SAFE AND CHILD-FRIENDLY SCHOOL CONSTRUCTION GUIDELINES

Department of Basic Education,
Ministry of Education,
The Republic of Union of Myanmar

In collaboration with the Ministry of Construction and School Construction Sub-Working Group

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Highly appreciate those who reviewed and provided inputs in the initial drafts of the Guidelines to enhance this product of collaborative work. Then, warmly thank those who provided documents and information in the development of these much-needed guidelines for Myanmar.

Special acknowledgement goes to the Myanmar Engineering Society and Education Thematic Working Group on Safe School Construction as well as all participating organizations: World Vision, UNESCO, UN-Habitat, UNICEF, UNOPS, Plan International, Handicap International, Save the Children, ARC, ADB, IOM, ADPC, MRCS, ADRS, JICA, Embassy of Japan and various private sector entities.

FOREWORD

Myanmar is undertaking reforms of its education system in tandem with the comprehensive National Education Strategic Plan (2016-2021). This "Safe and Child-Friendly School Construction Guidelines" for the construction of new schools in Myanmar is part of the implementation of the plan. The Guidelines come out at this important time of promoting our socioeconomic and education systems as safe and quality primary schools can be the only place for our future leaders to start their education journey, leading to our better future.

Myanmar is a nation with diverse geographical features, national races, culture and traditions, languages, beliefs, resources and calamities. Correspondingly, various practices such as community-initiated schools, government schools, and schools that are rebuilt after natural disasters or conflicts have been adopted in the construction of schools. It is, thus, crucial to develop the guidelines that will address the needs of the huge diversity. The Guidelines are inevitable initial steps towards the quality education we aim at.

Formerly, though the Ministry of Education alone took the responsibility of setting the norms for school construction, currently the Ministry of Construction is sharing the responsibility of constructing safe and child-friendly schools throughout the country. I believe that these Guidelines will be the guiding principles for school construction in Myanmar.

Dr. Myo Thein Gyi

Union Minister

Ministry of Education

FOREWORD

The need for the design and construction of child-friendly school buildings in Myanmar with due consideration for safety from natural hazards is well-recognized. In 2008, Cyclone Nargis had disastrous impacts on the education sector, destroying or damaging over 50% of public schools in the Ayeyarwady Delta. Two years later, another cyclone damaged over 350 schools in Rakhine State.

At the same time, many thousands of schools must be built in the coming years across the country. With the high priority attached to the education sector reform, the Ministry of Education estimates that over 30,000 new schools will need to be built in the coming decade. Based on its experiences of many years in the construction of school/storm shelter in the Delta after Cyclone Nargis (42 schools) and the commitment towards quality basic community infrastructure in Southeast Myanmar (more than 50 schools included), Switzerland now actively participates in the development process of the Safe and Child-friendly School Construction Guidelines for Myanmar.

In 2015, Switzerland and World Vision as co-chairs with several other agencies and government institutions, reactivated the School Construction Sub-working Group to develop the Safe and Child-friendly School Construction Guidelines for Myanmar in collaboration with the Ministry of Education. Based on international standards, these guidelines highlight basic design principles and points to consider when planning new schools. They aim to serve as a planning, implementation and management tools for policymakers and planners from township and district authorities, regional/state and national governments, construction companies, engineers and site managers, NGOs and UN agencies.

FOREWORD

I would like to take this opportunity to warmly thank the Ministry of Education, the Myanmar Engineering Society and all other partners of the School Construction Sub-Working Group for their commitment and close partnership. I am very happy that Switzerland's contribution resulted in the successful accomplishment of this project for the benefit of school children in Myanmar.

On behalf of the government and people of Switzerland, and the project team, I wish success to the students and their teachers to study and work in safe schools.

Ambassador Paul Seger

Embassy of Switzerland in Myanmar

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Terminology

Children – in this document means students of school age in Myanmar (currently 0-16 years old: Years 0-5 at kindergarten, years 5-9 at primary school, years 10-13 at middle school, and years 14 -16 at high school).

Community-based construction covers a range of possible community involvement, from making informed programmatic planning and design decisions to directly taking part in building construction. Communities may receive funding, technical assistance and other support from government agencies or development organisations.

A **child-friendly school** ensures every child an environment that is physically safe, emotionally secure and psychologically enabling. These guidelines are based on the UNICEF model of a Child-Friendly school.

A **disaster** is a serious disruption of the functioning of a community or a society that involves widespread human, material, economic or environmental losses and impacts, and which exceeds the ability of the affected community or society to cope using its own resources.

Disaster risk: The potential disaster losses in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.

Engineers apply science, mathematics and ingenuity to develop solutions for technical problems. Structural engineers are qualified to design structures and certify their safety, although many do not have specialised training in hazard-resistant design.

Exposure: People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses.

Mitigation: The lessening or limitation of the adverse impacts of hazards and related disasters.

Natural hazard: Natural processes or phenomena that may cause loss of life, injury, other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Rehabilitation: The restoration of basic services and facilities for the functioning of a community or a society affected by a disaster.

Repair: Restoration to working order following decay, damage, or partial destruction.

Resilience is the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Retrofitting: reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards.

Risk: The combination of the probability of an event and its negative consequences.

A safer school combines three elements[1]:

Safe Learning Facilities - integrating structural safety in the construction of new schools and at retrofitting existing vulnerable ones so that they protect students and other occupants during hazards events.

School Disaster Management - school preparedness activities, including the conduct of evacuation drills.

Disaster Risk Reduction and Resilience Education - covering disaster risk reduction as part of school curricula and at strengthening teacher education institutions in disaster risk reduction and resilience education to allow children to acquire critical thinking and life-saving skills in support of a global culture of prevention.

School construction includes building of new classrooms, school blocks, passageways, latrines, kitchens, grounds, laboratories and fencing. It also includes projects that rehabilitate or retrofit existing schools (sometimes called renovation, remodelling, refurbishing, modernising or strengthening).

Vulnerability is the characteristics and circumstances of a community, system or school that make it susceptible to the damaging effects of a hazard.

[1] Adapted from: http://www.wcdrr.org/uploads/Developing-a-Worldwide-Initiative-for-Safe-Schools-Two-pager.pdf

Acronyms

AADMER	ASEAN Agreement on Disaster Management and Emergency Response
ASEAN	Association of Southeast Asian Nations
ASSI	ASEAN Safe Schools Initiative
BOT	Board of Trustees
CESR	Comprehensive Education Sector Review
DBE	Department of Basic Education
DEO	District Education Officer
DRR	Disaster Risk Reduction
MAPDRR	Myanmar Action Plan for Disaster Risk Reduction
MoE	Ministry of Education
MNBC	Myanmar National Building Code
NESP	National Education Strategic Plan
OPC	Ordinary Portland Cement
PTA	Parent Teacher Association
RC	Reinforced Concrete
SCSWG	School Construction Sub-Working Group
SDC	Swiss Agency for Development and Cooperation
SDGs	Sustainable Development Goals
SMC	School Maintenance Committee
TEO	Township Education Officer
UXO	Unexploded Ordinance
WASH	Water, Sanitation and Hygiene

INTRODUCTION

This chapter presents the purpose of the guidelines, who they will be of interest to, and how to use them.

Purpose of these guidelines

Improved education has been identified by the Government of Myanmar as a key driver to achieve the national goal of Myanmar becoming an upper middle-income country by 2030[2]. To achieve this, Myanmar is aiming to upgrade its education standards to an international level and provide expanded access to basic education across the country.

Upgrading education standards also supports Myanmar's progress towards the Sustainable Development Goals (SDGs)[3]. These call for a shift from *access* to education alone to *quality* education, including safe and child-friendly schools.

Safe and child-friendly schools can largely be achieved through well-planned and designed schools that are built in the right place in accordance with high construction standards and professional quality control. These guidelines aim to meet that need with practical advice on the school project cycle, from planning to construction and maintenance, in accordance with MNBC's 2012 provisional draft.

The use of these guidelines by the Department of Basic Education and other stakeholders will help to ensure that future schools will:

- Provide a safe, inclusive, welcoming environment for all children
- Resist natural hazards (protecting life)
- Attract students (increase access)
- Improve attendance rates
- Improve retention and completion rates
- Improve learning achievement
- Provide an enabling learning environment, including accommodating children with physical and mental/learning disabilities
- Cultivate harmony between school and community
- Reduce the need for costly repairs and rebuilding of sub-standard schools

Who should read this?

The guidelines are intended for practitioners aiming to achieve safe and child-friendly construction. It should **primarily** be useful for:

- Engineers, architects, planners and construction managers from the Ministry of Education and the Department of Basic Education at all levels, and the Ministry of Construction
- Private sector
- Policymakers and planners, Local Authorities (State and Regional), Township and Village Tract officials and local communities
- Contractors, supervisors and construction workers involved in school construction
- Head teachers and those involved in school management
- Donor agencies

[2] Draft National Education Strategic Plan, 2016-2021.
[3] For further information, refer to : http://www.mm.undp.org/content/myanmar/en/home/post-2015/sdg-overview.html

How to use these guidelines

The guidelines are divided into five chapters. They can be read as a completed guide or each chapter can be read and used separately. They are relevant for all construction work, from simple maintenance to building new schools.

- **Chapter 1 Safer Schools: Know your hazards** summarises the main hazards in Myanmar and the main steps to achieve safe and child-friendly schools.
- **Chapter 2 Planning** describes the Department of Basic Education (DBE) planning processes for new construction. It provides guidance on carrying out site assessments and identifying hazards.
- **Chapter 3 Design** provides guidance on designing school infrastructure. It covers principles for resilient design including retrofitting and water sanitation and hygiene (WASH).
- **Chapter 4 Tendering, construction and supervision** provides guidance on DBE tendering, and basic site supervision guidance.
- **Chapter 5 Looking after schools** provides maintenance guidance to keep school infrastructure in good condition.
- **Annex**
    - Shelter/ school design based on hazard zones, geographical area and types of materials suitable for use in the area.
    - Additional guidance, including specifications, and supporting checklists.

The guidelines should be read and used in conjunction with the International Comprehensive School Safety Framework, the regional level with the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) and ASEAN Safe School Initiative (ASSI), the Myanmar Action Plan for Disaster Risk Reduction (MAPDRR), the Comprehensive Education Sector Review (CESR), the National Education Strategic Plan (NESP) and the Myanmar National Building Code (MNBC Provisional 2012).

▶ **IMPORTANT:** The guidelines do not replace the need to engage professionals such as architects and engineers.

The Myanmar National Building Code, statutory guidance or best practice codes of practice should always be followed as appropriate.

The guidelines must be considered as a 'working document'. It should be periodically reviewed and updated in accordance with the changes in Myanmar codes or good practice.

CHAPTER 1: SAFE SCHOOLS, KNOW YOUR HAZARDS

This chapter summarises the steps to achieving safe and child-friendly schools taking recognition of potential hazards.

Hazards in Myanmar

Myanmar experiences hazards such as earthquakes, flooding and cyclones, all of which can put students, teachers and schools at risk. The planning and design of a school must consider these hazards so the school provides a safe, inclusive and welcoming environment for all children. Safer schools save lives, but also last longer and will need less costly repairs.

A *hazard* is a threat or is something that can cause harm. A *risk* is the chance, high or low, that any hazard will actually cause the school damage. Each state and region has different levels of risk. The table below presents a regional guide to the likelihood of the main hazards and when they are likely to occur. Darker colours represent higher probabilities (1 low risk, 2 moderate risk and 3 high risk).

▶ **IMPORTANT:** This table is a guide only. *All* areas have risk, even where risk is level 1 or below.

The reader must determine exact hazards and risks, including at site level.

Overview of likelihood of hazards by region and season[4]

Hazards	Impact Factor	Likelihood by States and Regions															Likelihood by Season											
		Ayeyarwady	Bago	Chin State	Kachin State	Kayah State	Kayin State	Magway	Mandalay	Mon State	Naypyidaw	Rakhine State	Shan State	Sagaing	Tanintharyi	Yangon	January	February	March	April	May	June	July	August	September	October	November	December
City Fire	1	2	3					1	3		2			1		3	1	2	3	3	2	1	1	1	1	1	1	1
Conflict, Unrest	2			1	3	2	2			2		3	2	1	1		1	1	1	1	1	1	1	1	1	1	1	1
Drought, Heat	1		1					3	3					2		1		2	3	3	2							
Earthquake	3	2	3	3	3	1	1	2	3	1	2	2	2	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1
Flood	2	3	3	2	2		2	1	1	1		3		2	1	1					2	3	3	3	2			
Forest Fire	1		2	3	2	1	1	2	2	1		1	1	2				2	3	3	2							
Hail Storm	1				3			2	2		1		3	3						3	3			2	2			
Landslides	2			3	1							2		2							2	3	3	3	2			
Storm, Cyclone	2	3	2					1	1		1	3	1	1		2					3	3	3	3	3			
Thunder	1	3	2									2				2				2	3	3	2	2				
Tsunamis	3	2										3			1	1	1	1	1	1	1	1	1	1	1	1	1	1
Overall Score		2	2	2	2	1	1	1	2	1	1	3	1	2	1	2	1	1	2	2	3	3	3	3	2	1	1	1

1 Low 2 Moderate 3 High

[4] Source: Based on Myanmar: Inter-agency Emergency Response Plan, 2015

▶ **IMPORTANT**: FOR FURTHER GUIDANCE Check the Myanmar Information Management Unit (MIMU): http://www.themimu.info/ as a good source of information mapping on schools, climate, topography, hazards, and other areas in Myanmar.

▶ **THE CHILD-FRIENDLY SCHOOL (CFS) MODEL**

These guidelines are based on the UNICEF model of a CFS: Schools should operate in the best interests of the child. Educational environments must be safe, healthy and protective, endowed with trained teachers, adequate resources and appropriate physical, emotional and social conditions for learning. Within them, children's rights must be protected and their voices must be heard.

For further details, refer to UNICEF website: https://www.unicef.org/cfs/

Consider climate change: flood, wind, temperature

Planners and designers should consider how climate change may affect Myanmar's weather patterns. These changes will increase risk to schools. For example, the height of flood water may increase, wind speeds may be higher, and classrooms may get very hot. Estimated effects:

- **Central dry zone of Sagaing, Mandalay and Magway Regions**: will be vulnerable to increases in drought events and extreme high temperatures
- **All coastal regions**: will be at greater risk from increased cyclones, flooding, storm-surges and sea-level rise
- **Tanintharyi, Yangon, Rakhine, Ayeyarwady and Mon State/Region**: will be at increased risk from flooding, as they have the longest exposure to the southwest monsoon flow.

Why a safe and child-friendly school

Natural disasters can occur at any time and can have a devastating effect on communities and school infrastructure. A safe and child-friendly school recognizes and protects child rights by providing a safe environment, guaranteeing the learning process. Learning environments must be a haven for children to learn and grow, with innate respect for their identities and varied needs. The child-friendly approach promotes inclusiveness, gender-sensitivity, tolerance, dignity and personal empowerment.

There is no single way to make a school child-friendly, but measures must focus on child-centered education in a safe, healthy and holistic environment.

Safe and child-friendly schools will save lives, sustain economies and minimize harm to students and teachers, and:

- Minimize the disruption of education activities and provide space for children's learning and healthy development
- Safeguard education sector investments
- Serve as a center for community activities and become an important tool in helping to eradicate poverty, illiteracy and health problems
- Become a learning center to coordinate response and recovery efforts after a disaster

▶ The **Comprehensive School Safety Framework,** adopted in Myanmar by the Ministry of Education**,** places responsibility to deliver a safe school on those responsible for construction, repair and retrofitting of school buildings. These responsibilities emerge from two fundamental rights of children:

Every child has the right to safety and survival

a. Every school building should be planned, designed and constructed to minimum standards of life safety
b. Every existing school retrofitted, strengthened, renovated, remodelled or refurbished should be brought up to the life safety standard
c. Every school designated as a shelter for emergencies and disasters should meet the higher standards of operational continuity

Every child has the right to access education.

a. Every school building should be constructed to protect a child's access to education from hazards
b. Every school should be maintained to protect education sector investment from hazards

Further details are available through the Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector: http://gadrrres.net/resources/comprehensive-school-safety-framework

5 steps to achieve safe and child-friendly schools

The steps below should be applied through a Project Cycle Management approach - effectively and efficiently covering the planning, organizing, coordinating, and controlling phases of a project.

Step 1 Understand Hazards and Risks	• Assess local hazards and risks when selecting locations for construction of school infrastructure. Avoid building at hazardous sites	**Chapter 1** Safe schools know your hazards
Step 2 Good Site Planning	• Check the site for hazards and suitability for construction	**Chapter 2** Planning
Step 3 Design Good Practice	• Consider hazards and risks and child-friendly elements when designing school layout and infrastructure • Design school infrastructure using good practice standards so schools are resilient to hazards and risks, and create a child-friendly environment.	**Chapter 3** Design
Step 4 Build to Good Quality	• Ensure that the school is built to good construction standards with good- quality materials and professional quality control.	**Chapter 4** Tender construction and supervision
Step 5 Ensure Good Maintenance	• Ensure school is well maintained	**Chapter 5** Looking after schools

KEY POINTS

- Safer schools will save lives but should also last longer and will need less costly repairs.
- **Avoid building at hazardous sites**. Where this is not possible, mitigate risk and carry out detailed site planning and design with full knowledge of the potential hazards.
- **Climate change will increase risk to schools**. For example, rising flood levels in the future and increases in wind speeds.

CHAPTER 2: PLANNING

This chapter provides guidance on the DBE planning process for new construction, including checking the site for hazards and suitability for construction.

Effective planning

Good planning ensures that money is effectively spent on schools with the greatest needs and takes into account any hazards a school may face — for instance, poor site selection will increase construction costs. School planning should always be coordinated with other stakeholders and other educational initiatives such as health, water and sanitation, disaster management and curriculum.

The following highlights a 6-step process for the construction of school buildings: assessment of needs; hazard and risk assessment; key considerations for site selection; development of a site plan; application for construction; and assessment, budgeting, verification and approvals.

Step 1: Assessment of needs

The School Principal should lead the decision-making process about the most appropriate construction option (see Table below) based on an assessment of needs and risk.

CONSTRUCTION OPTION	CONSIDERATIONS	FOR FURTHER GUIDANCE
Regular Maintenance	Repair/improvement of existing school buildings to keep the buildings in operational conditions.	See Chapter 5
Retrofitting	Describes structural improvement to increase a building's resilience. Buildings built with poor quality materials/workmanship and/or non-engineered buildings should be retrofitted to make buildings safer where retrofitting is justified. The decision whether to build a new school or to retrofit is a combined engineering and economic analysis. **Note**: if retrofitting costs are less than 50 per cent of the reconstruction costs, it can be considered a viable option (MNBC).	See Chapters 3, 4 and 5
Replacement	Consider replacement of a building or facilities when 1) the existing building or facilities are unsafe 2) space is constrained on site and existing buildings are not fit for purpose, so the building needs to be demolished and replaced. For example, a multi-storey building can replace a single-storey building.	See Chapters 3, 4 and 5
New buildings or new school or extension	Can either be a completely new school or new buildings and facilities in an existing school.	See Chapters 2, 3, 4 and 5

▶ **IMPORTANT**: Further advice is also contained in the Basic Education Schools Management Manual for School Principals.

Step 2: Hazard and risk assessment

When choosing and planning a site, an understanding of hazards and risks at the local level is needed. For example, flooding levels can vary even within the same village or township. One school may be built next to a very steep slope, which is at risk from landslides or rockfalls, whilst one built close by on flatter land may have less risk. If risks cannot be mitigated, changing the location of the school is the best option.

Potential impact of hazards on schools

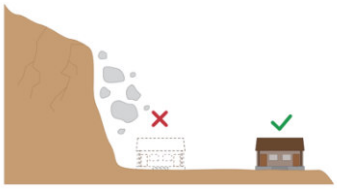
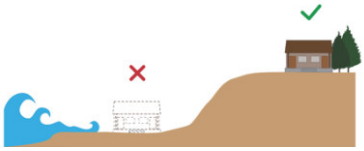
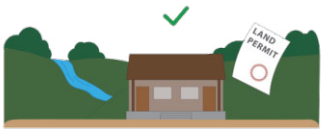
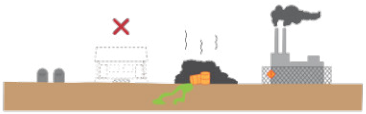
Hazard	Potential impact on schools
City fire and forest fire	Can cause death and injury. Damage to school buildings and facilities: school furniture and other teaching aids.
Cyclones, high wind	Risk to life. Damage from wind, flood and wave action. Can cause collapse of weak school buildings and rip off roofing sheets or tiles which can then cause injury to people. When high winds are accompanied by rain, it can ruin books, equipment and other building contents by leakage through poorly constructed buildings. It increases risk from secondary hazards such as landslides and flooding.
Drought	Ground can dry up and damage buildings with shallow foundations. Heat increases risk from secondary hazards such as fire and health problems.
Earthquakes	Risk to life. Can cause collapse of weak school buildings. Non-structural damage such as cracks in the walls, crumbling of plaster, toppling large furniture, shattering window glass. Secondary damage from landslides or tsunami is possible.
Flood	Risk to life. Can cause site erosion, damage buildings and facilities, especially ground floor storeys. Debris and dirt are left once flood stops. Damage to school supplies, books and furniture. Health hazards from disease and lack of health and sanitation.
Hailstones	Risk to life from large hailstones (ice pellets). Damage to school buildings (especially roofs) and facilities.
Landslides	Risk to life. Damage to school building and facilities from rockfalls, mudslides or movements of the ground.
Lightning (and thunder)	Risk to life. Damage to school building and facilities from direct lightning strikes. Secondary risk from fire.
Tsunami	Risk to life. Can destroy buildings completely. Toxic debris in and around school sites can be deposited. Contamination of water (wells, ground water and piped water supply).

▶ **IMPORTANT**: Risks at two schools can be very different, even when they are close to each other.

The table above shows the potential impacts on schools from hazards. All hazards carry some risk to life and/or damage to the school. More than one hazard can occur at a time at a school. This is known as a 'multi-hazard' event.

Step 3: Key considerations for site selection

When assessing a site for school infrastructure, the school, community and DBE must review their proposed site to understand the specific hazards and risks. A guide is below[5]. Refer to the Annex 3 for an example of a site selection checklist.

	Avoid building on or near steep slopes where landslides, rock falls, avalanches or similar hazards could kill or injure people or damage the school, especially during earthquakes which can cause steep slopes to collapse or rocks to start falling.
	Avoid building schools in flood plains. In flood prone areas, the schools should be built on high ground above the expected flood level. If an elevated site is not available, then individual buildings should be raised or flood resistant measures must be considered in the design and material selection. On tsunami-prone coastlines, build outside of the expected tsunami inundation zone where possible for probable worst-case events. If this is not possible, locate the school close enough to high ground for students and staff to safely evacuate in time, or design the upper floors of the school to survive a tsunami and be above the water level.
	In high-wind areas - especially cyclone prone areas - make sure the site and nearby areas are clear of objects that could become wind-born (poorly secured signs, utilities, building parts, roofing tiles, trees) and damage the school or occupants.
	Avoid selecting sites where children have to cross busy highways or dangerous waterways, or where safe access cannot be provided. Schools should be sited near the communities they serve. Below is guidance on recommended maximum walking distances to school based on students' ages[6] • Kindergarten students, 0.25 miles (0.4 km) • Primary school students, 0.5 miles (0.8 km) • Middle school students, 1.5 miles (2.4 km) • High school students, 2 miles (3.2 km)
	Consult with local and neighbouring communities for their opinion on proposed location for buildings. Also make sure land titles are available and land ownership is verified. 🕮: Use DBE Standard Form 1 (Annex 2)
	Consider the need for access roads, connections to water, sewage, electricity networks, and other engineering works such as retaining walls, earthworks or ground preparation. Avoid sites that need expensive clearing, levelling or compaction. Avoid clearing trees or bushes from the site or, alternatively, reforest the site to create a cooler micro-climate or to stabilize soils.
	The school site should be located away from sources of pollution, toxic or hazardous materials. Schools should also be located away from sources of excessive noise, such as aircraft, cars, trains, sirens, and industrial operations so noise levels do not affect children.

[5] Adapted from: Towards Safer School Construction: A Community-based approach, GADRRRES
[6] From: Myanmar National Building Code (MNBC Provisional 2012)

▶ SCHOOLS IN EMERGENCIES: CONSIDERATIONS FOR PLANNERS

Schools can be designed as emergency shelters, particularly for protection against cyclones, shelter during flood or earthquakes. This additional use of school buildings can mean it takes longer for the school to return to normal use after an emergency. It can also put students at risk. This disruption of schools should be avoided if possible. When educational facilities are used as emergency shelters, the negative impacts must be minimised in collaboration with the shelter and protection sectors.

▶ USING COMMUNITY MAPPING:

A map prepared by the school and the community can help add information to the Site Plan. It can show the location of the school site in relation to hazards, community resources, land use, structures, institutions, relationships and interactions within the community.

Step 4: Development of a site plan

After having selected a suitable site location, the school must develop a site plan. It should show the detailed arrangement of the school and other useful information on roads, vegetation, and access to infrastructure. A scale of 1:500 or similar is suitable, so it can ideally fit on one sheet of paper.

It should include:

- Compound boundary
- Location of existing buildings
- Location of planned new buildings
- Location of external toilets and water source
- Road access and escape routes
- Play areas
- Indication of nearby features and hazards
- Flag pole and location of school sign
- Waste disposal area
- Electricity accessibility

Site planning checklist

- Avoid building schools in high risk areas
- Always conduct detailed site assessment
- Identifying hazards on site (hazard mapping)
- Produce site plan that clearly shows required construction
- Consult with community and stakeholders over plans
- Ensure appropriate school design is resilient to hazards and in accordance with the site layout and hazards

Also be sure to consider

- Establishing geo-referenced inventory of all schools for both planning and evaluation.
- Preparing a comprehensive program to assess and deal with both backlogs of low-quality buildings and underserved areas.

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Step 5: Application for construction

Use a DBE Standard Form 1 application form (refer to Annex 2) to request new construction, retrofitting, repair works or maintenance. The form must be completed by the School and submitted to the DBE.

In addition to DBE Standard Form 1, the School should support their application with the following information:

- The condition of the existing school.
- The ownership of the school land (Form 105 or LANA 39).
- Recommendation from the respective department (Administrative Department).

Step 6: Approval process

The application form is submitted to, reviewed, and approved by the Township Education Officer (TEO). The TEO should check and prioritise the applications received. The recommended prioritisation criteria are:

- **Priority 1**: Existing schools are dangerous.
- **Priority 2**: Existing schools are in poor condition (for example; non-standard classrooms; unhealthy environment, insecure condition).
- **Priority 3**: Existing schools are not in a condition to receive increases in the numbers of students.

The TEO must consolidate all applications from schools before sending to District Education Officer (DEO). The application form is then reviewed and approved by the State/Regional Education Office. The DBE Engineering Unit checks proposals and the prioritisation. Approval is followed by fund allocation.

▶ MAPPING SCHOOLS:
An asset register or asset management system with details of each school and the buildings within each school is an effective planning tool. The schools' needs, locations and infrastructure condition assessments can be linked with hazard information to prioritise and plan construction. Resources should be targeted to areas of greatest need. The prioritisation and selection process for regions, districts and schools should be fully transparent.

KEY POINTS

- Always carry out a detailed assessment when planning school infrastructure so that the hazards and risks are identified early and budgeted for. Select a less hazardous site if the risks are too great.
- Always consult with the community and stakeholders when planning.
- An asset register containing information on the condition of the buildings and infrastructure at each school is an important effective and planning tool. This can be linked with hazard information to prioritise and plan construction.

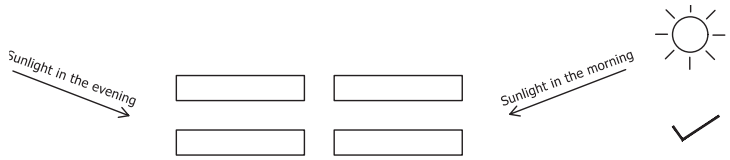
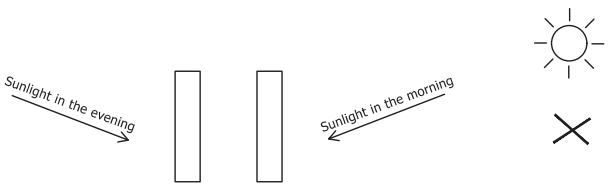
CHAPTER 3: DESIGN

Schools must be designed as child-friendly spaces that resist hazards such as earthquakes, cyclones and flooding. This chapter explains hazard-resistant design principles and how layout and design can improve safety. It outlines decision processes for construction and retrofit for school buildings and infrastructure; including water, sanitation and hygeine facilities and solid waste management.

▶ **IMPORTANT**: The guidelines do not cover all hazard or design scenarios. The Myanmar National Building Code (MNBC) must always be followed together with these guidelines. Design work must always be carried out by a competent design professional.

Annex 4 of the guidelines contains shelter/ school design example.

Design of the school compound

Design considerations	Before starting design, potential hazards at the site or school must be identified. The designer must understand the likelihood of these risks before making design decisions about the site compound or buildings.
Defining Performance Objectives	The first step when designing a school is to define what is expected of the building during hazard events. At a minimum, a school should be designed to save lives. For example, a building designed to withstand a cyclone or an earthquake of a certain frequency and intensity, if designed to save lives, would not collapse during that event. But the building might still sustain damage. A life safety performance objective might be insufficient. Higher performance objectives such as 'cyclone shelter' or 'immediate occupancy' after a disaster may be more appropriate and could be more cost effective in the long term. For instance, schools in flood areas have a choice to be built elevated so they remain structurally intact even when inundated. Building to a higher standard means damages are minimal and students will be able to return to school immediately after the disaster.
Appropriate layout	The school layout and buildings must meet students' learning requirements in terms of space and site planning. Consider future expansion of the school and think about where new classrooms might go in the future. Consider classroom sizes that can be used by different grades of students, teaching shifts and curriculums.
Reduce risk	Avoid building in high risk areas. Make sure designs allow for hazards and risks. Consider fire risks on and off the compound and how emergency services can gain access.
Orientation	As a general rule, to keep buildings cooler, align them in an East-West direction. Refer to Annex of the Guidelines for more details on Building Layout Guidance.  There is less area exposed to sunlight for the schools aligning in an East – West direction.  There is more area exposed to sunlight for the schools aligning in a North – South direction.

Gender-sensitive	Child-friendly schools must provide facilities for boys and girls, including playgrounds and appropriately sized toilets and hand-washing facilities.
Access for all	The whole school must be accessible and useable by students with and without disabilities, teachers and visitors.
Locally appropriate	Involve the community in planning processes. Layout should be culturally appropriate.
Environmentally sustainable	Layout should not damage local environment. Trees and water sources should be protected.
Safe environment	Provide secure boundary fence or wall with adequate controls over access for visitors during school hours and after school. Buildings themselves should also be secure.
Landscape	Indigenous trees, shrubs and flowers should be planted in the school compound to filter sun, reduce dust and noise and provide shade and insulation. They can also be used to teach children about food production and conservation.

How to make schools accessible

Example design considerations

Access to ground floor classrooms	Schools must be accessible for people with disability including wheelchair users and those with other physical disabilities such as low vision and blindness. ▶ Refer to MNBC Provisional 2012. All teaching, administrative and common areas should be accessible to wheelchair users. Provide ramped alternatives to ground floor. Provide level access to classrooms. Pathways and doors must be a minimum of 3 ft. (0.9 m) wide for a wheelchair.
Toilets and water sanitation	Provide access facilities for people with disability, constructed new or incorporated into existing. Provide accessible pathway to toilets.
Pathways and corridors	Provide flat or gently sloping pathways (at a maximum gradient of 10%) and corridors at ground floor level. Ensure no breaks in paths. Cover drains that cross or are next to pathways.
Stairways	Provide handrails on both sides. Repair broken steps. Provide adequate lighting.
Signage and colours	Provide signs that are readable. Use colour, contrast and braille if possible

▶ **IMPORTANT**: for further guidance on accessibility, refer to:

- Accessibility design guide (AusAid)
- Myanmar National Building Code (MNBC Provisional 2012)

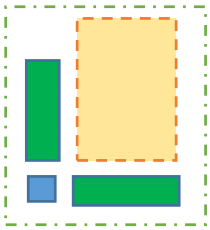
Compound size and layouts

The school environment, as a child-friendly one, must provide the basis for the mental and physical development of children, meaning that the facilities are the social setting for child interaction as much as a formal learning environment. The designer must decide the best layout for the school using the key principles and an understanding of the needs of the school, site size and constraints. Example generic school layout plans according to MNBC are shown below. These can be used as a basis for compound layout design. These 'U'-shaped layouts use space efficiently and create an open space.

Examples of layouts for schools

<table>
<tr>
<td>Primary School

Classroom Units

Toilet Units</td>
<td>  </td>
<td rowspan="3">Classrooms

Toilets

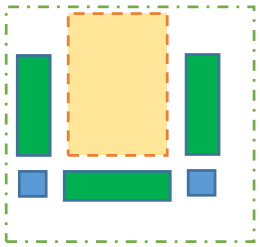
Playground

Compound

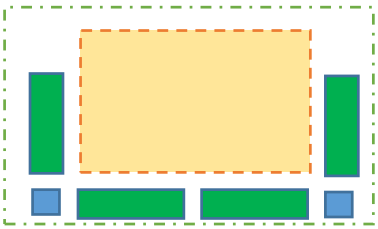
Principle: It is recommended for the length of the building not to exceed three times the width since buildings with one of their overall sizes much smaller or larger than the other two, do not perform well during earthquakes.

Seek structural engineering advice on robust design layouts.</td>
</tr>
<tr>
<td>Middle School

Classroom Units

Toilet Units</td>
<td>  </td>
</tr>
<tr>
<td>High School

Classroom Units

Toilet Units</td>
<td>  </td>
</tr>
</table>

Guidance on layout sizes

Playground	20,000 ft^2 (1,858 m^2) for all schools with more than 500 students
Toilet and WASH facilities	Minimum of 1 toilet per 40 students
Canteen and food facilities	Needs to be large enough to hold 25% of the students providing 12 ft^2 (1.1 m^2) per student

▶ **IMPORTANT:** For further guidance please refer to:

- Guidance on Mainstreaming Disaster Risk Reduction in the Education Sector, Myanmar – Rural Settings
- ASEAN Common Framework for Comprehensive School Safety
- Myanmar National Building Code (Provisional 2012)

Design of the classroom

Groupings and classrooms

Classrooms should allow sufficient space for the maximum number of students (see table below). In small rural communities, classrooms should allow adequate space for multi-grade teaching. A classroom should also allow space for changes in teaching methods during its lifetime.

The number of children in each group for respective ages and levels and required minimum floor areas must conform to the following norms, unless otherwise-defined by the concerned educational authorities.

Floor area requirements in classrooms (in accordance with MNBC Provisional 2012)

Type of classroom	Students per room	Minimum area of classroom	Minimum height of classroom
Kindergarten	15	450 ft^2 (42 m^2) (plus space for play area and resting area) 30 ft^2 (2.8 m^2) per student	9.5 ft. (2.9 m)
Primary school	25	20 ft. x 24 ft. (6.1 m x 7.3 m) 25 ft^2 (2.3 m^2) per student	9.5 ft. (2.9 m)
Middle school	40	30 ft. x 24 ft. (9.1 m x 7.3 m) 20 ft^2 (1.9 m^2) per student	10.5 ft. (3.2 m)
High school	40	30 ft. x 24 ft. (9.1 m x 7.3 m) 20 ft^2 (1.9 m^2) per student	10.5 ft. (3.2 m)

Positive learning environment in the classroom

Classroom designs and layouts should allow school furniture to be arranged in different ways to support the teacher in inclusive teaching, group work, practical activities, and activities involving the whole class. The layout should include

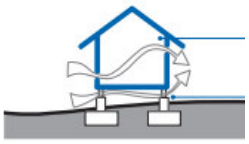
- **space and good circulation** of furniture, taking into account needs of pupils with disabilities and space for teacher
- **good sightlines** to teacher and board. Two blackboards/whiteboards and a cupboard to store books should be installed in each classroom.
- **flexible classroom layout** (rather than teaching platform). Wheelchair users must be able to approach the board.

Design features that can be included at little or no extra cost during construction include

- **reading corners** with built-in benches and display space (this is a much more cost-effective way of improving reading outcomes than providing libraries)
- **storage areas** for books and other teaching materials
- **pin boards, built-in hooks, or timber strips** around the classroom walls for displaying work
- **tiles** by local artists showing maps or the alphabet

▶ Refer to Myanmar Educational Reform which promotes innovative and inclusive approaches to teaching

Guide to lighting and ventilation

Natural lighting and windows	Maximise use of natural light in the classroom. Window area should be a minimum 30% of floor area. Caution: Too many windows can weaken the building. Avoid putting windows facing the blackboard/whiteboard because the light can make reading the board more difficult. **IMPORTANT:** Openings can reduce earthquake resistance in a building. Refer to ▶ Doors & Windows for guidance.
Ventilation and temperature 	Use window orientation, shutters, shading, roof eaves, veranda and other passive techniques to reduce glare and heat. Promote cross-ventilation from windows on opposite sides. Low to high airflow is always best. Orientate longer facades to face North and South with windows best placed on these North-South facing sides. Avoid putting windows on East-West facing sides and shade these sides. Classrooms need windows that can be opened. Use roof and wall insulation to both, reduce temperatures in classrooms in hot climates by preventing heat build-up and to keep classrooms warmer in colder weather by trapping warm air. In colder areas, windows should still provide enough lighting.
Use trees 	Use trees and vegetation to shade buildings and keep them cooler. Leaves can dramatically reduce surrounding temperatures. However, trees should not be too close to building, as roots can damage buildings. Consider risks from falling trees during high winds.

Design of other buildings and educational access

In addition to classrooms, schools must provide other buildings and infrastructure to function effectively. For further details, refer to the MNBC Provisional 2012.

Design information for school buildings and access

SCHOOL	DESIGN REQUIREMENTS
BUILDINGS AND ROOMS	
Headmaster's room	School must have Headmaster's room with space for table, chair, and cupboard. Recommended minimum floor space is 140 ft^2 (13 m^2)
Teachers' rooms	Maximum 8 teachers per room; Minimum 80 ft^2 (7.4 m^2) per teacher Recommended minimum floor space is 140 ft^2 (13 m^2)
Teacher's accommodation	Min. 150 ft^2 (13.9 m^2) per teacher
Assembly Hall (separated Building)	All education building must have assembly areas, which should hold at least 50% of all children, with minimum floor areas of 7 ft^2 (0.65 m^2) per child.
Student dormitory	40 ft^2 (3.7 m^2) floor space per student
ACCESS	
Stair surface	Use non-slip surface
Railing height	Net railing height on stairs, balconies, terraces and similar structures at schools shall not be lower than 4 ft. (1.2 m) (measured from the floor finishing to the top of railing). There should be no horizontal divisions in the railing to avoid children stepping on railings. All stairs having more than 6 steps must have railings on both sides.
Additional railing	Staircases exceeding 8 ft. in width shall be provided with intermediate handrail. Handrails shall be at least 8 ft. away from each other.
Min. width, stairs	3.5 ft. (1.1 m)
Min. width, corridor	5 ft. (1.5 m) for corridors serving classrooms 3.5 ft. (1.1 m) for other corridors
Ramps for wheelchair access	Slope less than 10% (Rise: run ratio 1:10)
Fence	5 ft. (1.5 m) high
Gate	Must allow for truck access
WASH	
Toilets	1 toilet per 40 students ▶ Refer to WASH Chapter 4 for further details
Wastewater disposal pit	▶ Refer to WASH Chapter 4 for further details
Water tank	5 litres per student for drinking (from a protected groundwater sources: spring, well or borehole, or from a treated supply and keep it safe until it is drunk) and washing per day ▶ Refer to WASH Chapter 4 for further details

Guidance on design decisions to reduce risk

School buildings must be designed to withstand all potential hazards. When schools cannot be relocated away from risky areas, reduce risk through design decisions. The designer must carefully select the correct solutions and consider whether schools could be exposed to more than one hazard. For example, classrooms on stilts provide excellent protection against floods, but are more vulnerable in an earthquake.

The table below shows example design features that can reduce risk from hazards.

Note: the designer must always check the hazards and their possible intensity at each school site.

Guidance to hazard design features

Component	City Fire	Conflict, Unrest	Drought, Heat	Earthquake	Flood	Forest Fire	Hail Storm	Landslide	Storm, Cyclone	Thunder	Tsunami	Example Design Options for Risk Reduction
Site					✓				✓		✓	Elevate the compound or built on mound
	✓		✓			✓			✓	✓	✓	Grow trees around the compound
Architectural			✓									Provide plenty of windows and shading
				✓	✓				✓			Simple symmetrical layouts
Materials	✓		✓			✓						Use fire resistant materials
				✓								Use lightweight materials
	✓		✓			✓						Use thermal lightweight materials
		✓		✓	✓		✓	✓	✓		✓	Use stronger materials
Foundation				✓	✓			✓	✓		✓	Stronger and deeper foundation
Concrete Frame				✓	✓			✓	✓		✓	Add more confinement steel
				✓	✓			✓	✓		✓	Add shear walls
Timber and Bamboo Frame				✓	✓			✓	✓		✓	Add bracing
				✓	✓			✓	✓		✓	Stronger joints and connections
Steel Frame				✓	✓			✓	✓		✓	Add bracing
Floor					✓				✓		✓	Raised floor
Wall				✓	✓			✓	✓		✓	Use ring beams
			✓	✓	✓			✓	✓			Use stronger and thicker walls
					✓				✓			Waterproof the walls and plinth
					✓				✓			Provide damp protection
Roof and Ceiling									✓			Use hipped roofs and avoid large overhangs
									✓			Provide wind bracing and roof ties
	✓		✓	✓								Use lighter thermal mass roofing
										✓		Provide lightning protection
Doors and Windows									✓			Protect with shutters or avoid glass windows
			✓									Larger windows

Building frame: material choices

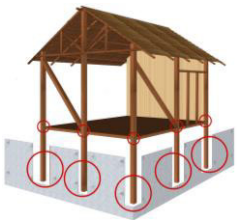
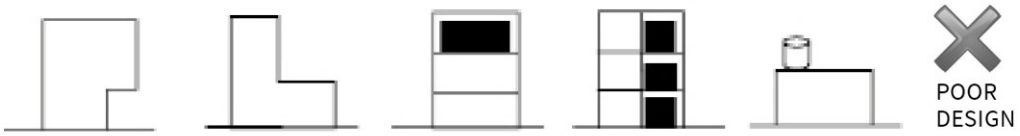
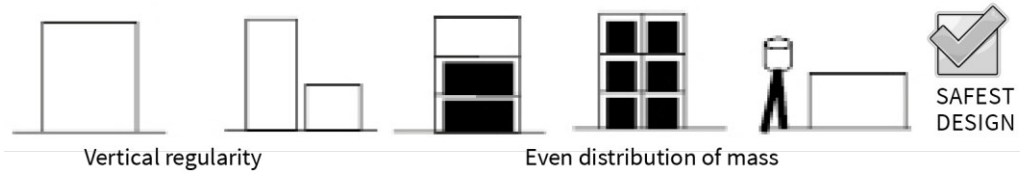
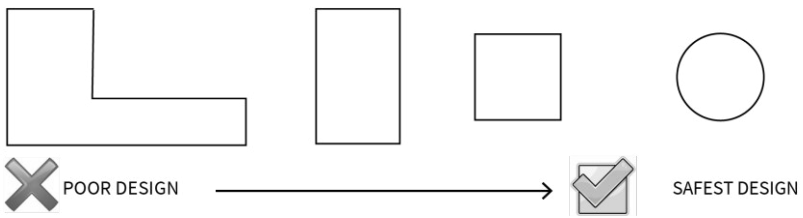
The table below provides guidance on the main building frames and materials used in school construction. Choices must be fit for purpose, must be sustainable and economical, and must be able to withstand natural hazards. Try to avoid the use of low-quality materials in construction, as they will reduce lifespan and durability of the buildings.

Guidance on building frame and materials

Frame and materials	City Fire	Conflict, Unrest	Drought, Heat	Earthquake	Flood	Forest Fire	Hail Storm	Landslide	Storm, Cyclone	Thunder	Tsunami	Note
Reinforced concrete frame 	✓	✓	✓	✓	✓	✓		✓	✓		✓	○ Multistorey possible ○ Needs qualified supervision
Steel frame 			✓					✓	✓			○ Quick to build ○ Multistorey possible ○ Needs qualified supervision ○ Not suitable for community construction ○ Needs fire resistant measure
Brick noggin (timber frame) 		✓	✓		✓			✓	✓		✓	○ Quick to build ○ Simple to build ○ Low Cost
Bamboo 			✓	✓								○ Quick to build ○ Simple to build ○ Low Cost ○ Short life span

Structural design

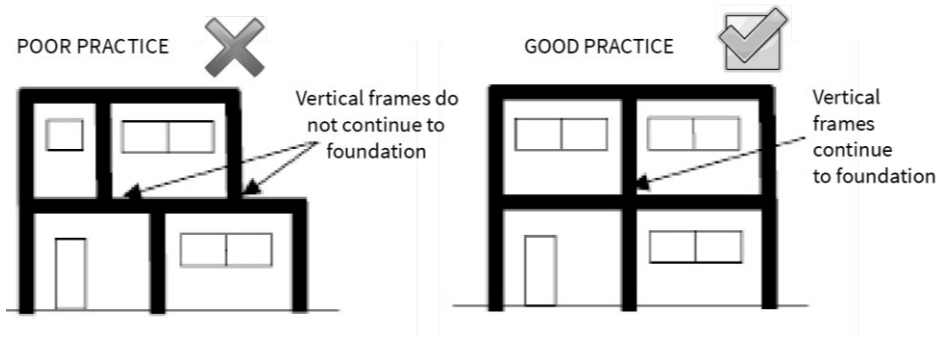
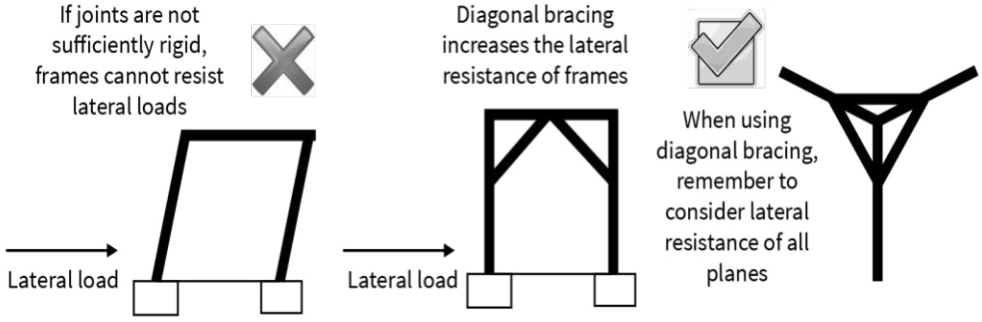
Principles for safe and child-friendly buildings

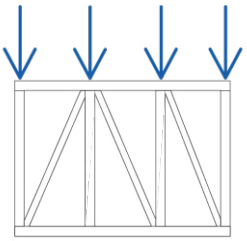
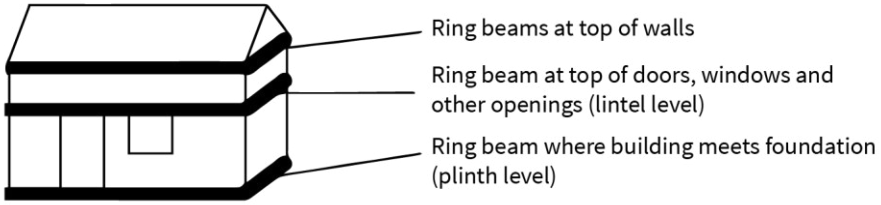
1. Technical	
Resilient Design	Always locate schools away from hazards first. If the school cannot be built in a safe location, it must be designed against multi-hazards.
ABC Principle	The designer must make sure the structure is strong enough to withstand hazards. A useful principle to apply to all structures is the 'ABC principle'.  Anchoring: Every part of the structure must be tied back to some secure points which can resist all applied forces.  Bracing: Every part of the structure must be held rigid so it cannot tilt, slide or rotate.  Continuity: Every part of the structure must be properly connected to every other member.
Simplicity and ease of construction	Simpler designs are generally cheaper and easier to build.
Shape	School buildings shall not be longer than three classroom sizes. If a rectangular plan building is used, ensure length is equal to, or less than three times the width. Limit the building length to 26ft unless buttressing or cross walls are used.   Regular shapes are safer. Adopt square or rectangular plan buildings. A symmetrical plan about both axes is better than an asymmetrical plan. Avoid: 'L', 'T', 'C', 'H' plan shaped buildings. When two separate buildings are needed make sure the separation is at least 10 ft. 

Flexibility	Consider a design that is easy to upgrade and expand. Adaptability is also required to allow for long-term changes such as developments in the curriculum, changes in class sizes, etc.
Locally appropriate	Involve community in design process to identify hazards and support the design and construction. Design must be culturally appropriate.
2. Social and environmental	
Gender sensitive	Provide facilities for boys and girls equally. Girls and boys must have equal access to adequate sanitation facilities in the school. Consideration for privacy especially for girls is paramount.
Access for all	Make the school accessible and useable by students, teachers and visitors with and without disabilities. ▶Refer to Section - Making Schools Accessible
Locally appropriate	Involve the community in the planning process to identify hazards and support the design and construction. The layout must be culturally appropriate.
Environmentally sustainable	Consider energy use through renewable technology, such as solar and rainwater harvesting. Building should maximise use of sustainable building materials. ▶Refer to MNBC Provisional 2012
Acoustics	Classroom acoustics must be good and appropriate for use. Design must consider reducing sound transfers between classrooms by, for example, providing structural walls instead of partitions.

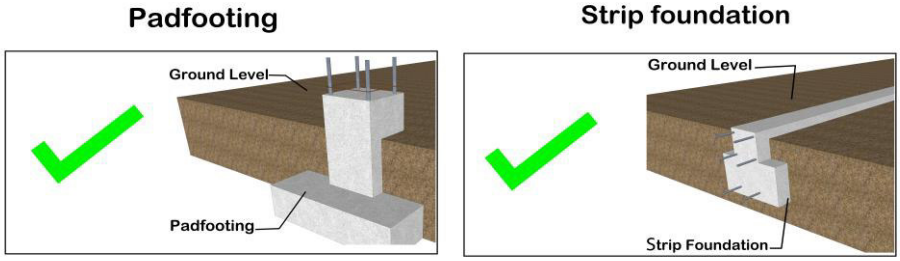
Designing building elements

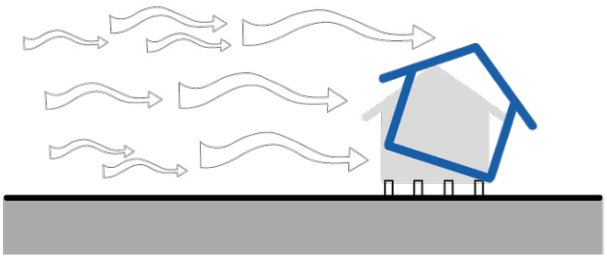
Supporting frames

Load transfer	Design all elements to transfer loads directly to the ground 
Connections and bracing	

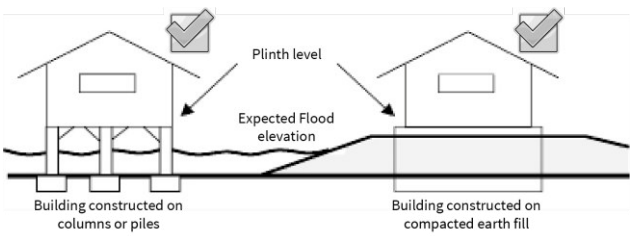
	Make strong connections between beams, columns and the foundation, especially in seismic areas. Load from the roof truss and other load bearing members should connect at columns to allow the load to be transferred through the columns. Use bracing in both directions. 
Strengthening the frames	Columns and beams must create a box-like structure to make a strong building. Concrete frames are recommended for seismic areas. Ring beams at ground level and beneath the roof will provide a stronger frame. 

Foundations

Soil	Establish water-table, soil type and strength to help select the right type of foundation. Liquefaction: soft clays and loose to medium dense sand may liquefy during an earthquake. Assess soil strength according to MNBC Provisional 2012.
Type	Use strip foundations to distribute the load. Avoid using isolated footings with no ground beams. Pad footings are not recommended in areas prone to flooding. 
Materials	Reinforced concrete is recommended for pad and strip footing. In bamboo and timber buildings the post should be embedded/anchored in the concrete foundation and there should be diagonal bracings.
Structural considerations	Foundations support the load of the building by distributing the forces into the ground. They must be deep enough to be built on good solid ground. If solid ground cannot be reached by digging, then specialist design and construction techniques may be needed.

	Foundation depths must be as deep as needed to reach strong ground. Typically 3 - 4 ft. (0.8-1.2 m) deep as a minimum. In cold climates, the top of the footing of the foundation must lie below frost line.
	Ensure foundation is designed, and at a depth, to resist erosion by potential storm surge. Assess soil strength for seismic design of foundations.  Avoid building in areas with soft clays and loose to medium dense sand that may liquefy during earthquakes. Buildings may sometimes need to be anchored to the foundations to prevent uplift. ▶ Refer to MNBC Provisional 2012

Floors

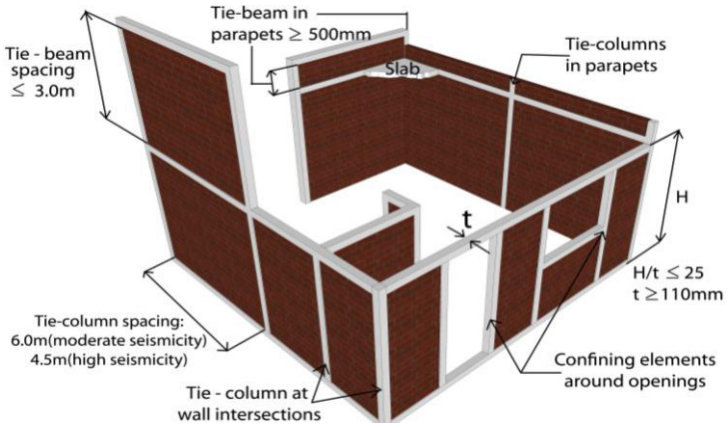
Materials	Use wooden or concrete floors for classrooms, office and libraries. For toilets, verandas, pathways, balconies and ramps, floors must be durable against weathering. Concrete is recommended. Floor materials must not be slippery. Use non-glossy material to prevent undesired reflections from lights in classrooms floors. Anchor ground floors and wall columns into the foundations.
Type	Ground floors are generally one of two types. One is a concrete slab that rests on the ground. The other is a suspended floor that is built into the walls and has a gap under the floor. A suspended floor is often made from wood.
Structural considerations	Raise floor to help ventilate the space underneath and avoid moisture problems. Allow for a minimum gap of 30cm. (~12in) above the surrounding ground level to the underside of the floor (to the underside of a timber floor joists for example).
	Elevated floors can provide protection from floods but can make the building more vulnerable to damage from earthquakes.  Any technique used to raise the building must also be designed to resist the forces of standing and moving water and floating debris.

Walls

Materials	Most walls are built with bricks. Use reinforced concrete columns at building corners but put joints in walls (for flood, seismic and temperature extremes). Use ring beams in earthquake and flood zones to strengthen the building.
Type	Should not have too many openings. For safety, masonry panels should not be greater than 13 ft. (4.0 m) high. For details on the dimensions of openings. ▶Refer to Doors and windows section below
Structural considerations	Walls to be connected to foundation. Ensure that the ring beams are connected to the reinforcement of walls and columns. Provide reinforced concrete seismic banding and beams in earthquake zones. Use diagonal bracing for timber, steel frames or bamboo walls. Make sure masonry panels are fixed or braced to the concrete frame and will not shake out during an earthquake or flood. Use seismic bands in masonry walls.
	External plaster can help to protect a building from weather damage. Do not use a mortar or plaster too hard or stronger than the material to which it is bonded. Protect the bottom of walls with an apron or waterproofing and the top of walls with roof overhangs (eaves).

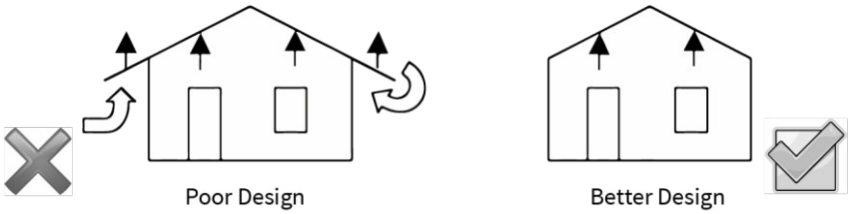
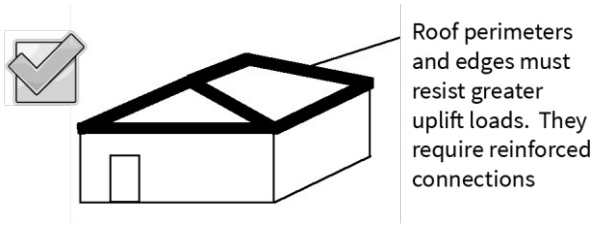
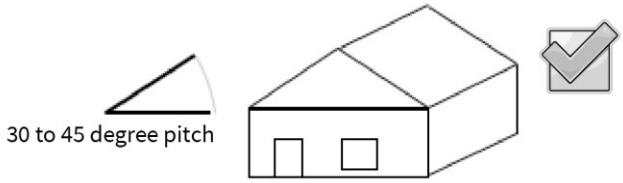
Doors and windows: ventilation and daylight

Windows	Use window sill height of 3 ft. (0.9 m) as a general guide. In cold areas, windows should have transparent shielding to enable sufficient natural lighting. Minimize direct exposure to rain and sunlight. To improve cross-ventilation locate windows toward prevailing winds.
Doors	Outside doors should open outwards in case of an emergency evacuation. All toilet doors should open inwards except toilets for people with disability. Knobs and handles must be placed at an accessible height for pupils and be easy to grip and move. Minimum door height x width is 6.5 ft. (2.0 m) x 2.75 ft. (0.8 m)

Structural recommendation	Doors and windows must be fastened to frames with reinforced hinges and latches. Lintels are horizontal beams set above windows and doors to support the wall above. They can be made from timber or concrete. Every door and window should have continuous lintels. All lintels should be the same height. Window width should not exceed 4 ft. (1.2 m) and should not cover more than one third of the wall's width. Wall openings should be placed 2 ft. (0.6 m) or more from building corners. Windows and doors should be at least 3 ft. (0.9 m) apart. 

Roof

Materials	Roofs of traditional materials such as Dani may require more maintenance than a CGI roof. Recommend CGI-Sheet 0.017 in. (0.43 mm) thickness. A thatched roof made from natural materials may be a fire hazard.    Dani roof CGI roof Roofing sheet
Rain water and water tanks	Water should not be allowed to flow down the walls or collect at the bottom of the wall. Use rainwater gutters and downpipes to keep rainwater away from the building or to the rainwater harvesting tank.
Loads	To reduce risks from earthquakes, do not place water tanks on the roof – place the tank on a separate trestle. If this is not possible then place tank at centre of the building to reduce seismic loading and ensure roof design can carry this load. ▶Refer to MNBC Provisional 2012

Structural considerations	In seismic prone areas, roofs should be as light as possible. Roof overhangs should be large enough to keep the sun out of windows during school hours. The size of the overhang will depend on the height of the roof and the location of the school. In areas where high winds or cyclones are hazards, roof overhangs should not be too large and must always be anchored to prevent the roof getting blown off. In buildings with more than one floor, window screens (awnings) should be added to provide shade.   The roof structure must be braced horizontally and vertically, and every part of the roof system should be connected to each other. Avoid building flat roofs in areas with heavy rains. In cyclone-prone areas, roof slopes of around 30° reduce wind suction forces. Consider insulating the roof to reduce the heat gain through the roof and reducing the solar load through the roof. Suspended ceilings provide very effective insulation. 

▶ IMPORTANT: requirements for schools used as shelter facilities

- Meets temporary needs of displaced people requiring shelter
- Very robust design and good quality reinforced concrete construction required
- Ensure complete and safe decommissioning of temporary facilities
- Repair and improvement of permanent facilities
- Hand over to appropriate authorities once internally displaced people or refugees leave school building

Guidance for materials in design of building structures

Guidance on material choices

Material	Advantages	Disadvantages
Bamboo	Easy handling No waste Environmentally friendly, as it grows quickly Good tensile strength	Low durability compared to other materials Easily attacked by biological agents Predrilling is essential to avoid splitting Not fire-resistant Prices have increased in some areas
Bricks	No dimension and design limitation Equal dimension Easy transport Faster building; Local material High-quality if done in factories	Costly May not be locally available Locally made bricks might not have required quality Manufacturing process uses scarce raw materials such as wood or fuel High levels of breakage leads to waste
Timber	Cost-efficient Good lasting performance and natural appearance Easy to work with Naturally anti-corrosive	Not widely available in Myanmar Needs to be from sustainable sources Easily attacked by biological agents Shrinks, swells, twists, cracks and bends over time and different climatic conditions Often prone to pest, rot, mould and fungi attacks, some are far better than others but they both require a minimum of treatments for outdoor structures Tend to sliver or look old if left natural and unpainted Maintenance need is higher than other building materials Negative impact on environment (deforestation)
Reinforced concrete	Economical when ingredients are readily available Concrete's long life and relatively low maintenance requirements increase its economic benefits Less likely to rot, corrode, or decay compared to other building materials Non-combustible, fire-safe and able to withstand high temperatures Resistant to wind, water, rodents, and insects.	Susceptible to cracking. Strength depends on quality of materials used and an appropriate construction process.
Steel Structure	High strength Uniformity and elasticity Ductility can withstand extensive deformation without failure under high tensile stresses Very strong and flexible – steel framed buildings are ideal in cyclone/ hurricane prone regions	Steel structures are susceptible to corrosion when exposed to air, water, and humidity. Steel has very small resistance against fire as compared to concrete. Susceptibility to buckling – as the length and slenderness of a compressive column are increased, its danger of bulking increase. Has high expansion rate in changing temperatures.

Child-friendly furniture

The designer must consider the physical comfort of students when sitting, reading and writing. Good furniture is important to ensure the comfort of students and good learning. Furniture should be seen as a resource in the same way as buildings are and it should be:

- well-designed and constructed
- correctly sized
- fit for its purpose
- if possible made and repairable locally

There should also be simple ways of disposing of furniture that is damaged beyond repair in order that valuable classroom space is not taken up with un-useable but un-disposable items. The school should, provide adapted furniture, table and chair, for pupils with special needs.

▶ Refer to Annex 4 for further details of DBE furniture designs

Electrical lighting and solar

Lighting extends the number of hours a classroom can be used; ceiling fans produce a more comfortable environment for learning and electricity enables equipment that can help teaching or school management (e.g., computers) to be used. The provision of power also increases the potential for income generating activities at the school.

The provision of lighting and power is not essential in many rural primary schools as they are mainly used during daylight hours. Where there is electric grid access, the decision to take will be on who provides the budget to cover running and maintenance costs of providing the power – the school or the DBE. Solar power is an option, but issues remain over maintenance, theft and long-term sustainability. The use of generators is not recommended due to cost, reliability and maintenance.

▶ Difference between retrofitting and repair/renovation

Repairing/Renovation is restoring a building to its original condition by for example, repairing cracks in a wall or fixing a leaking roof.

Retrofitting is structural improvement to enhance the multi-hazard resistance of a building by adding seismic bands, improving joint connections along the load path or adding bracing or by providing steel jacketing (also carbon fibre) to columns and beams.

▶ Refer to

- MNBC (Provisional 2012)
- UN-Habitat Guidelines on Retrofitting of Rural Houses in Myanmar
- MOE Retrofitting/ Repair Standard Guideline

Retrofitting

Many schools in Myanmar are self-designed non-engineered buildings, which are vulnerable to hazards. These schools can be strengthened by simple and inexpensive retrofitting methods.

Existing school buildings can be vulnerable due to design or construction deficiencies. Some buildings may not have been originally built as schools, and others may not comply with the current building codes. **Retrofitting aims at strengthening and repairing existing buildings to improve their resistance to natural disasters like earthquakes, cyclones and landslides.**

Retrofitting stages

Retrofitting has four main stages:

1. Determining risk: determine what hazards pose a risk to existing and prospective school buildings and where risk is greatest.
2. Vulnerability assessment: essential to determine level of risk, to select best retrofitting method and to assess budget needed for retrofitting. The following aspects must be considered for a vulnerability assessment:

Visual investigation	Map site condition, details of structural damage, observe deflection and displacement of structural elements (walls, roof etc.), and deterioration of materials. Look for cracks and defective members Check deformation of the building Look for truss member and joint defects ▶ Refer to Annex 5 for Visual Assessment Form
Structural investigation	Two stages: Structural investigation for upper structure Structural investigation for sub-structure (underground) For details, ▶ refer to Manual on Retrofitting of Existing Vulnerable School Buildings for details
Detailed structural analysis	Retrofitting strategy will be result of a structural analysis by qualified structural engineer.

3. Design of the retrofitting approach
    - The approach must be designed by a qualified structural engineer.
    - Be simple and able to be maintained inexpensively.
    - Follow strict technical requirements for assessment, design, and construction/retrofitting supervision.
    - Must comply with MNBC.
    - The cost of retrofitting should be at least 50% lower than the cost of a new construction.
    - Advantages
        i. Retrofitting can be done in phases, depending on availability of funds.
        ii. Retrofitting cost can be lower than constructing a new building.
        iii. Will not change building configuration and shape.
4. Construction/ implementation: should consider duration of construction and must be closely supervised to ensure quality of work.

Retrofitting techniques

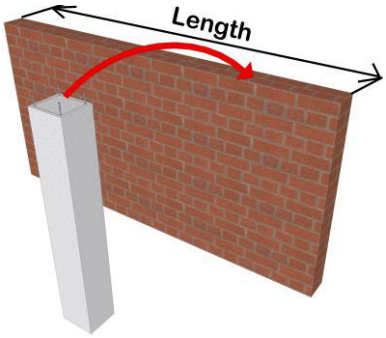
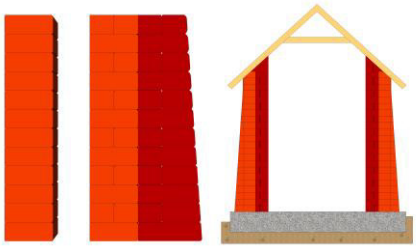
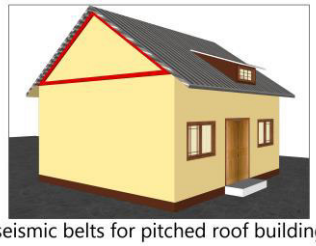
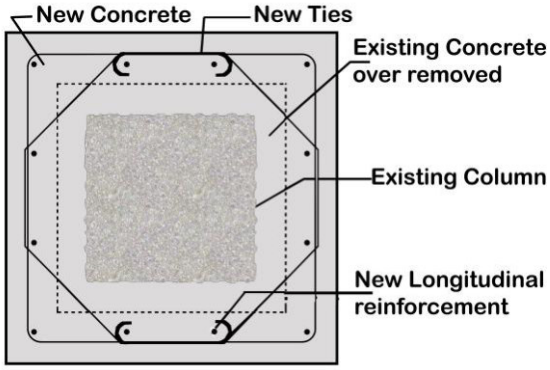
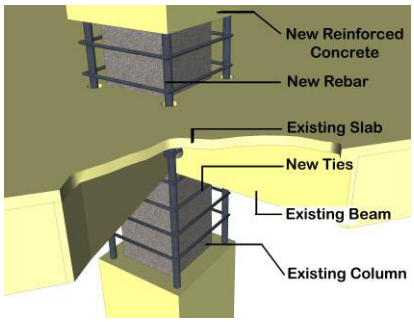
Techniques adopted during the retrofitting process must be appropriate for the structural deficiencies. For example, if the structural assessment shows lack of stiffness in the structure, possible retrofitting techniques could increase structural element's dimensions or insert more structural elements. Below are primary retrofitting techniques.

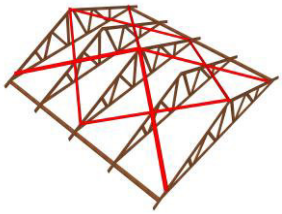
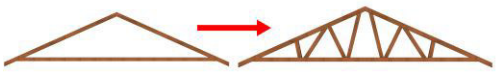
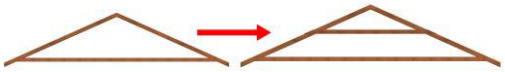
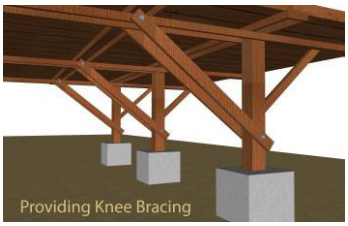
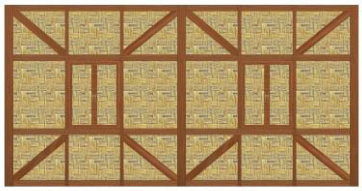
▶ This section provides examples of retrofitting techniques. For a more exhaustive list and techniques, see

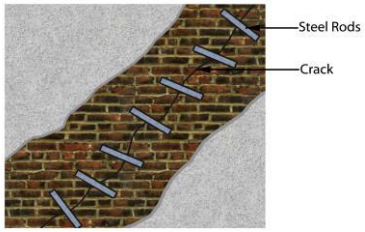
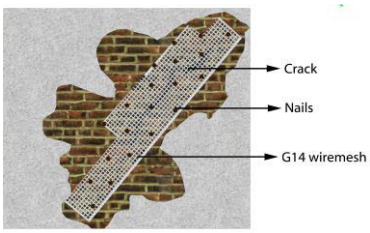
- UN-Habitat Guidelines on Retrofitting of Rural Houses in Myanmar
- MOE Retrofitting/ Repair Standard Guideline
- Save the Children manual on "Retrofitting of Existing Vulnerable School Buildings – Assessment to Retrofitting"

General reinforcement techniques by structural elements		
Roofing	Add truss bracings Add roof bracings horizontally and inclined Tie and firmly connect all roof members	
Wall and Framing	Repair or replace defect parts Check for verticality Add wall struts and rails Add brackets to connect brick walls to the timber frames	Tighten all connections Paint timber members with preservatives
Floor and Footing	Repair or replace defective parts Add additional support or reinforcement if necessary	Compact around the footing Check for verticality

Reinforcement techniques by strategy

Inserting structural elements	Insert structural elements to reduce the load in each element, or by reducing span of structural elements. For example, adding a column in a masonry wall where the area without a vertical structural element is greater than 95 ft^2 (8.8 m^2).   Addition of reinforced concrete column | Addition of Buttress in Masonry Structure
Seismic belts in masonry building	Belts or banding will strengthen a masonry building against earthquake damage by tying the walls together. Belts are best located above lintels of door and window openings and below the floor or roof. They should comprise reinforced concrete or steel ties can be effectively used.  Seismic belt for slab roof building  seismic belts for pitched roof building
Jacketing of structural elements for RC elements (Beam and Column)	Concrete jacketing is an addition of a layer of reinforced concrete in the form of a jacket around existing structural elements (usually columns). Enhances flexural strength, ductility and shear strength of structural elements. Steel or carbon fibre jacketing are also alternative techniques.  
Strengthening roof trusses and roof diaphragms	The addition of a diagonal truss connecting two nearby roof trusses increases stiffness of the roof diaphragm system by bracing the truss. In this case the truss must be strong as it is the primary member that transfers forces from roof to frames of building. It can be reinforced and made stronger by adding web members and/or collar ties.

	   Strengthening truss by providing additional web members  Strengthening truss by providing additional collar ties
Connecting roof elements	Connect rafters and purlins appropriately to ensure that purlins will not be blown away during high wind. Roofing sheets must be properly attached to the purlin to avoid being blown away.   Tie roofing strips closely
Weaknesses in Brick or Stone Masonry Walls	Installing lintel columns ties to the brick walls improves bending strength of wall to control horizontal cracks, reducing possibility of walls going out of plumb or collapsing. It helps bond roof to walls, providing support to wall and controlling its shaking in an earthquake, and helps improve bond between adjacent storeys, which also strengthens walls.
Replacing Column base	The whole weight of the building is supported by columns. Columns must be strong and firmly connected to the ground.
Ground beam around the building	When there are cracks in the foundation, a ground beam around the building will make the foundation stronger to support the building.
Adding bracings	When the frame of the building is weak, bracing will add strength and allow it to better resist lateral forces like earthquakes, wind and floods.  Providing Knee Bracing  Bracing of a bamboo building

Steel stitch in Masonry walls	When walls have been damaged by a lateral force or have a weak foundation steel stitching will improve strength.  

KEY POINTS

- Retrofitting can improve the hazard resistance of existing unsafe school building.
- When resources are limited, rapid visual assessment tools help quickly identify weakest schools and schools with most-vulnerable students.
- Local engineers may have little formal training in methods for assessing existing structures for vulnerability to hazards. Partnering with qualified assessment experts with local universities can build capacity of engineering students, the faculty and government officials.

Water, sanitation and hygiene (WASH)

All children need a safe and hygienic learning environment. But lack of such appropriate facilities inside a school or in the wider community impacts girls more negatively than boys and students with disabilities when appropriate facilities are not accessible. Evidence has demonstrated that enrolment and retention of girls increases when clean, safe, separate and private toilet facilities are available to them.

Schools in Myanmar suffer from either non-existent or inadequate sanitation facilities, unsafe, erratic or non-existent water supplies and poor hand-washing facilities. Facilities are often not maintained, they are consequently unsanitary and do not meet needs of users.

A child-friendly school must have accessible, gender-appropriate toilets and hand-washing facilities as well as access to potable drinking water. The school must also teach children appropriate hygiene practices.

School construction or retrofitting must provide potable drinking water and gender separate sanitation facilities. The table below summarizes the minimum standards for WASH facilities in schools in Myanmar.

▶ For further guidance on WASH, refer to: Thant Shin Star: Achieving the minimum requirements for WASH in schools

Minimum WASH requirements in Myanmar Schools

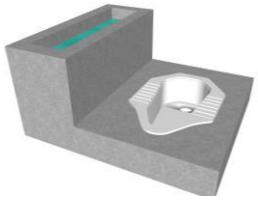
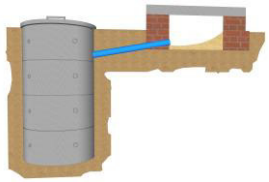
WASH component	Minimum requirements
Drinking water	Each child must have access to at least 500 ml per day of safely treated drinking water. This requirement may be met by requiring each child to bring their own safe (boiled, filtered, chlorinated or bottled) water from home or from water sources tested and declared safe by competent local authorities. Children are required to bring their own cups or bottles. Sharing of water cups or bottles is not recommended. For low-cost drinking water treatment options, ▶ refer to Thant Shin Star: Achieving the Minimum requirements for WASH in Schools
Water for cleaning	School management must ensure sufficient water for cleaning. This must not be less than 3 litres per day per child. For types of water sources, ▶ refer to Thant Shin Star: Achieving the Minimum requirements for WASH in Schools

Toilet facilities	There must be at least one toilet for boys and one toilet for girls. These must be accessible to children with disabilities. Toilets must be clean and accessible to children during normal school hours. Pit latrines must be at least 50 ft. (15 m) away from any drinking water source. Pit latrines should be at low level area. Latrine blocks should be about 33 ft. (10 m) from and downwind of school buildings. Boys' and girls' facilities should be separated by at least 33ft. (10 m) and preferably screened from each other. Toilets should also be at least 98.5 ft. (30 m) away from any wells. Sufficient toilets must be available – 1 per 40 girls or female staff, and 1 toilet plus 1 urinal or 20 in. (50 cm) of urinal wall per 40 boys or male staff.
Hand washing	There must be at least one functional hand-washing facility Toilets should have convenient hand-washing facilities close by. Hand-washing facilities and soap must be available throughout the day. All children must be able to rinse hands under flowing water, for example by using a ladle, tippy tap or a bucket fitted with a tap. Group hand-washing is promoted daily by teachers and Thant Shin Club members.
Operation & maintenance	Classrooms should be cleaned daily. Toilets must be cleaned (both inside and surrounding areas) at the end of each school day. They must be kept unlocked, functional and accessible to all children during school hours. Hand washing facilities should be repaired or replaced whenever necessary. If a school has a water pump, it has to be kept working. Funds must be reserved for this purpose. Schools with public piped water must pay their monthly water bill.
Hygiene education and behaviour change	Schools must be Open Defecation Free. Group hand-washing activity is to be practiced daily in school. All children must practice hand washing with soap at critical times (before meal times and after using the toilet). Hygiene education messages must be given regularly.
Solid waste and wastewater management	There must be at least one waste bin in a school. Waste pits must be located far away from the school buildings. Wastewater puddles must not be allowed within the school area to avoid the contagious of diseases.
School shops, kitchens and food handling	Schools must ensure shops and kitchens are located away from sources of contamination, including toilets, waste collection points and disposal sites. All cooked food must be covered to avoid potential contamination from insects and rodents.

Sanitation and water supply

Water supply	A school must offer adequate access to safe drinking water. Safe drinking water should be odourless, and its turbidity should not exceed 5 NTU (Nephelometric Turbidity Unit). Every water system must be tested once construction is finished and at least once a year after that.
Design considerations	Toilets with a wastewater disposal pit must be located downstream from any spring and at least 66-98 ft. (20-30 m) from wells and water sources to avoid pollution of the water sources. Pits should not be deeper than the groundwater table. The design of toilet facilities should consider: availability and regular flow of water; soil type and soil conditions, including if the area is water logged or if it is rocky; cost and availability of expertise for design, construction, operation and maintenance; safety of pupils and teachers; and the types of anal cleansing material to be provided and how it will be disposed of.
Security & Access	Children must feel secure when visiting toilets without fear of harassment by people or attacks by animals such as snakes. Access routes must be open and clear. Facilities must be in hearing/visual distance of the school so assistance can be called for if necessary. It must be possible to reach facilities in all weather conditions, including after heavy rains or flooding. Toilets must be provided with lighting.
Cleanliness	Toilets must be clean at all times so they do not smell or attract flies or other vermin. This will motivate people to use facilities. Separate toilets should be provided for teachers, and they should be separate for women and men, boys and girls.
Gender considerations	Toilets with water supplies are required for girls and women to comfortably change and dispose of sanitary pads or change and wash the absorbent materials in privacy when they menstruate.

Components

Toilet superstructure 	Includes walls, door, roof and openings for ventilation and illumination. Materials will depend on skills and materials available within local community. Superstructure provides privacy for users and protection from the elements (wind, sun and rain). The roof can be made of thatch, leaves, ceramic tiles or galvanized sheets. Walls and door can be made from woven bamboo, leaves, wood, bricks, galvanized sheets or other materials. Natural lighting and circulation and the need to ensure privacy, security and safety are the key considerations. The door must have a lock on the inside and it should be possible to secure it from the outside to prevent damage that can arise if it is allowed to blow open in the wind.
Toilet floor (or slab) 	Floors must be made of non-slippery and durable materials. The most common material used for the floor is concrete or tiles because they are easy to clean, not slippery nor expensive. The toilet bowl, usually made from cement or (preferably) porcelain, is an integral part of the floor. Slabs may be made from wood or concrete and it is important for safety reasons that they can support the weight of at least five large adults without any noticeable bending.
Wastewater disposal pit 	A pit for wastewater disposal is an underground hole where wastewater is disposed. The maximum depth of the pit depends on soil conditions and groundwater levels in the rainy season. In unstable soils, line the pits with woven bamboo, bricks or concrete rings (preferred). The pit may be placed directly underneath the superstructure, but it is recommended to offset it by one or two meters. Vent pipes should be installed from the pit to at least the eaves height of the roof to remove any foul smells. Fly mesh should be used in the ventilators of the toilet and the vent pipe to prevent flies from entering the toilet.

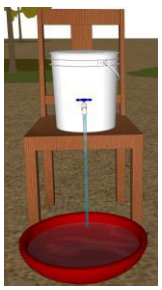
Drainage and Washing facilities

Provision	Every child-friendly school must provide washing facilities.
Location	Hand washing and water points must be located in such a way that encourages use. Locating a hand-washing facility near the classroom of younger children, for instance, allows for better monitoring than placing it near the toilet exit. External hand-washing facilities can be placed at each end of the block, possibly draining into urinals to assist with flushing in boys/men's toilets.
Accessibility	Hand-washing facilities must be accessible to all children, especially younger children and children with disabilities. The school may provide soap, or parents may be asked to contribute a bar of soap per term to create a school stock of soap.

Waste water	Wastewater from hand washing must be properly drained or soaked away to avoid creating stagnant water puddles, which can become breeding sites for mosquitoes. In areas with a water shortage, wastewater from hand washing can be collected and reused to flush toilets or urinals, or to wash school floors.
Drainage system and stagnant water	Schools should include a good drainage system that carries water away from the premises. All external drainage and storm water should be channelled away from school grounds. Pools of stagnant water can spread disease and pose a danger for small children.
Responsibilities	Township education departments or headmasters must establish plans for providing regular supplies of soap in schools.

Example of a low-cost handwashing facility

Hand washing facilities options

Low-cost options (approx. 1,800 MMK/ less than 2 USD)	 
Medium costs with water and soap (9,500-20,000 MMK/ 7 to 15 USD)	

Solid waste management

A child-friendly school must have a solid waste disposal procedure. Solid waste generated in schools generally includes paper, plastic wrappings and bottles, cans, glass bottles and organic waste such as fruits, vegetables and other uneaten food.

School management should ensure solid waste from the school is collected daily and taken to a central waste site or collected for off-site disposal. If there is no collection, then the school will need to set up its own disposal site with demarcated boundaries away from access routes to the school.

The school should set up links with any recycling activities implemented by the community or private sector. Each school should separate waste into recyclables and non-recyclables. If collection points are located within the premises of the school, they must be fenced and, if possible, covered. Increasing waste reuse and recycling will lead to savings in the disposal phase.

▶ RECOMMENDATION: Clean School Day

The school should organise a **'clean school day'** once a week, when all pupils clean the school compound and classrooms.

Composting: An opportunity to recycle waste on school premises

What is it?	In its simplest form, composting is done by piling up organic materials, covering and turning the pile regularly and then leaving to decompose until suitable for distribution over fields or gardens. Time needed for composting depends strongly on local conditions but is often about 12 weeks.
What can be composted?	Several kinds of organic waste: vegetable and fruit waste, farm waste such as coconut husk and sugar cane waste, crop residues such as banana skins, corn stalks and husks, garden waste such as leaves, grass and trimmings, sawdust, bark and kitchen waste. Animal waste such as meat and fish scraps can be used - but this may attract dogs, flies and other insects to the composting pile.
What cannot be composted?	Plastic, tin cans, stones, glass bottles, broken glass, batteries and medicines should not be composted and must be kept separate.
Barrel composting	Easy and available option for schools. Schools can provide a concrete or steel barrel measuring about 47 in. (120 cm) height and 28 in. (70 cm) diameter. Organic waste is placed into the barrel and harvested as mature compost from the bottom after 4 months. Compost produced can be sold to a local organisation to generate income for the school.

CHAPTER 4: TENDER, CONSTRUCTION AND SUPERVISION

This procurement process before construction is an important element of the project cycle to get value for money when building or repairing schools. This chapter provides details of the DBE tendering process and provides basic information for schools or communities supervising construction.

The tender process

There are several ways to employ a building contractor, but currently in Myanmar, there are two main funding paths for construction; through the DBE standard tender process and through communities funding their own schools. Ideally, all schools should be built within the DBE framework. Government procurement rules should be followed.

The tender process used to select and appoint a suitable contractor consists of different companies competing against each other and submitting a price to complete the work specified. The intention is for government, DBE and the school to be able to obtain best value for money for the construction (or extension) of a safe and child-friendly school.

Community built schools

When communities build their own schools, the tender, management and accounting procedures must satisfy government requirements. However, their resources and knowledge of tendering and construction practices can be restricted which can impact the quality and resilience of the school construction.

Communities should be supported by a qualified engineer to supervise the construction process.

DBE tender process

Once the DBE has approved the school, or schools, that will receive funding and the work to be undertaken is determined, the DBE may gather several schools together in one contract to be tendered, this is known as contract lots. The following five steps describe the DBE tender process:

▶ For further information on DBE tendering, refer to

- DBE Tender Guideline for Departments document
- DBE Tender Procedure
- Contract Agreement Local prices for Construction

Step 1: Preparation of tenders

Lots for construction are determined by the DBE. Documents will be prepared by the consultant who has designed the school/extension, or they may be prepared by DBE with input from the school committee (if the work is more minor/straightforward in nature). They will contain the information a contractor needs to price the construction. Tenders for lots will contain the invitation to tender along with technical details (drawings, specifications and schedules of quantities, for example).

Step 2: Invitation to tender

Lots are advertised by DBE in the national press and in local newspapers in the state or region. Any contractor can bid for the lots – this is called open tendering. Contractors should be asked to justify their capability of financing the work and that they have the requisite skills to deliver the contract on time. Information on their health and safety record, their method statement for the contract and references from previous jobs will be required. According to current procurement regulations one contractor is not allowed to bid for more than four lots.

▶ Checking contractors

Contractors with a poor performance record may be blacklisted and not included in the tender process.

Step 3: Tender submission

Tenders are submitted on or before the date specified in the invitation to tender. The tender receipt process at DBE shall record the name of all companies submitting a tender, and the time and date that tenders are received. Only those tenders submitted before the tender closing time shall be accepted.

Step 4: Tender evaluation

A tender assessment is carried out by an individual or an evaluation team comprising staff of the Regional/ State government and the DBE for compliance (and perhaps a consultant). They will check the arithmetic of all tenders to make sure there are no mistakes. If there are arithmetic errors, the tenderer's price may be adjusted in the manner stated in the tender documents.

If the tender is purely based on price, then the lowest evaluated tender will be advised to the Tender Board. If there is some form of technical evaluation as well as a comparison of the tender prices, it will follow a structured evaluation procedure (which should be included in the tender documents for transparency).

The evaluation will:

- Check tenders are compliant
- Numerical checks
- Check the experience and ability of contractors

Step 5: Contract award

The Tender Board selects the successful contractor(s). Regional and State Government authorities are responsible for awarding the lots. An award letter is issued which defines the construction works, including specifications and compliance with rules and standards of construction, the design drawings, and contract form. The selected company countersigns its acceptance and construction will start at the date stated in the contract.

Managing Construction

Roles and responsibilities

Contractor	The contractor has full responsibility for the quality of his workmanship. His duties under the contract consist of: • Constructing in accordance with the contract (including drawings, specifications and schedules) • Regular communication with School Committee • Setting out of works • Submitting requests for payment • Monitoring progress • Materials testing • Providing effective site supervision • Ensuring health and safety on site
DBE & School Inspection Committee	The work of the contractor must be supervised by the School Inspection Committee. The School Inspection Committee comprises engineers/ architects (Department of Construction), officers for buildings, principals and teachers (Department of Education), authority and head (administrative officers) and members of parliament. The School Inspection Committee (or the appointed engineer or architect) shall also make payments for successfully completed work. The main duties of the School Inspection Committee are: • Oversee construction • Check on quality of materials used and construction • Sign off inspection certificates • Oversee site safety • Certify payments • Keep photographic records • Review progress • Review any laboratory testing results The school must ensure a contract is in place and signed by all parties. It should understand the contractor's construction programme including the work start and end dates. The School should have books and forms ready to record all the information on the project. This should include a Minute Book for all meeting records and a Site Visit Record. It should keep a copy of the drawings and specifications at the school.

Paying the contractor

Once the contract is awarded, the contractor will start construction on site. Payments to contractor should only be made when the construction works are satisfactorily completed and checked at key stages.

A typical DBE payment schedule is:

- 25% of building cost payment made when the foundation and footings are completed
- 25% of building cost payment made when the frame and roof are completed
- 25% of building cost payment made when the floors and walls are completed
- 20% of building cost payment made after the final inspection and acceptance. *

*Often 5% of the contract sum is retained by the client until the end of the defects liability period. The contractor has responsibility for any defects that arise in the construction work during this period, which is often one year. At the end of this year, and providing the contractor has fixed any defects, the client will release the 5% to the contractor.

Sometimes a contract will allow an advance payment to be made to the contractor which is used to purchase materials and equipment and to help him start the contract. If this is made (often it is around 20% of the contract value) then a guarantee should be provided by the contractor to the client against default until this money has been certified against work done.

▶ Always increase transparency and reduce risk of corruption in tendering and construction:

- Ensuring regular and planned funding disbursements to the works
    - Never make payment to a contractor unless the work has been successfully completed on site. Always record construction quality and progress with, photographs, notes, and/or checklists.
    - Using checklists to check construction—a supervision checklist related to the stage and progress of the work aligned to the work schedule should be used.
- Use transparent disbursement procedures including publishing payment schedules in the local press, as well as on district and school and community notice boards
- Provide professional site supervision
- Robust reporting, monitoring and verification procedures
- Establish of a system of reporting of suspected corruption independent of the programme management

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Health and safety

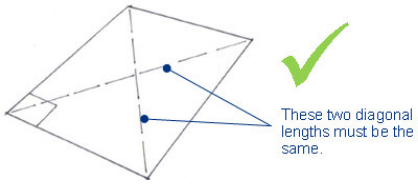
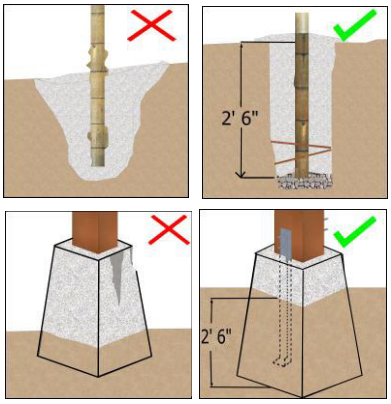
Before and during the works the school must carry out and check the following areas to keep everyone safe at the school, if the contract is for work at an existing school:	
Explain risk to students	It is recommended the School Inspection Committee appoints a senior teacher with responsibility for Health & Safety. This teacher will liaise with the contractor and can also explain to students to keep away from the work site for their safety. The school is to provide a list of emergency phone numbers to contractor and teachers.
Restrict access to construction site	The school should ensure that the contractor has fenced off the construction site within the school. Agree on access times and vehicle movements within the school. Ensure that the contractor maintains a clean site at all times. This should ensure pupils and teachers are safe during construction.
Delivery vehicles	Keep children away from vehicles on site. It is best to have materials delivered when students are not present. Reversing delivery vehicles should have a worker watching behind the vehicle to warn the driver of dangers.
Monitor safety	The school should oversee what the contractor is doing and ask the contractor to stop any dangerous practices immediately. Should there be an accident on the school compound during the construction process, no matter how small or big, the School Inspection Committee and contractor should record the details, take appropriate action, and report the incident to the appropriate overseeing organisation.

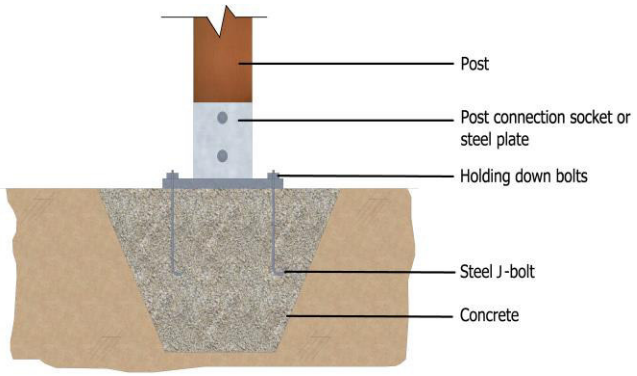
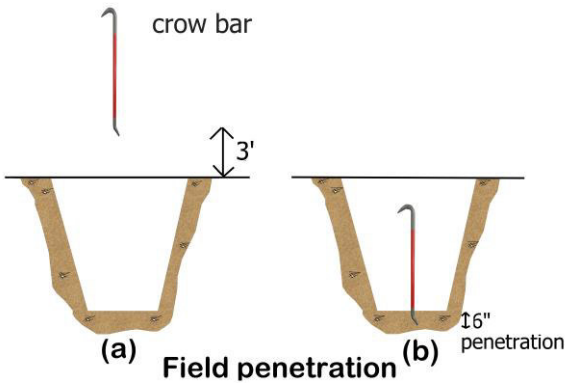
Considerations for construction materials

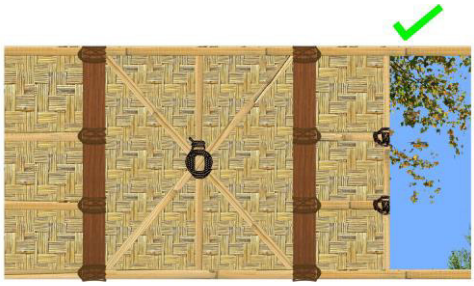
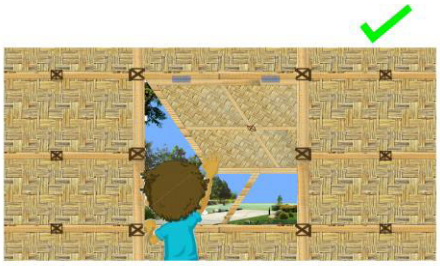
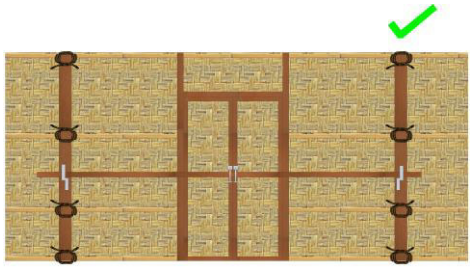
Using good-quality materials is critical to ensuring safe and durable schools. The contractor shall not be allowed to use poor quality materials. The School Inspection Committee should ensure the contractor stores materials safely and securely. Testing must be carried out by the contractor to make sure the materials and construction are good quality and meet the contract requirements. Where testing is carried out at an independent laboratory, the school should always ask for copies of the test results.

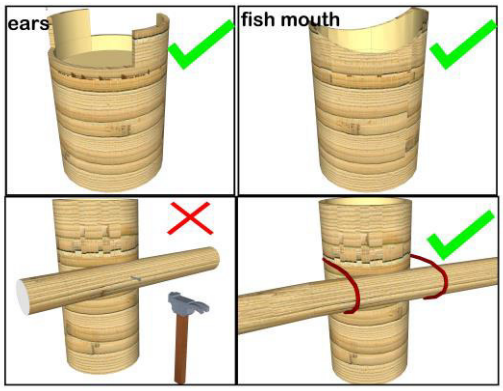
Basic site checks

The following checks are suitable for community-led construction. ▶ Refer to Annex 6 for construction of DBE schools.

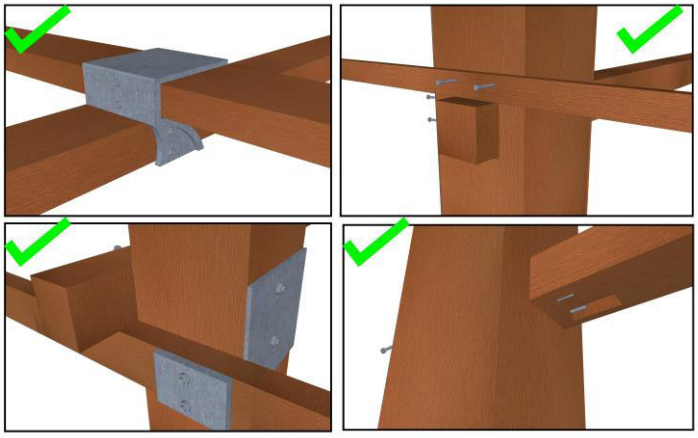
Importance of site checks	Never assume things are correct on site; always check. Common sense must be used - a general rule to use is "Does the building look reasonable and would I be happy to pay for it with my own money?" If the answer is "No", or if you are not sure, then get further technical advice.
When to carry out site inspections	As a minimum it is recommended to carry out a check of the site at the end of each day. A site supervision checklist should be used to record key site activities. Take progress photographs each day of key activities.
What to check on site layout	The construction area should be cleared of vegetation. The contractor should then follow the design drawings and to mark out on the ground where the building is to be built. The two diagonals of a building must be the same length and corners 90 degrees. Checks on the correct line and levels of the foundation should be made after the foundations have been excavated and again once they have been constructed i.e. before the walls are set on the foundation. 
Foundations	Check the following: • That soil is compacted under the entire building. • Ensure the footings are at least 30 in. (76 cm) deep. • Check that any holes around the footings are filled with sand or gravel. • Ensure proper drainage, so water does not lie in the footings. • Check that posts/columns are protected against fungi and insects by covering the posts with bituminous paint or smoked bamboo. • For wooden columns/posts on concrete footings, fix timber with 2 bolts through a L-shaped bracket. • For Steel/ Galvanised Iron columns or posts on Reinforced Cement Concrete (RCC) footings, fix the post with two bolts (at least) through threaded rods/ L-shaped brackets inserted into the footing. 

	 Is the soil hard and compacted enough to place footings/posts? Hold a 5kg crow bar 3 ft. (0.9 m) above ground, directly above the pit, with its pointed end downwards. Drop it freely on bottom. If the penetration of the crow bar is less than 6 in. (15 cm), the soil is hard enough for placing the footing. If not, it should be compacted or a deeper footing excavated. *Rule of thumb procedure for testing soil at the bottom of post footings:* 
Walls, doors and windows	All fittings, hinges, locks etc. must be placed at an accessible height, be working, free of cement and be oiled prior to the contractor leaving the site. • Glass panes should be clear of putty and paint. A lintel should be above every door and window. • Doors and windows should close tightly with no visible gaps and lock properly. • Walls must be vertical so use a plumb line. Brick and reinforced concrete building checks: • Walls must be built up simultaneously and not higher than 4ft (1.2m) in one day. • Brick joints are properly jointed with mortar - mortar joints are a maximum 0.6 in (15.2 mm) thick. • Anchored to the fundations in cyclone and earthquake areas. Brick wall should have all loose or excess mortar cleaned off face of the brickwork. • All bricks are bonded with no continuous vertical joints to create weakness • All external and internal brick foundation walls are waterproofed and plastered, especially where flooding is likely to occur and walls are of masonry construction. • Plaster on brickwork should only be applied once the wall is completely dry.

	For bamboo school buildings: • Avoid large window openings • Bracing to be used • Cut bamboo mats at corners • Shut doors and window frames vertically. • Lighter materials can be used for non-structural parts. • Corners and columns in timber framed walls should be built using longer pieces, which helps the transferring of loads over a wider area. • Intermediate posts should be placed in walls to provide strength, although these may be smaller than end posts.   
Connections	• Select suitable materials: continuous, solid pieces of good quality material. • Choose good quality materials: good timber, strong toddy palm, seasoned bamboo. • Avoid weak materials: do not use inferior, deteriorated or burnt bamboo or timber. • Protect materials used: apply earth-oil or bituminous paint, seasoned/smoked bamboo, anti-rust paint. • Ensure that the joists are strong: the posts, the tie beams and the main rafters. Underlay joists with cleats. • Prepare the joists: for example, cut notches into timber, “ears” or “fish mouth” into bamboo. • Apply the correct type of joints: For bamboo use nylon ropes, strong coconut fibre ropes or binding wire. Fix the ropes correctly. • Work carefully: when nailing, avoid splitting the bamboo and nail straight, not diagonally to the surface of the timber. • Check joints before and after the rainy season: re-tighten bolts or ropes, replace rotten nails and add new ones.



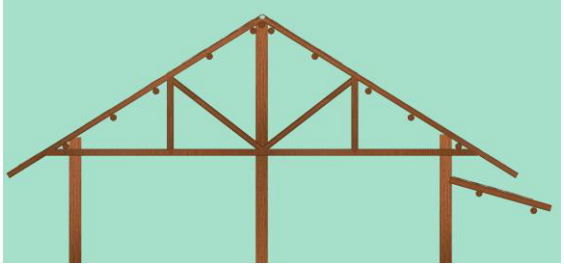
- Nails, screws, metal fixings must not be re-used, old, rusty or bent nor be unprotected mild steel as the item will corrode.
- Steel or galvanised Iron (GI) columns or posts should have anti-rust paint to protect against corrosion. Primers and finished coatings protect metal surfaces by providing a barrier between the steel and the corroding elements.



Roof

Securely connecting the roofing material to the solid roof frame should avoid water leaks and reduce the risk of roof sections blowing off.

- Roof pitches should be at least 30° (ideally 30° - 45°). In areas at severe risk of storms or high winds, hipped roofs (four sloping sides) can perform better than gable roofs (two sloping sides).
- Roof surface should not be too large: disconnect the roof of veranda from the main roof.
- Roof projection should not exceed 18 in. (45.7 cm) on any side.
- Strengthen roof frame by using good materials, adding braces and connecting the roof frame well to the posts.



- Lay a sheet of thatch or ‘dani’ roofing (Nipa Palm thatch) from side to ridge

	at least every 4 in. (10 cm) and fix with bamboo strips. Dani requires rafters at 9 in. (22 cm) – 12 in (30 cm) centres for firm fixing. • Place a lattice on top of the thatch or dani roofing and secure it to the roof frame to avoid the lattice blowing off. • CGI (Steel) sheets should be fixed with screws or, preferably, J-hooks at top of the ridge or undulation. Fix the edges well, all CGI sheets should overlap at least one and half corrugations in the horizontal direction and at least, 6 in. (15.2 cm) in the vertical axis (increase the overlaps if roof is very exposed to rain and wind). When fixing the sheets to the purlin, make sure connections are through the top ridges, and not the bottom troughs, as otherwise it will leak.

▶ IMPORTANT:

- Do not let the contractor cover up any work, especially in the foundations and reinforcement, before it has been checked.
- For more guidance on site checks, ▶ refer to the checklist in the Annex 6.

Handover

When works are completed, a school completion report shall be prepared by the contractor, incorporating photos of progress, inspection and completion certificates. This will be submitted to the School and the DBE.

Once the project is complete and handed over, there is a 1-year defects liability period during which the contractor must correct any defects that occur in the construction. These will be carried out at the contractor's expense. It is very important that the school monitors and checks for defects and makes sure this is reported to the overseeing organisation. It is important, however, to understand and distinguish between what are construction defects and what are normal wear and tear maintenance items.

▶ IMPORTANT:

Before the DBE makes the final payment to contractor**,** the School must check that works have been satisfactorily completed.

KEY POINTS

- When carrying out tendering, always use the most appropriate approaches to increase transparency and reduce the risk of corruption.
- Always have a competent supervisor to oversee the work of the contractor.
- Using good quality materials is critical to ensuring safe and durable schools.

CHAPTER 5: LOOKING AFTER SCHOOLS

Good maintenance can increase the lifespan of school buildings and infrastructure, reduce need for more expensive future repairs, keep the school safe and secure, and promote a good environment for all.

Taking responsibility for school maintenance

Who	Roles and responsibilities
Township Education Officer (TEO)	Manages budget for maintenance of school buildings. Reviews application requests from schools for maintenance funding. Prioritises and selects when schools receive maintenance funds.
School Principal	Forms and supports School Maintenance Committee. Applies for maintenance funding to the TEO.
School Maintenance Committee (SMC), Chairman, Co-Chairman, Treasurer, Secretary, Members (2-5 people)	Plans and manages maintenance budget and activities. Consults with TEO office, PTA and Board of Trustees (BOT). Proactive in getting funds for regular maintenance. Works with staff, community and students to look after buildings. Helps get technical support, labour and materials from community, members of SMC, teachers and parents.
Teachers	Educate community and children in maintaining schools. Report damage and repairs needed to school principal or SMC.
Students	Treat school with care and respect. Help carry out basic maintenance .
Parent Teacher Association (PTA) / School Board of Trustees (BOT)	Works with SMC. Assists with budget planning process. Advises and supports SMC on available community-based contractors and support.
Community, including parents	Support school financially and technically with maintenance.

What to include in a school maintenance plan

- List of all items (buildings, toilets and furniture, for example) in school
- Write down condition P = Poor S = Satisfactory G = Good
- List routine maintenance activities (daily, weekly and monthly, periodic and annual)
- Inspection checklists (daily, weekly, monthly, quarterly, periodic and annual)
- Emergency maintenance checklist

▶ Refer to Annex 7 for example contents

School maintenance plan and activities

1. SMC prepares maintenance plan. See box below for maintenance plan essentials.

2. Using the maintenance plan, the SMC should list school's assets and their condition.

3. The school must carry out simple maintenance activities. If anything dangerous or urgent is found by the school users, this must be reported immediately to a teacher, school principal or member of the SMC, who have to take responsibility for putting it right.

   Note: For maintenance needed after a disaster, the school must make the application within two weeks to the TEO (for primary schools) and the State/ Region for middle and high schools**.**

   ▶Use standard application form 1. Refer to Annex 2.

4. School should carry out weekly, monthly, quarterly, periodic and annual inspections. Record the results in the maintenance plan.

5. SMC and school principal should periodically review maintenance plan and results of inspections. They will use this to review and adjust their maintenance budget, if necessary.

6. Required maintenance budget should be sourced either from existing school funds, requested from TEO (▶Use standard application form 1. Refer to Annex 2) or sourced through community. School principal and SMC to decide most appropriate method.

Budget planning

The DBE application and approval process for maintenance funding can take several months, so the school principal should apply for maintenance funds as early as possible to prevent further damage. The following checklist can help the SMC estimate budget needs for maintenance:

- Estimated cost of equipment, materials and labour
- Schedule of the activities needed
- Bill of quantities, technical specifications and built drawings when available
- Costs of similar works
- Quotes from contractors for work.

Emergency maintenance

Emergency maintenance may be required when a school is damaged by a hazard such as flooding or a cyclone. A safe school building should withstand the hazards**,** but in the case that a school is damaged, then emergency maintenance might include repairs of the building as well as significant cleaning.

Note: A school inventory before a disaster will help the school to quickly identify what is missing or what needs urgent attention.

▶ Refer to Annex 7 for further guidance.

Recommended maintenance and operations activities

When	Tasks
Daily	Sweep classroom and veranda, teacher room and library every day. Toilets (inside and the surrounding areas) must be cleaned at the end of each day. They must be functional and accessible to children during school hours, but locked at end of school day (if there is no parents or teachers event in the evening). Flush toilet bowl generously with water when cleaning toilet Lock all rooms at end of school day Collect trash in school compound. Empty trash cans. Solid waste should not be thrown in the toilet. Remove any solid waste from toilet, wash basin or floor drain
Weekly	Remove furniture from classroom and wash floor every week Wash walls, windows and doors Trim grass, and remove weeds Inspect whether all toilets are functioning well Check water tank and valve(s)/ taps Hand washing facilities must be repaired and/or replaced when necessary Inspect soakaway pit Empty leach in the soak pit once a week (before weekend)
Monthly	Clean all hand washing bins and the rainwater gutters Clean open drainage in compound
Quarterly (every three months)	Inspect roofing, ceiling, flooring, walling, windows and doors. If any are broken, replace immediately to prevent injury Check the water level and empty the septic tank if it is full Inspect rainwater down pipes Inspect wooden parts of buildings for rot and deterioration Check all the fixtures and lubricate all hinges generously with proper oil Inspect ceiling for damp and roof leakages
Annual and periodic maintenance*	Inspect flooring for damage Inspect fixture of hand washing bins. If necessary, retighten Inspect classroom furniture. Repair as necessary Inspect playground furniture, and repair if necessary. Tighten any bolts and nuts Rub rust from parts, and coat with paint Inspect fixings of gutter, and repair if necessary Inspect open drainage and retaining wall(s). Clean, and repair if necessary Inspect and repair plumbing works - water tank, taps and pipes Repair roof leaks as soon as they become evident ***** For further guidance on **Seasonal maintenance (**before and after the monsoon period), refer to ▶ Annex 7, Example contents of a school maintenance plan, (C) Emergency maintenance checklist

▶ Reference for detailed repair techniques

UNICEF Maintenance Manual for Child-Friendly Schools, Myanmar.

KEY POINTS

- Looking after schools is critical to maintain a safe and secure school and increase the lifespan of infrastructure. The cost of rebuilding a deteriorated school is much greater than the cost of maintaining one.
- School Maintenance Committee (SMC) should be formed by the school principal. The SMC must manage the maintenance of the school.
- A maintenance plan is an effective tool for schools to plan and budget for maintenance.

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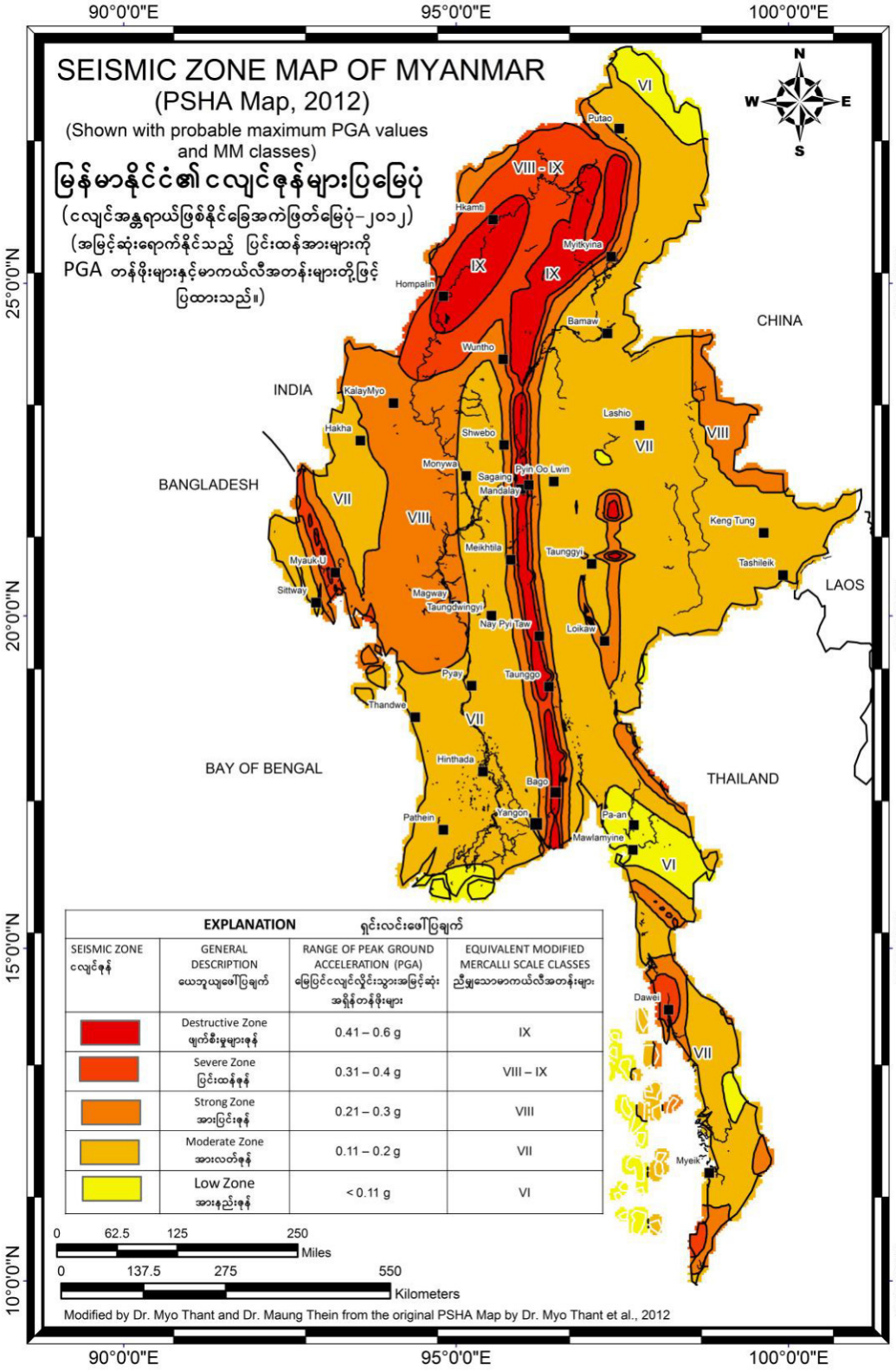
Annexes to Safe and Child-Friendly School Construction Guidelines

The annexes to the safe and child-friendly school construction guidelines comprise:

Annex 1	**Mapping** Seismic and meteorological mapping supports the design and planning of schools in Myanmar. Further mapping is available from the Myanmar Information Management Unit (MIMU): http://www.themimu.info/
Annex 2	**DBE Standard Form 1: Application for construction** This DBE Standard Form 1 is an application form to request new construction, retrofitting, repair works or maintenance.
Annex 3	**Site assessment checklist & Key issues for consideration** The checklists should be used when choosing and planning a site so that hazards and risks are considered in decision making.
Annex 4	**Shelter/ School design** Shelter/ School designs are provided based on hazard zones, geographical area and types of materials suitable for use in each area. MoE Building Layout Guideline & DBE Standard Furniture Design Guidance Guidance on solar power is provided.
Annex 5	**School condition assessment form (visual)** The visual assessment form supports the vulnerability assessment of buildings. This will determine the condition of the structure, level of risk and select the best retrofitting method.
Annex 6	**Supervision of construction activities – general checklist** The checklist identifies general good practice construction supervision items to be checked. It is written in cases where the School has a responsibility for oversight of construction activities.
Annex 7	**Example contents of a school maintenance plan** The maintenance plan and checklists should be used by schools to plan, manage and budget for their maintenance. It includes the example templates: **(**A) Asset inspection report (B) Cleaning and maintenance schedule (C) Emergency maintenance checklist

Annex 1

Seismic, climatic and meteorological mapping



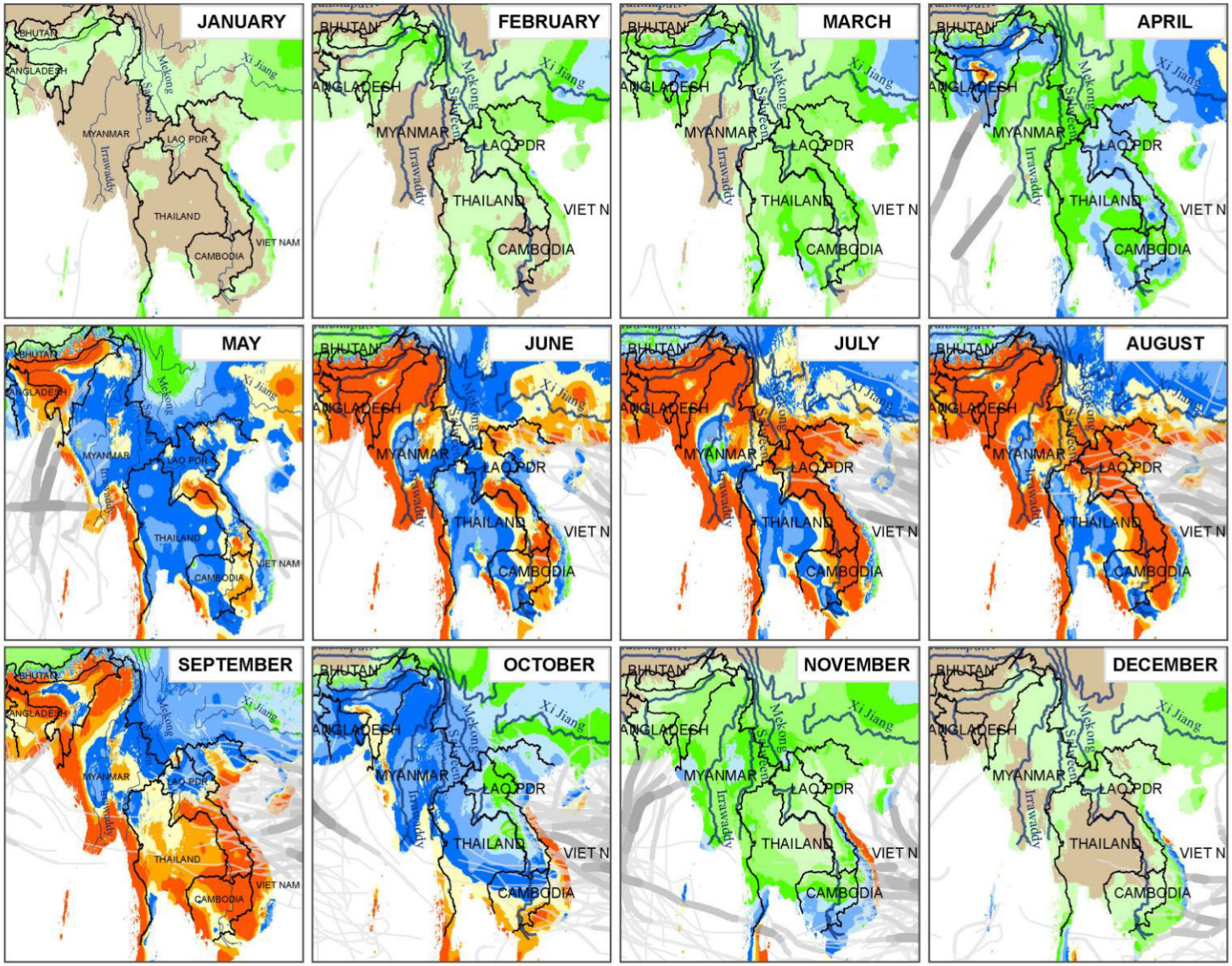
Probabilistic Seismic Hazard Assessment Map (PSHA Map) of Myanmar showing expected peak ground acceleration (PGA) values with 100% probability in 500 years. (Note: 0.21 - 0.3 g zone in the northern part of Shan State is taken from the Seismic Zone Map of Myanmar by Dr. Maung Thein et al., 2005)

Historical Monthly Data on Average Precipitation and Tropical Storms

Average monthly precipitation and all tropical storms recorded for the month between 1956 and 2006

MYANMAR

OCHA
Regional Office for Asia-Pacific



Historical Average Monthly Precipitation: mm (WORLDCLIM)

Below 10	100 - 150
10 - 25	150 - 200
25 - 50	200 - 250
50 - 75	250 - 300
75 - 100	Above 300

All tropical storms recorded dring month: 1956 to 2006 (UNISYS)

- Tropical Depression
- Tropical Storm
- Category 1
- Category 2
- Category 3
- Category 4
- Category 5

Map Doc Name:
OCHA_MYA_Monthly_Climate_v1_090710
GLIDE Number:
n/a
Creation Date:
10 July 2009
Projection/Datum:
Behrmann
Web Resources:
http://ochaonline.un.org/roap
Nominal scale at A4
1:40,000,000

0 700 1,400
Kilometers

Map data source(s):
WOLRDCLIM, UNISYS, UN Cartographic Section, Global Discovery

Disclaimers:
The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Annex 2

DBE Standard Form 1: Application for construction

Standard Form (1)	
Department of Basic Education	
(/) school year – state/ regional , township priority level of new construction/ expanding/ renovation	
Township priority rank ( )	
State/ Regional priority rank ( )	
Form (to be completed by School Principal)	
Application Form for Basic Education High/ Middle/ Primary Schools, Offices building renovation	
1. School Name:……	
2. Location:……..	
3. Current school layout plan ( ) and area ( ) feet/ acre	
4. Land Ownership Status:……..	
5. Requested amount for	(a) Renovation
	(b) New construction/ expanding
[state which parts want to renovate (roofing, walling, floor, post), detail statement and reason for new construction/ expanding] (for new construction/ expanding, please attach MoE standard design drawings, it does not need to bedrawn again by Engineer)	
6. Request building dimension and type:……	
7. Estimated cost:……	
8. Parent/ Communities contributed amount: , value of contributed materials:	
9. Request amount to DBE:……..	
10. If request for outstanding activities of requested building:	
(a) Outstanding activities:	
(b) Previous approved amount/ fiscal year:	
(c) Outstanding amount to withdraw:	
(d) Explanation letter for incompletion with separate sheet.	
11. History of previous allocated budget with fiscal year by DBE for school maintenance (if forget/ omit the information to submit, appropriate action will be taken)	
Fiscal Year (Types of activities) _____ _____ _____ _____	Allocated Budget _____ _____ _____ _____ (Name) School Principal

Form (1) – Para. (a) Status of school buildings

Name of building	Type of building			Dimension			One storey/ two storey	Value	Type of fund (DBE/ Parent/ DBE+Parent/ State-owned)	No. of classroom	Dimension of classroom and usage for other activities
	Roofing	Walling	Floor	Length	Width	Height					

Remark: Separate sheet for building layout in attached.

(Name)
School Principal

Form (1) – Para. (b) Statement of student in class/ grade

Grade	No. of class	No. of students	Remark
10th Grade			
9th Grade			
8th Grade			
7th Grade			
6th Grade			
5th Grade			
4th Grade			
3rd Grade			
2nd Grade			
1st Grade			
Kindergarten			
Total			

Form (1) – Para. (c) No. of students and teachers in school

Level	No. of students	No. of teachers	Remark
High			
Middle			
Primary			
Total			

Form (1) – Para. (d) One shift/ two shift school

Form (1) – Para. (e) All the information stated in above are correct.

Name:

School/ Office:

Township:

Form (1) – Para. (f) Recommendation and priority ranking by TEO (priority rank)

Township Education Officer

……Township

Form (1) – Para. (g) Recommendation and priority ranking by State/ Regional Education Officer (priority rank)

State/ Regional Education Officer

…….State/ Region

DBE Requirement and Standard Form for new school construction/ expanding & renovation

New school construction/ expanding

1. To complete following documents when submitting the proposal for new school construction/ expanding
   (a) Land tenure (copy of Form – 105 or ownership status)
   (b) Area of school compound
   (c) School layout plan (with scale)
   (d) Stated new construction/ expanding/ renovation building in school layout plan (with scale)
   (e) Complete the information of new construction/ expanding/ renovation in Form (1)
   (f) Complete the information of existing buildings (dimension, height, types of building) in Form (1) – Para. (a)
   (g) Complete current number of students in each grades in Form (1) – Para. (b)
   (h) Complete number of existing class rooms (stated classrooms, office, teachers' room, library, science laboratory and so on separately) and required classrooms requested by School Principal
   (i) Copy of proposed building plan (BP) (MoE/DBE standard design) with School Principal's endorsement
   (j) Abstract of Materials, Bill of Quantity (BoQ) calculated with current market prices with School Principal's endorsement and Engineer's detail measurement
   (k) Township Construction Committee chaired by TEO (Township Education Officer) evaluates all application and recommend the priority list as 1^{st}, 2^{nd}, 3^{rd} and 4^{t}. Do not allow to recommend as 1^{st} – A, 1^{st} –B, 1^{st} –C priority list.
   (l) State/ Regional Education Office screen the recommended applications that received from Township Education Office and recommend the priority list as 1^{st}, 2^{nd}, 3^{rd} and 4^{th} as needed. Do not allow to recommend as 1^{st} – A, 1^{st} –B, 1^{st} –C priority list.
   (m) TEO/ State/ Regional Education Officers recommend as a special case and state as "Important"

Renovation

2. Complete the following documents when submitting the requests for renovation
   (1) Complete the information and documents as per paragraph 1.
   (2) Please indicate clearly which parts of building need to be renovated (roofing/ walling/ floor) and attach the photos of damage location from different views (front, back and side view)
   (3) Submit together with detail measurement and estimated cost for repair items which was calculated by technical person (Engineer), contribution from parents/ communities, request amount to DBE.

3. Complete the following documents when submitting the requests for renovation of the building effected by natural disaster:
   (1) Complete the information and documents as per paragraph 1.

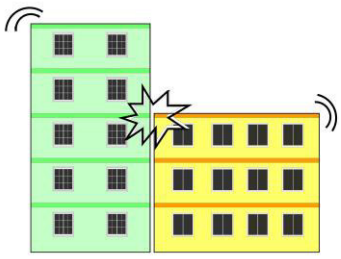
Required information for application for construction

i. Cover letter of proposal with attention to Director, State/Region Educational Director Office
ii. Cover letter of proposal with attention to Township Education Officer, Township Education Office
iii. Instructed Order to access to land use according to prescribed method (Land Tenure status)
iv. School Layout
v. Form (105) from Department of Land Records
vi. DBE – Form (1)
vii. Abstract of Cost
viii. Detail of Measurement
ix. Proposed Architectural and Structural Drawings

Annex 3

Site assessment checklist

GEOGRAPHICAL	**Checked** ☑☒
Determine the number of classrooms school requires and how much land is needed for the compound based on current and projected student numbers and ages (new school or extension to existing school).	☐
Check local and neighbouring communities' acceptance of site location.	☐
Make sure land titles are available and land ownership is verified. Can formal lease agreements or land tenure be secured for the proposed site?	☐
Access: Attempt to avoid sites where children must pass along busy highways or cross dangerous waterways to access the school. Check if the access road to the site of the new school is safe and is suitable for evacuation use in case of an emergency	☐
Check need and provision of water, sanitation, waste, and power supply.	☐

DISASTER RISK REDUCTION	**Checked** ☑☒
Hazards: Assess risks from hazards such as storms, flooding, landslides, earthquakes and cyclones. Avoid building in high-risk hazard zones if possible. Consider relocating existing school when risks are high. Are the school population and the local community aware of potential hazards/risks?	☐
If the school compound is at risk from flooding, the school should be placed on an elevated site. If an elevated site is not available, then individual buildings should be raised.	☐
In high-wind areas, make sure site and nearby areas are clear of objects that could become wind-born (poorly secured signs, utilities, building parts, trees) and damage school or occupants.	☐
Unstable soils: Check the stability of slopes in hilly areas. Check that the ground will be strong enough to support a school.	☐
If the school is in an earthquake prone area, provide adequate distance between buildings so buildings do not come into contact when if they shake or sway. 	☐
On tsunami-prone coastlines, check if site is outside expected tsunami inundation zone. If it is not possible to move the school, make sure site is close enough to high ground for students and staff to safely evacuate in time, or ensure upper floors of school are above inundation level and structure can withstand the effects of the event without collapse.	☐

HEALTH AND SAFETY	Checked ☑☒
Identify potential evacuation routes and access routes for emergency services.	☐
Place buildings away from stagnant water, which may be a breeding location for mosquitoes and insects which spread diseases. Be aware of seasonal sources of stagnant water, such as dried-out rivers or ponds.	☐
In conflict and post-conflict regions, avoid areas that may contain mines or unexploded ordinances (UXO). Seek specialist advice if it is suspected that mines or UXO are present in area.	☐
Site should be away from sources of pollution, toxic or hazardous materials.	☐
School should be located away from sources of excessive noise, where possible, such as aircraft, cars, trains, sirens, and industrial operations, so noise levels do not affect children.	☐
Consider fire regulations and access in emergency. ▶ Refer to MNBC (Provisional 2012) for fire safety requirements.	☐

TECHNICAL	Checked ☑☒
Have all natural hazards posing a threat to schools been identified?	☐
Avoid building on or near steep slopes where landslides, rock falls, avalanches or similar hazards could kill or injure people or damage school.	☐
Where schools are located in hilly or mountainous areas, check slope stability (angle, soil type, drainage, etc.) and assess soil characteristics. This will provide important information for, in addition, determining foundation type (strip or slab); depths for drilling water wells; and excavating for septic tanks (rocky ground is not very suitable). Conduct soil analysis.	☐
Consider whether land filling is needed to elevate new structures above maximum flooding levels.	☐
Identify groundwater table depth. This will be important information for establishing foundation depth and size as well as the depth and distance between latrine system/septic and water tanks.	☐
Whenever possible, avoid building on weak water-logged soil. Select site composed of firmest sub-soil available.	☐
Ensure adequate site drainage to prevent ponding or flooding. Can construction vehicles, equipment and workers easily access the site?	☐
Has the soil been tested?	☐
For existing schools and retrofitting: Have all natural hazards posing a threat to schools been identified? Are the school population and the local community aware of the risk? How often are these risks reassessed? Were the school buildings designed to meet building code standards? Was the soil tested before the school was built?	☐ ☐ ☐ ☐

ENVIRONMENTAL	Checked ☑☒
Identify and protect existing natural features and ecosystems.	☐
Avoid excessive clearance of trees or bushes from the site or, alternatively, re-plant the site (to create a cooler micro-climate or to stabilize soils).	☐
Respect and incorporate historic, cultural and artistic resources.	☐

FINANCIAL	Checked ☑☒
Avoid sites that need expensive clearing, levelling or compaction that will add to cost of construction.	☐
Consider need for access roads, connections to water, sewage, electricity networks, and other engineering works such as retaining walls, earthworks or ground preparation.	☐
Assess site's existing buildings and infrastructure. Determine whether demolition work is needed.	☐

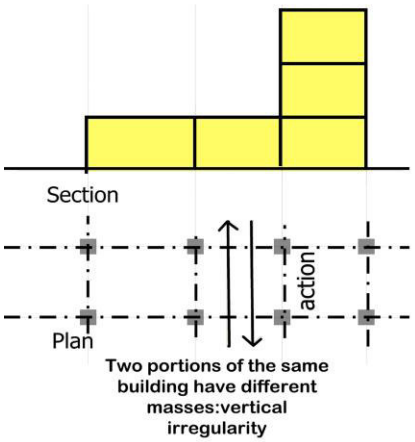
Key questions for hazard prone areas

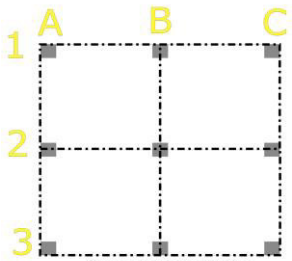
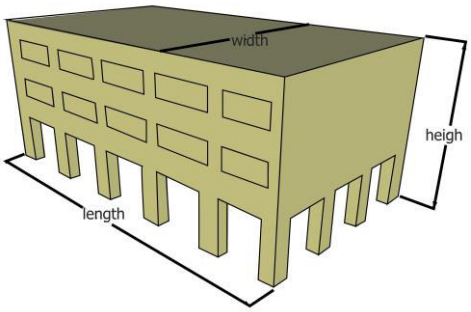
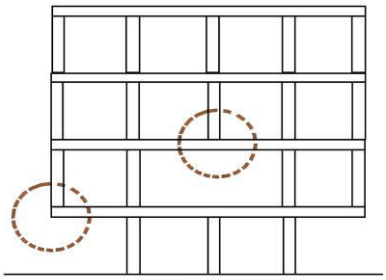
Understanding and improving school safety is based on understanding the issues in each community and taking precautions to reduce the risk of hazardous events occurring.

KEY QUESTIONS FOR ALL SCHOOLS (new and existing schools[7])	Checked ☑☒
Have all natural hazards posing a threat to schools been identified?	☐
How often are these risks reassessed?	☐
Are the school population and the local community aware of the risk?	☐
Were the school buildings designed to meet building code standards?	☐
Who designed the school?	☐
Was the soil tested before the school was built?	☐
Were builders trained to apply hazard-resilient techniques?	☐
Was the school construction supervised by a qualified engineer?	☐
Who is responsible for managing the school maintenance program? Are mechanisms in place to ensure school maintenance is financed and executed?	☐
Are school furnishings and equipment designed and installed to minimize potential harm they might cause to school occupants?	☐
Do students, teachers, staff, and school administrators know how to act and react before, during and after a hazardous event?	☐
Is the school population and local community aware of how they can reduce their vulnerability to the damaging impacts of a hazardous event? Are they actively taking measures to do so?	☐

[7] Source: GFDRR & INEE Guidance Notes on Safer School Construction

KEY QUESTION FOR FLOOD SAFETY SCHOOL: Information should be gathered in advance on any history of flooding in the area. The site should be investigated for the presence of seasonal rivers/torrents. The community can also be asked for advice.	**Checked** ☑☒
In coastal areas, sites some distance inland may be exposed if there is an extreme storm surge. Check whether the site could be in an inundation zone by referring to historical data and by consulting the meteorology department.	□
Foundations: Flowing water erodes soil which can undermine building foundations. If siting in a floodplain is unavoidable, new facilities are to be designed to minimise impact and foundations designed accordingly e.g. piles, deep foundations. The plinth must be protected, or undermining may occur.	□
Foundation material that comes into contact with water during flooding events can be weakened. Floodwaters seep into walls, frames and foundations potentially leading to collapse. Check for the extent of potential damage over the expected duration of flooding? Services have to be protected. Elevating buildings on top of piles or columns, or building on top of compacted earth, can raise the building above damaging floodwaters.	□
Waste Water: Unprotected waste water from soak pits, for example, could cause a major health problem after a flood. Check whether the wastewater service for the school is (or can be) protected from flood events. Septic tank openings and vents should be raised to be above the expected design flood elevation.	□
Fresh Water Supply: Critical facilities in schools that depend on potable water should be aware of the vulnerability of the local water supply system, and the Service Authority's action plan during flooding events. If served by a well, ensure that the wellhead is protected.	□

KEY QUESTIONS FOR EARTHQUAKE RESILIENT SCHOOLS: Information should be gathered in advance on the overall risk for the region and on the specific risk for the area (seismic zoning) particularly regarding the nature of the soil.	**Checked** ☑☒
In seismic and high wind areas, check that the building plan is regular, meaning buildings of similar height with gaps between the different buildings. Are there vertical irregularities in the configuration of the school building?  Two portions of the same building have different masses:vertical irregularity	□

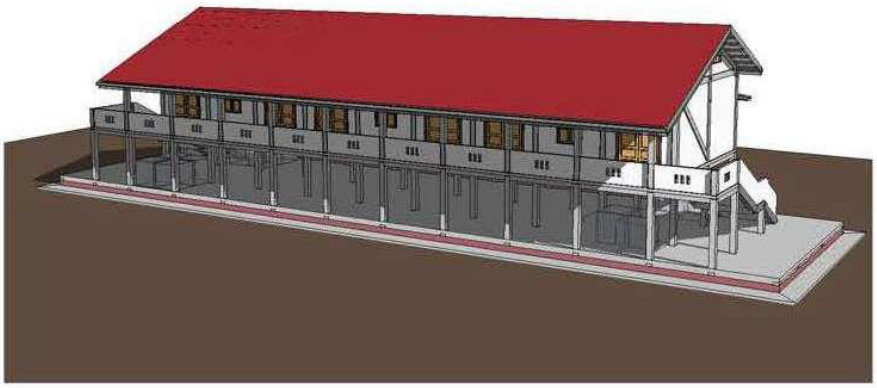
Are the walls and/or columns in grid lines in each direction?  Good example; Building Plan shows that the column are in grid lines in both directions	☐
Is the length/width ratio and the height/width ratio as per code within the safe limit?  	☐
Check that buildings with timber or steel frames have sufficient diagonal bracing to resist shaking effect and high winds	☐
A continuous load path allows the structure to act as a unit when shaken by an earthquake. Connections from walls to floors and roofs are part of the load path. Check there is a continuous path from all structural components to the foundation?  **section show that the load path of the building is discontinuous-this is not desirable**	☐
Masonry Building: Check if there are reinforced concrete bands at plinth and lintel level. Check for vertical reinforcements at wall junctions and at sides and tops of doors and windows.	☐
Has seismic load been considered in the building design?	☐
Openings: Check that small window and door openings are placed at least 4 ft. (1.2 m) from building corners to reduce the likelihood that cracks forming at doors and windows will reach and weaken building corners. Is the total width of doors and windows less than half of the total wall length?	☐
Check that the non-structural components are not a risk during seismic events.	☐

KEY QUESTIONS FOR SCHOOLS IN HIGH WIND AREAS:	Checked ☑☒
Did the engineer take into account the wind design speed along with building height, width and topographic features?	□
Check that the buildings have 'hipped' roofs without overhangs. Providing window coverings can help prevent high winds from blowing roofs off.	□
Make sure there are strong connections between all elements. Check connections between the roof and columns or walls.	□
Check that the non-structural components are not a risk during high wind events.	□

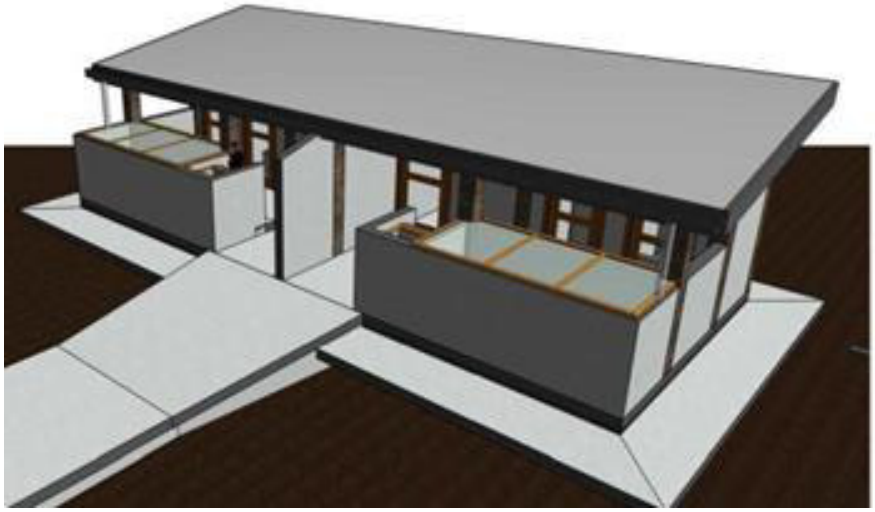
Annex 4

Shelter/ School Design

Shelter/ School Design of SDC (Improved School Design _ Rakhine State)

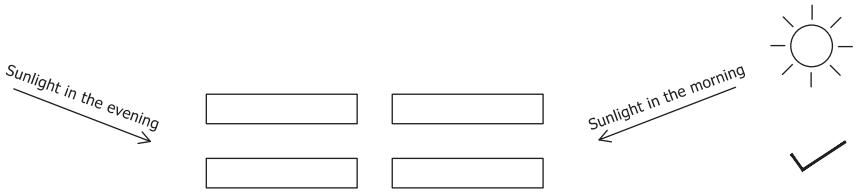


3 Classrooms: 106 ft. (32.3 m) x 32 ft. (9.7 m)

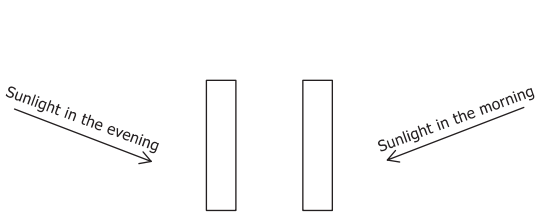


6 toilet units : 34 ft. (10.4 m) x 14 ft. (4.3 m)

MoE Building Layout Guideline

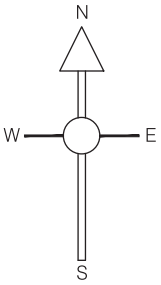


There is less area exposed to sunlight for the schools aligning in an East – West direction.



There is more area exposed to sunlight for the schools aligning in a North – South direction.

The schools should be aligned in an East – West direction to have less area in exposure to sunlight; without having the front or being parallel towards the entry road, main road and the water way of the village. One building could be built 30 feet or 40 feet away from the next. The length of the building should not be more than 120 feet or 150 feet to be resistant to natural disaster and wind.



Orientation-

DBE Standard Furniture Design Guidance

Ministry of Education

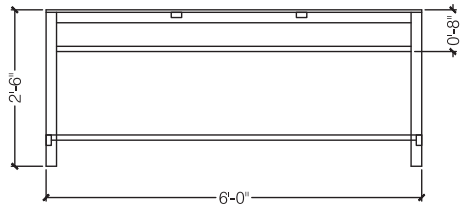
Department of Basic Education

Higher Grades/ Pages (1,2,3)

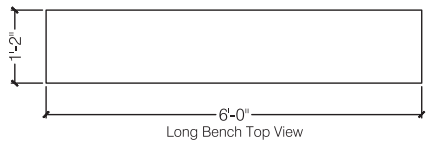
Primary Grades (Grades – 2,3,4,5)/ Pages (4,5,6)

School Furniture

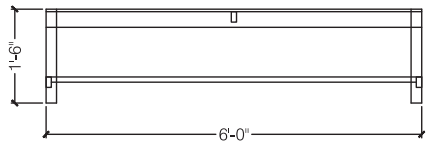
Long Desk Top View



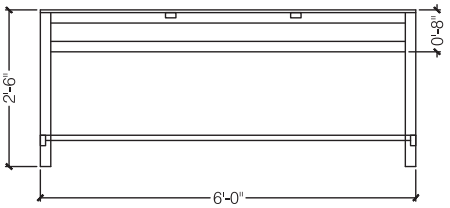
Long Desk Back View



Long Bench Top View



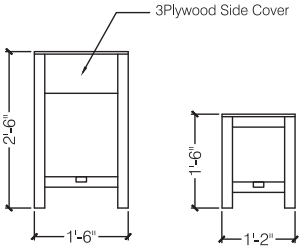
Long Bench View



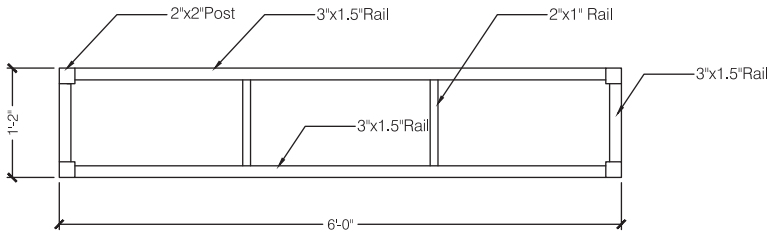
Long Desk Front View

Note - All wood must be used Hard wood.

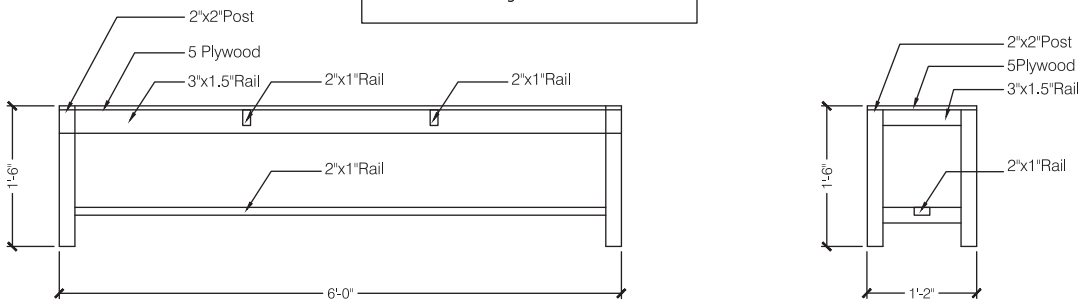
Higher Grades Desk and Bench



MOE. Furniture Design	LONG DESK & LONG BENCH	APRIL, 2016	1

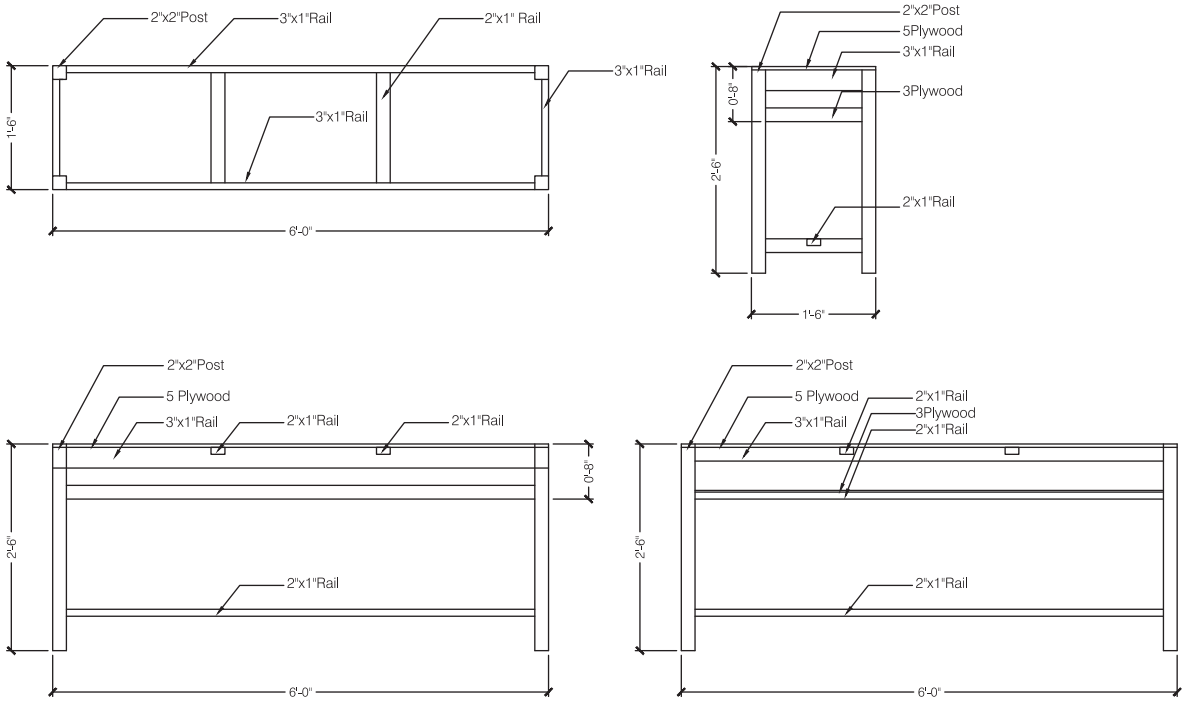


Higher Grade: 1'-6" high bench has to be used with 2'-6" high desk.



Long Bench

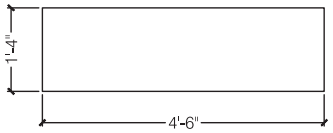
MOE. Furniture Design	6'x1' - 2"x1'-6" LONG BENCH	APRIL, 2016	2



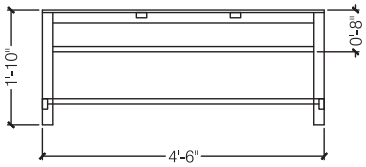
Higher Grade: 2'-6" high desk has to be used with 1'-6" high bench.

Long Desk

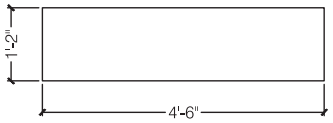
MOE. Furniture Design	6'x1' - 6"x2'-6" LONG DESK	APRIL, 2016	3



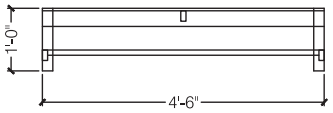
Long Desk Top View



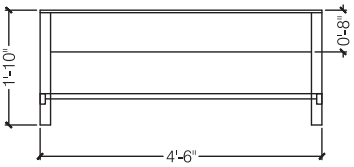
Long Desk Back View



Long Bench Top View



Long Bench View

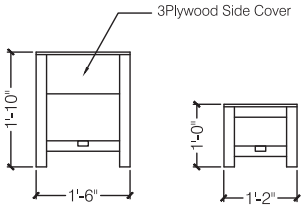


Long Desk Front View

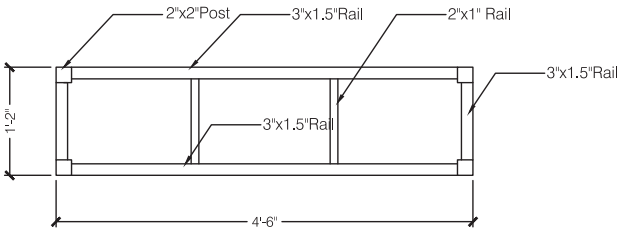
Note - All wood must be used Hard wood.

Primary Grades Desk and Bench

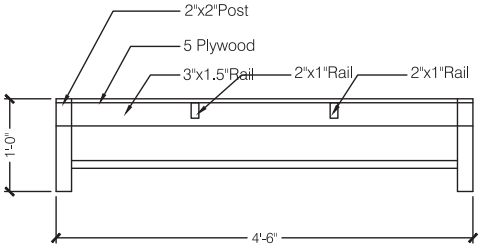
(Grades 2,3,4,5)

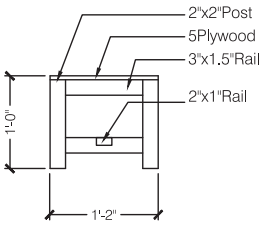


MOE. Furniture Design	LONG DESK & LONG BENCH	APRIL, 2016	4



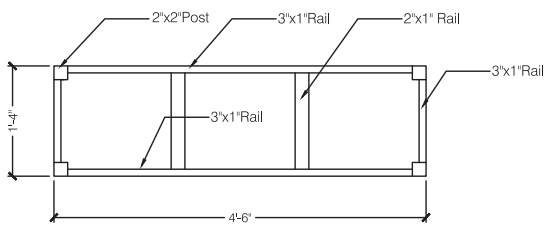
Primary Grade: 1'-0" high bench has to be used with 1'-10" high desk.

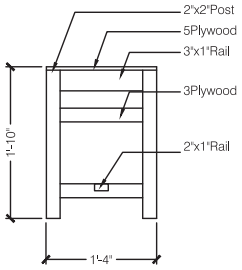


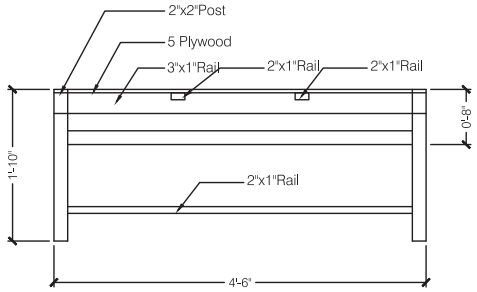


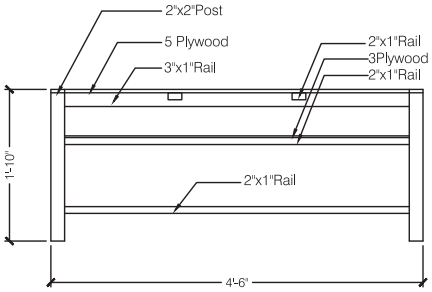
Long Bench

MOE. Furniture Design	4'-6"x14"x12" LONG BENCH	APRIL, 2016	5









Primary Grade: 1'-10" high desk has to be used with 1'-0" high bench.

Long Desk

MOE. Furniture Design	4'-6"x16"x22" LONG DESK	APRIL, 2016	6

Solar power systems

Solar power systems are safe when operated correctly. However, there are potentially dangerous hazards associated with some system components. Solar power systems may vary at each school, so each system should have written guidance on how to operate and maintain the system. Always refer to this guidance, or get further professional advice, before using or carrying out maintenance for safety and technical reasons.

General guidance on using and maintaining solar equipment is below:

Keep a Maintenance Logbook:

User manuals should give clear instructions for the solar systems. A maintenance schedule with an equipment logbook should be provided to the school. In the logbook, the type and frequency of maintenance and who performed it should be recorded. If kept up to date, it can be used to provide a history of the system which can then be used for fault diagnosis.

Solar panels

Dirty solar panels will reduce their electrical generating capacity. Keep them safe and clean. Clean the panels during dry periods (when there is no rain to provide natural cleaning). Wash the panels with water and a soft sponge. Do not use detergents. Do not clean in the hot part of the day. Do not connect them to anything besides the school electrical system. Take safety precautions when accessing solar panels which are high up - on a roof, for example.

Batteries

The battery should ideally be charged to 100% on at least a weekly basis (daily is better) — keeping batteries in a discharged state can decrease their life. Keeping the batteries in moderate temperatures (25°C is ideal) is critical for battery longevity; keep batteries in cool, ventilated locations avoiding direct sunlight. Keep the terminals and tops of batteries free from corrosion and dirt. The batteries and the wiring connections should be checked periodically; pay special attention to any degradation of the wiring insulation and check that panels attaching the solar panels to the structure are strong and secure.

Electrical Installations

The solar power system's components (batteries, controllers, for example) should be located in a clean, dry and ventilated area with restricted access for safety reasons. It is important to conduct periodic visual inspections to check for breaks, deterioration or signs of corrosion.

System malfunctions that cannot be addressed by basic operations and maintenance will require the services of a qualified technician.

Annex 5

School Condition Assessment Form (Visual)				
A. General Information				
Name of school:				
Village:	Village Tract:			
Township:	District:			
State/ Region:				
B. School Information				
Year school opened:				
No. of school buildings: (including sport hall/ assembly hall/ laboratory)				
Staff quarters (e.g Principal's house)	☐Yes, ☐No If yes, No. of quarters:			
Library	☐Yes, ☐No			
Toilets/ Latrines	☐Yes, ☐No Combined: Separated: (M), (F) If yes, No. of toilets/urinals/blocks/latrines (specify)			
Drinking water facilities	☐Yes, ☐No			
Electricity	☐Yes, ☐No			
Telecommunication	☐Yes, ☐No If yes, ☐Landline, ☐Mobile, ☐Internet			
Main climatic conditions	Describe: *For example: Tropical/Monsoon, Temperate, Highland*			
Geographical condition:	☐Hilly, ☐Plain, ☐Coastal, ☐Delta			
Hazards which may affect school and area :				
☐ Flood	☐ Landslide	☐ Cyclone	☐ Earthquake	
☐ Tsunami	☐ Drought	☐ Others, specify:		
C. Building (including toilet blocks)				
Types of construction material used for the building:				
Post/ column	☐ Concrete	☐ Brick	☐ Wood	☐ Others, specify:
Wall	☐ Brick	☐ Wood	☐ Bamboo	☐ Others, specify:
Floor	☐ Concrete	☐ Brick	☐ Wood	☐ Others, specify:
Roofing	☐ Tile/ Clay	☐ Asbestos	☐ C.G.I/ Color coated	☐ Others, specify:
No. of storeys:	☐ One	☐ Two	☐ Three	☐ Others, specify:
Year of construction:				
Building width x length x height (in feet): (W) x (L) x (H)				

Condition of building:				
Post/ column	Wall	Floor	Roofing	Doors & windows
☐ Major cracks	☐ Major cracks	☐Holes	☐ Blown away	☐ Glass broken (windows) or holes in door
☐ Minor cracks	☐ Minor cracks	☐ Cracks or unevenness	☐ Holes/Heavily corroded	☐ Handles or hinges broken
☐ Out of vertical	☐ Frame broken/ tilted	☐ Floor sunk	☐ Truss and roof frame broken, sunk	☐ Frame broken or twisted
☐ Loose connection	☐ Loose connection	☐ Loose connection	☐ Roof frame tilted	☐ Frame corroded
☐ Insects attack	☐ Insects attack	☐ Insects attack	☐ Insects attack	☐ Insects attack
☐ None	☐ None	☐ None	☐ None	☐ None

Additional condition information for toilet block(s):

Toilets: *Good/Fair/Poor/comment*……..……

Handwashing facilities: *Good/Fair/Poor/comment*……..…..……..

Pipes: *Good/Fair/Poor/comment*……..….

Septic tank: *Good/Fair/Poor/comment*……..

Soakpit/Leach pit: *Good/Fair/Poor/comment*……

Other: *Good/Fair/Poor/comment*……

Add the information for other buildings as C.

D. School Environment

Source of electricity:	☐Government grid ☐Community based ☐Solar system ☐Others (specify),
Source of water:	☐Pool/ pond/ stagnant/ dam ☐River/ Stream/ Spring ☐Rainwater collection tank ☐Tube well/ dug well/ shallow well ☐Piped supply ☐Others (please specify),
Perimeter fencing	☐Yes, ☐No If yes, specify type e.g wood or steel mesh
Flag pole	☐Yes, ☐No
Food stall/ Canteen	☐Yes, ☐No If yes, ☐ Open space, ☐Under shelter

Annex 6

Supervision of construction activities – general checklist

This Annex is written for cases where the School is involved with the day-to-day monitoring of construction work. This will be in instances where either the school has signed the contract with the builder or where the DBE has nominated the school to oversee the activities of the building contractor.

Should the DBE not provide direct supervisory support of the structural elements of the building then the school will need to employ a registered architect or engineer to supervise these elements of the building work.

Preparation for construction

Introduction - as general guide common sense must be used at all times: attention to detail, frequent monitoring and liaison with the contractor are key. Never assume things are correct on the site – always check.	**Checked** ☑☒
Community Awareness - details of the project should be displayed on the school and community centre/council office notice boards.	☐
Records and Minutes Checks - record books and forms should include a Minute Book for meeting records and a Site Visit Record Book to record observations and recommendations for monitoring or supervision visits. **Recording Site Visit Observations** - before leaving the school (site) all observations and recommendations must be recorded in the Site Visit Record Book and the School Inspection Committee should be informed.	☐
Drawings and specifications – The Contractor will have the construction drawings and specifications on site, and the School should also have a copy for reference.	☐
The **School should** understand the scope of the works: What has been agreed to be constructed? Have a copy of the construction programme showing when activities will be carried out. The School should have a copy of the approved site plan as well as the drawings (see above). The following information should be shown on a notice board at the school (site). a. Name of School b. Type of building c. Name of construction company/group d. Name of Officer in Charge (OIC) e. Contact number of OIC f. Architect or Engineer in charge (EIC) of the structural elements of construction work g. Contact number of EIC h. Local address of construction company/group i. Head office address of construction company/group j. Contact numbers of company/group k. Emergency contact number of contractor representative If there are any concerns over the operations of the Contractor, the School Principal should seek advice from the Township Education Office (TEO) at the Department of Basic Education (DBE) or their appointed architect or engineer.	☐
Keep a record of the number of contractor's personnel on site.	☐

Environmental and social management	**Checked** ☑☒
Protect trees, shrubs. Keep the site clean. Prevent contamination of land and water.	☐
Child Labour: no one under the age of 16 years should be employed by, or be working on site for, a contractor, supplier, or subcontractor.	☐

Health & Safety in Construction - construction activities can be dangerous: the Contractor has a duty of care during construction to avoid dangerous working practices.	**Checked** ☑☒
He should not be using badly erected or unsafe scaffolding or poorly made ladders.	☐
The construction work site should be fenced off from the school. Excavations are to be demarcated and then fenced/covered outside working hours.	☐
Potentially dangerous materials should not be left lying on the ground. For example, wood with protruding nails.	☐
Students should be kept away from the construction site and away from delivery vehicles.	☐
Workers should wear protective clothing appropriate to the task: hard hats, boots, gloves, and masks for example	☐
The Contractor's staff must not use the school's toilets.	☐
Recording / Reporting of Accidents: any accident on site should be recorded by the Contractor and reported to the DBE, TEO and School Inspection Committee immediately.	☐
The site should look tidy with materials stored neatly.	☐

Before construction works start	**Checked** ☑☒
The site should be checked for overhead or underground utilities (cables and pipes) before excavation work starts.	☐
The site must be cleared of all obstructions, trees (if not possible to keep) and their roots, bushes and vegetation. Unless otherwise specified grass and 5.9 in. (150 mm) top soil shall be removed from that part of the site to be used for the proposed buildings and for a distance of approximately 9.8 ft. (3 m) around it, and the area levelled. The top soil shall be preserved in stock piles if so directed by the Officer -In Charge.	☐
Any setting-out for construction must follow the design drawings and specifications. Checks for correct line and levels (floor level) should be made before and after foundations have been dug and when walls are set on the foundation. ***Quick check:*** *Check the building dimensions by measuring both the internal diagonals - they must be of equal length. A tightly held string/rope can also be used. Corners must be at 90 degrees. Check the dimensions at foundation level and again when the walls are laid out.*	☐

MATERIALS

Materials storage	**Checked** ☑☒
The final quality of any construction work will be significantly compromised by poor materials and bad storage methods. **Materials should be neatly stacked off the ground**: kept covered and dry (out of the sun and rain) and secure from theft and access. For example, wood should be stored so it doesn't warp or bend, cement must be kept dry and off the ground.	☐

Materials quality	**Checked** ☑☒
Bricks – always use burnt (Fired) bricks. Never use mud bricks. ***Quick checks:*** *Bricks and Blocks must not crumble or have weak areas – test by scratching the surface with a hard object. Reject damaged or poorly made blocks. Bricks should make a ringing sound when tapped together. If they sound dull, then reject them.*	☐
Bricks can be soaked before use to give a stronger bonding of the wall.	☐
Cement – Ordinary Portland Cement (OPC) is usually the best and strongest type of cement.	☐
Use an approved cement brand, in undamaged bags. Cement should be loose in bags and not hardened.	☐
Cement should be used as soon as the bag is opened - old cement loses its properties.	☐
Check sample of bags delivered for weight (usually 50kg).	☐

Aggregate (Crushed Stones)	**Checked** ☑☒
River gravel or crushed rock (from a stone quarry or manually broken into a small size) is generally acceptable for coarse aggregate. Very fine crushed rock or river sand is used for fine aggregate. Do not use smooth rounded stones/pebbles in concrete.	☐
Use a variety of aggregate sizes - recommended sizes are: Coarse aggregate size = 0.4 in. (1 cm) - 0.8 in. (2 cm): Max. 1 in. (2.5 cm) Fine aggregate size = less than 0.2 in. (0.5 cm)	☐

Sand	**Checked** ☑☒
The Contractor must use clean sand, free of mud and dirt.	☐

Water	**Checked** ☑☒
Water used for construction should be clean and free from mud, silt or dirt.	☐

Steel reinforcement bars ('rebars')	**Checked** ☑☒
Used in reinforced concrete should always be new, free from corrosion, dirt and grease and never be reused from demolished buildings.	☐

Minor bits of loose rust should be cleaned off.	☐
Bars should generally be straight and 'ribbed'. There are smooth bars which are used for 'tying' the ribbed bars. An engineer or architect should check these materials.	☐
Before the steel is offloaded on site verify the grade of steel is as in the design drawings – check the manufacturer's marking (generally, the minimum strength is Grade 40 steel).	☐
Test results for the steel should be obtained from the supplier.	☐

Nails, Screws, Metal Fixings and Corrugated Galvanised Iron Sheets (CGI)	**Checked** ☑☒
Steel nails should not be reused, old, rusty or bent.	☐
Use galvanised or zinc coated steel nails and screws for the roof so that they do not corrode.	☐
The recommended minimum thickness for CGI sheets is SWG 26 ~ 0.02 in. (0.5 mm).	☐

Concrete mixing	**Checked** ☑☒
Concrete should be mixed in quantities that will be used within one hour.	☐
Mixing must be done on a clean hard surface of metal, wood, or concrete and preferably in a mechanical mixer.	☐
All dry ingredients should be mixed thoroughly before water is gradually added – too much water will weaken the concrete. Water to cement ratio is critical and a 50 kg bag of cement will need approximately 27.5 litres of water (27.5 kg). **But** the amount of water already in the sand and aggregates will affect how much water is required.	☐

Mortar and plaster mixes	**Checked** ☑☒
Use the recommended mortar mixes – walls built with mortar that is too strong coupled with weak bricks or blocks can crack (in warm climates) and cause maintenance issues.	☐
Do not mix mortar for more than three minutes and never remix it.	☐
Mortar should only be mixed in amounts that can be used within 1 hour.	☐

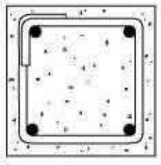
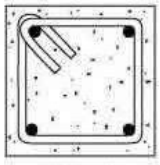
Curing cement-based materials	**Checked** ☑☒
Protect freshly laid concrete or cement/mortar from direct sunlight and wind – cover it with old cement bags, sacking, tarpaulin or damp sand; water 3 times a day for the first 3 days.	☐
Keep fresh concrete moist for at least 7 days - reinforced concrete could be left for longer if possible to achieve its full strength. ***Quick Test:*** *Scratch the surface of cured concrete with a hard, sharp object like a nail. If the surface can be indented or parts break off, then it may have not been correctly mixed or cured. Contact the architect or engineer or TEO immediately.*	☐
In cold weather, concrete must not freeze or get too cold. It should be covered with insulation and warm water should be used in the mixing to increase the curing time.	☐

FOUNDATIONS

Foundations	**Checked** ☑☒
Erect a barrier to prevent students from falling into trenches	□
Dig the trenches down to solid ground - heavy soils need deeper foundations	□
Never allow sloping foundations – flatten the ground or use a 'stepped' foundation on sloping ground	□
Make the foundation trench width three times the width of the wall it will support - a 9 in. (30 cm) thick wall need a 27 in. (68.5 cm) wide foundation	□
Level the bottom of the foundation trenches – roll the base of the trench or put a 1 in. - 3 in. (2.5 cm – 7.6 cm) thick layer of mass/lean concrete mix in the bottom of the trench to level it if reinforced concrete foundations are to be used	□
The trenches must be clean and free of any standing water before concreting begins	□
Check measurements and position of foundations	□
Take special measures in flood zones – extra strength and waterproofing of foundations may be needed	□
An architect or engineer should normally be present when the contractor is mixing, placing, and compacting concrete	□

STRUCTURE

Floors	**Checked** ☑☒
Make sure any backfilling under slabs is well compacted	□
Floors for heavy use need steel reinforcing mesh installed to control cracking	□
Floor slabs should be cast in sections, not greater than 12 ft. (3.6 m) wide, with expansion joints between, to prevent cracking	□
The floor should be level and have the correct finish - a screed (a levelled strip) above the concrete can be added	□

Reinforced concrete	**Checked** ☑☒
The concrete cover protecting the steel should generally = 1.5 in. (3.8 cm) for beams and column and = 2 in. (5.1 cm) for footings/foundations.	□
All concrete mixes should be compacted and distributed evenly, especially around reinforcement bars, mats or cages - a vibrating poker is best used at about 1 ft. (0.3m) intervals. Alternatively, but not recommended in hazardous zones, workers can tap the mix with steel bars or shovels, or tap the formwork with iron rods or a hammer at regular intervals.	□
Binding wire should be used to tie the reinforcement bars together at every bar intersection. Use hooks in 135° or 180° never 90° in seismic zones.  90° hooks ☒  135° hooks ☑	□

Horizontal bars and vertical bars must be fixed firmly and completely with washers and spacers/ 'mules'. The architect or engineer should be present **before** concrete is placed in all instances when reinforcing steel is used.	□

Walls	**Checked** ☑☒
Mortar joints should be a maximum of 0.6 in. (1.5 cm) thick.	□
All bricks should be bonded with no continuous vertical joints (which create weaknesses).	□
Walls must be vertical so use a plumb line often – does the weight line hang vertically?	□
Have all the walls been built up simultaneously?	□
The height of finished walls should not be higher than 12 times their thickness, i.e. with 9 in. (22 cm) bricks the wall should not be above 9 ft. (2.74 m) high.	□
Walls must be free of bulges; cracks in the foundations or brickwork particularly in corners where strength can be lost.	□
Has all loose or excess mortar been cleaned off the face of the brickwork?	□
Has the brickwork been moistened and covered for 7 days?	□
Plaster should only be applied when the walls are completely dry.	□
Plaster should be applied in 2-3 layers - each layer should be less than approximately 0.4 in. (1 cm) thick with the final finishing layer being the thinnest.	□

Roof	**Checked** ☑☒
The Architect or Engineer should check the roof trusses carefully before they are fixed in place: - Quality and type of timber used - Completeness (are all of the component pieces in place?) - Sizing of roof trusses members (do they match the drawing) - Number and diameter of bolts - Number and size of nails - Cracks (no structural cracks allowed) - Fixing of the truss - Anti-termite treatments	□
Are roof pitches at least 30 degrees, ideally 30–45 degrees in high wind areas?	□
Are roofing elements fixed to the wall or wall plates using cast in situ bolts or steel hoops, or other robust fixings;	□
Do CGI roof sheets overlap by one and half corrugations on the horizontal axis and by at least, 6 in. (15 cm) on the vertical axis (with increased overlaps where the roof is very exposed to rain and wind)?	□
Do roofs have roof caps and eaves overhang with a ventilation gap at eaves?	□

Doors and windows	**Checked** ☑☒
Doors and windows must open and close easily and remain open with no physical assistance. Door bolts and catches must operate easily without using force.	□
All fittings, hinges, locks etc. must be placed at an accessible height, be working, free of cement	□

and be oiled prior to the contractor leaving the site. Glass panes should be clean of putty and paint. A lintel should be above every door and window.	
Coloured glass should not be used accept where agree in the design by DBE.	☐
All marks and dirt must be cleaned from glass windows.	☐

Painting and decoration	**Checked** ☑☒
All surfaces should be clean and dry before paint is applied. Some surfaces will need light sanding before painting.	☐
Painting should be done before adding fixtures and fittings.	☐
Is paint of the right type, colour and quality?	☐

Classroom furniture/fittings	**Checked** ☑☒
Is the furniture type and quality correct with the right number of units?	☐
Is it fitted correctly – are shelves sturdy and fixed properly?	☐
Are the blackboards/ whiteboards fixed at the correct height and of the correct size?	☐
Are handrails and ramps in place?	☐

Electricity, switches and lights	**Checked** ☑☒
All of these checks should be made by a qualified electrician Is the system the same as in the specifications?	☐
Has electrical wiring system been checked and certified safe by a reputable third party?	☐
Are electrical fittings, sockets and cables fixed properly to the wall, neat, level and straight?	☐
Are any wires exposed?	☐
Are light bulbs and tubes fitted properly?	☐
Flick every switch, is it working and the lights or fans come on? Is switch down ‘on’ and up ‘off’?	☐
Are cables placed in a good and tidy manner without running over sharp edges?	☐
Have all the correct circuit breakers been used?	☐
Is the circuit board fixed securely and out of reach of the students?	☐
If solar power is used, are the batteries, if provided, stored safely and securely?	☐
Ground (Earth) cables must be in place in RCC 3-stories buildings.	☐

Toilets	**Checked** ☑☒
Flush every toilet and turn on every tap - make sure there are no leaks in the drains.	☐
Are water pipes fixed securely to the wall with brackets and are the pipes insulated?	☐

FINAL INSPECTION

Final inspection is carried out after all the work of the contractor is completed. Final completion should be checked before the final payment to the contractor is approved and forwarded. At the conclusion of the site work, the contractor shall tidy up and leave the site of the work in a clean and sanitary condition. All unserviceable material shall be removed from the area and disposed of as directed.	**Checked** ☑☒
Toilets are completed and functioning	☐
Classrooms cleaned	☐
Site cleaned (and waste material removed)	☐
Keys of door and cupboards are handed over to the headmaster	☐

Annex 7

Example contents of a school maintenance plan

There are four basic principles to consider in the plan:

1. What needs to be done? Inspections will identify a list of the building maintenance needs.

2. When should it be done? Plan and prioritize the tasks as much as possible. Safety issues are the most important

3. Who will do the work? Identify who will be responsible for maintenance.

4. How much will it cost? Keep track of costs so that you know how much work you can afford.

Example templates:

(A) Asset inspection report

(B) Cleaning and maintenance schedule

(C) Emergency maintenance checklist

(A) ASSET INSPECTION REPORT		
Name of School: **Inspected by:** **Date:**		
School asset	**Item details/ description**	**Condition and comment (specify material)** **P = Poor condition:** damaged, heavily worn, needs to be replaced now or quite soon. **S = Satisfactory condition**: some wear and tear, but useable. **G = Good condition:** does not need repair or replacing.
Buildings	***Classroom name or number - outside***	
	Roofing sheets & eaves	*S. Some minor rust at the edges,*
	Brick walls	*G*
	Door and Windows including frames	*G*
	Guttering and downpipes	*G*
	Verandah and ramp and steel handrails	
	Inside the classroom	
	Plaster walls	*G*
	Ceiling boards	*P. Classroom 1 has a small leam in the left-hand corner. Urgent repair is needed.*
	Concrete floor	*S. Minor concrete repairs are needed to make floor smooth*
	40 metal and wooden chairs	*S. Four chairs are getting very worn.*
	20 Wooden tables	*G*
	Light switch and cabling	*G*
	Wooden shelves	*G*
	2 wooden doors	*G*
	4 glazed windows with steel frame	*G*
	4 wooden cupboards	*G*
	2 concrete blackboards	*G*
Toilet block	*Brick walls and plaster*	*G*
	Door	*G*
	Flat roof	*G*
	Plastic water tank	*G*
	Latrine and septic tank	*P. The septic tank need repairs to the brickwork.*
	Hand washing tap	*G*
Compound	*Concrete path*	*G*
	Boundary metal fence and posts	*G*
	Grass area for playing	*G*
Cleaning and maintenance equipment in the school	*1 x Broom* *4 x dustpan and brush* *1 x ladder* *1 x bucket* *4 x cleaning cloths* *1 x machete*	*S. The broom needs replacing soon.*

(B) CLEANING AND MAINTENANCE SCHEDULE			
Name of school: **Inspected by:** **Date:**			
To do		**Completed** ☑☒	**Comment**
Daily			
INSPECT/CHECKS	**MAINTENANCE TASKS**		
Inspect the condition of the classrooms and toilets each day to make sure they are clean and tidy. Report any defects.	Sweep inside classrooms.	☐	
	Clean toilets (inside and the surrounding areas). Report any blockages.	☐	
	Empty rubbish bins around the school.	☐	
	Remove any solid waste from toilet, wash basin or floor drain.	☐	
	Clean hand wash basin or washing facilities. Replace hand soap when it has run out.	☐	
Weekly			
INSPECT/CHECKS	**MAINTENANCE TASKS**		
Inspect the condition of the classrooms and toilets, as daily inspection	Remove furniture from classroom and wash floor on a weekly basis	☐	
	Clean windows and window sills	☐	
	Clean dirty marks off walls in the classroom	☐	
Check compound is neat and tidy and all accesses are clear and clean.	Trim the grass, and remove weeds from the compound, especially around buildings.	☐	
	Clean open drainage in compound and remove any blockages and rubbish.	☐	
Inspect any playground equipment.	Tighten any bolts and nuts	☐	
Monthly			
INSPECT/CHECKS	**MAINTENANCE TASKS**		
Check ceiling for damp areas or water stains.	Repair any defects.	☐	
Check roof guttering is free of leaves and dirt	Empty rainwater gutters on the roofs of leaves, dirt and rubbish.	☐	
Check fence and gate are secure.	Repair any defects.	☐	

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Inspect soakaway pit and leach pit	Empty the soak pit if it is nearly full.	☐	
Check water tank(s) and valve(s) open and close properly.	Repair any defects.	☐	
Open and close all windows and ensure they lock properly.	Lubricate all hinges with oil	☐	
Quarterly (every three months)			
INSPECT/CHECKS	**MAINTENANCE TASKS**	☐	
Inspect all buildings for cracks and damage to floor, walls, and brickwork.	Repair any defects.	☐	
Check wooden parts of buildings, especially windows for rot and deterioration	Repair any defects. The wooden parts should be cleaned and removal of fungus and possible insect nests. When wooden parts are identified as decayed, those parts have to be replaced with the new one. Repair any defects. As a guide, allow for repainting woodwork at least every 4 years.	☐	
Inspect the roofing sheets for signs of rust, holes, or sheets which have come loose.	Replace any badly corroded roof sheets. Securely fix sheets.	☐	
Check rainwater downpipes have no leaks and free of rust.	Repair any defects.	☐	
Check all handrails are handles are secure	Repair any defects.	☐	
Check shelves are securely fixed	Repair any defects.	☐	
Periodic and Annual Maintenance			
INSPECT/CHECKS	**MAINTENANCE TASKS**		
Inspect all classroom furniture.	Repair furniture where feasible or replace.	☐	
Check inspect chambers and septic tank	Empty the septic tank if it is full.	☐	
Check storm drains in the compound and outfalls before monsoon or rainy period.	Clean storm drains.	☐	

c) Emergency maintenance checklist

THINGS TO CONSIDER TO REDUCE EFFECT OF DISASTERS
Always carry out maintenance planning in conjunction with preparedness planning or disaster management planning at the school[8]. • Do natural hazard events regularly create disruptions in the school calendar? Is there a backup plan to ensure that school operations continue? • Are school furnishings and equipment designed and installed to minimize potential harm they might cause to school occupants? • During a hazard event, does the school serve as a shelter? Has it been designed to do so? • Is the school population and local community aware of how they can reduce their vulnerability to the damaging impacts of a hazard event? Are they actively taking measures to do so?
Repair the school building to become resistant to hazards such as cyclones, floods and earthquakes.
A completed asset inventory before a disaster will help the school to quickly identify what is missing or what needs urgent attention after the hazard (winds, floods, and earthquake for example) has stopped or moved away.
Keep a stock of cleaning equipment and materials which can be used to clean the school after a disaster.
Make sure that any exit doors and windows are not locked during school hours and that they are in good condition and operable.
Make sure that shelves, bookcases, cabinets in classrooms are securely fixed so that they cannot become loose during an earthquake or strong winds and injure people.
Make sure that open spaces and accesses at a school which are to be used for evacuation are well maintained with clear exits.
Make sure that the school bell for warning or alert is fully functioning and inspected regularly.
Maintain the drainage system at the school, by clearing gutters, drains, creeks and streams of any debris so that they can carry rainwater away quickly and reduce the risk of flooding.
Consider removing branches from trees which could damage buildings during a cyclone or high winds.
AFTER A DISASTER
Following a disaster situation and before cleaning and getting the school operational again, the site should be carefully checked for dangers. Damage to a building structure should be assessed by a professional engineer before classes resume.

[8] Adapted from: MoSWRR & MoE, (N.D) *Guidance on Mainstreaming Disaster Risk Reduction in the Education Sector, Myanmar – Rural Settings*, ADPC, Yangon.

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