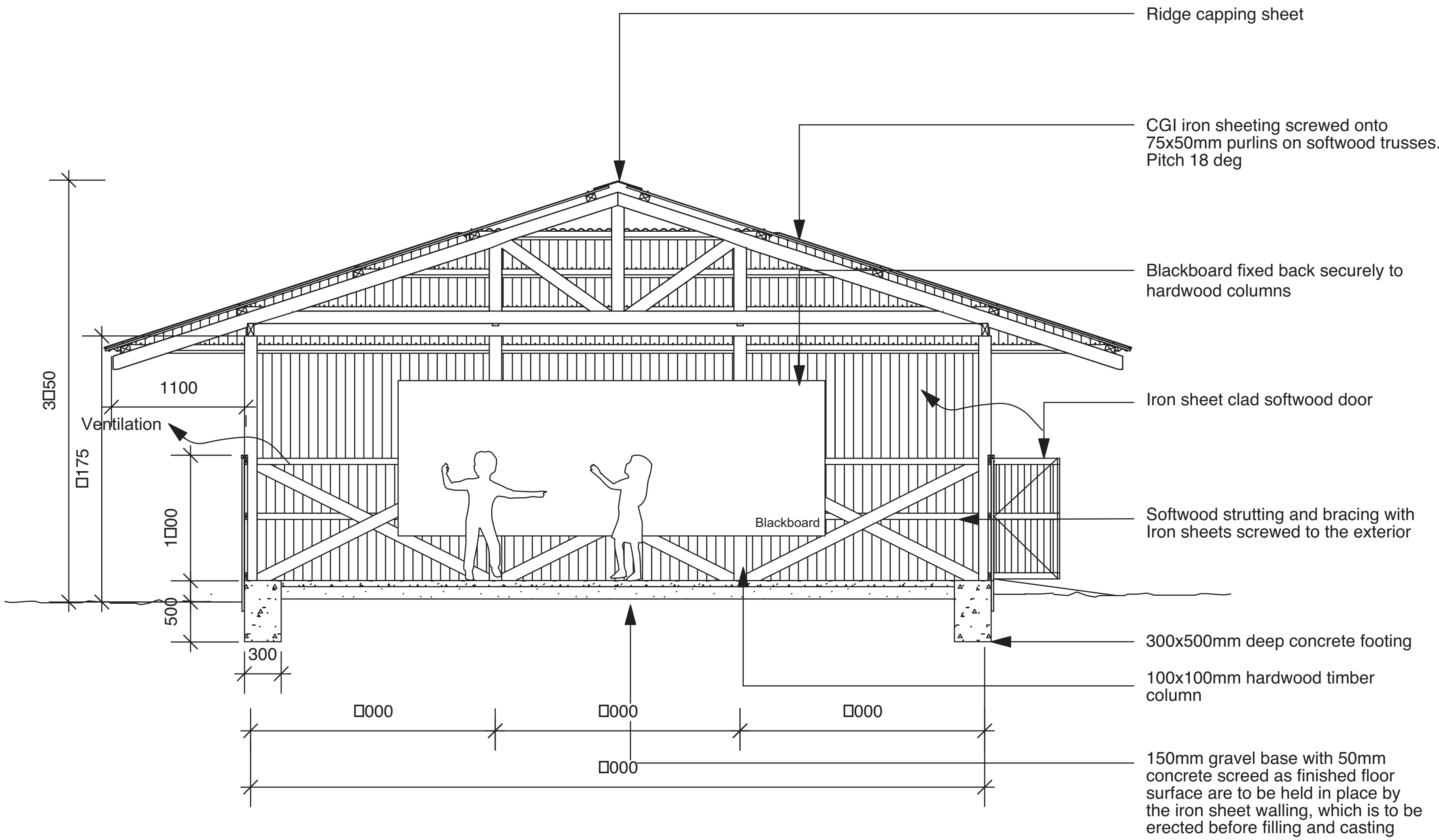
Hipped roof
• Hipped roof recommended for climates that have strong winds

Transportable structure
• The structure was designed to be easily dismantled, moved and reassembled in a new location

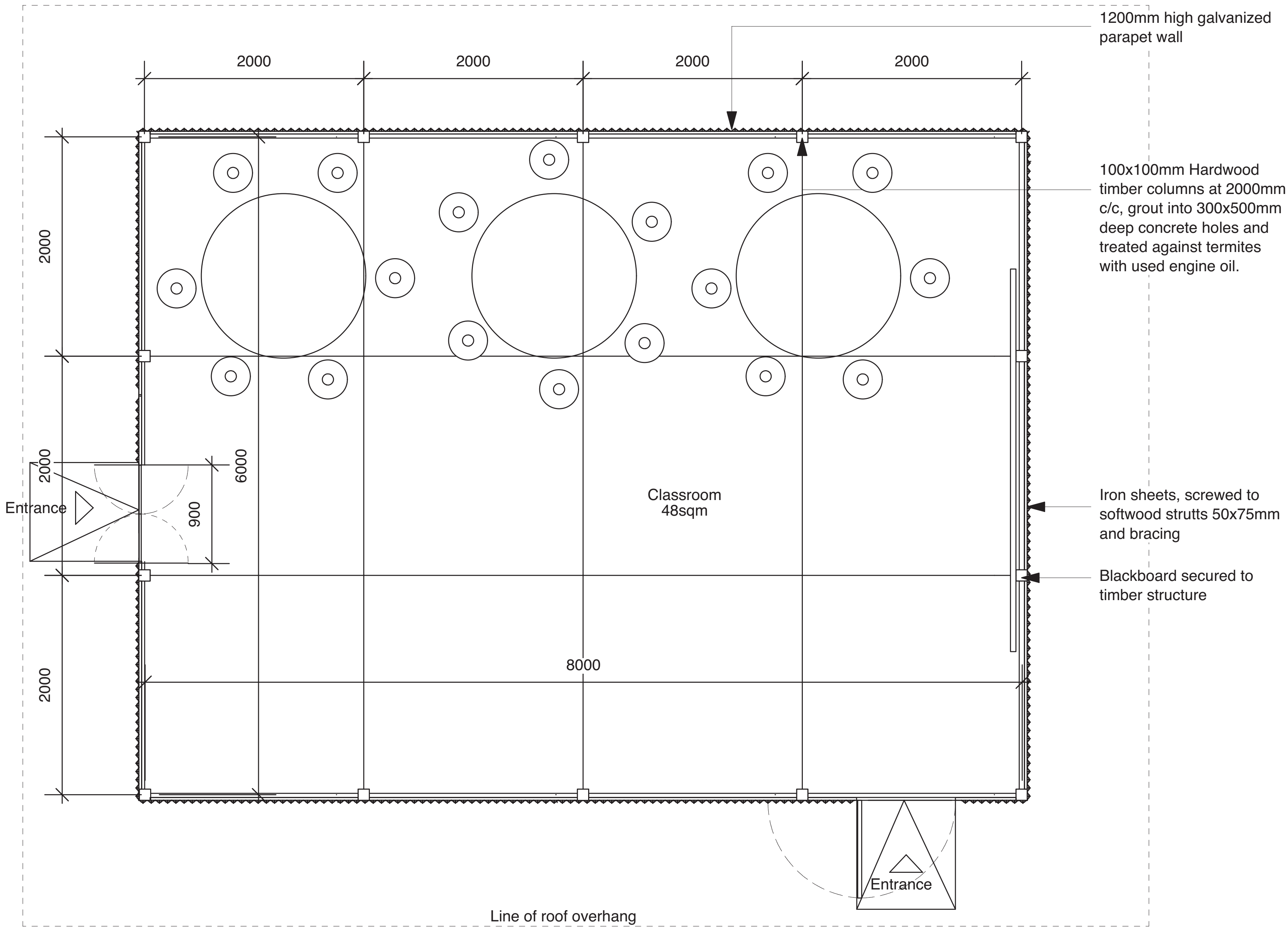
Window mesh
• Openings covered with wire mesh for security reasons but still allowing passage of air and light

Ramp
• Access ramp added by the community at a later date

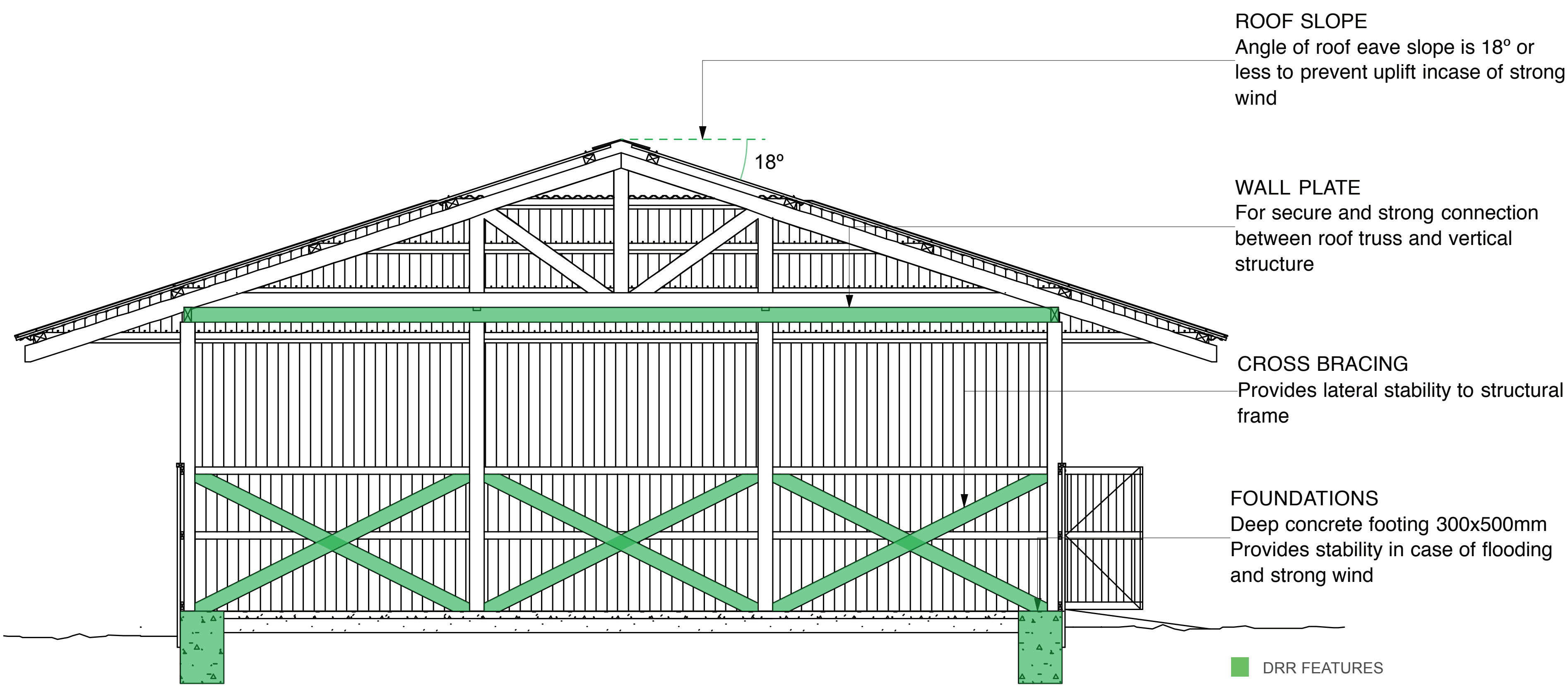
SECTION SCALE 1:50



FLOOR PLAN SCALE 1:50



DRR SECTION


18º
ROOF SLOPE
Angle of roof eave slope is 18º or less to prevent uplift incase of strong wind
WALL PLATE
For secure and strong connection between roof truss and vertical structure
CROSS BRACING
Provides lateral stability to structural frame
FOUNDATIONS
Deep concrete footing 300x500mm
Provides stability in case of flooding and strong wind
DRR FEATURES

FIELD NOTES

This is space for individual observations

SECTION D:
INNOVATIVE PRACTICES

Section D is a collection of innovative ideas for TLS in emergenciesand related innovative technical solutions that have been developed by organisations and companies around the world. Some of the innovations have not yet been implemented or tested within a large-scale emergency response. However, they offer inspiration and innovative practices that may be of interest for in future TLS projects.

1. ESSENTIAL HEALTH CARE PROGRAM (EHCP)

Photo: Fit for School Inc., 2011

Who made it: Implemented by the Philippine Dept of Education based on a framework developed by the NGO Fit for School Inc.

Project description: The project is an outstanding example of scale action to promote children's health and education. At the core of this national programme are three group activities – washing hands daily with soap, brushing teeth daily with fluoride toothpaste and de-worming twice a year. These WASH activities lower rates of diarrhoea, respiratory infections, worm infections and severe tooth decay. These hygiene related diseases prevent children attending school and this hinders their academic achievement and quality of life.

Why is it innovative: The project was funded by the government through local government health units and reached two million children in 2011. The cost of hygiene materials is less than 60 cents per child, thus ensuring that the project can be planned and allocated for by local governments. Parent teacher associations are engaged and a self-monitoring and evaluation process is used to encourage motivation. This project is simple, sustainable and scale-able and easily be applied to a number of countries.

For more information:
http://www.unicef.org/wash/schools/files/Raising_Even_More_Clean_Hands_Web_17_October_2012(1).pdf

2. TUTU DESK

Photo: TUTUDESK

Who made it: Tutudesk (UK)

Project description: A tutu desk is a portable school desk that a child can place on their lap, whether they are sitting on the floor or on a chair. It is made of child safe durable materials which should last at least five years. It is lightweight (<1kg) and has a handle so a child can carry it to and from school. Schools that have received the desks have reported that the children's school work had improved, the classroom was more organised, the children were more comfortable and the teacher better able to provide lessons. When the child takes the desk home siblings and parents also often use it.

Why is it innovative: UNESCO research shows that over 95 million children in sub Saharan Africa don't have a school desk and since 2001, over 1 million desks have been distributed across 95 million schools in sub-Saharan Africa. In 2005 Archbishop Desmond Tutu became patron of the organisation and in 2012 a campaign was launched with the aim of delivering 20 million Tutudesks to 20 million children by the end of 2015.

For more information:
becca@tutudesk.org (Executive Director, Tutudesk UK)
www.tutudesk.org

3.SOLAR RADIO

Photo: Lifeline Trading

Who made it: Lifeline Technologies (LT) a for-profit social enterprise that is aligned with the UN millennium goals.
Project description: The solaris radio and the prime radio are compact, robust, waterproof communication products, making them ideal tools for communication in emergencies, or in long-term education projects. They can both be powered by hand crank, solar or AC/DC input. The solaris can be used to charge your mobile phone and both have integrated LED lights. The larger prime radio is able to recieve all FM, AM and SW bands, even in the most remote environments and features a simple LCD screen that enables accurate tuning.
Why is it Innovative: Energy for lighting and communications are basic needs. In emergency situations, radios are often the most reliable form of communication with the outside word and can provide assured listening to individuals and small groups. The polaris has been used in relief efforts during the Pakistan floods and during the Tsunami in Japan. The prime radio has been used in a number of education initiatives across sub-saharan Africa and south Asia. It provides support to teachers and pupils to improve literacy in English and local languages.

For more information:
www.lifelinetrading.net

4.5 $ GRAVITY LIGHT

Photo: GravityLight from fastcoexist.com

Who made it: Martin Riddiford and Jim Reeves (UK designers)
Project description: A light that gets its power from gravity – A 22lb bag of sand gradually cranks a gear train attached to a DC motor to give 30 minutes of light. To recharge, simply lift up the weight again. It works inexhaustibly as long as you have the strength to lift the bag. It produces a brilliant quality beam, providing equivalent illumination to a kerosene lamp. Thus it can work in places where the sun does not always shine, and does not require storage of energy. Solar lamps of an equivalent value require a panel and batteries, are not durable and eventually have to be disposed of. In comparison the 5$ light is more robust, does not require batteries and is therefore better value for money.
Why is it innovative: The impetus behind the design was to reduce the usage of kerosene oil lamps in Africa, because the fuel is expensive and the fumes bad for health if used in small unventilated spaces. The design is unique because it challenges commonly held wisdom that solar lamps are the only alternative to battery/mains powered lights.

For more information:
http://deciwatt.org/

5. LMU–COMMUNITY CLASSROOMS IN NAVI MUMBAI

Photo: LMU BABAN SETH field trip report

Who made it: Collaboration between London Metropolitan University's Faculty of Architecture and Spatial Design (London, UK) . NGO ARPHEN (India) and quarry owners and worker settlement families in Navi Mumbai

Project description: The stone quarry communities of Navi Mumbai are on the periphery of a booming industrial zone. With local NGO APRHEN, who provide children of the quarry workers basic numeracy and literacy skills to gain certification and access to government schools, ASD projects (UK) constructed two community classrooms within the settlements. The design was robust and simple, consisting of a single roomed space raised up on a 2ft plinth to account for seasonal monsoon flooding.

Why it is innovative: Community members were fully involved in the construction process of the building and local skills, techniques and materials were used throughout. The proximity of the new classrooms within an existing temple space and the decision to link the two within the centre of the settlement was instrumental in its success. It is used not just as a classroom but a meeting room for women's self-help groups, weddings, and health clinics. It is a public building the community can fully take ownership of.

For more information:
http://openarchitecturenetwork.org/projects/babanseth

6. ECO–DOMES, JORDAN

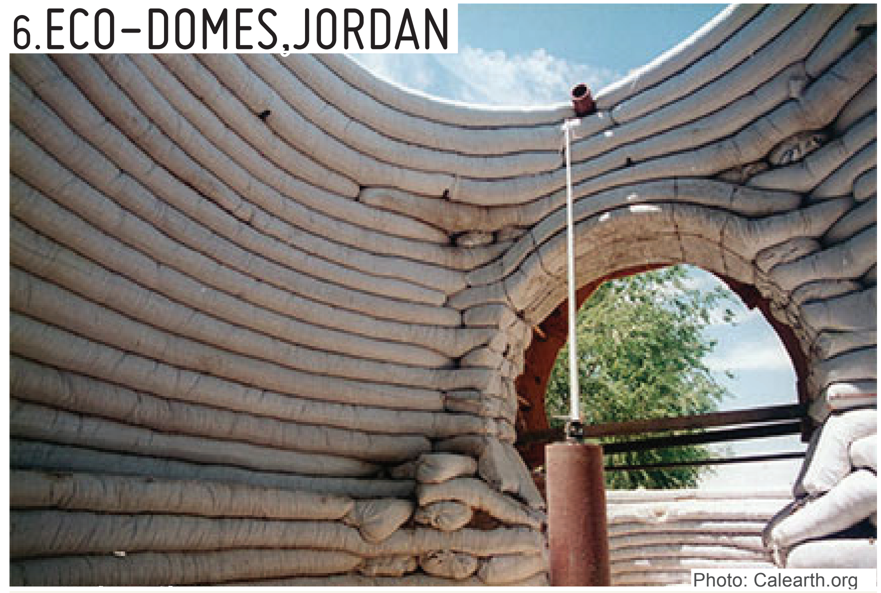


Photo: Calearth.org

Who made it: Invented by Engineer Nader Khalili

Project description: The eco-dome is a small home design of approximately 40m^2 interior space. It consists of a large central dome, surrounded by four smaller niches and a wind scoop, in a clover leaf pattern. It can be the first step in a clustered design for community use in an eco-village of vaults. It is constructed from 'super-adobe', a building technology that uses synthetic, long sand bags, filled with local site earth (stabilised with cement or lime) arranged in long layers or coils, with strands of barbed wire placed between them to act both as mortar and reinforcement. The building has high thermal mass so passively heats and cools providing an ideal shaded, cool home for hot dry climates.

Why it is innovative: The earth dome uses the timeless structural principle of the arch, dome and vault built with readily available, sustainable materials. The shell structure is strong in compression and the use of barbed wire adds a tensile element to the earthen structure, creating earthquake resistance. The aerodynamic form resists strong winds, the sandbags themselves provide flood resistance and the earth bags provides insulation and fire proofing.

For more information:
hhttp://calearth.org/building-designs/what-is-superadobe.html

7.PAPINOTAS

Who made it: Socialab
Project description: Papinotas is a web program which makes parent/guardian and teacher communication more streamlined. To send a message, the teacher types it into the website and it is sent to parents' cell phones with just one click. This makes parent-school communication more effective because the same SMS can be delivered to many parents at once and is more direct and reliable. Furthermore, it is convenient because almost all parents already have cell phones, and even the most basic cell can receive Papinotas.
Why it is innovative: In general, parents want to be involved in their children's education. Printed notes get misplaced and are a hassle, and e-mail is not a dependable or realistic alternative for many. Papinotas knows parents need a reliable and universally convenient way to get notes from school. Papinotas was born as a finalist of the first social innovation contest made in Chile in 2011, Desafío Clave. Papinotas is one out of the 20 projects that Socialab (socialab.com) works with all over Latin America, focused on creating business with social impact in the bottom of the social pyramid. Today, Socialab has a virtual community of 18,000 entrepreneurs and delivered 1.8 million USD in seed capital for social enterprises.

For more information: http://www.sociolab.com/

8.SHELL.TER

Photo: João Marques © / Eva Vieira ©

Who made it: LIKE Architects
Project description: Shell.ter is a pavilion built from monoblock chairs in the gardens of a natural park in the north of Portugal, during a short summer workshop by LIKE Architects. When the sun is strong, the shadow projected on the structure itself emphasises the tracery of the pavilion, creating effects of great complexity. Shell.ter invites park guests to relax in the shade along the river, creating a new meeting place that has even received small concerts.
Why it is innovative: The pavilion, which resembles the most advanced digital formalisations of parametric design, is actually set by the association of arches formed by ordinary chairs, which, rather than serving to seat, serve as shadow and backrest and create new frameworks that enhance the surrounding nature. Being fully reversible, Shell.ter has a virtually zero environmental impact, and can also be (re)assembled every summer. It illustrates that everyday objects, instead of being thrown away, can simply be reassembled together to create innovative, useful structures.

For more information:
http://www.archello.com/en/project/shellter
http://likearchitects.com/projects/shell-ter/

9.RAPID SMS BIRTH REGISTRATION

Who made it: National Population Commission of Nigeria
Project description: Since January 2011 the National Population Commision of Nigeria has been registering births in real time via the decentralised mobile phone platform Rapid SMS. This data is collected at a number of dedicated centres by registrars and then uploaded to a RapidSMS dashboard, which is accessible over the web. It is in operation in 33 states across the country in over 2500 registration centres.
Why is it innovative: Birth registration is a fundamental human right, ensuring that each individual has a name and a nationality from day one. It is the first legal acknowledgment of a child's existence and will help realise a number of practical needs including provision to health care, immunisation, education and other civil and societal rights. Most countries have a legal provision for registering births, however in many countries the laws have either fallen into misuse through lack of oversight or bureaucracy. RapidSMS is as much a straightforward method for registering births at clinics as well as a tool of accountability, ensuring that registrars are reporting birth cases every other week, spotting regional disparities and taking prompt action.

For more information: http://rapidsms.nmcpnigeria.org/
http://unicefstories.org/2012/10/17/nigeria-using-rapidsms-for-birth-registration/

10.HABITECH CENTRE

Photo: UNICEF School, Myanmar

Who made it: School of Engineering and Technology, Asian Institute of Technology, Thailand.
Project description: The Habitech building system is used to build low cost housing and social infrastructure that is durable and resistant to fire, wind and earthquakes. Prefabricated modular and interlocking components are used, such as cement stabilised soil or concrete bricks, concrete joists, concrete pans, adjustable concrete beams, concrete staircases and roofing tiles. Interlocking bricks can be produced using locally available soil, sand or stone. They can be laid dry without mortar, and are automatically aligned. This reduces the need for skilled masons thus bringing down the overall labour cost. The Habitech building system undercuts the cost of conventional building systems by as much as 30-50%.
Why it is innovative: It is widely acknowledged that inadequate access to inexpensive building materials is one of the principal constraints that hold back the poor in developing countries from acquiring proper housing for themselves. The Habitech centre has been active since 1989 and focuses on developing building materials that affordable for the majority of people. The centre has been involved in 200 projects in several countries across the world.

For more information: http://www.habitech.ait.ac.uk,or contact sthapit@ait.ac.th

11.GANDO BURKINA,FASO

Photos: courtesy of diebedo francis kere

Who made it: Francis Kere Architecture

Project description: The public library in Gando is a freestanding addition to a primary school completed by the firm some years earlier. The ellipse-shaped brick library space is held within an orthogonal canopy of eucalyptus columns in a concrete frame. The interior space of the library is calm and there are few windows, to allow the storage of books along the walls. Instead circular shaped light wells in the roof let in sunlight, creating dappled circles of light on the earth floor.

Why it is innovative: The construction of the perforated concrete slab ceiling was not technically complex, but required the collaboration of many community members and careful design engineering. A timber formwork was set up and the steel reinforcement cage for the roof fixed into place. Terracotta pots of various sizes, the kind used to store and transport water, were brought to the site by local people, and cut horizontally into thick cylindrical bands. These were placed in a scattered pattern within the formwork, and then concrete was poured. It illustrates that with creative thinking, simple vernacular materials can be used to create diverse and interesting spaces.

For more information: http://www.designboom.com/architecture/diebedo-francis-kere-public-library-in-gando/

12.PALM LEAVE SCHOOL

Photo: Book Arish: Palm-Leaf Architecture by by Sandra Piesik

Who made it: ADACH, 2 Ideas ltd.
Project description: A prototype school building that uses palm leaves as a main building material. The structure was able to span 13m with 4m in height and a typical module could provide space for 20 children. It consists of a series of arches, made from bundled palm leave stalks reinforced with a steel rod, embedded into a stone trench foundation. Stone walls provide additional support to the structure and quarter trunks act as a central beam. The roof is composed of palm leave mats with a bitumen lining. It can be constructed by approximately 15 local craftsmen (who can be trained in the required bundling and weaving techniques) and supervised by an architect and an engineer.
Why it is innovative: Dry palm leaves are a redundant material in the United Arab Emirates, currently land filled in the region. This prototype provides an innovative way to recycle palm leaf whilst also reducing the amount of wastage. The technology could be used in sites worldwide where palm is grown and the technology has the potential to be used for school and emergency shelter construction because of its simplicity and robustness.

For more information:
Sandra Piesik
Chartered Architect RIBA
3 ideas Ltd
e-mail: sandra.piesik@3ideasme.com
tel: 00 44 (+) 7530337884

Palm: availability and use

Photo: Atlas of Vernacular Architecture of the World-Marcel Vellinga,Paul Oliver,Alexander Bridge

FUTURE READING/LINKS

Further reading

• Child-Friendly School Manual, UNICEF, 2009
http://www.unicef.org/publications/files/Child_Friendly_Schools_Manual_EN_040809.pdf

• Education in Emergency- a resource tool kit, UNICEF, 2006
http://www.unicef.org/rosa/Rosa-Education_in_Emergencies_ToolKit.pdf

• Education in Emergency: Including Everyone, Pocket guide to inclusive education, INEE, 2009
http://www.eenet.org.uk/resources/docs/IE_in_Emergencies_INEE.pdf

• Even more clean hands, examples of worldwide WASH programmes
http://www.unicef.org/wash/schools/files/Raising_Even_More_Clean_Hands_Web_17_October_2012(1).pdf

• Guidance Notes on Safer School Construction-Global Facility for Disaster Reduction and Recovery, GFDR et al , 2009
http://gfdrr.org/docs/Guidance_Notes_Safe_Schools.pdf

• Guidebook for Planning Education in Emergencies and Reconstruction,2nd edition International Institute for Educational Planning, UNESCO, 2010

• Guidelines for Child Friendly Spaces in Emergencies, INEE, Global Education Cluster, January 2011
http://toolkit.ineesite.org/toolkit/INEEcms/uploads/1040/CFS_Guidelines.pdf

• International Building Code (IBC), ICC (International Codes Council), 2009

• Minimum Standards for Education: Preparedness, Response, Recovery ,2nd edition, Inter-agency Network for Education in Emergencies, INEE, 2010
http://sphereprototype.conted.ox.ac.uk/cases/learningistheirfuture/pdf/Minimum_Standards_English_2010.pdf

• Minimum Standards for Education in Emergencies, Chronic Crises and Early Reconstruction.", Inter-agency Network for Education in Emergencies (INEE), 2004
http://www.unicef.org/violencestudy/pdf/min_standards_education_emergencies.pdf

• Plastic sheeting, a guide to the use and procurement of plastic sheeting in humanitarian relief, Oxfam, IFRC, 2007

• Pocket Guide to Supporting Learners with Disabilities, INEE, 2010
http://www.eenet.org.uk/resources/docs/INEE_Supporting_Learners_with_Disabilities.pdf

• Schools for All –including disabled children in education, Save the Children, 2002
http://www.eenet.org.uk/resources/docs/schools_for_all.pdf
http://www.savethechildren.org.uk/sites/default/files/docs/schools_for_all_1.pdf

• SPHERE PROJECT, Humanitarian Charter and Minimum Standards in Humanitarian Response, Third edition, 2011
http://www.ifrc.org/PageFiles/95530/The-Sphere-Project-Handbook-20111.pdf

• The Core Commitments for Children in Humanitarian Action, UNICEF, May 2010
http://www.unicef.org/publications/files/CCC_042010.pdf
http://www.unicef.org/publications/index_21835.html

• Teaching children with disabilities, UNESO, 2009
http://unesdoc.unesco.org/images/0018/001829/182975e.pdf

• UN Decade of Education for Sustainable Development (2005-2014), UNESCO
http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/

• WASH in schools, raising clean hands, UNICEF, 2010
http://www.unicef.org/media/files/raisingcleanhands_2010.pdf
http://www.unicef.org/wash/schools/files/rch_call_to_action_advocacypack_2010.pdf

• WASH compendium, UNICEF, 2011
www.unicef.org/wash/schools

Assessment tools

• Child led disaster risk reduction
http://www.preventionweb.net/files/3820_CHLDRR.pdf

• Disaster prevention for schools guidance for education sector decision makers (2008)
www.preventionweb.net/english/professional/publications/v.php?id=7556

• Disaster risk reduction begins at school,
http://www.unisdr.org/we/inform/publications/761

• Effective education for DRR teachers network
www.edu4drr.org/page/drillsplans-1

• Rapid Visual screening of buildings for potential seismic hazards
www.fema.gov/library/viewRecord.do?id=3556

• School Environmental Assessment Tool, SEAT, 2010
www.humanitarianschools.org

• Tools for community assessment and risk planning
http://www.preventionweb.net/english/professional/contacts/v.php?id=177

Join us in sharing your experience in designing and constructing temporary learning spaces:
Please contact Carlos Vasquez, UNICEF child-freindly school designs at **cvasquez@unicef.org** or **www.unicef.org/cfs**