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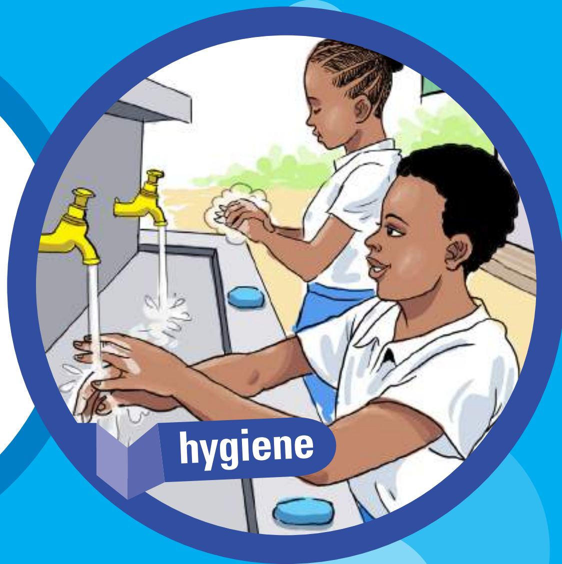

STANDARDS & GUIDELINES FOR WASH INFRASTRUCTURE

IN PRE-PRIMARY & PRIMARY SCHOOLS IN KENYA

STANDARDS & GUIDELINES FOR WASH INFRASTRUCTURE IN PRE-PRIMARY & PRIMARY SCHOOLS IN KENYA

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Ministry of Education
Ministry of Health
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2018

Citation: Ministry of Education, Ministry of Health, Ministry of Water and Sanitation 2018. Standards and Guidelines for WASH Infrastructure in Pre-Primary and Primary Schools in Kenya. UNICEF – Kenya.

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Foreword

The Kenya Constitution 2010 provides for free and compulsory education to all children and places this responsibility on the state and parents to facilitate quality basic education for all children.

The Ministry of Education is committed to the achivement of quality basic education and its prime goal in the National Education Sector Plan (NESP) 2013-2018 is "Quality Basic Education for Kenya's Sustainable Development" which emphasizes on a holistic and balanced development of the entire Education sector. Among the areas of investments outlined in the NESP for achievement of quality basic education are: Health and Nutrition, Basic Infrastrucure investments and achievement of Child Friendly School environment. School infrastructure and particularly safe water supply facilities and appropriate sanitation and hygiene facilities within the schools has been proven to improve health, enhance girls' attendance and retention, boost education achievement, promote gender equity and provide inclusiveness. School WASH infrastructure is therefore a critical component to the achievement of quality basic education.

Free Primary Education (FPE) has brought about tremendous benefits in the Education sector, particularly on the increased school enrollment. There is therefore need for commensurate increase and improvement of school facilities to cater for the growing enrollment. To encourage inclusive education, there is also need to improve the schooling environment to ensure access to all levels of education by children with special needs.

Provision of safe water and appropriate sanitation facilities within the schools requires multisectoral involvement. The Ministry of Education, the Ministry of Health and the Ministry of Water and Sanitation have thus partnered with UNICEF and other school WASH partners to develop these *Standards and Guidelines for WASH Infrastructure in Pre-primary and Primary Schools in Kenya* to provide an important reference document to support the proper planning, design, construction and management of water supply, sanitation and hygiene facilities in schools.

The manual additionally complements other relevant reference materials on school infrastructure development, such as the Minimum Standards and Checklist for Low Cost Primary Boarding Schools (LCPBS), Kenya Primary School Design, Safety standards manuals for schools, KESSP School Infrastructure Technical Handbook, among others.

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Preface

Investments in improving pupils health have direct benefits to education outcomes. Water sanitation and hygiene promotion has been spelt out in the National School Health Policy 2009 as one of the key strategies for achieving school health. This makes adequate, safe, inclusive and childfriendly water, sanitation and hygiene facilities crucial infrastructure in schools for both health and educational benefits. The Ministry of Education, Ministry of Water and Sanitation and Ministry of Health, in collaboration with UNICEF, the National School WASH Technical Working Group and other WASH in Schools actors have thus developed these *Standards and Guidelines for School WASH Infrastructure in Pre-Primary and Primary Schools in Kenya* to ensure that school WASH facilities are built to a set of minimum standards and provide a healthy and safe school environment which facilitates good hygiene practices.

The document sets out technical guidelines and processes for the planning, design, construction, management, operation and maintenance of water supply, sanitation and hygiene facilities in schools. It is intended to be a technical reference document for the planning, design, construction and management of school WASH facilities and for use by any person who has a role and/or professional responsibility in the design, construction and management of school WASH facilities. Additionally, the document provides a set of designs for water, sanitation and hygiene facilities, that schools can utilize when undertaking WASH infrastructure improvements and developments.

The document has been developed through a collaborative process that has involved and taken into account the views, experiences and technical inputs of various WASH in schools stakeholders and experts. It has been developed in reference to already existing guidelines and manuals already in use with a view to support effective implementation of relevant education, water and health policies and guidelines.

School boards of management, the school communities, WASH sector partners, engineers, contractors and other practitioners involved in the planning, design, construction and maintenance of school WASH facilities will make good use of this document to improve and develop their WASH infrastructure to meet at the least, the minimum standards. The Ministry of Education, Ministry of Water and Sanitation, Ministry of Health and other relevant National and County Government ministries while undertaking their financial and technical support and supervisory roles will encourage the use of these guidelines to ensure provision of quality school WASH infrastructure.

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Rationale

Adequate provision of water supply, sanitation, hygiene and waste management in schools has a number of positive effects and contributes to a reduced burden of disease among children, staff and their families. Such interventions also provide opportunities for greater gender equity in access to education, and create educational opportunities to promote safe environments at home and in communities.

This document provides standards and guidelines for Water, Sanitation and Hygiene infrastructure required in pre-primary and primary schools in Kenya. The guidelines it contains are designed to be used in low-cost settings in low- and medium-resource counties, and to support the development and implementation of national policies.

In Kenya, legal mandate for various aspects of Water, Sanitation and Hygiene in schools is shared between the Ministry of Education, Ministry of Health, Ministry of Water and Irrigation. These are thus several policies, and legislation relating to these Ministries that address school WASH conditions. The implementations of these guidelines will therefore call for participation of the relevant Government Ministries.

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Acknowledgements

The Ministry of Education is grateful to UNICEF for the strategic partnership through the technical and financial assistance in development of these Standards and Guidelines for WASH Infrastructure in Pre-primary and Primary Schools in Kenya. The document was developed in broad consultation and collaborative efforts by various WASH in school stakeholders including; The Ministry of Education (School Infrastructure Management Unit, the School Health Unit and the Quality Standards team including Mr. Apollo Apuko, Ms. Barnett Walema, Mr. Chris Okoth, Mr. Hothan Adballa, Mr. Boniface Ouko and Ms. Keziah Wandera), the Ministry of Health (WASH HUB and the Family Health Division team including Ms. Janet Mule, Mr. Ibrahim Basweti, Mr. Ngari Karani and Mr. Adam Mohamed), the Ministry of Water and Sanitation (Water Services and Sanitation Department team including Mr. Kennedy Musumba, Mr. Stephen Kihaguru and Mr. Benard Mulwa), County Government education, water and health actors from select counties, UNICEF, Local and International Non-Governmental Organization and agencies, professional consultants with relevant experience in school WASH, the National School WASH Technical Working Group, head teachers, parents and pupils from 32 selected schools across Kenya.

The contributions of the Ministries of Early Childhood Development and Education, Health and Water within the County Governments of Kilifi, Kitui, Wajir, Turkana, Migori and Kisumu are also highly appreciated. The ECDE Ministry provided useful information on the designs of the Model ECDE centers, while the ministries of Water and Health were an invaluable link to members of WASH forums anchored in the ministries.

We also acknowledge members of the National School WASH Technical Working Group and other WASH partners for sharing their experiences and WASH infrastructure designs and further inputs to the content and layout of these Guidelines, including: Kenya Redcross Society, World Vision, CARITAS Switzerland, AMREF KCO, Plan-Kenya, Sweden Mutomo, SANERGY, CIFF, WSTF, Afya Jijini, Kenya WASH Alliance, Care Kenya, Fin Christian Aid, SANA, OXFAM, ALDEF, Mercy Corps, MWA and WASDA.

We additionally appreciate the UNICEFconsultant, Rural Focus LTD, for techncial inputs and facilitating a process of stakeholder engagement to develop these standards and guidelines.

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Abbrevations

BOM	Board of Management
BOQs	Bill of Quantities
COK	Constitution of Kenya
ECDE	Early Childhood Development and Education
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EWC	Electricity, Water and Conservancy
FGD	Focus Group Discussion
FPE	Free Primary Education
GIZ	German Development Agency
GS	Galvanized Steel
HCW	Human created waste
HDPE	High Density Polyethylene
HWS	Hand Washing Stations
KESHP	Kenya Environmental Sanitation and Hygiene Policy
KESSP	Kenya Education Sector Support Program
KII	Key Informant Interview
LCPBS	Low Cost Primary Boarding Schools
LPO	Local Purchase Order
MHM	Menstrual Hygiene Management
MoE	Ministry of Education
MWI	Ministry of Water and Sanitation
NCA	National Construction Authority
NEMA	National Environment Management Authority
NESP	National Education Sector Plan
O&M	Operation and Maintenance
PTR	Pupil Toilet Ratio
PLWD	Person living with disability
PPOA	Public Procurement Oversight Authority
PVC	Polyvinyl Chloride
RHW	Rain Water Harvesting
RMI	Repair, Maintenance and Improvement
SDGs	Sustainable Development Goals
SIC	School Infrastructure Committee
SIDP	School Infrastructure Development Plan
SIMU	School Infrastructure Management Unit
SIMMU	School Instructional Materials Management Unit
SNE	Special Needs
UDDT	Urine Diverting Dry Toilet
UNICEF	United Nations Children's Fund
VIP V	entilated Improved Pit

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Chapter 1

Introduction

1.1 Background

Provision of safe water and appropriate sanitation facilities within the schools has been proven to improve health, enhance girls' attendance and retention, boost education achievement, promote gender equity and provide inclusiveness. While schools have played a primary role in providing formal education, they have also played a key role in promoting good practices on various aspects of daily living with habits and practises established in school tending to stay with pupils throughout their lives. Schools therefore play a key role in developing a culture of good water, sanitation and hygiene practices.

In Kenya, the pupil toilet ratio (PTR) in public primary schools for both boys and girls stands at 34:1 and 29:1 respectively and generally compare favourably with the national norm of 30:1 and 25:1 respectively (2014 Basic Education Statistical Booklet). 92% of all public primary schools have access to a source of water with borehole sources taking the largest share (51.8%) followed by rainwater (22.2%) and river water (17.8%) (2014 Basic Education Statistical Booklet). There have also been countless WASH interventions that have positively impacted on the health and performance of pupils and evaluations of these interventions have corroborated the health and education benefits of investing in School WASH programmes. At the policy level, the Government of Kenya adopted the National School Health Policy in 2009 and made it compulsory for all schools to adopt. The government of Kenya also issued the National School Health Guidelines in 2010 to promote WASH, disease prevention and control, gender issues, child rights and special needs in the school learning environment. The policy and guidelines are being implemented in line with other national frameworks.

However, there still exist various gaps that stand in the way of optimal promotion of WASH in schools. There are for example, still a number of schools without access to a water source with public primary schools being the most affected (9.5 % according to 2014 the Basic Education Statistical Booklet), as well as schools that are yet to achieve the national PTR norm. It is also important to note that quality of available toilets and access to a safe and reliable water source is equally important and therefore while PTR in public primary schools compare favourably to the national norm and the percentage of public primary schools with access to a water source is reasonable there is substantial room for improvement on the quality of water, sanitation and hygiene facilities.

Other cross cutting challenges include: water supply disruptions, lack of child friendly WASH facilities for disabled and very young children, inadequate facilities for staff; lack of disposal facilities for used sanitary pads, and challenges of sustainability of WASH intervention.

A number of these challenges directly relate to th e design, construction, operation and maintenance of WASH facilities. This problem is further compounded by the fact that various WASH interventions introduce different types of sanitation and water facilities some which do not meet basic government design standards. It is in response to this that the Ministries of Education, Health, and Water and Irrigation and UNICEF supported the development of designs for school sanitation facilities as described in the Design and construction manual for Sanitation and Water supply facilities (WASH) 2011 in an effort to standardize construction of WASH facilities.

This document Standards and Guidelines for School WASH infrastructure in Pre-Primary and Primary Schools in Kenya is a revised version of the aforesaid 2011 manual. This edition incorporates revised standards and guidelines that support creation of child friendly technologies that are innovative, replicable, acceptable and applicable in both urban and rural situations, disability, gender and age sensitive and have due consideration of the need for adaptability due to geographical, cultural variations and affordability. It also brings on board experiences and valuable feedback in the use of the 2011 manual as well as general feedback from WASH in school stakeholders. Appropriate facilities for ECDE centres, for children living with disability and for disposal of sanitary towels as well as additional options for improved sanitation which were not included in the 2011 manual have additionally been incorporated.

1.2 Purpose of these Standards and Guidelines

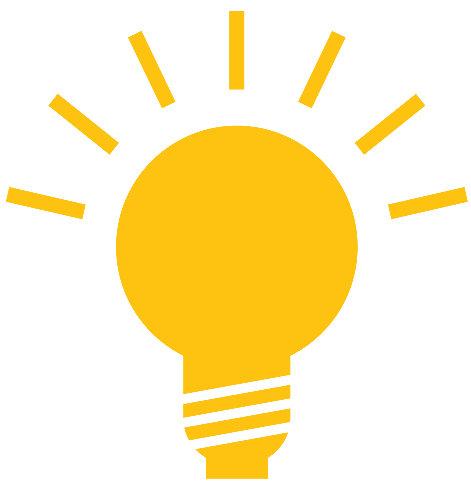
This document sets out technical guidelines for the planning, design, construction and management of basic water supply, sanitation and hygiene facilities in pre-primary and primary schools.

The document is intended to be a technical reference document for the planning, design, construction and management of WASH facilities and is developed to provide guidance and propose best practice to implementers of sanitation and water supply facilities in pre-primary and primary schools. Within this context, this document:

a) Recommends procedures to be followed in the selection, design and implementation of water, sanitation and hygiene facilities; b) Gives suggestions and advice to ensure effective implementation in order to get value for money and improve quality of completed facilities; c) Gives facility implementation technicians and other stakeholders information that is needed to ensure successful implementation, operation and maintenance of the school WASH facilities; d) Recommend operational and maintenance procedures to increase facility performance and sustainability.

It is expected that the manual will contribute towards ensuring that all school WASH facilities are built to a set of minimum standards that offer low cost, replicable but structurally sound designs that are adapted to gender, age, disability and local cultural needs and ultimately provide a healthy and safe environment that facilitates good hygiene practices.

a technical reference document for the **planning**, **design**, **construction** and **management of WASH facilities** and is developed to provide guidance and propose best practice to implementers of sanitation and water supply facilities in pre-primary and primary schools.



1.3 Target Users

Board of Management form the primary target of this document. As well as other persons who have a role and/or professional responsibility in the provision of WASH facilities in Schools

A School Board of Management plays a key and direct role in ensuring the provision and management of proper and adequate physical facilities in schools, as mandated by the Education Act. Additionally, for any school infrastructure development or management activity to take place within any school, the school's BOM must be involved. Thus the pre-primary and primary schools Board of Management form the primary target of this document and much of the content provides useful information to the BOM for decision making during the entire school WASH infrastructure development process.

In implementing its mandate, the BOM has to work with other stakeholders for purposes of technical and financial input, supervision, monitoring and evaluation, as well as ensuring participation of all key stakeholders. This document is thus also intended for use by such other persons who have a role and/or professional responsibility in the provision of WASH facilities in Schools. This includes; technical, design and architecture departments within the relevant National and County Government Ministries, head teachers, school communities, WASH sector partners including local and international non-governmental organizations, public sector players specifically constituted to bridge financing gaps in development such as CDF and the engineers, contractors and other practitioners involved in the design, construction and maintenance of school WASH facilities.

Provision of safe water and appropriate sanitation facilities within the schools has been proven to improve health, enhance girls' attendance and retention, boost education achievement, promote gender equity and provide inclusiveness.

1.4 Organization of the Document

The document has been laid out into seven Chapters which address key areas in WASH in Schools.

Introductory Chapter

highlights the benefits and rationale of investment of WASH in Schools, briefly describes the current status of WASH in Schools in Kenya as well as presents some of the challenges that have resulted in the need for this standards and guidelines. The chapter further spells out the purpose of the document, how it was developed and is to be updated, how it is to be used and by who. Finally the chapter introduces the three star approach to WASH in Schools.

Chapter 2

provides a brief overview of the policy and legislative framework that guides WASH facilities implementation in schools.

Chapter 3

provides a general guide to the planning, design and construction process for school WASH infrastructure. The section highlights the principles for planning, design and construction of child friendly WASH facilities, responsibility for planning and development of school WASH infrastructure, and further proceeds to breakdown the infrastructure development process.

Chapter 4

provides a general guide to the planning, design and construction process for school WASH infrastructure. The section highlights the principles for planning, design and construction of child friendly WASH facilities, responsibility for planning and development of school WASH infrastructure, and further proceeds to breakdown the infrastructure development process.

Chapter 5

covers sanitation facilities and presents the standards of sanitation. It further discusses the various improved sanitation options, wastewater management as well as the aspects of design and construction of sanitation facilities.

Chapter 6

discusses hygiene facilities and practices which covers handwashing facilities, menstrual hygiene management (MHM), solid waste management, operation and maintenance of hygiene facilities and hygiene awareness and training.

Chapter 7

details management and sustainability of school WASH facilities and particularly addresses the roles and responsibility of various WASH in school stakeholders, coordination and participation of stakeholders, monitoring, operation and maintenance and the subject of financing of school WASH program.

Appendixes

Appendix A provides the WASH Score Card which is a tool to assist schools to assess their WASH facilities and the services provided by these facilities.

Appendix B provides forms and contracts relevant to the process described in Chapter 3 for engaging a contractor to implement proposed works.

Appendix C provides a schedule of operation and maintenance tasks covering WASH infrastructure and is relevant to the structures discussed in Chapters 4, 5 and 6.

Appendix D provides a Schedule of Drawings and the drawings themselves. Readers should refer to the Schedule of Drawings to identify the drawing(s) appropriate to each structure.

Appendix E provides the Bills of Quantities and Cost Estimates. The Cost Estimates provide the consolidated price only which can be used for budgeting purposes.

Appendix F provides the Specifications to guide the standard of construction and materials.

1.5 How to Use these Standards and Guidelines

This document provides information on the basic requirements for the selection of WASH facilities, details on the facilities including drawings, construction notes and indicative bills of quantities. Thus it is to be used as a general reference during planning, design, construction and operation and maintenance of school WASH facilities.

This document expounds on and provides a useful technical guide to other already existing relevant guidelines and manuals already in use, such as the Minimum Standards and Checklist for Low Cost Primary Boarding Schools (LCPBS), Kenya Primary School Design, Safety Standards Manuals for Schools, the Minimum Package of School Hygiene (MPOSH) guidelines, KESSP School Infrastructure Technical Handbook, MWI Practice Manual for Water Supply Services in Kenya, among others. It should therefore be used in conjunction with other existing guidelines and manuals.

Appendix D provides drawings for a range of different water and sanitation facilities with the corresponding Bills of Quantities and Cost Estimates provided in Appendix E. Amendments can be made to the structures to accommodate specific onsite conditions as long as the minimum standards are not compromised. Any changes to the structures should also be reflected in the drawings and Bills of Quantities.

Further, it is important to note that the cost estimates are based on current market prices at the point of preparation of this manual and users thus need to check the local market prices and amend the BOQs accordingly when undertaking school WASH infrastructure projects.

1.6 Development and Updating of the Standards and Guidelines

These Guidelines and Standards have been developed through a collaborative process that has included the participation of various WASH in schools stakeholders and experts. Through various consultative meetings, FGDs, KIIs and workshops, the views and inputs of the stakeholders were sought and have largely informed the preparation of this document. The stakeholders involved included; relevant government ministries (The Ministry of Education (MoE), The Ministry of Health (MoH) and The Ministry of Water and Irrigation (MWI)), County Government Education, Water and Health Actors, UNICEF, WASH partners (Local and International Non-Governmental Organization and agencies and professional consultants with relevant experience in WASH in Schools), School WASH Technical Working Group, head teachers and parents. Additionally, the views of pupils from 32 schools selected from different counties across Kenya including different categories of schools, pastoral and farming communities in rural areas and urban areas, including within informal settlements and medium density urban areas, were sought and have been factored into the designs provided in this document. It has further been validated by the various school WASH stakeholders at a validation workshop held in Nairobi on 2nd August 2017.

These Standards and Guidelines have also been developed with due consideration of all relevant local Acts, regulations and policies as well as local and international best practises.

Future revisions of this document may be undertaken as part of the process of continually strengthening the school WASH infrastructure standards and guidelines particularly in the case of any new standards, Acts and their regulations that impact on current WASH in School design and construction. Users are also encouraged to continually provide feedback via e-mail (SchoolWASHInfrastructureKE@gmail.com) to help inform future revisions.

1.7 Three Star Approach to WASH in Schools

Many school WASH facilities are significantly below the minimum WASH standards, partially due to the lack of resources and partially due to failure to prioritise WASH facilities, budgets, maintenance and operations. Achieving appropriate targets will often not be possible in the short-term. It is necessary to both prioritize required improvements and work in a phased way so that the most urgent problems (or those that can be addressed rapidly) can be identified and targeted immediately and other changes can subsequently be made in a phased manner. The use of the three-star approach developed by UNICEF can be adopted to address the resource disparities (UNICEF & GIZ, 2013).

The three star approach (Table 1) is based on the fundamental principle that expensive water, sanitation and hygiene infrastructure in schools is not a precondition to meeting health goals. The approach focuses on initial simple inexpensive steps to ensure that all students wash their hands with soap, have access to safe drinking water and are provided with clean, safe, gender segregated toilets at school every day. The approach is to stay focused on meeting health goals even as a school progressively improves its infrastructure towards meeting the national WASH infrastructure standards. The key concept of 'keep it simple, scalable and sustainable' should be reflected at all stages. While much of the three star approach is focused on group activities to drive behaviour change, this document provides designs and guidelines to help schools meet the infrastructure requirements.

Table 1: Characteristics of Three Star Approach

No Star Unacceptable Status	"Bronze" Daily Activities to Promote Healthy Habits	"Silver" Incremental improvements	"Gold" National Standards
Limited or no hygiene promotion	Daily supervised hand washing with soap, normally before meals	Hygiene education & facilities to promote handwashing with soap after toilet use	School facilities and systems upgraded to meet national standards
May or may not have WASH infrastructure	Daily supervised cleaning of toilets, provision of soap and water, functional gender specific toilets, no open defecation	Improved sanitation facilities with facilities & education for menstrual hygiene management	
Limited use of safe drinking water	Daily supervised use of safe drinking water by all children	Low cost point of use water treatment introduced in schools	

In line with the Three Star approach, this document sets out a WASH Score Card (Appendix A) that enables schools to assess their WASH infrastructure and operations to see whether they are making progress towards the desired national standards. The 'No Star' status is clearly unacceptable and schools should take immediate steps to improve their WASH status to the 'One Star or Bronze' status. This can be achieved through hygiene behaviour change and sufficient appropriate infrastructure to ensure no open defecation. The information and structures discussed in this document provide a guide towards achieving the 'Three Star or Gold" status.

Chapter 2

Policy and Legislative Framework

2.1 Introduction

Policies and legislation at global, national, county, sub-county, ward, community and school levels collectively encourage and facilitate the achievement of appropriate standards of WASH in schools.

Education, water and sanitation have continued to receive attention in both the global and national development agenda. In 2015 the world adopted the 2030 agenda for sustainable development that lays out a new set of 17 Sustainable Development Goals (SDGs), three of which relate to WASH in Schools (goal (3), (4), & (6)) and form the basis of the overarching global focus on access to services that deliver health, inclusive and equitable quality education, and water and sanitation for all by 2030, respectively.

Kenya's long term development blueprint, The Kenya Vision 2030, similarly aims to create a globally competitive and prosperous country providing high quality of life for all its citizens by the year 2030 and identifies education, water and sanitation among the focal sectors to achieving development. The Social Pillar which aims to build a just and cohesive society enjoying equitable social development in a clean and secure environment indentifies education and training, health, water and sanitation sectors among the key sectors to achievement of desired transformation of society.

In Kenya, legal mandate for various aspects of WASH in Schools are shared between the Ministry of Education, Ministry of Health and the Ministry of Water and Irrigation. There are thus several national policies and legislation relating to these ministries that address school WASH conditions. They include but are not limited to; the Basic Education Act, the Public Health Act, the Children Act, the Water Act, The National School Health Policy, and the Kenya Environmental Sanitation and Hygiene Policy.

Below is a highlight of some of the policies and legislation related to WASH in Schools.

2.2 Constitution of Kenya (COK) 2010

The COK is the overarching framework for all policies and other legislation in Kenya. Article 42 guarantees the right of every person to "a clean and healthy environment." Article 43 1) b) and d) guarantees every person the right to "reasonable standards of sanitation" and "to clean and safe water in adequate quantities" respectively. The constitution further mandates the State to take legislative, policy and other measures, including the setting of standards, to achieve the progressive realization of the rights guaranteed under Article 43.

The fourth schedule of the COK delineates the national government and county government roles. As relates to WASH, most water and sanitation functions and services have been devolved to the 47 counties with the National government mainly retaining responsibility for national policy, training, capacity building, technical assistance and standards formulation. It is important to however note that in the education sector most roles have remained with the National Government with the exception of pre-primary, village polytechnics, home crafts centres and child care facilities.

2.3 The Kenya Environmental Sanitation and Hygiene Policy - KESHP (2016 – 2030)

The KESHP provides a broad guideline to both state and non-state actors at all levels to work towards universal access to improved sanitation and aims to increase the proportion of the population with access to improved sanitation to 100 percent by 2030 and ensure a clean and healthy environment for all in Kenya.

Within Policy Strategy Number 1 of KESHP on scaling up access to improved rural and urban sanitation, consideration has been made for sanitation and hygiene in schools and some of the key aspects of school WASH in the policy are:

- School children shall have a healthy learning environment, including access to and use of clean child-friendly environmental sanitation facilities, hand-washing and water supply;
- Water, environmental sanitation and hygiene education shall be one of the essential teaching components in schools;
- All schools will have at least one toilet unit for girls and one for boys designed for access and use by children with disabilities in accordance with the principles of reasonable accommodation and universal design and the government and stakeholders will ensure that each school has adequate toilet facilities in line with the minimum standards;
- There shall be separate toilets for girls and boys in the schools on a ratio of one toilet for every 25 girls and one toilet and urinal for every 30 boys;
- Separate disability-friendly latrines will be provided for male and female teachers and all school latrine facilities will be constructed in a way that considers the security, privacy and hygiene needs of girls and female teachers and workers, including during menses.

The Kenya Environmental Sanitation and Hygiene Strategic Framework 2016 – 2020 is also already in place to facilitate implementation of KESHP.

2.4 National School Health Policy 2009

The School Health Policy enables the Government to utilize available resources in an effective and efficient manner towards child health. It provides a coordination mechanism that enhances the roles of the various ministries, institutions and stakeholders. To operationalize the National School Health Policy, the National School Health Guidelines 2010 were developed. They provide specific guidelines which ensure that school age children, teachers, support staff and community members access quality and equitable services for improved health. The Kenya National School Health Strategy Implementation Plan was subsequently developed to provide a framework for implementation of a comprehensive school health programme in Kenya. The strategy implementation plan spells out specific activities and budgets pertaining to WASH in School infrastructure development, technical design development, and training on O & M among others.

2.5 Prototype County Environmental Health and Sanitation Bill, April 2016

A Prototype County Environmental Health and Sanitation Bill was developed by the Ministry of Health to assist and guide county governments in coming up with the necessary enabling county legislation for the implementation of Articles 42 and 43(1)(b) of the Constitution and to enable county governments to effectively execute the sanitation and environmental health related functions and powers vested in them by the Fourth Schedule to the Constitution. So far, Migori and Uasin Gishu counties have made use of the prototype to develop their Environmental Health and Sanitation legislation.

The Prototype County Environmental Health and Sanitation Bill provides that every school, educational institution or similar establishment whether private or public shall maintain health and environment standards to the highest level attainable to prevent, reduce or eliminate public or environmental health or sanitation risks 83 (1). It shall be a requirement for every school, educational institution or similar establishment to obtain a sanitary license 83 (2) and the County Government department responsible for environmental health and sanitation may not issue a sanitary license to an institution which does not provide and maintain:

- An adequate supply of clean and safe water for drinking and running water for hand washing;
- Sanitary toilet facilities for each gender and for persons with disabilities;
- Containers or receptacles for the collection of refuse or litter including facilities for safe and hygienic disposal of sanitary pads which shall be collected at regular intervals;
- Adequate drainage facilities to prevent flooding or any surface runoff; and
- Connectivity to a sewerage system or where such is not available, infrastructure for the collection and disposal of effluent and sewage.

2.6 Water Act 2016

This Act provides the legal and institutional framework for the management and development of Kenya's water resources and the provision of water services. The MWI Practice Manual for Water Supply Services in Kenya 2005 has furthered underscored the basic policy for water supply and has recommended that the following factors must be considered in water supply:

- Provision of safe and sanitary water;
- Wise, effective and efficient use of water;
- Safe and sound O & M of water facilities with no negative environmental impacts;
- Systems in conformity with Water Act.

Roles and responsibilities as described in the Constitution 2010 and reflected in the Water Act 2016 include:

- Water and sanitation provision is the responsibility of the county government but will be provided by water and sanitation service providers regulated by the Water Services Regulatory Board;
- Water resources information and regulation is the responsibility of the Water Resources Authority.

2.7 Environment Management and Coordination Act 2009

The Environment Management and Coordination Act (EMCA) makes provisions for mangement of the environment. It establishes NEMA (Section 7) whose object is to exercise general supervision and coordination over all matters relating to the environment (Section 9). Environmental planning, protection and conservation of the environment and EIA are some of the areas that the EMCA regulates. The Act has further made provisions for various environmental quality standards resulting in various regulations such as: The Water Quality Regulations, The Waste Management Regulations among others. This document has made reference to the provisions on EIA and the aforementioned quality standards.

2.8 Basic Education Act 2013, Associated Regulations and Amendments

The Basic Education Act 2013, aims at giving effect to article 53 of the constitution and provides for promotion and regulation of free and compulsory basic education. It particularly makes provisions for accredation, registration, governance and management of basic education institutions in Kenya.

In relation to these Standards and Guidelines, the Act requires that Pre-Primary and Primary Schools have a BOM (Section 55) whose role among others, includes ensuring and assuring the provision of proper and adequeate physical facilities in the institution (Section 59 (c)) and managing the institution in accordance with occupational safety and health rules and regulations (Section 59 (d).

Among the conditions for registration and licencing of basic education institutions by the County Education Boards stipulated in the Act are:

- Available premises are suitable with regards to the number, age, gender and security of learners who attend the institution (82 (c);
- Available premises conform to prescribed requirements of the occupational health and safety regulations (82 (d)).

In exercise of the powers conferred by section 95 of the Basic Education Act 2013, the Basic Education Regulation 2015 were made. Regulation 50 (1) provides for among other necessary provisions in an institution:

- Adequate, safe and clean water (b);
- Adequate, clean and appropriate sanitation facilities which are age and gender appropriate (c);
- Disability friendly facilities and enviornment (d).

This is further emphasized in regulation 64 which requires that every institution of basic education shall have provision for among other facilities; sanitary facilities including washrooms for both learners and other persons, segregated by gender and age.

Regulation 81, then vests all matters of safety, security and hygeine in the school upon the BOM, who are expected to put in place reasonable measures regarding hygiene, security and safety of learners (82), including; ensuring that kitchens, toilets and other physical structures are clean, well maintained, safe, and properly utilized (83 (b)).

Finally, to better address the issue of MHM in school, the Basic Education Act 2013 (Principal Act) was amended through the Basic Education (Amendment) Act 2017. The two key amendments in this regard are:

- Insertion of a new paragraph (k) in section 39 which now provides for free, sufficient and quality sanitary towels to every girl child registered and enrolled in a public basic education institution who has reached puberty and provision of a safe and environmentally sound mechanism of disposal of the sanitary towels.

- Amendment of subsection 2 of section 88 of the Principal Act to include conditional capitation funds to facilitate the acquisition of the sanitary pads.

2.9 Public Health Act Cap 242

The Public Health Act makes provisions for securing and maintaining health. Various provisions in the Sanitation and Housing part of this act are relevant to these *Standards and Guidelines*:

- Section 115 prohits nuisances while section 118 describes what constitutes as nuisance which includes: premises or part thereof which are of such construction or state or situation or dirty or verminous as to be in the opinion of a medical officer of health, injurious or dangerous to health or which are liable to favour spread of disease; wells or other sources of water supply to be used for drinking purposes which in the opinion of a public health officer renders it dangerous to health; accumulation of refuse, waster water and any other waste which is offensive, injurious or harmful to health; among others.
- Section 126 makes provision for bylaws as to buildings and sanitation as well as passing and rejection of plans of any proposed works.

2.10 Building Code of the Republic of Kenya

Established to be enacted by the local authorities, the Building Code of Kenya defines building specifications and the quality of building material to be used as well as connection to common facilities such as sewers, electricity and water pipelines.

The code regulates erection of buildings and land developments by making provision for submission and approval of plans and specifications on: siting and space about buildings; building materials; building sites; foundations including general classification and bearing capacity of various subsoils; walls; floors; refuse disposal; and water supply among many other. While most sections of the building code are relevant to this standard and guidelines, the sections on water supply, refuse disposal and sanitary conveniences including the water closets, urinals, trough closets, latrines and ablution minimum dimensions, hand washing facilities, septic tanks and refuse pits are particularly relevant to school WASH infrastructure.

2.11 Kenya Public Procurement and Asset Disposal Act 2015

This Act gives effect to article 227 of the COK which provides for a system that is fair, equitable, transparent, competitive and cost effect. In the construction context, this Act governs the procurement and disposal of public property. It defines who a contractor is, the form of tendering, the procedures to be applied in both the procurement and disposal of property. These standards and guidelines particularly relate to public schools which are expected to undertake procurement in line with provisions of this Act.

Chapter 3

Planning, Design and Construction Process

3.1 Introduction

This section provides a general guide to the planning, design and construction process for school WASH infrastructure. These guidelines follow the process outlined in the School Infrastructure Improvement Programme as described in the School Infrastructure Improvement Program Management Handbook and the School Infrastructure Technical Handbook, Ministry of Education, 2007. These *Standards and Guidelines* are intended to complement the documents developed for the School Infrastructure Improvement Program with additional details specific to school WASH requirements.

3.2 Principles for Planning, Design and Construction of Child Friendly WASH Facilities

The following child friendly principals are central to the planning, design and construction of school WASH facilities and should act as the core principles in all considerations relating to design, construction and maintenance of School WASH Facilities:

- Involvement of children during planning (on decisions related to siting, technology, colours, talking messages, etc) and operational stages;
- Involvement of teachers, parents and communities must be ensured;
- The design options must provide low-cost solutions with no compromise on quality;
- The facilities should have documented operation and maintenance plans (See Appendix C);
- Have appropriate dimensions and features for children;
- Address gender-related needs and roles and have physically separated facilities;
- Should not do harm to the environment;
- Should encourage healthy hygiene behaviour;
- Offer adequate capacity and provide minimal waiting time;
- Have well-considered locations that factor in security, privacy (especially for children over eight years old) and accessibility in all weather conditions, among others.
- Should provide facilities for children and staff with special needs, especially the physically challenged, to enable all children to attend.

3.3 Responsibility for the planning and development of School WASH Infrastructure

At the school level, the School Infrastructure Committee takes charge of the planning, implementation and monitoring of development of school WASH infrastructure. The Education Act 2014 requires that each school have a properly constituted Board of Management (BOM). Under the BOM are various committees one of which is the School Infrastructure Committee (SIC). This committee may include:

- Chairperson: an elected member of the School BOM but this should not be the chairperson of the BOM;
- Secretary: Deputy Head Teacher;
- Head Teacher who is supposed to ensure that decisions of the SIC are implemented;
- Teachers representing upper and lower primary;
- Two elected representatives from parents (one male, one female);
- Matron (if a boarding school);
- Representative of the Sub-County Education Officer;
- Representative of the Sponsor (if any).

Table 2 provides a brief summary of the key responsibilities for school WASH infrastructure development at different levels.

Table 2: Roles and Responsibilities for the Development of School WASH Infrastructure

Level	Body	Key Responsibilities
National (MoE/HQ)	School Infrastructure Management Unit, Quality Assurance, School Health Meals & Nutrition	• Setting standards • Providing technical and financial support • Monitoring and evaluation
County	County Director of Education MoE	• Policy implementation
	County Ministry in charge of ECDE	• Providing Support • Technical support • Monitoring and evaluation
	County ministries of Water and Health	• Technical support and alignment with sector policies
Sub-county	Sub-county departments of Education, Water, and Health	• Collaborating with school (SIC/BOM) • Technical support • Coordinating & supporting training • Monitoring and evaluation
School	School Infrastructure Committee (SIC)	• Preparing the School Infrastructure Development Plan (SIDP) • Implementing SIDP • Collaborating with other technical departments for technical assistance (e.g. Public Works) • Monitoring and evaluation

3.4 Planning for School WASH Infrastructure

Schools are expected to have formulated a five year School Strategic Development Plan, one component of which is dealing with infrastructure. This component may be documented as the School Infrastructure Development Plan (SIDP) in which the needs of the school are assessed against minimum acceptable standards. The SIDP is therefore an important document as it sets out the needs, priorities and anticipated budgets to bring the school progressively towards a situation in which the facilities provide a secure learning environment. The SIDP also provides a mechanism to measure progress towards meeting the required standards.

Planning for school WASH should therefore not be seen as a separate process from the SIDP but an integral part of the SIDP. The WASH component of the SIDP is referred to as the SIDP/WASH component.

3.4.1 Process to develop the SIDP/WASH

Table 3 sets out eights steps to guide the development of the SIDP. The planning and analysis of the requirements to meet school WASH infrastructure requirements should follow the same process and structures as used for the SIDP.

Table 3 : Steps to Develop SIDP

Step	Activity
1	Preparing to develop the SIDP
2	Assess existing infrastructure
3	Establishing requirements
4	Develop SIDP
5	Strategize and Prioritise
6	Action Planning
7	Approval and Submission
8	Supervision, evaluation, reporting and updating

3.4.2 Step 1: Preparing to develop the SIDP/WASH

The following actions should be taken:

1. Constitute a School Infrastructure Committee (SIC) if none exists;
2. Discuss the Terms of Reference for the SIC so that members are clear on:
    - Procedure and frequency of meetings;
    - Work and expected outputs.
3. Review WASH component of existing SIDP.

3.4.3 Step 2: Assess existing WASH Infrastructure

The SIC should undertake an assessment of the existing infrastructure. This involves assessing the adequacy in terms of capacity and condition of the existing infrastructure as outlined below:

- List, update and assess the status of the existing infrastructure. This requires the use of the School WASH Score Card (Appendix A) and a site visit to each facility. It is important to allocate sufficient time for this data collection exercise as decisions will be made on the basis of this information.

- Create, review and/or update the existing site plan making sure to note:
  - Location of Lower and Upper Primary Classrooms as this is important for the location of WASH facilities;
  - Location of dormitories and ablution blocks;
  - Kitchen facilities as these will require water and will generate waste;
  - Dining rooms as these require handwashing stations;
  - Wind direction as latrines should be located downwind;
  - Existing water related infrastructure: water sources (wells, boreholes etc), water tanks, piping;
  - Existing sanitation infrastructure: latrines, abandoned latrine pits, septic tanks, soak pits, waste pits, incinerators;
  - Existing hygiene infrastructure: hand washing stations;
  - Existing services: electricity, roadways, sewer lines.
- Note community infrastructure in close proximity to the school e.g. latrines, waste pits, water services, etc.

3.4.4 Step 3: Determining WASH Infrastructure Needs

This process involves:

1 Compiling school population data. This needs to be broken down by boys/girls/teacher, day/boarding, ECDE/lower/upper primary.
2 Establishing the applicable standards for the particular school population (e.g. day, boarding etc).
3 Establishing the requirements to meet the standards;
4 Establishing existing facilities from the data collected during the assessment of the existing school WASH infrastructure.
5 Determining the WASH infrastructure needs or gaps.

Table 4 provides a worked example to determine the number of latrines required to meet the minimum standard.

Table 4 : Example to determine Sanitation Facilities Required

	Girl	Boys	Male Staff	Female Staff	PLWD
Number of Pupils, Staff	200	200	8	12	0
Standard	1 toilet per 25	1 toilet per 30 + urinal	1	1	1
Number required to meet standard	8	8 + urinal	1	1	1
Number existing that are functional	4	3 + urinal	1	0	0
Actual PTR	50	67			
Ifrastructure gap	4 latrines	5 latrines 1 urinal	0	1	1

Note that pre-primary and primary classes should not share sanitation facilities and specific child friendly facilities should be provided for the pre-primary students.

In addition, all schools must provide sanitation facilities for students and/or staff living with disability, regardless of whether any member of the current school population is a person living with disability.

3.4.5 Step 4: Preparation of SIDP/WASH Plan

The requirements as established in Step 3 should be reviewed with respect to the Site Plan and other existing infrastructure. The site plan which may be part of the 5 year School Strategic Development Plan is then drawn up regarding where the required infrastructure could be positioned. The site plan should be updated to reflect proposed WASH infrastructure and interrogated to see that it meets the guidelines for siting as laid out in this document in Chapter 4 for water facilities and Chapter 5 for sanitation facilities.

Some of the important points to be considered are:

- Consult with children regarding preferred structures and siting;
- Ensure latrines are downwind or a distance to classrooms;
- Separate boys, girls and staff latrines;
- Position ECD/lower primary latrines where teachers can supervise usage.

3.4.6 Step 5: Strategizing and Prioritising

The SIDP/WASH sets out the infrastructure that is needed with reasonable budget estimates (See BOQs in Appendix E). The items on the SIDP/WASH should be ranked against the criteria in Table 5.

Table 5 : Criteria for prioritizing items on the SIDP/WASH

Priority	Risk Level to school learning	Examples		
		Water	Sanitation	Hygiene
1	High - persistent conditions with potential disease outbreaks to entire school population	Water supply very unreliable or not available No safe water for drinking	Latrines frequently overflowing (or flooded) with open sewage in school compound	No HWS, no soap No trash pit
2	Medium – periodic conditions leading to potential disease outbreaks school population	Water supply unreliable at times of drought/floods Storage insufficient to span more than 1 day without supply	Functional latrines but PTR > 75	Soap rarely available Waste pit not fenced Waste not burned HWS available but with queuing
3	Low – infrequent conditions or small portion of school population at risk	Water supply mostly reliable and storage > 3 days supply	Functional latrines PTR < 50	HWS available, soap usually available

3.4.7 Step 6: Action Planning

Once the WASH infrastructure has been identified and prioritised, an action plan can be drawn up for the high ranked infrastructure that is to be developed in the short term.

The action plan should set out the actions, responsibility and timeframe and should include:

1. Obtaining designs and BOQs as per materials provided in Appendix D and E;
2. Updating the cost estimates for local prices;
3. Specifying the technical assistance requirements. These will depend on the nature of the anticipated works. For example a borehole would require the services of a MWI registered hydrogeologist;

4. Specifying the procurement plan. The issue here is whether the works are of sufficient size to warrant procurement of an overall contractor or the works will be handled through a material supplier and labour contractor. Furthermore details on the type of contractor should be specified. For example the drilling of a borehole would require a registered borehole drilling company.
5. Specifying the supervision plan with details regarding who will be inspecting the construction and at what points in the construction process. Where the SIC lacks technical know-how, then additional technical support should be factored in.
6. Preparation or updating of the School Environmental and Social Protection Plan.

3.4.8 Step 7: Submission and Approval

The SIDP/WASH plan must be presented to stakeholders who will contribute to or have a role in its implementation. Essentially this means that the plan should be posted on the school notice board and shared with and seek the approval of:

- School Board of Management (BOM);
- Sub-County Education Officer
- County government Education Officer (for stand-alone ECDE);
- Sub-County Public Health Officer;
- County Public Works Officer.

It would be appropriate to get feedback from the children on the proposed plan. In addition approval may be required by the National Construction Authority (NCA), Water Resources Authority (WRA) and the National Environment Management Authority (NEMA), for which additional documentation or studies may be required.

3.4.9 Step 8: Implementation and Supervision

Implementation of the project involves procuring and then supervising the contractor. These activities are dealt with in more detail below.

3.5 Procurement of Contractor

Procurement of a competent contractor or artisans and materials of the required specification is an important step to obtaining good quality infrastructure. The procurement process should be followed properly to obtain value for money and competence. The requirements of the Public Finance Management Act 2014, the Public Procurement and Assets Disposal Act 2015, and the Public Procurement Oversight Authority (PPOA) guidelines constitute the authoritative references for procurement. Note that the “Green Book” provides schools with guidelines on the use of the Free Primary School funds.

In general regarding public funds there is an accounting officer who is responsible for ensuring adherence to regulations, procedures, and budgets, and constitutes the committees that assist in the procurement process. In regard to the school setting, the head teacher is the accounting officer. These committees may include a committee to assist in with proposals for pre-qualification, registration of contractors, evaluation of bids, etc. and potentially a separate committee that deals with inspection and acceptance of goods, works and services.

The source of funds may dictate the requirements in regard to the procurement of contractors. For example, where a NGO or donor is supporting the WASH infrastructure development, the NGO or donor may have specific procurement guidelines that must be adhered to. Where the procurement process is not specified by the source of funds, then the following process can be followed. Where there is uncertainty regarding the correct procurement process, then consultations should be held with sub-county or county level education departments for clarification.

3.5.1 Category of Works and Type of Contract

There are two categories of works that influence the category of contractor, type of contract and level of technical supervision that are appropriate. The thresholds provided below are guideline values but PPOA guidelines should be consulted where public funds are being used.

1. **Category 1 (small):** Works up to Ksh 500,000. This covers repairs and maintenance work and minor infrastructure development;
2. **Category 2 (large):** Works in excess of Ksh 500,000 These projects require approval by the Sub-county Education Officer and supervision by the Public Works officer.

The procurement of the contractor is slightly different for the categories in that the Sub-County Education Department should be consulted to support the procurement for large works.

There are two type of contracts and the SIC should be clear on which form is to be used for the proposed works. The two types of contracts are:

1. Labour only (Appendix B). This type of contract will be accompanied with a Local Purchase Order (LPO) to a separate supplier for materials. This type of contract is mostly used for Category 1 works;
2. Labour and Materials (Appendix B). This type of contract is mostly used for Category 2 works.

It should be noted that where a NGO or donor is providing funds for the WASH infrastructure development the NGO or donor may prefer the use of a specific contract format.

3.5.2 Pre-Qualification

The pre-qualification process allows the SIC to shortlist a small number of contractors and artisans that meet the basic requirements to be able to undertake the work.

Table 6 : Pre-qualification Selection Criteria

Minimun Requirements	Preferred Requirements	Not Acceptable
Experience of similar works within the locality	Operational bank account	Member of SIC or BoM
Good quality workmanship	Technically qualified with certificates	Immediate family member with anyone on the SIC
Based locally	Previous work on high standard which has been verified by SIC	No experience
Full time in the building trade	Works from a permanent premises	Previous work of poor standard or unfinished
	Positive engagement of youth, women and persons with disabilities	

The pre-qualification process requires the following steps:

- Advertise locally (School notice board, BOM, Chief's notice board) that the SIC is going through a pre-qualification process and that contractors/artisans are invited to submit their documents;
- The advertisement should specify the service required and the deadline;
- The SIC will then evaluate the submitted documents against the criteria set out in Table 6 to establish the list of pre-qualified contractors and artisans and will publish a list of pre-qualified bidders (Form 2, Appendix B).

In the case of Category 2 works, the pre-qualification is done with the support of the sub-county / county level.

3.5.3 Request for Quotation

The SIC needs to prepare a document that summarises the scope of works and the timeframe (Form 3, Appendix B). This will help potential bidders to know the school intentions and to decide whether they have the time and capacity to implement the project within the stipulated time. This form is sent to prequalified bidders with the Request for Quotation (Form 4, Appendix B). The SIC should request a quotation for the proposed works from all of the pre-qualified bidders. At least three quotations must be received to ensure fair competition and value for money.

The bidders should be given an opportunity to visit the site and to ask the SIC any questions to clarify the scope of work. The bidders should have access to the drawings and specifications to help them prepare their quotations.

3.5.4 Evaluation of Quotations

The SIC will open and evaluate the quotations which involves:

1. Notifying the bidders so that they can attend the opening of the quotations. The bidders can verify that the tendered sum reported by the SIC on opening is indeed the correct sum as submitted by the bidder. The bidders should however not attend the deliberations of the SIC to evaluate the quotations;
2. Checking that the quotation forms are properly filled in, signed and are complete;
3. Checking the quotation for mathematical errors. Mathematical errors should be resolved in favour of the school but serious errors should indicate a contractor who is not attentive to detail and so should be given low points;
4. The SIC should discuss the relative merits of the different quotations to ensure that the best value for money is obtained;
5. The conclusion of the SIC should be documented on a form and signed by the SIC Chairperson.

The opening and evaluation process should be technically supported by the Sub-County Education department for large (Category 2) projects. The tender evaluation will be documented on a form signed by the tender evaluation committee (Form 5, Appendix B).

3.6 Procurement of Materials

The procurement of materials essentially follows the same process as for Category 1 contractors outlined in Section 3.5. The SIC will need to check the reputation of the supplier for supplying the correct quantity and quality of materials and on time and that the supplier is well established (been in operation for at least one year).

3.7 Award of Contract

The SIC should inform the successful bidder whether contractor or supplier and issue a Local Service Order or a Local Purchase Order (LPO) (Forms 6 & 7, Appendix B). It is important that the school does not issue an LPO without being confident of having the funds to pay the contractor on time.

The contractor will also enter into a contract (refer to Section 3.5.1) as the contract provides specific details regarding the responsibilities under the contract. When entering into the contract it is important that:

- The SIC and contractor read through the terms of the contract together to make sure that all parties fully understand the terms and conditions within the contract;
- That both the accounting officer and the contractor sign the contract.

3.8 Supervision of School WASH Infrastructure Project

This section has focuses on the planning phase of a School WASH Project which involves engaging a contractor or artisan on contract, engaging a materials supplier and managing the contract. Unless adequate attention is paid to this stage of the project the school resources may be spent without delivering the intended structures to the right standard. This can also lead to high maintenance costs.

3.8.1 Introduction

The construction of school WASH infrastructure should be accorded close supervision because many of the structures have detailed specifications and not all contractors are familiar with these specifications. The trail of poorly built latrines, leaky tanks and inefficient gutters are examples where supervision failed to ensure that the contractor or artisan built the infrastructure to the required specification. Contractors are liable to cut corners unless well supervised.

Schools face many challenges during the construction process, some of which can be mitigated by careful selection of a competent contractor (with a signed contract for the works) and using a technically experienced supervisor.

Some of the typical challenges that schools encounter during infrastructure projects include:

- Procurement of a component contractor or artisan able to read, interpret and follow the drawings and specifications correctly, delivering a high standard of workmanship;
- Inability of the artisans to provide realistic estimates in terms of materials, labour and time;
- Pilfering of materials and equipment;
- Ensuring the site is safe at all times for workmen and school population, especially given the curiosity of school children;
- Handling the interaction between workmen and school children and the behaviour of workmen (e.g. smoking within the school compound);
- Taking advantage of non-technical school infrastructure committee members assigned to supervise the works;
- Contractor or artisan failing to pay his labour.

3.8.2 Roles and Responsibilities between Contractor and Supervisor

The roles and responsibilities between the contractor and school are set out in Table 7.

Consequently the supervision plan should be detailed and followed closely. The County Public Works is expected to play a role in supervision although the daily supervision role should fall on the SIC or BOM.

Table 7 : Roles and Responsibilities between Contractor and School

Actor	Responsibility
SIC (BoM)	• Engaging contractor on contract with fair terms. • Ensuring that all statutory approvals have been obtained. • Providing all drawings and specifications. • Ensuring the contractor fully understands the scope of work. • Specifying the chain of communication and the timeframe for decisions. • Ensuring the site layout is clearly marked as per SIC requirement. • Ensuring that the materials to be provided by the school (or parents) are available in the correct quantities, quality and on time. • Making sure the contractor is paid on time as stipulated in the contract. • Providing the contractor with access to the site as agreed with the SIC. • Controlling any disruption to construction by school students or school events. • Supervising construction so that any discrepancies between the construction works and the school plans are identified, discussed and resolved as quickly as possible. Any design changes during construction should be noted, discussed and budget implications assessed. • Facilitate inspection by County or MOE staff as may be required. • Coordinate and liaise with the funding agency as may be required • Conduct site meetings to ensure all parties are aware of progress and issues.
Head Teacher	• Implementation of SIC (BOM) decisions • Liaising with Sub-county or county technical officers • Supporting SIC (BOM) on supervision of contractor • Ensuring health and safety of school children
Contractor or Artisan	• Provide high quality workmanship to the drawings and specifications within the timeframe agreed. • Supervise the labour force, including controlling behaviour, noise and language on site. • Inform the school of any issues and/or discrepancies related to the working documents and instructions. • Ensure the safety of the workmen and make sure the site is safe from damage or safe to the school population. • Keeping the site tidy.
Sub-County or County Technical Officer	• For Category 2 Works, technical inspection during key stages of construction including layout, at the end of excavation, prior to casting wall footings and slabs, finishes, etc.

3.8.3 Record Keeping

Supervision should entail the following components:

1. Ensuring that drawings, sketches and tape measure are available on site at all times for reference by the SIC and/or supervision team;
2. Ensuring that a site book (a school exercise book is suitable) is opened at the start of construction in which the following points are noted:
    a. Number and type of labour on site;
    b. Delivery of materials listing which materials, quality and quantity;
    c. Progress of the works;
    d. Any challenges faced;
    e. Any changes to the design;
    f. Weather;
    g. Inspection events by SIC or County staff.

3. Keep a file with all the pertinent records including:
   a. Site meeting minutes;
   b. Correspondence;
   c. Quotations;
   d. Contracts;
   e. Invoices;
   f. Receipts;
   g. Delivery Notes;
   h. Certificates (e.g. Certificate of Completion).

The Secretary of the SIC should maintain the records as part of his/her duties.

3.8.4 Schedule of Inspection

One of the important functions of inspection is to check the measurement and quality of workmanship, especially the works that will be covered by subsequent construction activity. In many cases it is not possible to verify at a later date the quality or measurement of the work which has been covered. So the inspection process must be thorough and timely. Additionally, the support of technical assistance by the relevant Sub-County or County staff is critical for Category 2 works especially for the sub-structure related to any works.

Key stages at which inspection should be undertaken are shown in Table 8. These stages may need to be customised for the specific project being planned.

Table 8 : Key Stages for Inspection

Construction Stage	Inspection Purpose/Activity
Initial site layout/setting out.	Position of the works Define a reference level bench mark
Periodic inspection of excavation in unstable soil conditions	Soil stability and safety of the excavations
End of excavation	Measured and confirm depth and soil conditions
Prior to concreting for wall footings and other foundation works	Formwork and steel (size, spacing, cover & overlaps) Quality of concrete
Slabs	Formwork and steel (size, spacing, cover & overlaps) Plumbing (drains etc) beneath or within slab Quality of concrete Gradients
Backfilling	Density and material of backfill
Walling	Vertical alignment, quality of mortar
Openings for doors and windows	Position, level, width
Lintels and ring beam	Formwork, steel (size, spacing, cover & overlaps), concrete quality
Wall plate	Hoop iron or fixture
Roof structure	Truss, roof slope, overhang
Roof covering	Overlaps
Finishes	Plaster smoothness Gradients Paintwork Door & window fixtures

The findings from the inspection activity for both Category 1 and Category 2 works should be documented in the Site Book.

3.9 Completion of School WASH Infrastrucure Project

It is necessary to ensure that all works described in the contract have been carried out and completed as specified, that there are no defects, that all payments have been made and appropriate handover of the facilities has also been done.The inspection schedule outlined in Section 0 forms a basis to the confirmation of the completion of the overall construction works.

Completion of the works often requires a Certificate of Completion which documents that the infrastcrure has been developed to the required standard and handed over by the contractor to the BOM.

As the construction nears completion, the SIC needs to prepare an operational and maintenance plan for the new WASH facilities which sets out how transition, operation and maintance of the facilities will be managed (See further details in Section 7). This plan should be updated on the overall school infrastructure operation and maintenance plan.

Chapter 4

Water Supply Facilities

4.1 Introduction

Clean and safe water in adequate quantities is a human right enshrined in our Kenya Constitution 2010 (Article 43 (1) (d)) thus water should be available to all, in adequate and safe amounts. Health and educational studies have shown that provision of safe, reliable and adequate water in schools results in tangible health benefits, better student attendance and lower time spent fetching water, a burden that is disproportionately carried by women and children. An adequate water supply is essential for promoting good hygiene practices among the school community (e.g. handwashing with soap) and to enable school children to drink safe water.

Every school must have a reliable water supply that meets the minimum requirements of quality, quantity and accessibility, regardless of the prevailing conditions within the community.

This chapter provides information on the planning, design, construction, operation and maintenance of school water supply facilities. This chapter draws particular attention on designing water supply systems for reliability as poor reliability is very disruptive to school operations and places the school community at risk.

4.2 Water Supply Requirements and Standards

The minimum requirements for water quality, quantity and accessibility are set out below.

a) Water Quality Requirement

Guideline 1:
WHO Water, Sanitation and Hygiene Standards for Schools in Low Cost Settings (2009)

Water for drinking, cooking, personal hygiene, cleaning and laundry is safe for the purpose intended.

The World Health Organization (WHO), NEMA and MWI specify drinking water quality guidelines.

Water for drinking, handwashing, bathing, dishwashing and cooking should meet drinking water quality standards. Water used for sanitation, laundry and cleaning floors and other surfaces need not be of such high quality as the drinking-water.

If water below drinking-water quality standards is used for certain purposes (e.g. cleaning), it should be in separated, clearly marked containers or distribution systems, and necessary measures should be taken to ensure that the drinking-water supply cannot be contaminated by the lower-quality supply.

Schools should aim to have the water at the point of use sampled and tested at least once per year by a KEBS registered water quality testing laboratory or when there is suspicion of a disease outbreak. The school should make a budget provision for this sampling and testing activity. Where the test results indicate a problem, then an expanded testing program should be undertaken to identify the source of the pollutants.

Water quality is tested against a variety of indicators in three different categories.

1. Microbial/Bacteriological

The water must be free from pathogenic (disease causing) organisms specifically, Escherichia coli (E-coli) or thermos-tolerant coliform bacteria which should not be detectable in any 100ml sample. Good bacteriological quality can be ensured through appropriate siting of sources, protection of intakes and adequate treatment in cases where there is contamination. All water for drinking should be treated unless the water source has been regularly tested and has been determined to be free from bacteriological contaminants as may be the case for borehole water or water supplied by a competent water service provider.

2. Chemical

The water must not contain any compounds that have an adverse acute or long-term effect on human health. Chemical quality mainly becomes an issue for underground water sources, brackish water or reclaimed water. Surface water sources are less likely to be exposed to high chemical concentration unless the source flows over highly concentrated geological formations. Chemical water quality also impacts on physical/aesthetic quality of water.

3. Physical/Aesthetic

The water should not have noxious tastes, odours or colours that would discourage consumption. The concentrations in which these constituents are normally present in water do not affect health, but deter the consumption of the water.

b) Water Quantity Requirement

Guideline 2:

WHO Water, Sanitation and Hygiene Standards for Schools in Low Cost Settings (2009)

Sufficient water is available at all times for drinking, personal hygiene, food preparation, cleaning and laundry.

Table 9 provides the basic water requirement per person for day and boarding schools. The quantities shown in Table 10 should be added to the basic water requirement as appropriate to the conditions in each school.

Table 9: Basic Minimum Water Requirements

Water Use Category	Consumption Rate
Day Non-residential schoolchildren and staff) schools	5 litres per person per day
Boarding schools	20 litres per person per day

Table 10 : Additional Water Requirements

Water Use Category	Consumption Rate Day School (l/p/day)	Consumption Rate Boarding School (l/p/day)
Flushing toilets	10 – 20	20 – 40
Pour-flush toilets	1.5 – 3.0	3.0 – 6.0
Anal washing	1 – 2	2 - 4

There is no specified standard for reliability. It is implied that the basic minimum requirements should be met at all times.

c) Water Access Requirement

Guideline 3:

WHO Water, Sanitation and Hygiene Standards for Schools in Low Cost Settings (2009)

Sufficient water-collection points and water-use facilities are available in the school to allow convenient access to, and use of, water for drinking, personal hygiene, food preparation, cleaning and laundry.

In addition to having safe and adequate supply of water in the school, it is also important that the water can be easily accessed by the pupils at convenient locations within the school preferably close to where the activity for which the water is being used (e.g. toilet, dining hall), is taking place. The designs of the supply facilities should also be suitable for the different ages and abilities of children within the school, to ensure that even very young children and children with disabilities are able to use the facilities with ease.

Therefore a reliable water point, with soap or a suitable alternative, should be provided at all the critical hand washing points within the school, particularly within or near toilets, kitchens and dining hall. There should also be reliable drinking-water points accessible by staff and schoolchildren, including those with disabilities, at all times. The number of water points should be adequate to meet the requirements for the school population which is approximately one tap per 25 students.

4.3 Planning

The objective of the water supply system is to exceed the minimum water requirements and deliver a reliable water supply of sufficient quantity and quality, at the appropriate places, in a cost effective manner so that students and staff can focus on education within a safe and healthy environment.

To initiate development or improvement of school water supply facilities, schools must plan and think through some of the following questions:

- What quantity and quality does the school require for drinking, cooking, sanitary and hygiene purposes?
- Where and how can the school get and maintain a reliable water supply? i.e. how can the school improve its water security?
- How clean and safe is the available water for the various needs within the school?
- What will be the cost of the development/improvements?
- Where should the water facilities be sited?
- What is the plan for operation and maintenance of the water facilities once they are developed or improved?

Figure 1 provides a schematic of a school water supply system. Features to note are:
1. Different water source options supplying into one robust and effective distribution system;
2. Water sources feed into an elevated tank which distributes water to the points of use;
3. Water delivered to latrines, kitchen, handwash stations and treatment facility for drinking water
4. Drinking water is treated;
5. Wastewater is directed to a soak pit or garden.

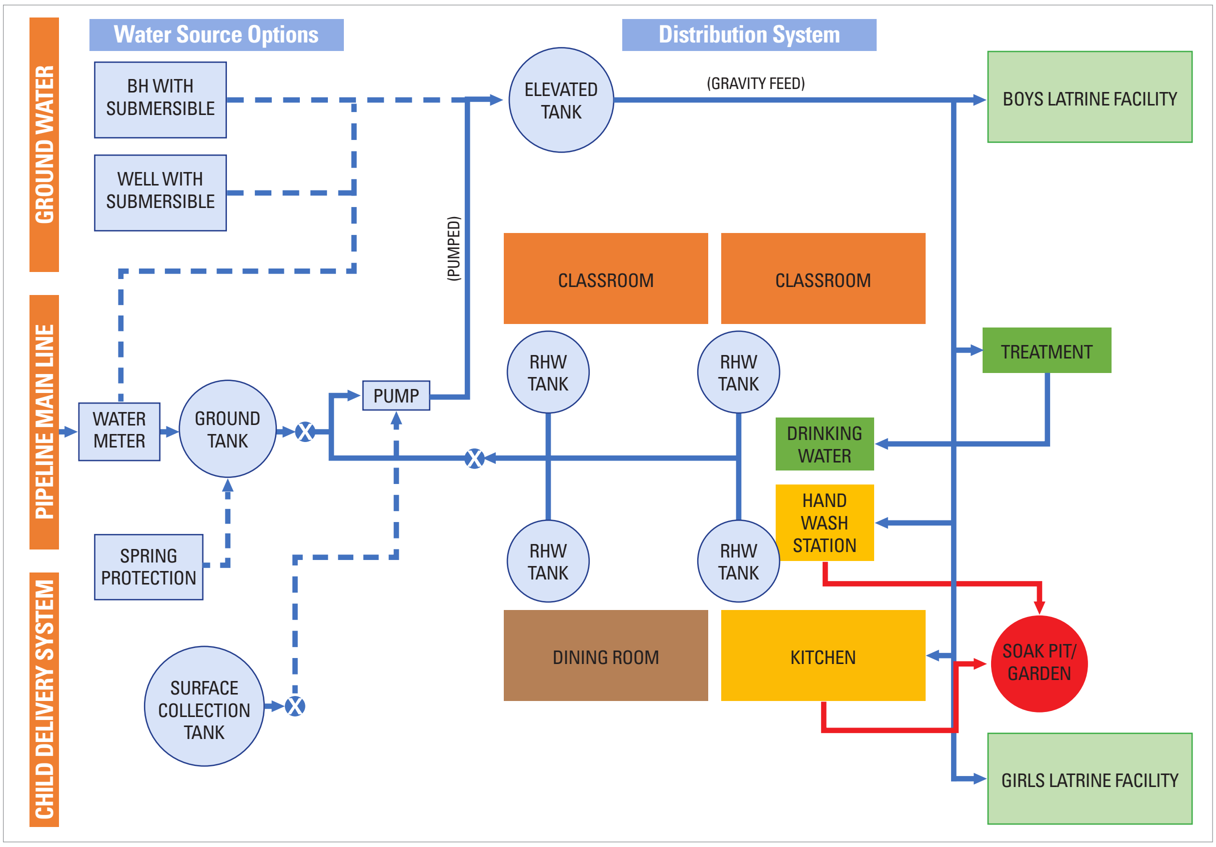


Figure 1: Schematic of School Water Supply

4.3.1 Water Demand

The standards provide the basis on which to calculate the water demand with respect to the school population and conditions.

Table 11 : Water demand calculation

		Units	Day	Boarding
1	No. of students & staff			
2	Basic water needs (drinking, hand washing, cooking)	Litres per day	5	20
3	Flush toilets	Litres per day	10 – 20	20 – 40
4	Pour flush	Litres per day	1.5 – 3.0	3.0 – 6.0
5	Anal washing (l/p/day)	Litres per day	1 – 2	2 - 4
6	Total daily water demand per person (l/p/day)	Litres per day		
7	Total daily water demand for the school (multiple row 1 x row 6)	Litres per day		
8	Grand total daily water demand for the school	Litres per day		

It should be noted that the water demand can change if the school population and/or the type of sanitation facilities change.

4.3.2 System Components

The water supply system in a school is made up of a number of different components that must work together to ensure that the water supply is reliable and meets the standards and needs of the school. These components are:

1. **Source.** The quantity, quality, reliability and cost should be considered;
2. **Conveyance.** How is the water conveyed from the source to the school? Does it require pumping and can it be maintained reliably and economically?
3. **Storage.** A school needs water security so that a break in the supply even if for maintenance purposes does not result in an immediate crisis in the school;
4. **Distribution system.** The water should be distributed to the critical water use points, namely the latrines, kitchen and dining hall and also to the showers in a boarding school;
5. **Point of use facilities.** The point of use may be the hand washing stations or basins which need to be located and designed appropriately for use by the school population;
6. **Water treatment.** Where the water quality does not meet drinking water standards, then a proportion of the water should be treated and made safe for drinking.
7. **Waste water disposal.** This may be in the form of a soak pit where grey water is channelled to a specific point where it can infiltrate into the ground.

These system components are discussed in detail below.

4.3.3 Siting

There are two main criteria for the siting of water supply facilities. One relates to set requirements and guidelines that limit where a facility can be located. These requirements are mainly intended to ensure water quality is preserved and that facilities function effectively.

Some of the set requirements and guidelines that relate to siting include:

- Springs: There should be no latrines within 30 metres upstream of the spring;
- Boreholes: To avoid interference between the cone of depression of various boreholes, it is proposed that a borehole should not be drilled less than 0.8 Km radius from an existing one. There should also be no latrines within 30 meters radius and there should be a distance of at least 10 meters from the school fence;
- Hand Washing Facilities: Should be situated next to the toilets, kitchen and dining hall to encourage good hygiene behaviour;
- Drinking Water Points: Should be located at a central location and accessible to all pupils and teachers.

The second consideration is cost and technology. For example if a school is making a decision relating to a source that is located a distance from the school then the conveyance system and its cost should be considered. A school may also wish to introduce a distribution system within the school to improve water accessibility. This would mean that siting of the current school water source and the various access points such as toilets, bathrooms, kitchen, water fountains e.t.c. to be covered by the distribution system will be key factors in the design and costing.

4.3.4 Budgeting

In Kenya, schools often use water supply systems that are similar to those of the community around the school. For example; in areas where the communities have no access to improved water sources, it is also likely that the schools within that community are facing similar accessibility challenges. It is also important to note that some water supply systems are not appropriate in certain schools owing to factors such as high investment and management requirements. Therefore, in considering the sustainability of a water supply scheme for a school, the choice of water source and supply technology should favour the use of systems with low operation and maintenance cost.

Once due consideration of the various requirements and the school needs have been made and a decision has been reached regarding development or improvement of a particular water source then a budget will be prepared. It should be ensured that the budget factors in both capital costs and operation and maintenance costs. Among the appendices to this report are bill of quantities for some water facilities to guide with the estimation of costs.

4.4 Source

The following are factors that a school should consider before selecting a water supply source:
- The existing water supply options in the area;
- The reliability and sufficiency of the existing water supply options;
- The convenience, quality and cost of getting supply from the existing water supply options;
- The best alternative water supply source and the cost of connecting/developing the alternative source;
- Capacity to develop, operate and maintain a safe water source.

In reality, a school may have to develop several water supply sources in order to address issues of adequacy, reliability and quality. This is an important consideration in building the school water security.

Schools in Kenya can develop water supply systems from a variety of water sources. However, protected water sources eliminate the need for bulk water treatment which may require chemicals, energy and skilled manpower, thus in considering water sources, schools should opt for protected sources.

Ground water sources such as springs, wells and boreholes are considered to be protected sources and when the siting of such sources is appropriately done, water from these sources is free from microbial contamination. Rain water also provides a safe source of drinking water when the necessary measures to prevent contamination from the catchment or storage facilities are taken. On the other hand, surface water sources such as rivers, dams, pans, rock catchment are unprotected sources and water from these sources is polluted and requires treatment.

Table 12 summarises some of the water sources that are considered most viable for schools, including brief indication on the investment, the running costs and other general requirements. Other types of sources (e.g. rock catchments, sand dams, etc) are generally community managed systems and are not discussed further in this document.

Table 12 : Water Supply Sources

Water Source	Capital Cost	Running Cost	Comments/Requirements
Roof catchment	Medium	Low	Needs rainy intervals (can be unreliable) Storage Tanks needed Water quality is good initially but could deteriorate due to long storage. Conditions of the roof can also compromise quality and there is need to take measures to deal with the first flush.
Spring protection	Low Medium if piped depending on distance from source to point of use.	Low	Needs a reliable spring flow throughout the year. Can be developed as a point source or piped
Hand-dug wells	Low	Low	Abstraction can be manual by bucket and windlass, low lift electric pump or hand pump. Utilizes local labour Quality may be compromised if well is not protected (covered).

Water Source	Capital Cost	Running Cost	Comments/Requirements
Boreholes	High	Medium if using solar or wind power High if using electricity	Suits deep underground aquifer. Well drilling equipment needed and the borehole should be cased. Requires mechanical pumping Needs maintenance of mechanical pumps.
Piped Scheme or Water Service Provider	Low	Low	Water service provider responsible for operation and maintenance from source to school connection

a) Piped Schemes
Schools also have the option of connecting to piped schemes operated by water companies or communities where such an alternative is available. The advantages of piped schemes include the fact that the school will only need to invest in its own storage and distribution system. Operation and maintenance is also limited to the facilities within the school while the service provider is responsible for the quantity, quality and reliability of the service.

The school can be guided by the water service provider on its responsibilities for getting a connection and the water tariff. The school may need to install a water meter and ensure that it is safe from theft and vandalism and is working properly. Note that while a water meter may be a requirement for purposes of measuring water use for billing, it is useful for the school to know and record water use for its own internal monitoring.

The school is not necessarily limited to the level of service provided by the piped scheme. The school can enhance the reliability through placing storage tanks and may need to treat a certain volume of water for drinking and cooking purposes.

b) Roof Catchment
Where there is no surface water, or where groundwater is deep or inaccessible, too salty, unpleasant or unfit to drink, another source must be sought. In areas which have regular rainfall (greater than 500mm per year) the most appropriate alternative is the collection of rainwater, referred to as "rainwater harvesting".

In Kenya, some of the community level water harvesting facilities include sand dams, sub surface dams, rock catchments, earth dams and pans. In the school setups however, harvesting of rainwater is mainly from roof catchments.

The key components of a roof catchment system include:

- The **roof catchment** surface collects the rainfall. Since most schools have roofs that are suitable for rainwater harvesting (galvanised metal sheet or "mabati"[1]), schools, particularly in areas that receive reliable rainfall (i.e. greater than 500mm per year), should exploit this option even where they have other water sources. When putting up new buildings within the school, due consideration should be made to incorporate installation of a roof catchment rainwater harvesting system. Essentially this means that the roof should include fascia boards on which the gutters can be attached.
- **Gutters and down spouts** channel water from the roof to the tank. These are made from either GS or PVC and the choice of which material to use should be guided by local conditions. The gutters should be securely fixed to the fascia boards so that they are not damaged when they are being cleaned. The gutter should be fixed at a gradient with an end piece and down spout. An elbow can then be attached to the down spout to direct the water to the storage tank.

1 Note that roofing material made with asbestos or painted with lead-based paints are not appropriate for rainwater harvesting systems.

- **Leaf screens** and first flush diverters prevent debris and dust from the captured rainwater from entering the storage tank. One first flush option that is easy to install and operate is to attach a tee piece to the horizontal pipe from the gutter to the tank. A vertical piece of heavy gauge PVC pipe is attached to the tee with an elbow at the bottom. A nipple and screw end cap on the elbow allows the vertical pipe to be opened and closed to control whether the rainwater should be harvested into the tank (Refer to Drawing 079)
- **Storage tank** stores the collected water. Refer to Section 4.6 for information on the various options for storage tanks. It should be noted that siting and top height of the tank(s) should be set once the gutter and downspout is in place. Note that PVC tanks come in different sizes and heights. It is important to procure a tank that can fit underneath the gutter and downspout.
- **Drawoff points** (taps) to deliver the water for end use.

A good RWH system design that includes all the above components must be accompanied by proper operation and maintenance in order to provide high quality performance. The following actions are particularly critical:
- Regular inspection and necessary repair of roof catchment system components;
- Inspection and cleaning of catchment, gutters, filters and tanks before the onset of the rains;
- Checking and opening of the first flush diverter at the onset of the rain to dispose of the polluted first flush;
- Where possible, water from other sources of poorer quality should not be mixed in the RWH tanks.

Table 13 : Advantages and disadvantages of rainwater harvesting systems

Advantages	Disadvantages
• Many schools already have suitable roof catchments • Quality of water is usually good but could deteriorate due to long storage • Low maintenance cost	• Seasonal and thus if adequate storage is not available and water is not efficiently used may not provide sufficient reliability • Initial cost of installation, particularly the storage component, is high • Roof catchment (roofing and gutter material) may deteriorate over time

Refer to Section 4.6 for information on calculating roof catchment runoff, rainwater storage tank sizing and construction of a roof catchment system.

c) Spring Protection

Surface springs occur where groundwater emerges at the ground surface because an impervious layer below ground prevents further seepage downwards. The rate of flow of water from the spring will vary with the seasons and determination of the potential reliable yield of the spring involves measurement of flow at the end of the dry season. However an inspection of the catchment area upstream of the spring is essential to ascertain any danger of pollution and take necessary measures to prevent it.

Water from a spring source can either be supplied to the point of use via a piped scheme or be obtained at the spring via a point source, which runs continuously and is set at a sufficient height to allow a container to be placed below it. If the flow from the spring is not sufficient to meet demands during the day, a storage tank can be incorporated either into the structure of the spring protection or within the distribution system. This enables the flow from the spring over the period of non-use to be stored, and then used during the day to meet the demand.

Spring water can become polluted if it stands in an open pool, or flows over the ground and thus the spring should be protected, so that the water flows directly into a pipe without ever being open to pollution from outside. There are many different methods of protecting the spring to ensure tapping of the clear spring water from its source into a bucket or pipeline. Site conditions also vary from one spring source to another, which may require adaptation of the method used to meet site conditions. The essential aspects are to protect the spring water from pollution, and to arrange for it to be delivered to a suitable level so that it falls into a container (Refer to section 4.10.2 on construction of spring box and collection chamber).

The following points should be considered when investigating a potential spring source:

- Making sure that the spring is not really a stream which has gone underground and is re-emerging;
- Making sure that the source and the collecting area are not likely to be polluted by surface runoff;
- Checking that there are no latrines or livestock enclosure within 30 metres upstream of the spring;
- Fencing the area around the spring to prevent pollution by humans or livestock;
- Making sure that if the spring is to be connected to a piped water system it is on higher ground than the area to be supplied;
- Taking care that the spring tank is not built on swampy ground or on land which is subject to erosion or flooding and that the flow from the protected spring itself will not cause erosion or damage;
- Checking seasonal changes to turbidity which could indicate contamination of source.

Table 14 : Advantages and disadvantages of spring sources

Advantages	Disadvantages
• If spring source is at an elevation above the school, a gravity scheme can be adopted • Quality of water is usually good • Low maintenance cost	• Yield subject to seasonality and therefore may not be reliable during dry seasons • Spring could disappear

d) Hand-Dug Wells

A hand dug well is the traditional and most commonly used means of drawing groundwater in rural areas. Because they are dug by hand, their construction is restricted in depth and to suitable types of ground, such as clays, sands, gravels and mixed soils where only small boulders are encountered. Some communities use the skill and knowledge of local well-diggers. Hand dug wells rely on infiltration from the underground aquifers. In some areas hand dug wells are used to obtain water from pans, dams, sub-surface and sand dams through infiltration.

The volume of the water in the well below the standing water table acts as a reservoir, which can meet demands during periods of abstraction in the course of the day and should replenish itself during periods when there is no abstraction.

In unstable ground, the walls of the well must be lined to protect it against possible collapse. Some of the methods of lining hand dug wells include the following:

- Use of precast concrete rings;
- Reinforced concrete or ferro-cement cast in situ above water line, concrete rings sunk below the water line;
- Masonry lining of burnt bricks above water line, caisson made of blocks with cutting ring below water line;
- Galvanised iron rings bolted together as temporary measure for emergencies;
- Plastic rings bolted together. These are manufactured in Kenya by several of the PVC tank manufacturers.

When siting the wells, it should be ensured that there is no latrine or livestock enclosure within 30 metres radius of the well. The selected area should also not be prone to flooding and in cases where there is risk of flooding,

measures should be taken to control runoff water from getting into the well. This may include building the well head above the expected flood level.

A hand dug well should be protected (capped) to prevent contamination and equipped with a suitable pumping system which may be a handpump or an electric submersible pump depending on depth. The advent of electricity in most Kenyan schools means that a small electrical submersible pump is a legitimate option although a solar system, despite higher capital cost, would reduce the operational costs.

Any hand-dug well that is not capped should be fenced to control access and ensure the safety of the children.

Table 15 : Advantages and disadvantages of hand dug wells

Advantages	Disadvantages
• Quality of water is usually good but should be tested • Low capital and maintenance cost • Simple technology that can be implemented using local labour	• Affected by seasonality and therefore may not be reliable during dry seasons • Pumping system must be maintained

e) Boreholes

Boreholes are usually deep wells mechanically drilled into the ground. They require proper siting by a MWI registered hydro-geologist and drilling and equipping is carried out by MWI registered borehole drillers.

Boreholes generally offer good quality water with regard to biological characteristics. Depending on the formations that are drilled through, the borehole water may have high mineral content and undesirable chemical properties. Analysis of water quality is a WRA requirement when the borehole is drilled.

Almost all boreholes will require some sort of pump to extract the water. Various wind, solar, electric and mechanical options are available and can be recommended by the driller or hydrogeologist who carried out the siting work. Because of the need for pumps, boreholes can be expensive to operate.

Boreholes do require licencing by the Water Resource Authority (WRA). The early involvement of WRA in any borehole development is highly recommended.

Table 16 : Advantages and disadvantages of boreholes

Advantages	Disadvantages
• Quality of water is usually good biologically speaking • Generally have a reliable yield that does not fluctuate	• Risk of dry strike • May have poor chemical water quality • High pumping costs • High capital costs • Can be prone to prolonged breakdowns

4.5 Conveyance Systems

Conveyance refers to the mechanism through which water is carried from the source to the point of storage, distribution and use so that the water is more accessible and convenient to use. Typically a piped system is used to convey the water from the source to the school.

In the absence of a conveyance system, water is typically drawn at the source and transported by jerry can or water bowser to the school. In many instances the school children are used to transport water to the school or have to go to the source to make use of it. While this reduces the cost of investing in a distribution system it compromises on the convenience of accessing the water close to the point of use and requires time and physical energy to carry the water from the source to the point of use. Using the children to carry water to the school or requiring the children to access the water at the source (where source is outside school vicinity) should be considered as an option of last resort.

4.5.1 Pipeline System

Piped Schemes can either be pumped schemes, gravity fed schemes or a combination thereof.

Gravity Schemes: A gravity-fed supply system uses the benefit of sources located upstream of the users. The advantage is that, using the force of gravity, water can be conveyed by pipework to water points placed closer or within the school without use of mechanical force thus eliminating the effort required in carrying water a long way and or the pumping costs of shifting water.

The capital costs of piped gravity schemes can be high due mainly to the cost of long pipelines from the source down to the school and partly to the cost of providing storage facilities. Running costs are usually low, with regular maintenance needed only for replacing taps, cleaning intakes screens, fixing pipe leaks, etc. Reliability is usually high and consequently the level of service provided is good.

The usual components of a gravity scheme are the source, main pipeline, storage and break-pressure tanks, distribution pipelines and the water points.

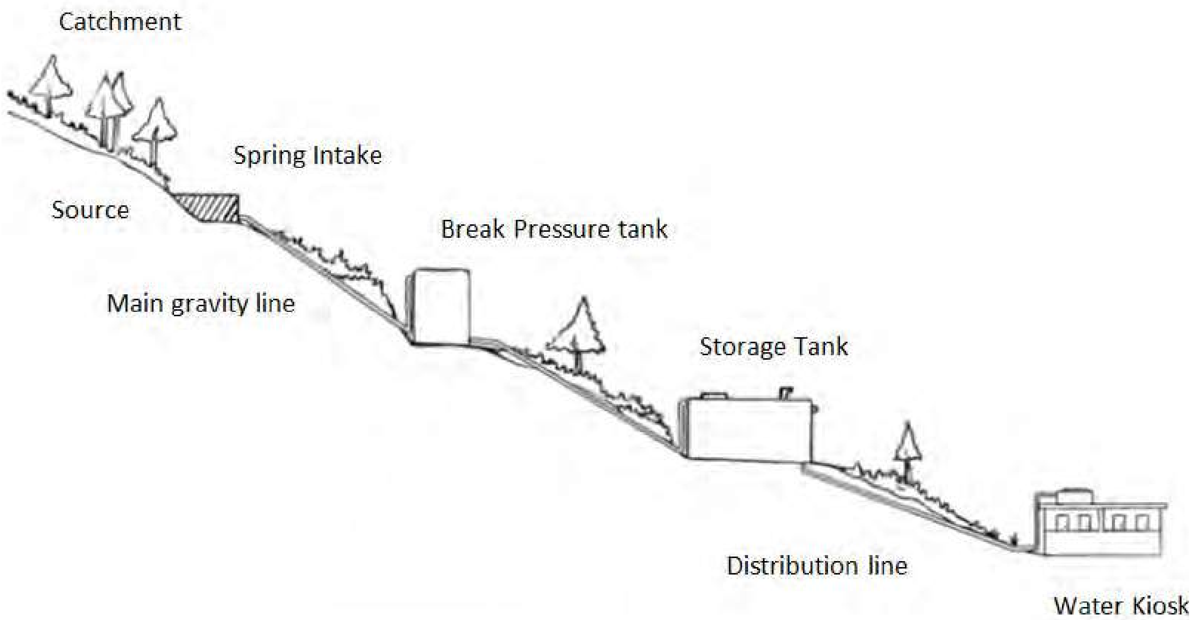


Figure 2: Typical Gravity Scheme

Pumped Scheme: Pumped schemes use mechanical energy to lift water from the source to be conveyed to the school. Water is pumped into storage tanks for distribution and use. Pumped schemes are generally more expensive to operate and maintain and require regular attendance by skilled manpower. Electrical power for pumping could be obtained from the national power grid, a diesel or petrol generator, wind turbines or solar panels. The operation and maintenance cost of a pumped scheme should be assessed before this option is adopted because the system will fail if the pumping costs are not affordable.

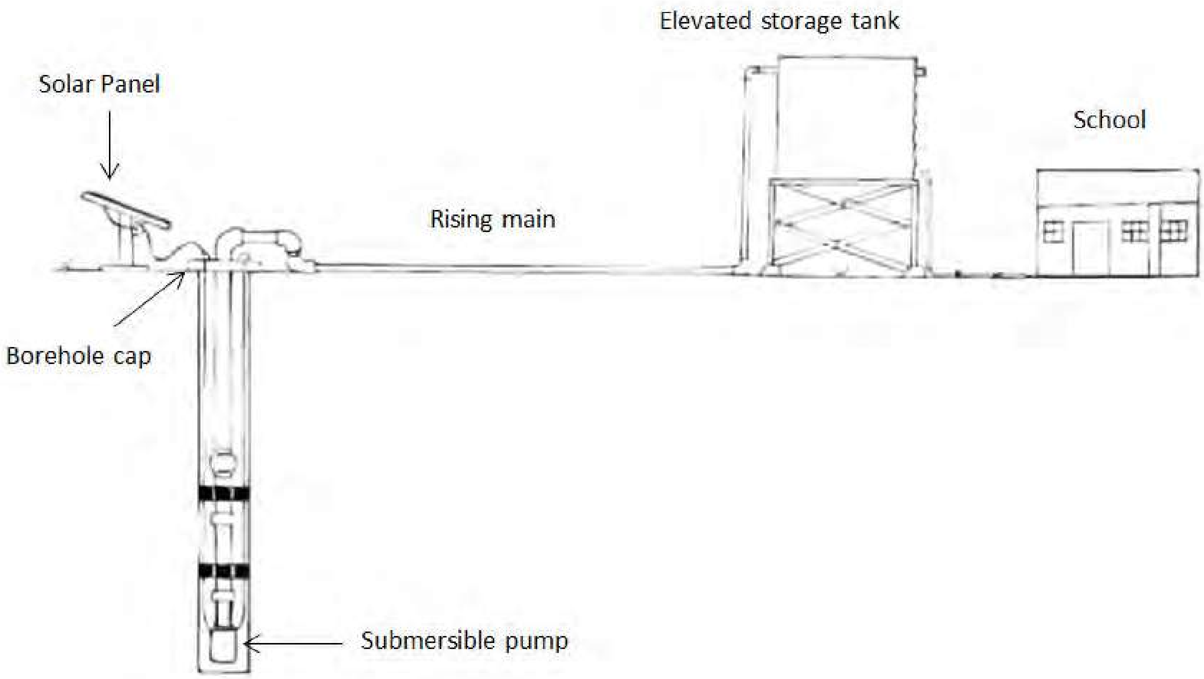


Figure 3 : Typical Solar Pumping Scheme

Combined gravity and pumping scheme: In this type of scheme, water is supplied by a combination of pumping and gravity systems. Depending on the location of the source in relation to the distribution area (higher or lower), water may for example be pumped from source to a storage tank and distributed to the school via gravity or vice versa. Most schools with any sort of conveyance system will be a combined gravity/pumped scheme.

In all piped schemes, adequate pressure should be available in all points of the distribution system, even at the remotest spots. The desired pressure depends upon different factors such as the height to which water is required to be supplied among others.

Key Components of Piped Schemes include:
- Pipes;
- Pipe fittings such as tees, elbows;
- Valves;
- Wash-outs, air valves and consumption meters;
- Pipeline markers.

For all but the most basic piped systems, a proper design that looks at pipe materials, pipe sizes, expected pressure, soil conditions, water quality etc. should be carried out by a competent engineer.

Pipe materials commonly found in Kenya include galvanized iron pipes, uPVC plastic pipes and HDPE plastic pipes. Pipes are manufactured to different specification with different wall thickness, sometime referred to pipe classes. The ability to undertake and cost associated with maintenance and repairs must also be considered when choosing pipe materials. Cheaper materials do not usually result in cheaper operation and maintenance costs and can adversely affect reliability of supply.

4.5.2 Pumps

These are devices used for lifting water from the source or storage to the point of use, storage tank or distribution system. There exist various types of pumps with the two main differences being their operation mechanism and how they are powered.

a) Hand Pumps

Hand pumps are commonly used in school setups owing to their low cost of installation and maintenance. Hand pumps are simple devices which use human power and mechanical advantage to move groundwater from an underground water source to the ground surface. While they are most suitable for shallow wells, certain types (India Mark II and Duba) can be used on deeper wells.

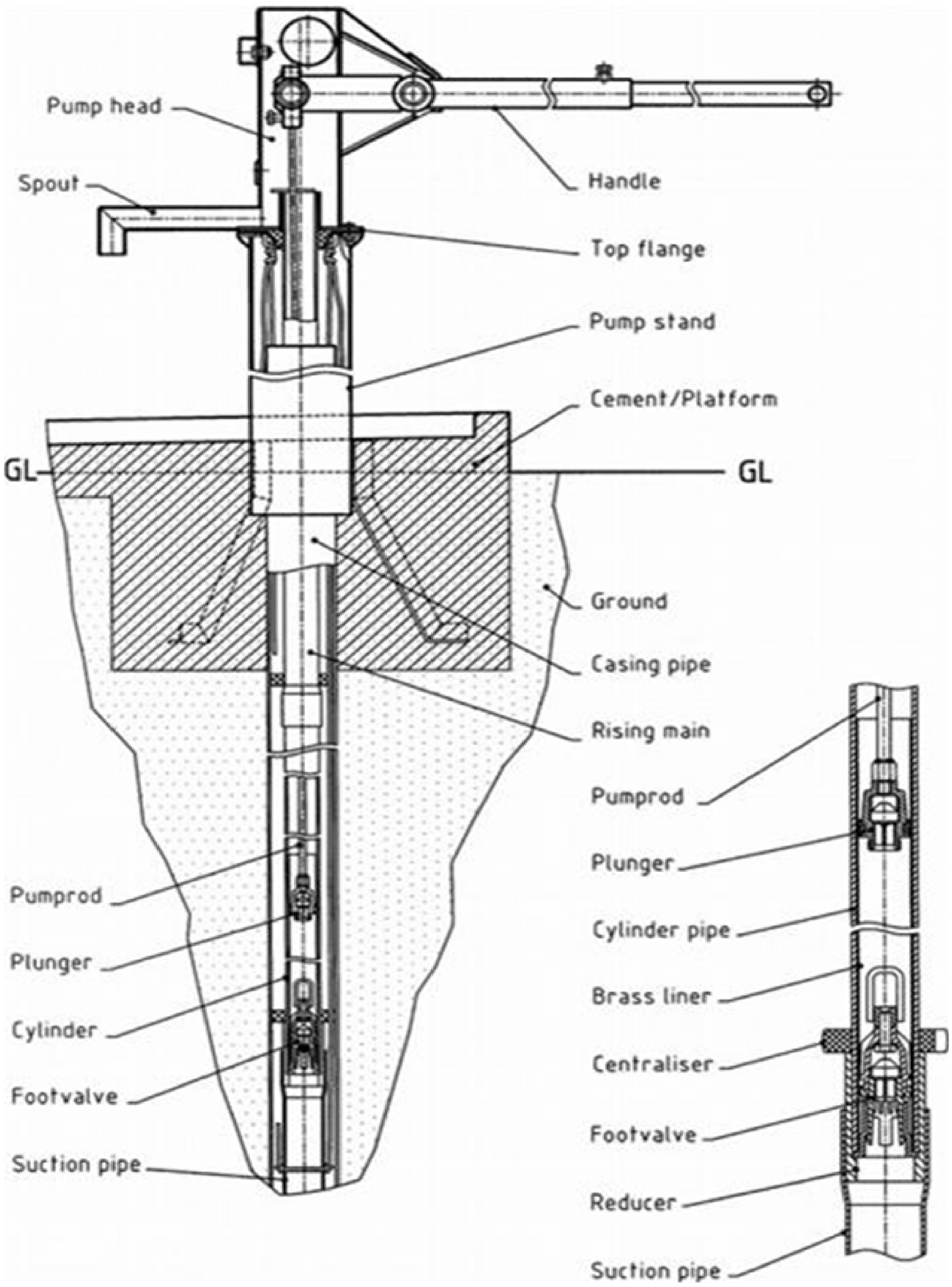


Figure 4 : Schematic of Handpump

A good well and hand pump system should meet the following conditions:

- Has access to sufficient quality and quantity of safe water in accordance with water services and public health guidelines;
- The type of pump is appropriate for depth of static and dynamic water level and discharge of the particular well;
- Has a well-constructed platform/apron that permits water to drain rapidly and safely to prevent other public health issues. Surface water diversion ditches can also be considered to protect against inundation;
- Protects the well water from contamination from surfacepollutants;
- Can easily be maintained and repaired locally (spare parts are readily available);
- Easy to maintain and operate by the school.

Some of the common brands of hand pumps available in the Kenyan market include Duba, India Mark II and Afridev. Advice should be sought from sub-county or county water offices regarding the selection of the most suitable handpump option.

The Duba hand pumps have no reciprocating movement in its mechanism; all moving parts either rotate or oscillate, and have roller bearings. They can be used for very deep wells and can discharge against a positive head of up to 20m if required which means the water can be raised into an elevated tank. The pump can be easily equipped with an electrical motor, or diesel engine.

The India Mark II Pump works on the positive displacement principle; hence the discharge remains constant irrespective of the depth of bore. It is suitable for a depth of up to 70 Meters and is thus a suitable option for deeper wells.

The Afridev Pump is a conventional lever action hand pump. The configuration includes an “open top” cylinder: This pump is designed with a “working barrel” which allows the piston to be extracted without removing the rising main. The Afridev hand pump can pump water from up to 45-60 meters below ground surface.

Note for depths above 30m handpumps can be difficult to operate and so may not be a suitable option for school children.

b) Submersible Electric Pumps

The advent of electricity in most schools in Kenya means that submersible electric pumps are legitimate options to raise water from shallow wells or boreholes to surface or elevated tanks or to distribute water within the school distribution system. A range of different submersible electric pumps are available from suppliers. The school can be advised on the choice of pump appropriate to the water quality, depth and well/borehole conditions.

The school can consider using solar powered pumps. These should be designed as a package to ensure that the solar array is appropriate to the pump requirements. Suppliers should be consulted on the most suitable pump and associated solar array for the well or borehole conditions.

Diesel or petrol generators can also be used to generate power for submersible electric pumps. The school should seek advice to determine the most appropriate generator for their needs. The operation and maintenance costs of running a generator should not be underestimated as the reliability of the generator is critical to the reliability of the water supply.

4.6 Storage

4.6.1 Minimum Storage Requirement

Storage of water serves to ensure water supply reliability during peak demand periods and also during periods when the source supply is disrupted. Each school should maintain storage in the school sufficient to meet at least one week of supply (5 days x total daily water demand m3). This means that when the source supply is disrupted the school can use the stored water while it makes arrangements for supply to return to normal or an alternative source is sought. The storage prevents a problem from becoming a crisis which affects learning and compromises on the health and hygiene of the school community.

A school that is relying on rainwater harvesting will need to have sufficient storage to get through each term without running out of water.

4.6.2 Storage tanks

Storage tanks can range from small portable containers up to large tanks of 150 m^3 or more at ground level, beneath ground level or elevated above ground. Tanks can also be made from a variety of materials including; concrete blocks, bricks, quarry stones, ferro-cement, plastic or steel and in various shapes with the most common shape being cylindrical. Tanks can also either be fully constructed in situ or installed (Readymade tanks).

All tanks require the following features:

- **Inlet and outlet pipes:** The inlet pipe should be located near the top of the tank. The end of the outlet pipe should be screened and should be at least 150mm above the tank floor. Below the outlet pipe, water cannot leave the tank and the area serves as a settling zone;
- **Overflow Pipe**: The overflow pipe should be located above the expected maximum water storage level. The overflow pipe should also be screened. Water that overflows from the tank should be moved away from it to prevent contamination and accumulation of standing water in which mosquito can breed. The overflow can also serve as an air vent;
- **Drainage/Washout Pipe:** A drain pipe should be installed at the bottom of the tank, to ensure adequate drainage, the floor should be sloped towards the drain. Drain pipes should not be less than 100mm so that sediments can be flushed without clogging the pipe. For plastic rainwater harvesting tanks that are installed with a first flush diverter and purely used for storing rain water the washout pipe may not be necessary;
- **Float Valve:** To control the level of water in the tank, a float valve can be fitted on the inlet pipe. If a float valve is not fitted, the operator should be trained to gauge the level of water so that there is no wastage through the overflow pipe.

Concrete, masonry and brick tanks require the following additional features:

- **Watertight manholes with tight fitting covers**: Manholes with raised covers should be installed at the top of the tank. The watertight cover prevents the entrance of dust, debris and sunlight which is a major factor in the growth of algae. The manhole can either be circular with a diameter of 0.8-1.0m or rectangular so as to be sufficient to allow access for cleaning;
- **Ventilation:** A screened ventilation pipe should be provided to allow escape of air when water enters the tank. The vent should be screened so that no insects, animals or debris can enter the tank.

Steel and plastic tanks may need to be raised above the ground level and may require a constructed base/platform. Some tanks can be installed on a levelled sandy base.

4.6.3 Types of Storage Tanks

Concrete Tanks

Concrete tanks are normally used for underground water storage or in construction of large capacity storage (normally greater than 250 m^3). The advantage of concrete tanks is that they provide very sturdy watertight storage facility that will last many years. The disadvantage of using concrete is that reinforcement steel, formwork and skilled labour is requited which is expensive. A concrete tank should only be constructed with professional engineering advice to support the siting, design and construction of the tank.

Masonry Tanks

Masonry tanks are among the common type of tanks in rural water supplies as well as in schools. The tanks are constructed from quarry stone, concrete block or bricks. The tanks are built on a reinforced concrete base and floor slab. The masonry wall is reinforced between courses using a reinforced strip or normal reinforcement steel. The advantage of masonry tanks is that they can be constructed using locally available materials and there are standardized designs in Kenya for a wide range of tanks (25, 50, 135, 150, and 225 cubic meters). The masonry tanks require properly cured waterproof cement plaster. Availability of water during construction for curing is an important factor when considering this type tank. Any masonry tank above 50 m^3 should only be undertaken by a school with professional engineering advice to ensure that the investment results in a water tight structure. (Refer to Drawing Nos 067 to 075).

Ferro-cement tanks

Ferro-cement tanks are generally smaller (less than 10 m^3) above ground level tanks constructed with a reinforced concrete base, a cylindrical wall of ferro-cement and a roof of ferro-cement, or sometimes mild steel sheeting. These are cheaper to construct than tanks made of masonry, block work, reinforced concrete etc., and do not require the rendering with waterproof cement mortar that masonry and block work often need. Ferro-cement tanks require water to be properly cured and will crack otherwise. They can be quite difficult to repair if they crack or leak.

Plastic and steel tanks

Manufactured plastic and pre-stressed steel tanks are used for elevated tanks but are also installed as ground level tanks mounted on a constructed platform. Elevated storage tanks are important both for providing storage and creating sufficient pressure in piped systems. Small elevated tanks are good for water from gravity systems where springs are the sources or where water is pumped from a well. Some areas of Kenya experience high temperatures where plastic tanks may get damaged if left empty and exposed to the sun. In these conditions, shading the tanks should be incorporated into the design of the system. (Refer to Drawing Nos 076 and 077).

4.6.4 Choice of building materials for tanks

Plastic tanks generally provide the cheapest, quickest and most reliable water proof tank to buy, transport and install. However, where these tanks cannot be used then alternative tanks should be built and consideration should be given to the type of material to be used.

The most economical way of building water tanks is to use as much locally available material in that specific region. An additional advantage is that local builders are conversant with using local materials. The choice of building materials can be decided by considering the following:

- Where coarse river sand is expensive, tanks should be built of either masonry stone, burnt bricks or soil compressed bricks to reduce cost;
- Where coarse sand is cheap, tanks can be built of ferro-cement if trained builders are available;
- Where coarse river sand, pebbles, stones and hard-core (larger stones) are in plenty, it is most economical to use concrete formwork (in situ) or concrete blocks;
- The cost of making concrete blocks can be reduced by compacting rubble stones into the concrete in the steel mould;

- Where readily available, plastic tanks which are easier and quicker to install can be considered. In hot areas however, the plastic tanks will require to be sheltered to prevent deterioration and destruction by the harsh weather conditions. The tank shelter in this case should be constructed in such a way that it provides protection for most part of the sunny day. The larger (greater than 10 m^3) diameter plastic tanks must also be installed on a concrete foundation.

In cases where there is an old or abandoned tank, it may be more economical to repair than to replace it by constructing a new tank. All types of cylindrical and spherical tanks can be repaired at a lower cost than building new ones. Repair of square and rectangular tanks are however more difficult and costly to repair.

In arid and semi-arid areas which suffer from the lack of reliable rainfall, water can be transported in tankers from reliable sources to refill school rainwater harvesting tanks to allow continuous supply of water for schools. Underground water tanks are proposed as the most appropriate tanks in these areas. The tanks should be sized to store at least a full bowser of water (15 to 20 cubic meters or more). Underground tanks should be accompanied by a hand-pump or small electric pump to raise the water to an elevated tank and onward distribution within the school.

4.7 Distribution System

It is desirable for a school to have a distribution system within the school so that the water is made available at the point of use, namely the latrines, kitchen and dining hall.

4.7.1 Ground Tank and Electric Pump

The electrification of schools means that schools can relatively cheaply install a small electric pump (0.75 Kw) to raise water from a ground or underground tank into an elevated tank to pressurise the distribution system.

Where a school relies on a piped scheme which provides an intermittent supply or the pressure head is very low, then a tank at or below ground level can be used to collect the water. This may also apply at a school that relies on rainwater harvesting where the rainwater tanks can deliver water to the pump for onward use within the distribution system.

The ground tank may also serve as a collection point if a school has resorted to getting the children to bring water to school.

4.7.2 Elevated Tank

The water in the distribution system must have a pressure head in order to reach the different points within the school. This can be achieved if the tank ("header tank") feeding the distribution in the school is 5 to 10 m above the ground level in the school. If the school is located in a hilly area, the header tank can be a ground tank located above the school. Where the area is flat, the school can place a 10 m^3 tank (plastic or GS) on a 5m elevated platform made of galvanised steel or timber poles and deck (Refer to Drawing Nos 076 and 077).

4.8 Point of Use

Water is needed at the points of use which are the latrines, kitchen, dining hall and shower block for boarding schools. A school may also need standpipes where water can be drawn for general cleaning and laundry purposes. Further details on hand washing stations are provided in Section 6.2.

Water for drinking should be available at a central location to support supervised drinking, and at the dining hall and kitchen so that students and staff can access the safe water.

Water points should allow easy access to water even at peak times of use. This means that the handwashing stations should be located at the places where handwashing is needed (latrines, dining hall), should positioned at a

height that children of different ages and abilities can access and control to avoid wastage. The hand washing stations should be well drained and should have valves installed to shut off water flow and allow repair of taps and tap-stands. For hand washing facilities that are integrated in the sanitation facility a ratio of 1 tap to every 25 students is recommended.

4.9 Water Quality Testing, Disinfection and Documentation

4.9.1 Water Quality Testing

One of the most critical requirements of water especially for human consumption purposes is quality which has been discussed in **Section 4.2.** Water quality is established through water quality testing and the aim of testing is usually to compare water samples with the indicators for bacteriological, chemical and physical quality of water.

When selecting a source, collection and analysis of water samples from the various alternative sources can aid in decision making on the best source to be considered for supply. In the case of schools, an uncontaminated source is considered the best option as it eliminates the need for water treatment. Water quality samples are also one of the requirements for authorization by WRA for water source development works.

Upon completion of drilling or construction of a water supply system the water must also be tested. For new well and boreholes, the sample should be taken after at least 24hours of pumping. It is important to carry out both biological and chemical analysis unless it is clear that only one of the two is of interest in a particular case. The consultant supervising the contractor is a great resource person in this case and the school can discuss the results as well as seek advice on necessary remedial actions where there are water quality concerns.

In the cases where schools are connected to a piped supply, it is the responsibility of the water service provider to undertake frequent water testing as per the requirements for water supply companies in Kenya as specified by WASREB. Where the school has its own source, then it is the responsibility of the school to ensure periodical collection and analysis of samples to ensure the quality of the water supplied to the school. The sample should be taken from the source, storage and at various points of the distribution system. For protected sources, frequent analysis may not be necessary unless there is a particular change in the environment such as increase of latrines in the area, flooding, e.t.c.

Particular attention should be paid to the fluoride level as high fluoride levels occur in many of the groundwater sources in Kenya.

4.9.2 Water Treatment

It is preferable to select a water source which does not require water treatment except for disinfection as water treatment may place an unaffordable cost and management burden on the school.

One option is for a school to separate water for drinking, based on a source that only requires disinfection (e.g. rainwater) from water for general purposes (cleaning, flushing toilets, bathing, laundry, anal cleansing, etc). This requires careful management of the good quality water as it is much easier to find alternative sources for the general purpose water.

Water treatment, if required, must be based on a detailed water quality analysis of the source water.

A full water treatment system typically involves the application of chemical coagulants to induce flocculation and control the pH, a settlement pond, a sand filtration chamber to remove the flocs, and a disinfection chamber plus a pumping system to backwash the sand filter. A full water treatment system is suitable for very turbid water (e.g. from rivers, dams, pans) but may not be appropriate where the water quality indicates high level of inorganic contaminants.

Storage of high turbidity water can improve the quality as the tank provides an opportunity for sedimentation. This does not however reduce the colloidal material.

A rapid sand filter is typically a pumped system in which the water is passed through a sand medium of specific granular size. Arrangements are provided for frequent backwashing of the sand medium. There are a number of commercial products available in the market and expert advice should be sought to specify the most suitable product for the school source water and demand.

A slow sand filter is an option where the source water has good chemical properties but has some turbidity (less than 10 NTU). The slow sand filter passes water by gravity through a specially designed sand medium. Slow sand filters require larger structures than rapid sand filters but are generally cheaper on operating costs. Again, expert advice is recommended to design a slow sand filter to meet the specific conditions at a school.

Reverse osmosis ("RO") systems are suitable where the water quality has low turbidity but a high level of in-organic elements (e.g. borehole waters). RO systems involve pumping the water through a membrane cartridge which is periodically replaced. RO systems can be expensive to purchase and run and require a regular power supply.

High fluoride waters require specific consideration as children are particularly vulnerable to high fluoride waters that can cause fluorosis (discolouration of teeth, skeletal weakness). RO systems can be used to remove fluoride. Other approaches can be used to remove fluoride from source water (e.g. bone-char) which offer cheaper and more robust systems for application in homes and institutions. Expert advice is recommended to establish what is the most suitable arrangement for a particular school.

A variety of water filters/purifiers (e.g. membrane filters) are commercially available and can be used to disinfect drinking water. Suppliers should be consulted to determine the most suitable option for a particular school population, quality and pressure of source water, and availability of power.

4.9.3 Disinfection

Since the source options recommended for schools are generally safe, disinfection may not be necessary for all but the drinking water. However, construction, repair and cleaning of water supply infrastructure can introduce contaminants into the water. Additionally, there are also quite a number of schools that do not have access to a safe source of water necessitating disinfection to destroy any harmful pathogens in the water. Disinfection particularly deals with pathogenic components present in low volumes and where there are other water quality concerns then other options of water treatment would be applicable. In such a case, because the school may not have the infrastructure and resources to undertake water treatment, then that particular source can be used for general cleaning, bathing and laundry purposes and an alternative source for drinking water must considered.

Basic disinfection systems consist of treating the drinking water with a disinfectant liquid (usually a mild chlorine solution) or tablets. The dilution ratio between the disinfectant and source water will be specified by the manufacturer. Schools are recommended to seek specialised advice to determine that the disinfection system appropriate for the source waters.

Remedial actions can be temporary or long-term depending on the cause of the contamination. Some of the long term actions include eliminating source contamination and treating the water.

In cases where water for drinking purposes is obtained from vendors or delivered to schools by pupils, since the school may not be certain of the sources the water was obtained from, simple disinfection must be done.

Schools should otherwise focus on sustainable water quality that places primary emphasis on preventing or reducing the entry of pathogens into the water sources such that simple disinfection is sufficient to remove any pathogens.

4.10 Design and Construction of Selected Water Facilities

4.10.1 Rainwater Harvesting System

Determining the storage required for a rainwater harvesting system is a function of the rainfall pattern, roof area and water demand. However it is possible to calculate how much water might be harvested from the roof area in any given rainy season, assuming a 90% runoff coefficient for a "mabati" roof and 40% of total mean annual rainfall is a reasonable reflection of a seasonal rainfall total.

RWH Vol (m^3) = 90% Runoff Coefficient x Roof Area (m^2) x 40% mean annual rainfall (mm)/1000

This total volume can be harvested into a number of smaller tanks in such a way that the school incrementally develops more storage and improves the reliability of its water supply system.

Installation of a rainwater harvesting system:

- **Roof catchment.** These should be made of galvanised metal sheet or "mabati" which are impervious. Fascia boards should be included so that the gutters can be firmly attached to the roof.

- **Gutters and down spouts.**
  - Gutters can be made from GS or PVC. PVC gutters and fittings are now more common and cheaper with easy-to-fit connector pieces. The gutters should be fixed at a gradient leading to an end piece with a down spout.
  - Gutters should be fixed for the maximum length possible to collect as much rainwater as possible;
  - An elbow can be attached to the down spout to direct the water to the storage tank;
  - Cleaning gutters is essential at least twice per year (just before each rainy season);

- **Leaf screens and first flush diverters**
  - There are no easy standard first flush systems. The best local option is to install a tee piece to the horizontal pipe from the gutter to the tank. A vertical piece of heavy gauge PVC pipe is attached to the tee with an elbow at the bottom which has a nipple and screwed end cap. If the end cap is open then the rainwater will flow into the vertical pipe and be discharged to the ground. If the end pipe is closed the vertical pipe will fill and water will then flow into the storage tank.

- **Storage tank**
  - The siting of the storage tank should consider the level of the gutter and downspout.
- **Drawoff points**
  - Draw off points should be located away and below the tank so that the water can easily be drawn into a jerry can or bucket;
  - Draw off points should be provided with proper drainage so that water does not stagnate around the drawoff point.

4.10.2 Spring Protection

To protect a spring, dig back into the hillside to the water bearing layer where the water is flowing from the "eye" of the spring and install a collecting chamber or "spring box" around the eye. Care should be taken not to dig too far into the impervious layer, as that may result in the water seeping downwards so that the spring disappears.

The outlet/delivery pipe should be at least 10cm above the bottom of the spring box, but below the eye of the spring if possible. If the water level in the spring box is too high, silt may settle over the eye and block it up. The end of the outlet-pipe inside the box should be covered with a screen, to prevent stones, rubbish and frogs from blocking the pipe.

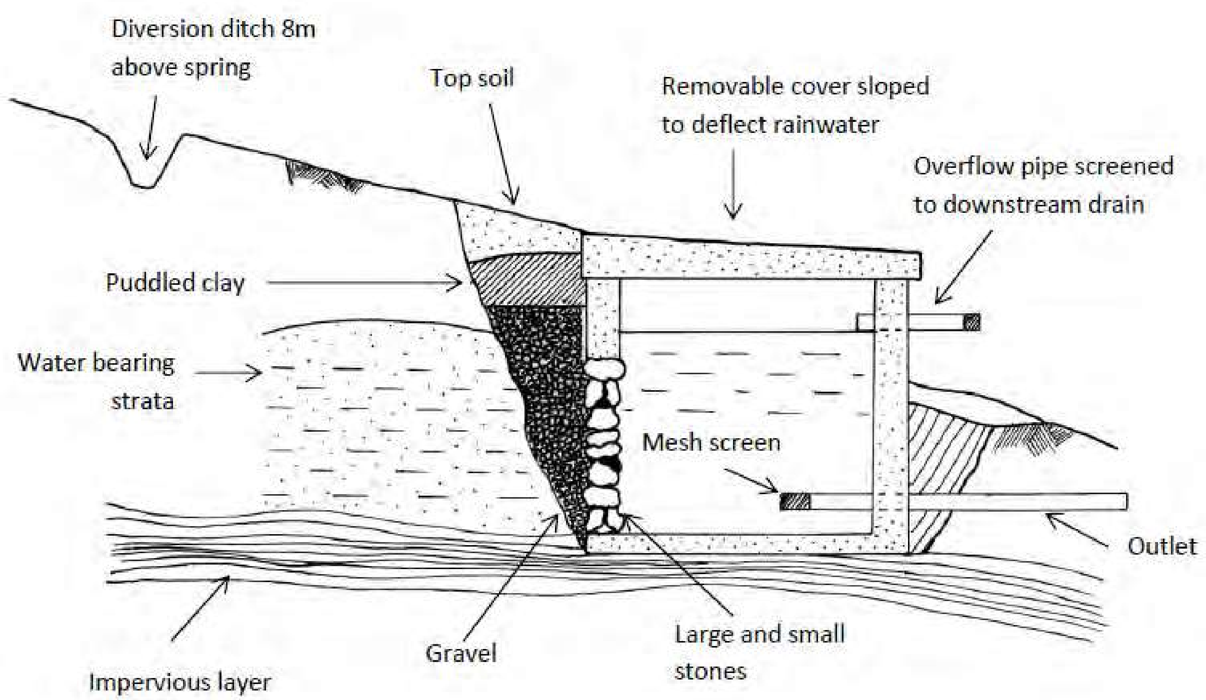


Figure 5: Spring Protection, Complete, Section View

There should also be an overflow pipe which is big enough to carry the maximum flow of the spring in the wet season. This pipe should be below the eye of the spring if possible. The top of the spring box should be at least 30cm above the ground to prevent surface water running into it.

The box should be covered with a concrete slab and should preferably have an access hole to enable cleaning. The hole should have a raised edge to prevent surface water running into the box.

The space behind the competed spring box should be filled with soil and at the bottom, level with the eye the space should be filled with gravel or sand at least as coarse as the water bearing layer. Further up, it should be made water tight with either cement or puddle clay to prevent surface water running down the outside wall and into the box. The spring box should then be scrubbed with bleach solution to sterilize it.

A ditch should be dug at least 8m up hill and around on each side of the spring box to direct surface water away and prevent pollution of the spring water. The soil from the ditch should be piled up the downhill side of the ditch, to make a ridge or “bund”, which will help to keep away surface water.

A fence or prickly hedge can be erected on top of the bund to help to keep people and animals away.

4.10.3 Hand Dug Wells

The diameter of a dug well should be at least 1.2m to allow digging and the well should be dug at least 3m below the expected lowest water level. Excavation is done from the inside unless there is very loose soil in thick layers where methods such as hand drilling can be used.

In areas with unstable soils, the wells need to be lined with brick, stone masonry, plastic rings, concrete rings cast in-situ or pre-cast concrete rings. In consolidated ground the well may stand unlined but the upper part (1.5m) should always have a lining. The section of the well penetrating the aquifer requires a lining with openings or perforations to allow the groundwater to enter. Any backfilling at the same level as the aquifer should be made with gravel.

However in fine sand aquifers the lining should be without perforations and the groundwater should enter only through the bottom of the well. The bottom should be covered with graded gravel.

The wall lining should be extended approximately 0.5m above the ground to form a wall round the well. A concrete apron should be constructed on the ground surface extending about 2m all around the well. The well top should be sealed with a watertight slab.

4.10.4 Boreholes

Borehole design should be done by a registered hydrogeologist. WRMA can assist in recommending a local expert. Borehole drilling, casing and equipping should be done by a registered drilling contractor.

The school should obtain and keep accurate records including:
- The borehole siting report from hydrogeologist;
- The driller report (WRA Form 009) from drilling company;
- Test Pumping Report from drilling company;
- Borehole Completion Report;
- The borehole permit from WRA;
- Details for pump and pump placement (from supplier);
- Details of water use (monthly) (from water meter);
- EIA Report (from EIA Expert);

4.10.5 Additional Details

Additional details on design and construction of water supplies can be found in the “Practice Manual for Water Supply Services in Kenya” Ministry of Water 2005 and “Project Unit Costing” Water Services Trust Fund 2011.

Chapter 5

Sanitation Facilities

5.1 Introduction

Sanitation is defined as those interventions that improve the management of excreta.[2] In this chapter, this definition has been expanded to encompass wastewater management in primary and ECDE centres.

In order to provide a conducive learning environment for pupils and prevent the spread of faecal-orally transmitted diseases, sanitation standards need to be upheld in the school setting. All schools should have enough (for pupils they should meet the recommended pupil to toilet ratio (PTR)), appropriate and inclusive sanitation facilities for boys, girls, teachers and other workers, including those living with disabilities.

In Kenya, sanitation facilities in most primary and ECDE schools are not adequate compared to the enrolment rates which can be partly attributed to the FPE programme that began in 2003. Other factors contributing to inadequacy of sanitation facilities include: low priority given to WASH facilities by the school BOM, high cost of sanitation infrastructure based on available designs, poorly constructed infrastructure and unfavourable environmental factors.

Wastewater management is also a major concern in schools especially those with water closet toilets, food preparation areas and boarding facilities.

5.2 Standards and Basic Principles

5.2.1 Standards

The national school health guidelines with regard to sanitation require that[3]:

- All schools should have adequate sanitation facilities as per the requirement of the Building Code and Public Health and Education Acts;
- Construction of sanitation facilities should be done in line with relevant laws;
- The toilet facilities provided should have separate provisions for boys and girls and where possible, the sites should be separate;
- The design of the sanitary facilities should take cognizance of children with special needs, gender and age especially their aperture design;

2 WSSCC and WHO (2005), Sanitation and Hygiene Promotion: Programming Guidance, Geneva, Switzerland

3 Government of Kenya, Ministry of Public Health and Ministry of Education (2010), National School Health Guidelines

- The technology used should be appropriate and affordable;
- Where possible, locally available materials should be considered for construction. However, quality should be upheld in all cases;
- The facilities should be designed for easy cleaning and maintenance;
- The facilities should provide privacy;
- Appropriate sanitary bins (where possible pedal operated) should be provided within the facilities for disposal of sanitary towels.
- There should be a proper mechanism for final hygienic collection and disposal of used sanitary pads/towels e.g. through proper incineration.

In addition to the above guidelines, it is recommended in terms of pupil toilet ratio that: 1 toilet door should be used by 25 girls and 1 toilet door and a urinal should be used by 30 boys.

5.2.2 Basic principles

The design of the toilets should meet the following principles: be child-friendly, be gender-sensitive, be environmentally safe and be cost-effective. The design factors discussed below aim to deliver on these principles.

The sanitation design options to be selected for a given school should take into consideration several factors including:

- Siting. Toilets for boys, girls, ECDE, and staff should be separated to improve privacy and supervision for ECDEs. Siting of toilets and urinals is discussed in more details below. Advice from the Ministry of Health can be sought if needed;
- Water supply. The quantity and reliability of water supply will influence the choice of toilet. Schools with limited and/or unreliable water should not use water closets as these require sufficient water to work properly. Cultural/religious practices may also influence the method of anal cleansing which will influence the choice of toilet type;
- Subsurface conditions. Latrine construction in stable soils require only the top of the pit to be lined whereas unstable soils require the entire wall of the pit to be properly lined to provide stability to the structure. Rocky or high water table conditions will require the slab to be raised to provide sufficient volume in the pit;
- Superstructure. The superstructure should meet certain specifications as in a proper slab, adequate space, appropriate squatting hole size, properly positioned footrest, walls and doors for privacy, door features suitable to child heights. However, the material for walling and roofing may be dictated by the budget and availability of local materials.
- Economy. In the past most latrines have been placed over a deep (>10m) pit with the expectation that the structure will be decommissioned when the pit is full. This has resulted in many abandoned latrines and generally relies on the 'use and dispose' approach. Investments in the structures are lost once the pit is full.

The alternative approach which has been adopted in this document is a 'reuse' approach whereby the pits are built specifically to be exhausted and reused. This protects the investment in the substructure from being lost. The superstructure can be improved over time if needed to spread capital costs.

A decision tree is provided in Figure 7 to assist in the choice of latrine design.

Specific factors to consider in the siting of toilets and urinals are:

i. **Security and safety:** The location of the toilets should provide safety and comfort to the pupils. All schools should provide a proper fence to secure the school from trespassers as well as secure the facilities within the school. They should also be located away from any potential hazards e.g. flood plains, electric lines, refuse dumping areas;
ii. **Accessibility:** Pupils should be able to use the toilets at all times including during rainy weather or at night. Access should also address the recommended PTR and distance from classrooms and boarding facilities;

iii. **Privacy:** There is need for provision of privacy when entering and using the toilets especially among girls. The facilities should have lockable doors and proper screening walls at least 1.5m in height. They should also be clearly labelled according to gender;
   - **Usability:** In order to promote handwashing after toilet use, handwashing facilities should be situated near the toilets. Waste dumping sites should not be situated close to latrines to discourage movement of vermin from the refuse to the toilet which may discourage use of toilets by pupils;
   - **Pollution:** Latrines should be located at least 30m away from and downhill from water sources such as shallow wells to prevent contamination of these water sources. This is explained in Chapter 4 under subsection 4.4.3 Siting.

vi. **Vandalism:** One way to address this challenge is to lock the facilities after the school hours. Another way is to involve the neighbouring households at the planning stage of developing the facilities. The neighbouring community should be empowered to protect the established facilities;

vii. **Pupil Participation:** Children should be involved in the decision on siting of the toilets and paintwork to be done. They should also be involved in the operation and maintenance of the facilities to ensure proper use and cleaning of the facilities.

It is also important to consult the local Public Health Office for further guidance on siting of the facilities.

5.3 Basic Latrine

A basic latrine in the school setting consists of a squatting concrete slab over a well-sized pit with a superstructure made of iron sheets, timber, brick or masonry walling. Having a concrete slab promotes durability of the latrine, seals off the pit and makes it easier to clean. The squatting hole should be small enough for safety and big enough to promote easy use and cleanliness. Appropriate footrest and position of the squatting hole will also promote easy use of the latrine. The surface of the slab should be self-cleansing such that wastewater during cleaning and urine can drain easily into the pit. Preformed plastic slabs are also available from various manufacturers in Kenya and these can be used in place of a concrete slab.

Basic latrines should only be considered as temporary measures and where possible improved sanitation options described in Section 5.4 to 5.9 should be used.

5.4 VIP latrine

Ventilated Improved Pit (VIP) latrine is common and applicable in rural and peri-urban school settings. It consists of a reinforced concrete slab, squatting hole, footrest, a vent pipe, a permanent superstructure, doors and roofing over latrine cubicles. As the name suggests, the latrine design promotes ventilation by having in place a vent pipe. The orientation of the latrine should be such that the prevailing wind blows through the entrance. This together with the wind blowing above the vent pipe draws air from the pit and reduces the odour. The fly density in this latrine is reduced by keeping the inside of the superstructure in subdued light. Hence flies breeding in the pit are attracted to the light emanating from the top of the vent pipe. They pass up the pipe and if the fly screen is intact, they die and fall back into the pit. Steel fly screen quickly corrodes from the gases emanating from the pit latrine. Therefore, plastic mesh should be used as an alternative to address this challenge.

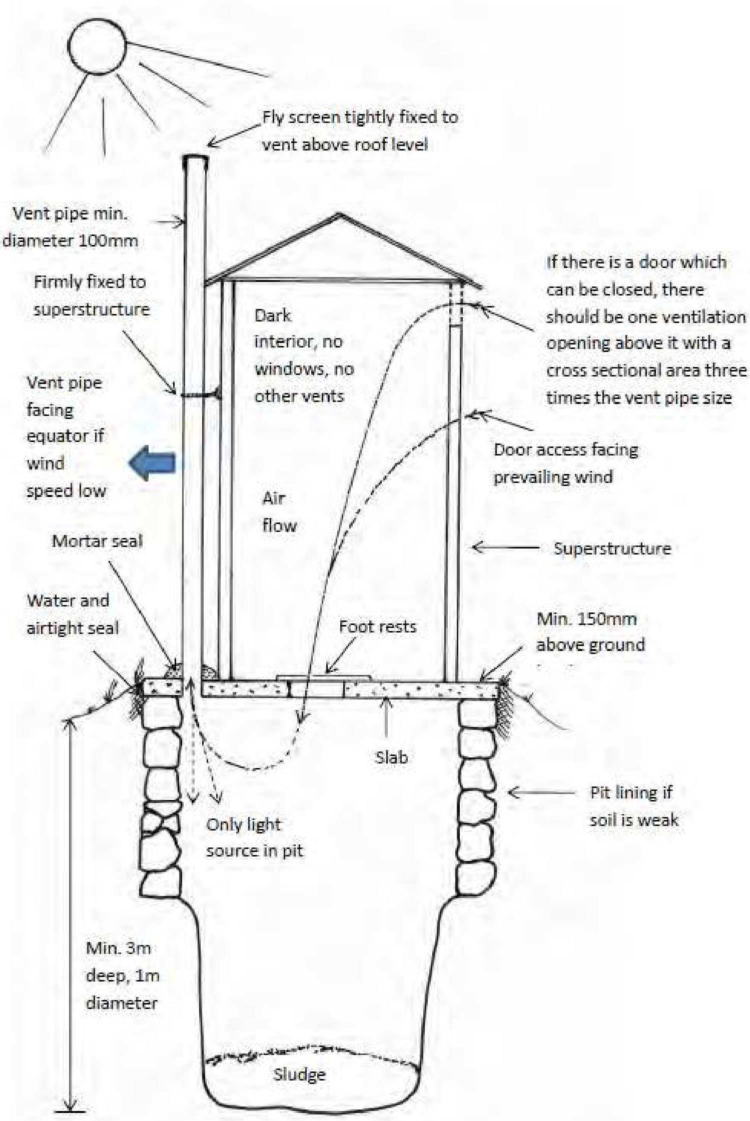


Figure 6: Side elevation showing the key components of a VIP latrine

From field observations PVC vent pipes situated outside the latrine block are predisposed to breakages due to vandalism by children. Therefore, it is essential to use heavy gauge PVC pipes. Locating the vent pipe inside the latrine should be discouraged as effective air movement is aided by the heating of the vent pipe from direct sunlight. The vent pipe should also not flush with the slab but there should be an allowance of 150mm below the slab to attract flies to the pipe.

The VIP latrine is a suitable option in places with deep groundwater, stable soil structure, non-rocky soil profile, water scarcity and low risk of flooding.

If built with proper lining and well managed, it can be easily exhausted. The designs presented in this document are all suitable for exhausting when the pits are full so that the infrastructure can be used for a long time if maintained properly.

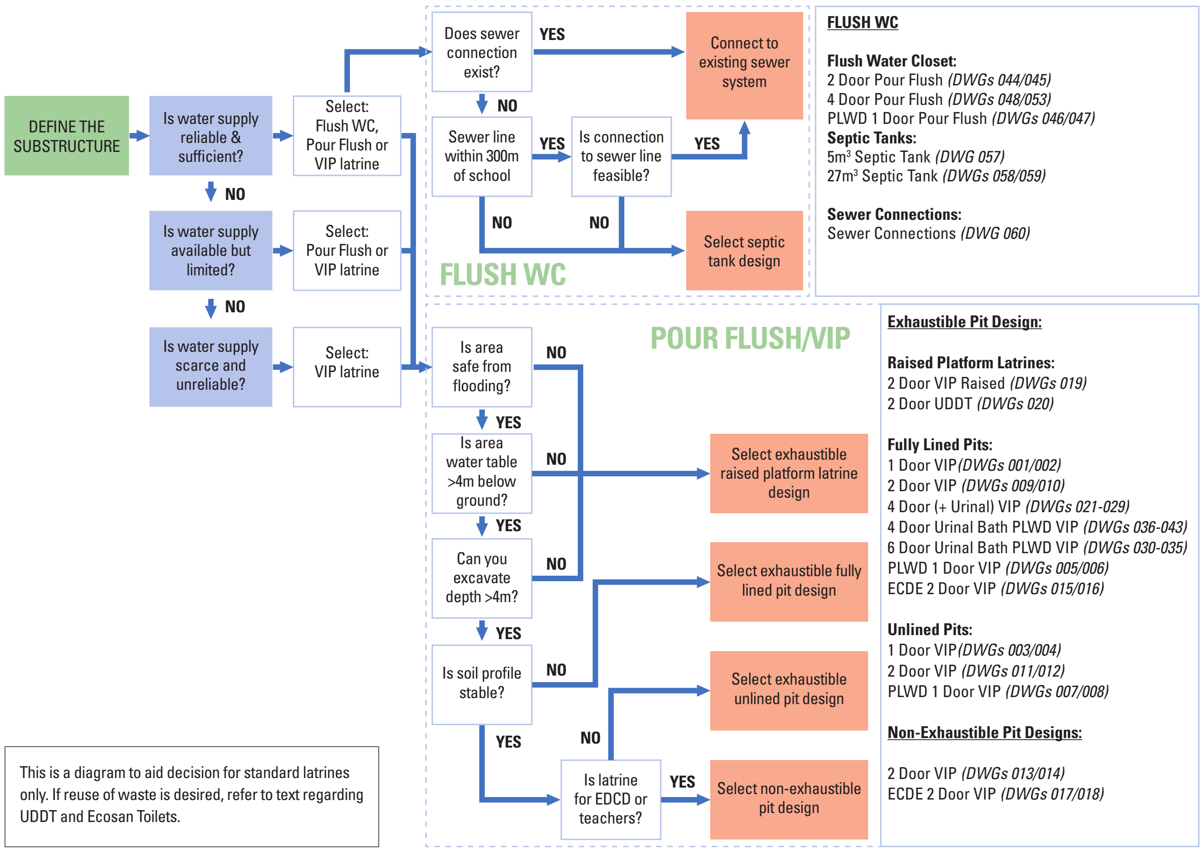


Figure 7: Decision Tree for Latrine Design Selection

5.4.1 Design Standards for Pit Latrine

The design features set out below aim to provide latrines that meet the requirements of safety, durability, appropriateness, and economy.

- **Facility Layout:** A layout that provides six latrine cubicles, one PLWD latrine cubicle, two concrete hand washing basins and a shower is proposed for the girls' facilities (See Drawing Nos. 030 – 032). A similar layout with five latrine cubicles, one PLWD latrine cubicle, two concrete hand washing basins and urinal is proposed for the boys' facility (See Drawing No. 033 -035). The girls' and boys' facilities are designed to cater for a pupil population of 175 and 180 pupils respectively. Similar blocks can be replicated to serve more pupils. In addition to the layouts described above, designs for a single, two, four and a single PLWD unisex cubicle have also been included to offer alternative latrine (See Appendix D).
- **Latrine Pit:** A latrine pit depth of 3m is proposed. Options for both lined and unlined pits are proposed for unstable and stable soils respectively (see section 5.4.3 on lining of pits). The pits are offset with respect to the superstructure to provide an external manhole to facilitate exhausting the pit. The pits are designed to be exhausted approximately every three to five years.
- **Latrine Slab:** A 150mm thick with 10mm reinforcement steel bars at 200mm spacing, both ways on the bottom to cover the latrine pit and provide a platform for the users is proposed. A 600mm by 450mm lockable manhole is provided to facilitate exhausting the pit.
- **Cubicles, Footrests and Apertures:** Most VIP blocks have a number of cubicles for individual use. The cubicle should provide privacy and comfort to users. It should have a drop hole and a slightly raised footrest. The proposed dimensions for the standard cubicles is 1100mm by 1100mm with a drop hole measuring 250mm by 150 mm and a footrests that extends from the corners of the cubicle and tapers towards either side of the drop hole and is raised 50mm above the drop hole. This arrangement of footrest provides more flexibility for people of different sizes and facilitates cleaning and drainage towards the drop hole.

The VIP latrines for ECDE pupils will need smaller squatting holes, dimensions of 250mm by 130 mm are proposed. The size of the cubicle will also be smaller, measuring 1100mm by 900mm. (See Drawing Nos. 015 -018).

The cubicles for pupils living with special needs should be provided with a concrete access ramp sloping at a minimum of 1:12 and a maximum of 1:20, a wide door (1000mm), sufficient space (1600mm by 1200mm), fitted with special seats (350mm high) and handrails (1.5” G.I Pipe , 650 mm high).

- **Doors and handles of the latrine:** The main access door to the latrine block should be a grilled steel door of 2100mm x 1600mm to ensure security and controlled use of the facility. The doors to the latrine cubicles including the PLWD may be metallic or wooden panelled measuring 2100mm by 900mm and 2100mm by 1000mm respectively with a 50mm gap at the bottom. The proposed height of the door handles from the floor slab is 1000mm.

The doors for the ECDE latrine measure 1600 by 700mm and should have handles fitted at a height of 700mm from the floor slab.

All the doors open outwards as this facilitates cleaning and easy access by users. Good quality door hinges should be used to minimise repair work.

A hook should be placed on the internal face of the door to provide a place for hanging clothes.

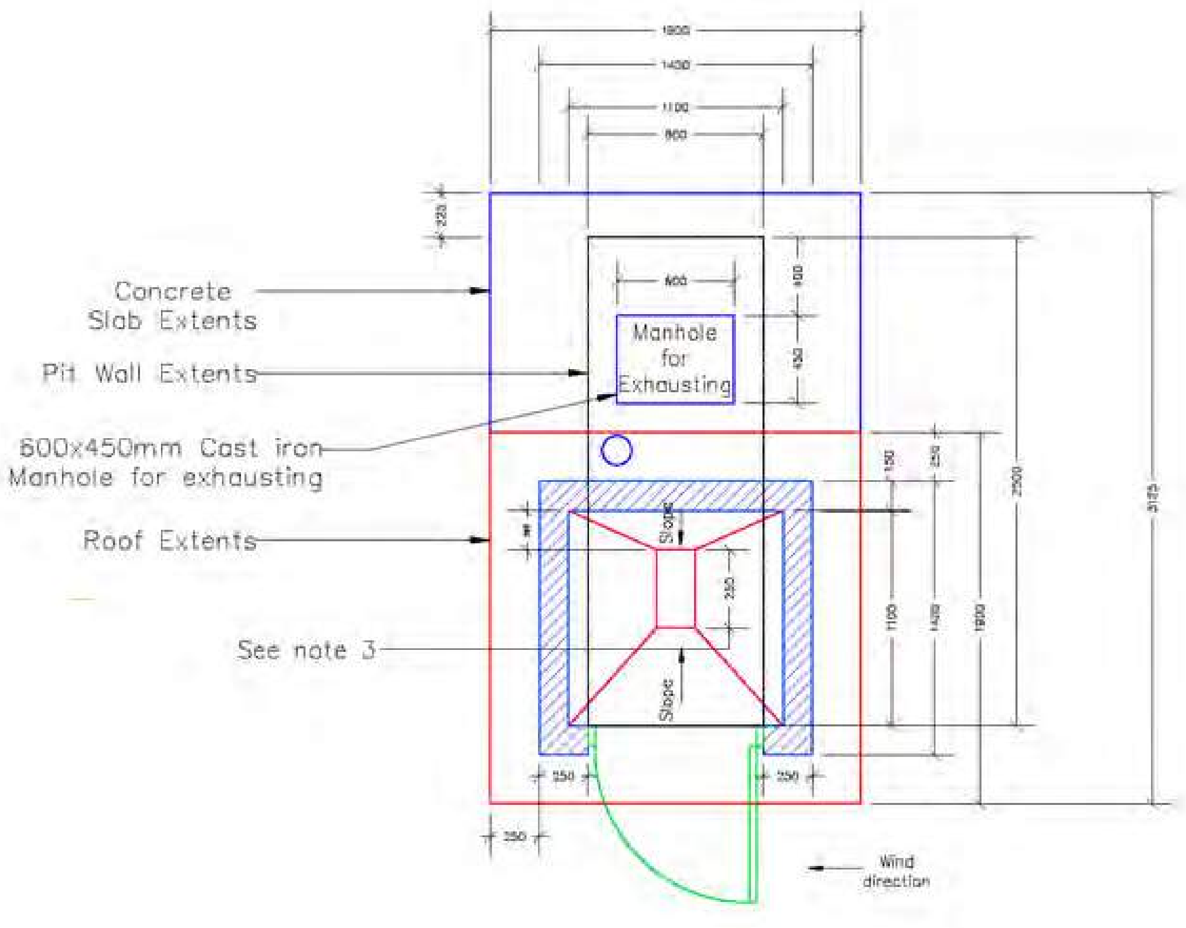


Figure 8: Plan view of an ordinary VIP latrine cubicle

5.4.2 Materials for latrine construction

Locally available materials of acceptable quality should be used in the construction of latrines. These include natural quarried stones, concrete blocks (solid/perforated), burned bricks, sand, cement, crushed stones (aggregate) and reinforced concrete for casting the slab and ring beams. Each of these materials should be analysed and carefully selected whether for the substructure or for the superstructure to ensure quality is upheld. Below are factors to be considered during analysis and selection of the materials:

- **Sand:** It must be cleaned and sieved through a fine screen (mesh of at least 5mm) to remove any large particles;
- **Sand and cement (mortar):** Mortar is used for laying stone masonry, burned bricks, cement blocks and plastering inside walls and partitions. The strength of mortar is determined by the kind of work it is used for. For plastering, mortar should comprise one part of cement and three parts of sand by volume (1 cement: 3 sand);
- **Masonry stones:** stone is one of the materials commonly available for construction of latrines. There are various types of stones with varied strengthens e.g. sand stone, basalt etc. Sand stone is good for producing well shaped stones. The joinery work should use mortar of 1:4 cement/sand mix;
- **Solid concrete block:** This should be used for partitioning the pit. The joinery work should use mortar of
- 1:4 cement/sand mix;
- **Burned brick:** If well burned clay bricks are locally available and affordable, they can be used for partitioning the pit. The joinery work should use mortar of 1:4 cement/sand mix;
- **Rubble stones:** Hard core should be free from weeds, roots, farming soil and other unstable materials. It should be spread out in layers not more than 150mm and properly compacted using ramming tools before another layer is added;
- **Crushed stone and or aggregate:** coarse aggregate should be hard crushed rock free from impurities. Size of individual particles should range from 20mm to 5mm nominal size. Aggregate will be used in mixing concrete;
- **Reinforcement Steel:** This is normally available in most local hardware stores. It is either high tensile (twisted Y bars) or mild steel (round bars). High tensile reinforcement should be used as the main reinforcement while round bars used as ties;
- **Formwork:** This is used to form edges to hold wet concrete during pouring. Sawn timber is the preferred material for formwork. It should be fixed securely using strong props and left in place for several days until concrete is completely cured. Minimum period that should elapse between the placing of concrete and removal of the formwork is as follows:
  - Beam sides, walls and columns: 2 days
  - Slab soffits (props left under): 3 days
  - Beam soffits: 7 days
  - Slabs: 10 days
  - Beams: 14 days

- R**oofing materials:** Corrugated iron sheets are the most commonly used roofing materials. Ridge pieces and gauge as the roofing material. In areas prone to rusting, pre-painted roofing sheets should be used. Gutters can be PVC or GS;
- **Timber for roofing and fixtures:** Timber for roofing should be well seasoned and painted with anti-termite paint. Locally available timber should be used.

5.4.3 Pit Design and Excavation

The latrine designs presented in this document use offset pits in that the superstructure is positioned to the front of the pit allowing an access manhole to the rear of the pit. This arrangement allows the pit to be exhausted (See Chapter 6, Section 5.11.2 for details on exhausting and waste management). Essentially, this means that the investment in the substructure is not lost once the pit is full but can be reused for multiple exhausting cycles. This means that the pit and pit lining should be built properly as this part of the structure needs to be very durable.

The depth of the pit should be between 3m to 4m to facilitate exhausting. The designs provided have assumed 20 litres of solid sludge per day student per year[4] which implies that the pits will need to be exhausted approximately once every five years.

The excavation of the latrine pit depends on the nature of the soil formation i.e. whether it is stable of unstable soil. Below are considerations to make in excavating either type of soil:

- **Stable soil:** Pit latrines in this type of soil can be excavated to the desired depth without the fear of collapsing. The pit can be excavated with a straight edge and regular shape to the bottom. The slab covering the pit should have a thickness of 150mm supported on a 225mm masonry foundation walling approximately 750mm (3 courses minimum) deep with a 450mm reinforced concrete footing. Only the upper part where the footing is required is excavated wider than the actual dimension to provide working space to construct the footing and compacted backfill is placed once the footing and foundation walling is done (Refer to Drawing No. 004).

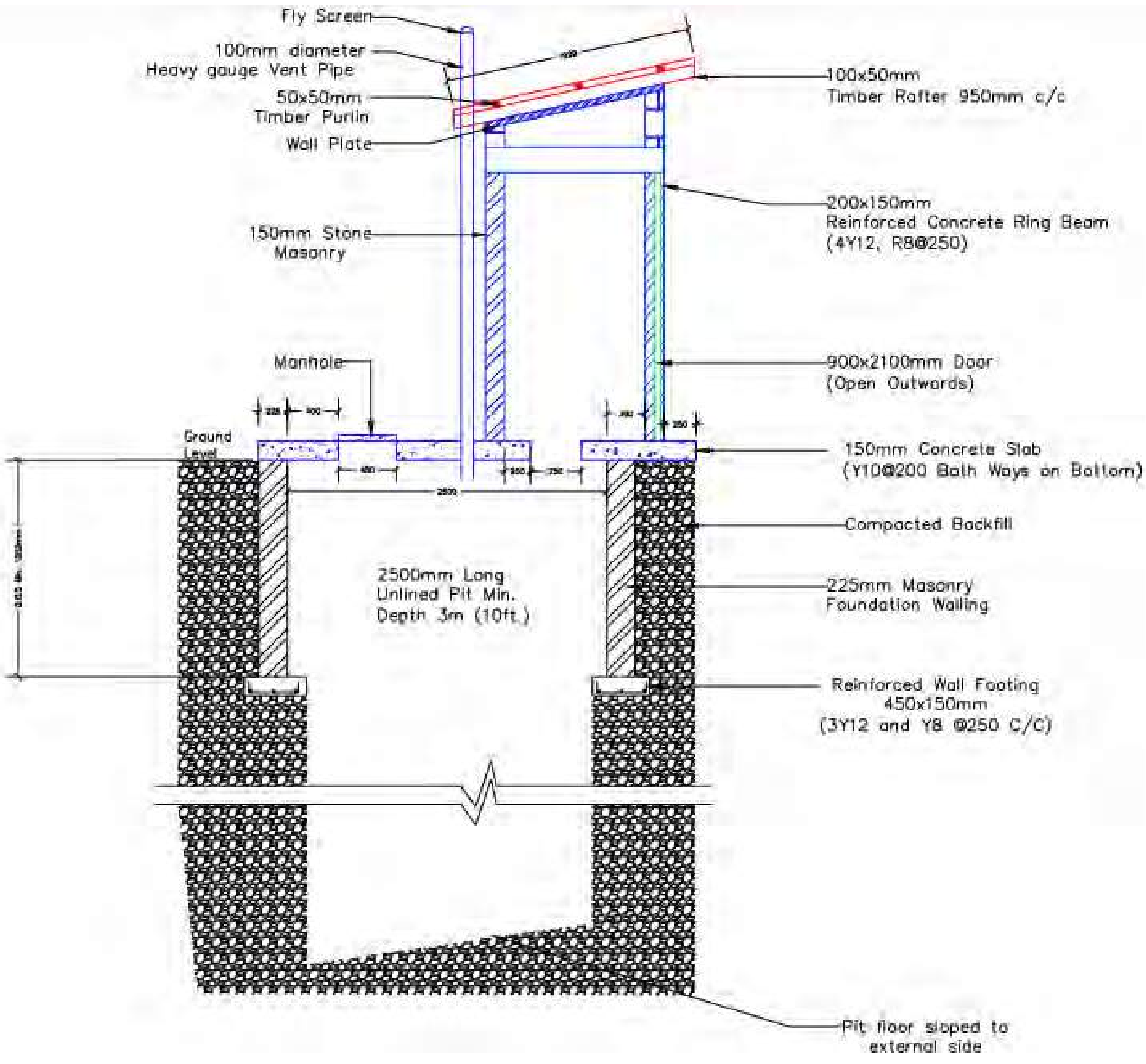


Figure 9: Typical Latrine Substructure in Stable Soil

4 MWI 2008 Practice Manual for Sewerage and Sanitation Services in Kenya. Government of Kenya. J Pickford 1991 Worth of Water. Technical briefs on health, water and sanitation. IT Publications, London. ISBN 1 85339 069 0

- **Pits in unstable soils:** The unstable soils include swampy, black cotton and sandstone which are likely to collapse during pit excavation or later when the latrine is in use. The pits in these soil conditions require lining to increase the pit stability. During pit excavation, space should be added for construction of lining and a formwork can be used to prevent collapsing of soil. During construction the wall may require support using props and struts. Pits should preferably be lined with 225mm masonry stone.
- **Pits in rocky grounds:** It is normally hard to achieve sufficient depth which means that the slab may need to be raised above ground level and the latrine will need to be exhausted or de-sludged more frequently. However, efforts can be made to achieve some depth in a smaller section of the latrine.
- **Pits in flood-prone and high water table areas:** In addition to lining, the slab will be cast substantially above the ground level to protect it from flooding or submergence during floods. It is important to investigate the normal flood depth to determine the height required. Pit latrines in hard soils may require floor level to be raised to provide more space.

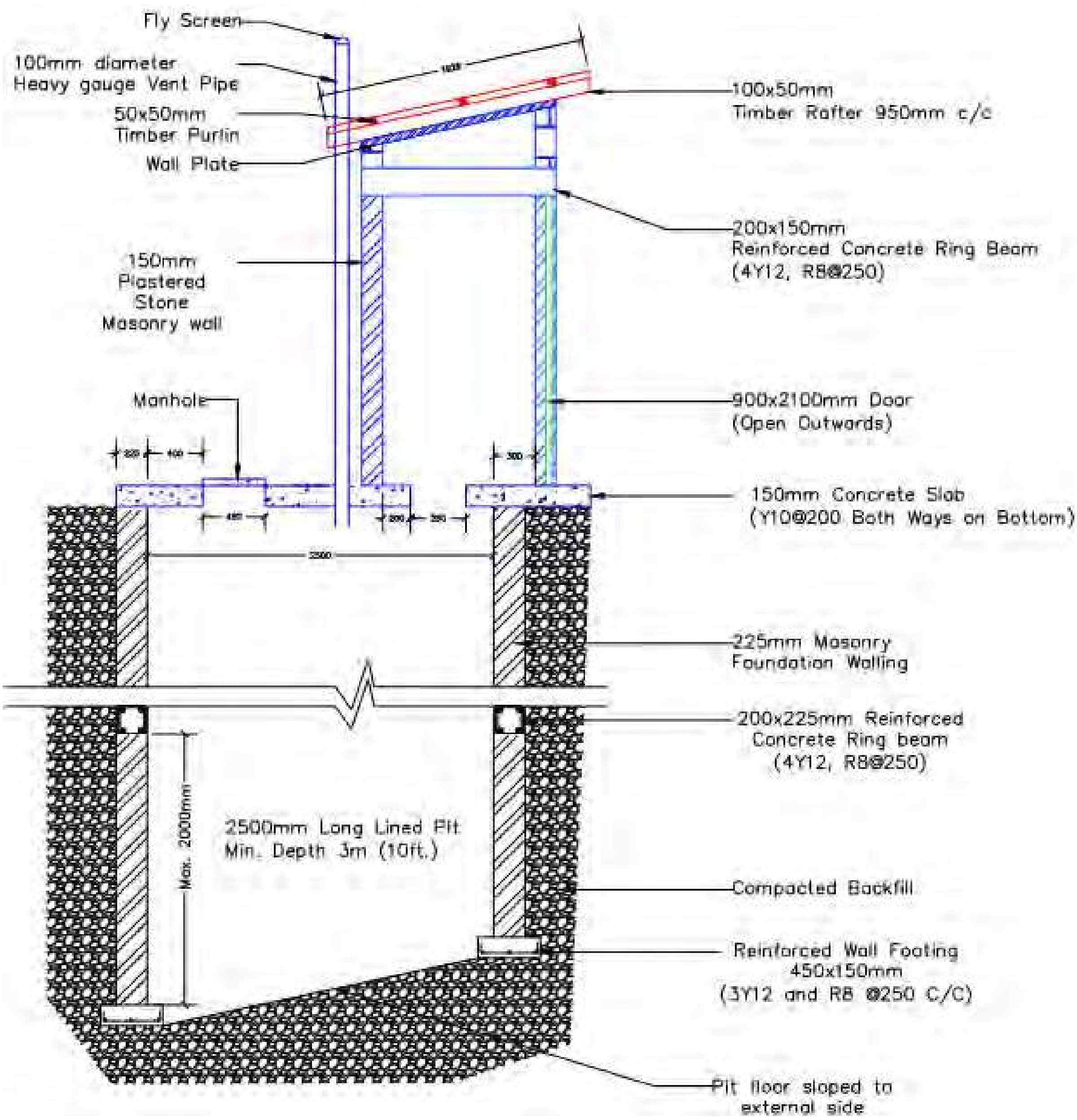


Figure 10: Typical Lined Pit Latrine Substructure

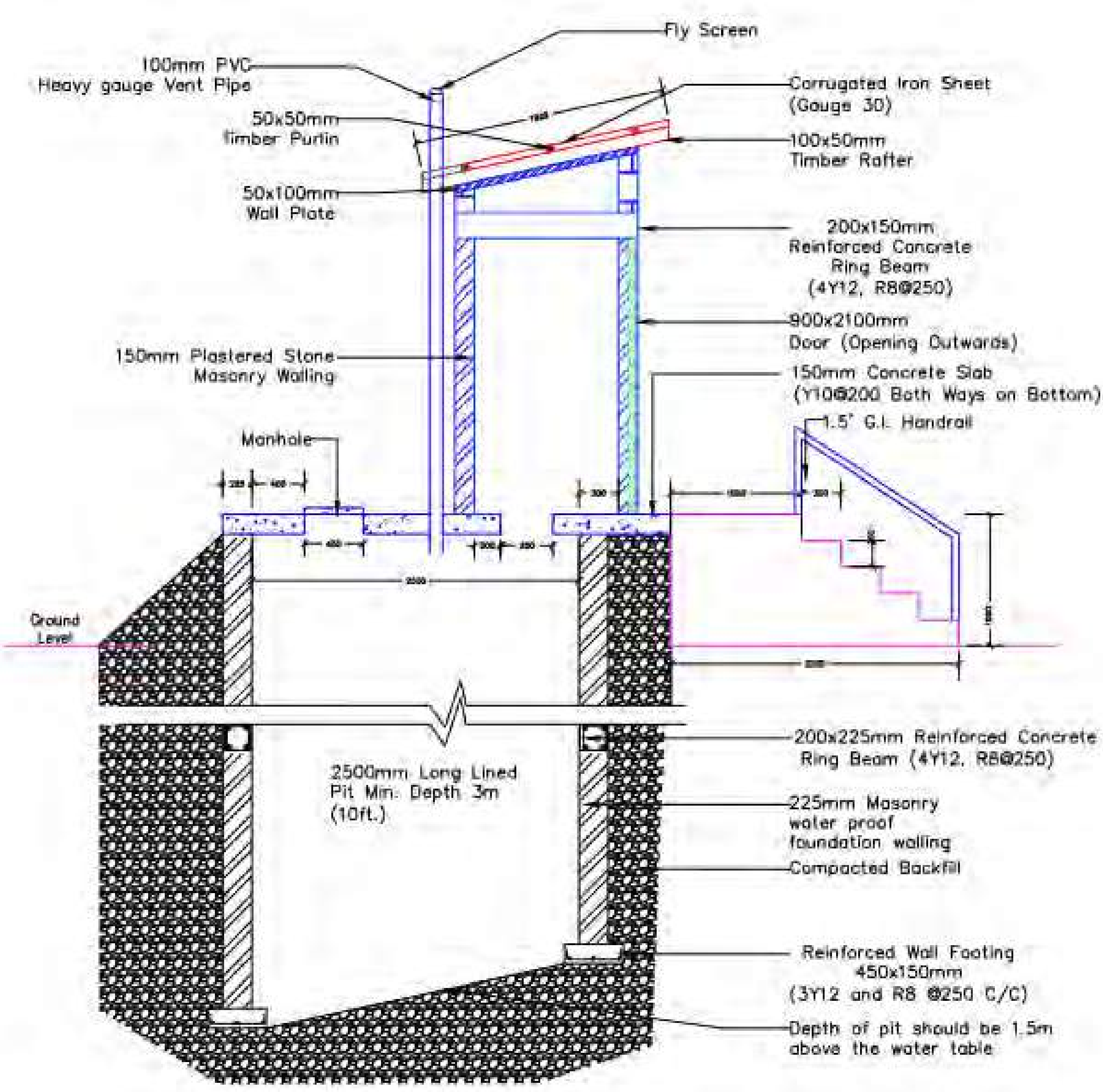


Figure 11: Raised Pit Slab in Flood Prone Areas

5.4.4 Concrete slab for the latrine

The concrete slab on the latrine should be cast to a thickness if 150mm in situ reinforced with 10mm steel bars at 200mm interval both ways on the bottom. During the casting of the slab timber shuttering is used as formwork laid on top of the foundation wall and left through the curing period.

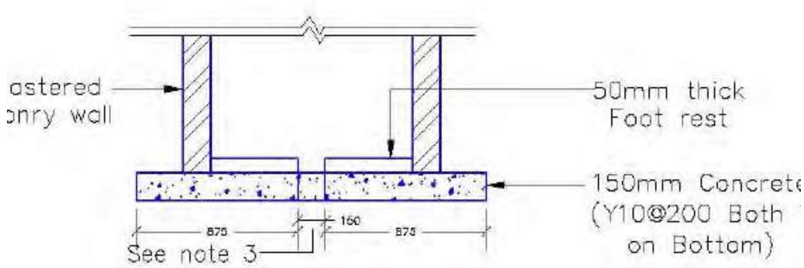


Figure 12: Pit Slab

5.4.5 Latrine walling

Walling for the superstructure of the latrines should consider the locally available materials, cost, quality, durability and the risk of termite damage. A variety of materials can be used including masonry stone, burnt bricks, timber, and iron frame with iron sheets. The drawings in Appendix D and the Bills of Quantities in Appendix E can be customised for the most desirable walling material. However, consideration should be given to the join between the roof and wall as appropriate to the selected walling material.

5.4.6 Roofing of the latrine

Roofing should be provided over the latrine cubicles while urinals especially for boys may not be roofed to enhance ventilation. It is however important in siting of the latrine to locate it away from trees that keep shedding their leaves and hence clogging the drainage channel for the urinal. Girls' urinal can be roofed to provide privacy. It is recommended to use 30 gauge corrugated iron sheet on 50 by 50mm timber purlins. The structural trusses should be seasoned timber painted with two coats of anti-termite solution and shall be tightly fixed with top tie beam of 6mm diameter plain bars.

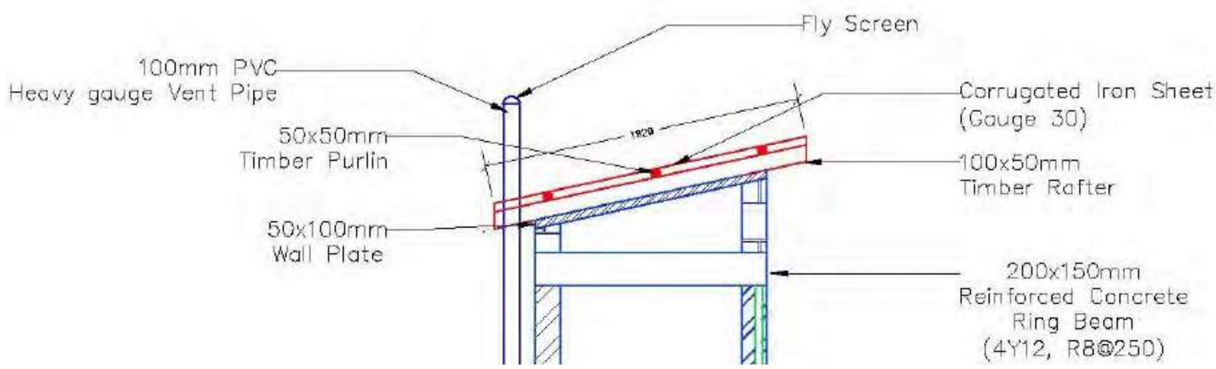


Figure 13: Design of Roofing Truss

5.5 Urinals

Urinals are an integral component of toilets for boys. However, some schools are adopting urinals for girls due to the emerging demand among girls. According to a study conducted by UNICEF, the demand for urinals is high among both boys and girls. Boys in schools without urinals were three times (10.2% vs. 3.2%) more likely to report not using the school sanitation facilities during break times whilst girls in schools without urinals were nearly twice (11.2% vs. 6.4%) as likely to not use the school sanitation facilities as compared to those with urinal[5].

The boys' urinal normally consists of a slab with a drainage channel to a soak-pit or leaching pit. The design for girls' urinal differs from that for boys to provide for squatting but it should also have a proper drainage channel. Key considerations in the design of urinals is the drainage slope (1% to 3%) and surface area for use. In addition, for boys' urinal, it is important to provide a waterproof and easy-to-clean wall surface (smooth plastering or waterproof ceramic tiling) up to at least 60cm above the slab. Urinals should be supplied with water to flush out urine in order to reduce odour. The area around the urinal slab or cubicles should also have a drainage channel to direct urine and wastewater away from the toilet floor.

5 UNICEF (2010), Study on the usage of urinals in Kenyan schools, December 2010

There is need to also consider the social cultural aspects of the school community before provision of urinals as this may affect their use. Alternative designs may be used to attain the recommended PTR.

Figure 14 : Boys' urinal in a VIP latrine block

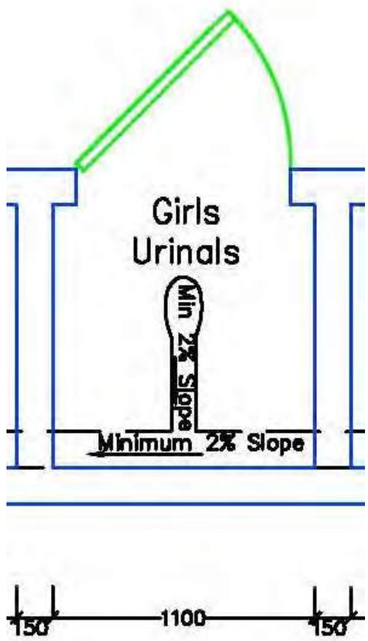


Figure 15 : Plan view of a urinal for girls

5.6 Pour flush toilet

These are water-dependent toilets suitable for places with deep groundwater, rocky soil formation, where the community uses water for anal cleansing and the supply of water is sufficient. They consist of a water pan (ceramic, plastic, mosaic, fiberglass or cement) with a water trap which is connected to an onsite or offset single or double pit which may be lined or unlined. There should also be a provision of a footrest well positioned beside the pan. It requires 1-2 litres for flushing excreta. Some water should always be at the bottom of the pan after it has been used to eliminate the entry of odour and prevent rodents or other vermin from the pit coming inside the toilet. The toilet should have a cover for the offset pit consisting of concrete or wooden slab.

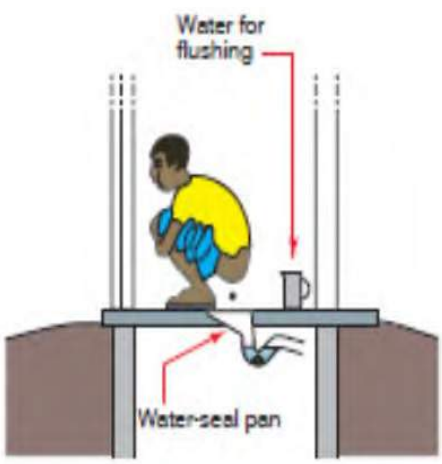


Figure 16: Pour flush toilet (with onset pit)[6]

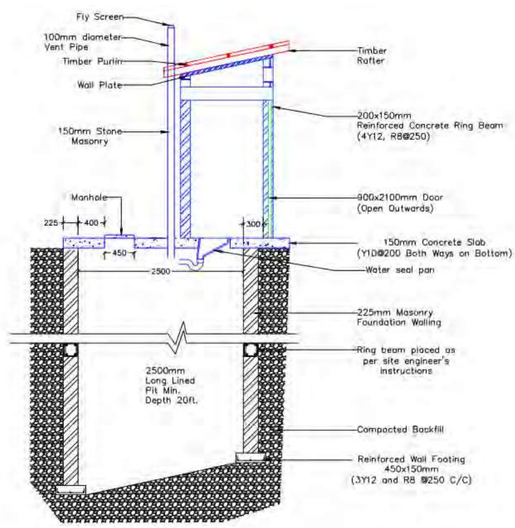


Figure 17: Pour flush toilet (with onset pit)

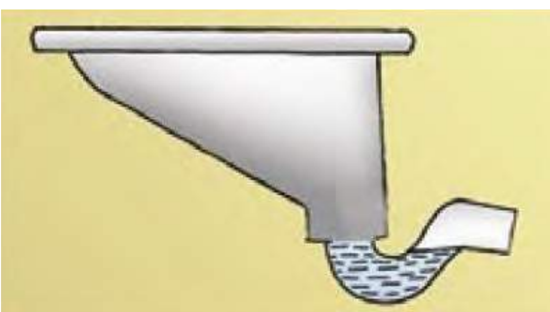


Figure 18: Water pan with water seal (trap)

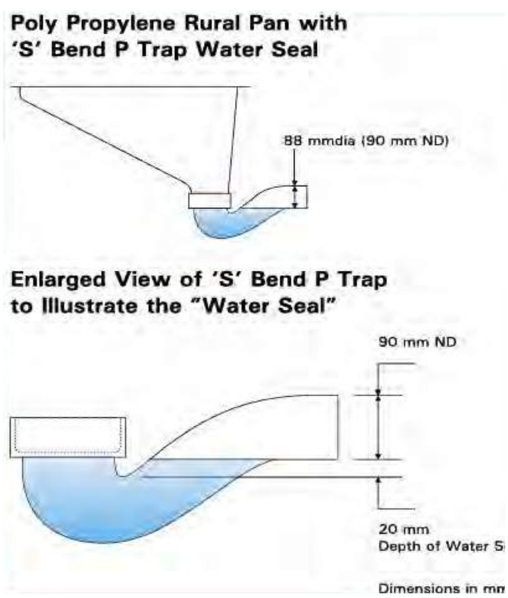


Figure 19: A cross section view of the water pan and trap

6 Source: WEDC, 2012

Operation and maintenance responsibility for teachers and pupils

1. Teachers should check for any blockage on the trap by solid objects e.g. papers, sticks thrown by children;
2. The squat pan needs to be cleaned regularly;
3. Water for flushing should be available after use.

Table 17: Advantages and disadvantages of pour flush toilets

Advantages	Disadvantages
• It is odour free • Prevents transmission of faecal related diseases • Appropriate where water is available • Has potential for long-life • Water requirement for flushing is low (1-2litres) • Construction and maintenance are cheap	• Water (1-2litres) is always needed for flushing • Risk of groundwater and surface water contamination • Not appropriate where water is not available • Dislodging of the toilet required every 3-5years • Difficult to construct in high water table areas

5.7 Urine-diverting Dry Toilet[7]

A urine-diverting dry toilet (UDDT) is a toilet that operates without water and has a divider so that urine can be diverted away from the faeces.

The UDDT is built such that urine is collected and drained from the front area of the toilet, while faeces fall through a large chute (hole) in the back. Depending on the collection and storage/treatment technology that follows, drying material such as lime, ash or earth should be added into the same hole after defecating.

It is important that the two sections of the toilet are well separated to ensure that a) faeces do not fall into and clog the urine collection area in the front, and that b) urine does not splash down into the dry area of the toilet. There are also 3-hole separating toilets that allow anal cleansing water to go into a third, dedicated basin separate from the urine drain and faeces collection. Both a pedestal and a squat slab can be used to separate urine from faeces depending on user preference.

The UDDT is simple to design and build, using such materials as concrete and wire mesh or plastic. The UDDT design can be altered to suit the needs of specific populations (i.e., smaller for children, people who prefer to squat, etc.).

Demonstration projects and training are essential to achieve good acceptance with users.

UDDT cleaning is different from other toilets because of both the lack of water and the need to separate the solid faeces and liquid urine. No design will work for everyone and therefore some users may have difficulty separating both streams perfectly, which may result in extra cleaning and maintenance. Faeces can be accidentally deposited in the urine section causing blockages and cleaning problems.

All of the surfaces should be cleaned regularly to prevent odours and to minimize the formation of stains. Water should not be poured in the toilet for cleaning. Instead, a damp cloth may be used to wipe down the seat and the inner bowls. Some toilets are easily removable and can be cleaned more thoroughly. It is important that the faeces remain separate and dry. When the toilet is cleaned with water, care should be taken to ensure that the faeces are not mixed with water.

7 Source: http://ecompendium.sswm.info/sanitation-technologies/urine-diverting-dry-toilet-uddt

Because urine is collected separately, calcium and magnesium-based minerals and salts can precipitate and build up in pipes and on surfaces where urine is constantly present. Washing the bowl with a mild acid (e.g., vinegar) and/or hot water can prevent the build-up of mineral deposits and scaling. Stronger (> 24% acetic) acid or a caustic soda solution (2 parts water to 1 part soda) can be used for removing blockages. However, in some cases manual removal may be required.

Refer to section 5.6 of this manual for more information on disposal of collected urine and faeces. Refer to Drawing No. 020 for UDDT details.

5.8 Ecosan Toilet

Ecological Sanitation shortened as "Ecosan" is an alternative to the conventional latrine designs. It does not recognize human excreta as waste but as a resource that can be reused as an enrichment to soil for agricultural production. Therefore, this design may be applicable in agricultural areas and those with high water table. There are two basic designs of the Ecosan latrine:

i. Urine-diversion. The urine and faeces are never mixed. The pedestal has a dividing wall, in which the urine exits from the front of the toilet, and faeces drop below the toilet from the back of the bowl;
ii. Combined urine and faeces. Urine and faeces can be processed together or separated.

Solar heaters should be fitted on the processing chamber to promote evaporation by increasing the temperature in order to facilitate the destruction of pathogenic organisms and discourage breeding of flies. The solar heaters may consist of a black-painted metal sheet covering the part of the processing chamber exposed to the sun. They may also serve as access lids to the processing chambers during inspection or emptying of the chamber. The solar heater must be fitted well to prevent water and flies from entering the chamber. It should also be airtight.

Figure 20 : Ecosan Toilet
Source: ECOSAN Programme GTZ

Most ecosan toilets have two vaults, each with its own seat riser or squatting slab or with a movable device. The advantage with the double-vault design is that each vault is used alternately for a certain period. When the first vault is full it is left dormant and the second vault is used. The contents of the dormant vault are emptied when the second vault is nearly full. The assumption is that after a specified period (6–12 months depending on climate) without new faecal material added, the contents of the dormant vault should be safe to handle.

Composting is an aerobic process. Many of the microorganisms responsible for the decomposition need oxygen. Air must therefore be brought into the pile. In some cases the processing chamber is provided with perforated pipes that bring air into the centre of the pile. Aeration can also be accomplished with the addition of a bulking agent that creates air pockets inside the pile.

All parts of the toilet require periodic inspection and removal of the end products. Particularly urine collectors, pipes and containers/ tanks need to be monitored. Urine pipes should be flushed periodically to avoid accumulation of deposits, which can block the flow and generate unpleasant odours.

Organic absorbents such as ash, lime, sawdust, husks, crushed dry leaves, peat moss and dry soil are used to deodorize (reduce smells), absorb excess moisture, and make the pile less compact as well as less unsightly for the next user. Absorbents should be added immediately after defecation in order to cover the fresh faeces.

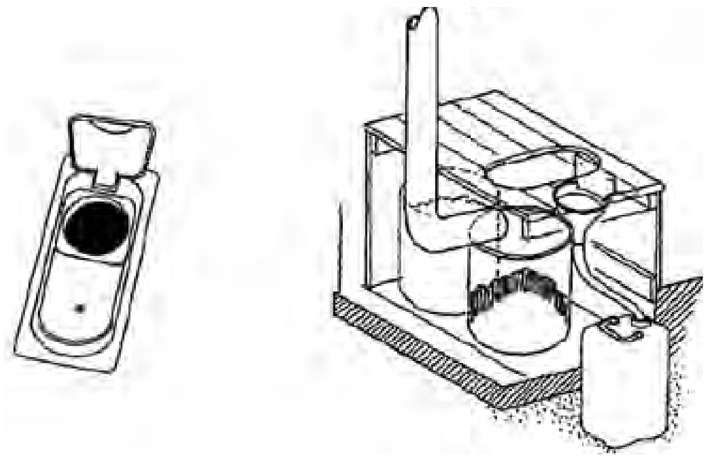


Figure 21 : Urine diverting squatting pan

Ecosan toilets are mainly suitable for regions with high average temperatures, long dry and short rainy seasons or arid climatic conditions with high evaporation rates. It can also be suitable for high groundwater levels to curb contamination, for rocky soil profiles and coastal regions.

Advantages of UDDT and Ecosan toilets[8]

- **Reuse of biomass and plant nutrients:** Human excreta — in particular, urine — contain essential plant nutrients in particular the macronutrients that present the bottlenecks of agricultural production, leading to the classic industrially manufactured agrochemicals. These are nitrogen (N), phosphorus (P), potassium (K), sulfur (S), and also some sodium chloride;
- **Saving the water resource:** Besides the water required for anal cleansing, UDDT use requires no water. Indeed, the less water that enters the composting chamber, the easier it is kept smell-free. The average water volume saved by not flushing stools may be in the range of at least seven liters per pupil per day, and for not flushing urine, in the range of two liters per student per day saved;
- **Improved handling hygiene:** In UDDTs, human stool is never touched or handled to complete sanitization, i.e. by desiccation/composting for sufficient time in tropical climates for one year, as per WHO (World Health Organization) standards. Human urine requires zero or minimal precautions, which are easily managed;
- **Prevents soil and water pollution:** With no sewage being produced and released using UDDTs, the risk of spills polluting soils, groundwater, public space and water bodies is minimized;

8 http://bopdesigner.com/2012/04/an-argument-for-ecosan/

- **Cost benefit:** Dispensing with sewers and sewage treatment leads to enormous cost savings in investment as well as in O&M. These savings are so huge that it would be justified to give incentives of several times higher to dry systems than to flush and sewage system;
- **Feasibility of (total) sanitation:** Due to dispensing with sewers and treatment systems, the benefits of sanitation — health benefits, saved expense, improved productivity, etc. — seem to be more readily achievable with Ecosan than with flush sanitation, financially as well as technically. A UDDT is a stand-alone system complete in itself. Every UDDT built is a real step toward total sanitation, which cannot be said for flush toilets where sewage runs through open sewers and/or is not treated sufficiently and/or sewage sludge is not treated adequately.

Disadvantages of Ecosan and UDDT

- Investment cost is comparatively higher than other designs e.g. ordinary latrine, VIP and water closets. However, this cost is affordable in the long run since they eliminate sewerage and exhausting expenses;
- There is a challenge in linking the market (agriculture) of the reuse products with the production sites (communal, household and institutional toilets).

5.9 Water Closet Toilets

Water closet or conventional flush toilets are suitable in urban school settings especially where there is consistent water supply through piped reticulation. The squatting types are more hygienic for common use than the seat types (Refer to Drawing No. 044 – 053 for water closet details).

WCs require septic tanks for wastewater treatment/disposal or a sewer connection. In urban areas with access to sewer lines the WC designs are mandatory. The schools should seek advice from the resident water service provider on the availability of sewerage system. It should be noted that a conservancy tank should not be used as an alternative to a septic tank (See Section 5.11.3 for details on septic tanks).

5.10 Facilities for Pupils Living with Disabilities

Schools should strive to provide latrines for students with special needs even if there are no students with special needs currently in the school. These facilities will enable children with special needs to be integrated into normal school operations. These facilities can be used by children without special needs to remove stigmatisation of these facilities.

The lack of accessible school toilets may deter pupils with special needs from attending school. Facilities for special needs require design modification and features to make them easy for use. Adaptation of the designs should be made at least for the following three categories of special needs[9]:

1 **Children with poor vision:** special grips, guiding systems and proper lighting are needed;
2 **Children in wheelchairs or with crutches:** facilities should include ramps, wider doors, extra room inside stalls for a wheelchair or assistant and special grips or foldable seats;
3 **Pupils with missing or paralyzed limbs:** lids, taps and knobs must be light and manoeuvrable with one hand or with feet.

This manual contains sample designs for both VIP and flush type facilities for pupils living with disabilities.

9 UNICEF (2012), Water, Sanitation and Hygiene in Schools: A companion to the Child Friendly Schools Manual

5.11 Wastewater Management

Wastewater is effluent consisting of greywater (kitchen and bathing wastewater) and blackwater (excreta, urine and faecal sludge)[10]. Some schools have access to sewerage systems and hence do not require onsite facilities for wastewater disposal. For those that need onsite facilities for wastewater treatment, they need to have properly designed collection facilities that separate blackwater and greywater. These facilities should be orientated in a manner that they can be easily emptied when full.

5.11.1 Greywater treatment for reuse in the school

The process mainly involves screening, soap froth removal, equalization, filtration and chlorination. The treated water will be stored in a simple and small underground tank for subsequent reuse for activities like flushing and cleaning toilets and gardening. Below is a description of each of the components of the process:

Primary treatment

- **Screening:** This is normally done at the source such as bathroom or kitchen outlet to remove grease and soap froth using foam or sponge filter. This is done to prevent the froth from appearing in the collection chamber provided at the end of treatment;
- **Equalization:** This is done to provide equal loading to filtration system and minimize quality fluctuations.

Secondary treatment

- **Gravel filtration:** This is done to remove turbidity, suspended solids and some amount of Bio Oxygen Demand (BOD);
- **Sand filtration:** This done to remove colour, bacteria, protozoan and helminthes eggs, suspended solids and some amount of BOD;
- **Polishing:** This done using either charcoal or broken bricks;
- **Step aeration:** This is carried out to remove odour from the treated greywater before reuse;
- **Chlorination:** This is done for oxidation and disinfection purposes.

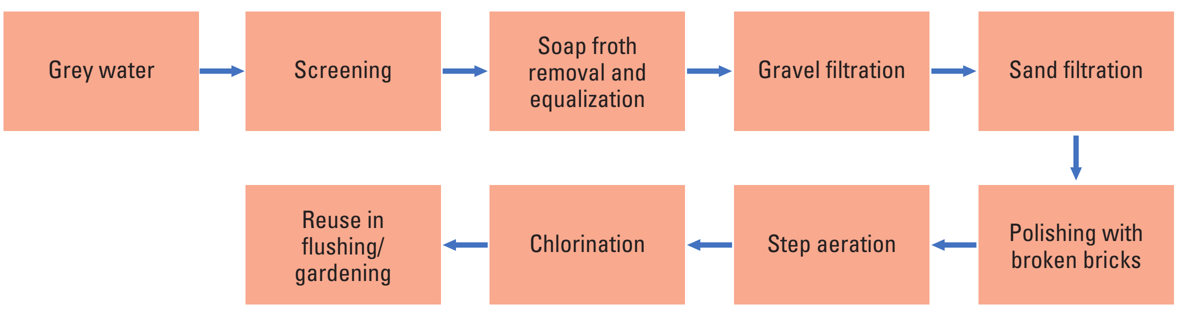


Figure 22: Greywater treatment for reuse in schools[11]

10 Corcoran E, Nellemann C, Baker E, Bos R, Osborn D, Savelli H (eds) (2010) Sick Water? The central role of wastewater management in sustainable development. A rapid response Assessment. UNEP/UNHABITAT.

11 Government of India and UNICEF (2007), Solid and Liquid Waste Management in Rural areas: A Technical Note

Benefits of having this system of greywater treatment in place include:
- It reduces freshwater requirement;
- Prevents greywater stagnation;
- Main water source will not be contaminated;
- Prevents vector breeding;
- Reuse of water for flushing toilets and gardening;
- Minimal risk to users of greywater as it incorporates principles of water safety.

The main considerations to make before constructing the greywater reuse system are:
- Water availability/scarcity;
- Quantity of greywater;
- Land availability;
- Ground slope;
- Soil type;
- Reuse type such as toilet flushing, gardening, toilet cleaning;
- Availability and cost of filter media.

The users of a greywater system need to undertake certain commitments after it has been established, including:
- Proper operation through a maintenance contract between government and user;
- Weekly maintenance of systems with filtering devices and media;
- Systems with two reuse areas require regular diversion;
- Sedimentation tanks require desludging every month.

In case the school has no provision for recycling greywater and blackwater, this can be disposed of in properly designed and built septic tank.

5.11.2 Fecal Sludge Management

The faecal sludge management process consists of emptying, transportation, treatment, and use or safe disposal of faecal sludge from an on-site sanitation technology (like a pit latrine or septic tank). It addresses the last three components of a non-sewered sanitation system as illustrated in Figure 23.

Figure 23: Faecal sludge management for non-sewered sanitation system[12]

12 https://www.cawst.org/blog/bydate/2016/09/fecal-sludge-management-in-5-minutes/

Schools should follow the sequence of tasks below to exhaust their latrines and septic tanks:

- Determine which latrines and/or septic tanks need to be exhausted. This involves opening the inspection manhole at the rear of the latrines and inspecting the level of sludge. A pit needs to be exhausted when the sludge is approximately 0.75 to 1.0 m below the level of the slab. Return the manhole cover into position as this provides an airtight seal;
- Contact the local water and sanitation service provider to determine whether a professional exhausting service provider can be engaged to exhaust the pits and what the charges are. Check with the professional exhauster regarding where the sludge is deposited. Ensure that there is access to the latrine pits for the exhauster service;
- If there is no professional exhauster service, then the school will need to engage local labour to undertake manual exhausting of the pit(s). This will involve:
  - Selecting a suitable site for a sludge pit. The location should be reasonably accessible to the pit to be excavated, fenced away from student movement;
  - Excavate a pit approximately equal to the size of the material to be exhausted. Retain the soil as this will be used to cover the sludge;
  - Issue the contracted labour with PPE which should consist of:
    - Gumboots;
    - Gloves;
    - Overalls;
    - Face masks
  - Issue the contracted labour with tools for the assignment which should consist of:
    - Buckets with lids;
    - Rope;
    - Brushes;
    - Wheelbarrows or handcart for transporting the sludge;
    - Water for washing the slab and for stirring into the sludge to loosen it.
    - Bleach or disinfectant for cleaning up.
- Inspect the condition of the pits after exhausting to make sure the walls are intact;
- Whether the pits are exhausted with a professional exhausting service or undertaken manually by contracted labour, the pit slab should be cleaned immediately with a disinfectant (e.g. bleach) after exhausting and the manhole covers returned into position, making sure that the seals are airtight.

Properties of faecal sludge in relation to collection and transportation

Faecal sludge can be removed from septic tanks and latrines through the use of manual and mechanized techniques that may rely on hand tools, vacuum trucks, pumping systems or mechanical augers. The specific method utilized will be based on the type of onsite system, accessibility of the site, the type of equipment owned by the service provider and the level of expertise.

Awareness of the properties of faecal sludge is necessary in order to understand the challenges faced in its collection and transport. These properties are primarily influenced by water content, sludge age, the presence of non-biodegradable material and organic material. For example within a pit latrine containment system, recently deposited faecal sludge found in the top portion typically has a higher water and organic content than that found in the deeper layers and consequently a lower density[13]. The top portion is therefore less viscous and relatively easy to exhaust. The absence of water and organic content in the deeper, older and more digested layers makes collection much more difficult, this condition is frequently referred to as ‘thick’. Depending on the collection method, ‘thick’ faecal sludge often needs to have water added to facilitate pumping. This suggests that the deposition period could be used as a strong indicator of the ease with which faecal sludge could be collected.

13 Buckley, C., Foxon, K.M., Brouckaert, C.J., Rodda, N., Nwaneri, C., Balboni, E., Couderc, A., Magagna, D. (2008). Scientific Support for Design and Operation of Ventilated Improved Pit Latrines and the Efficacy of Pit Latrine Additives. University of KwaZulu-Natal, Pollution Research Group, School of Chemical Engineering. Gezina: Water Research Commission.

Manual sludge collection falls into two categories, namely cartridge containment and direct lift. There are also a number of manually operated mechanical pumping equipment namely, the Sludge Gulper, the diaphragm pump, the Nibbler and the Manual Pit Emptying Technology (MAPET). The fully mechanized technologies are powered by electricity, fuel or pneumatic systems. They include motorized diaphragm pumps, trash pump, motorised pit screw auger, gobbler, vehicle-mounted vacuum equipment (conventional vacuum trucks, BREVAC and Vacutug).

Transportation of faecal sludge can either be done manually (customised cart) or using a motorised transport (motorised tricycles for low-income areas, tractor and trailer, pick-ups or trucks fitted with exhauster tanks).

These guidelines will not cover the last two aspects of faecal sludge management namely treatment and use since these are beyond the purview of most schools.

5.11.3 Septic Tanks

A septic tank is a tank specifically designed to collect and process sewage or blackwater. The effluent passes through a number of chambers over a period of 3 to 4 days which provides sufficient time to deposit the sediments and to breakdown the sullage. The result is an effluent stream that is disposed of in a soak pit or infiltration lines. The soak pit should be large enough to ensure that the effluent infiltrates faster than the inflow into the septic tank.

This manual presents a design for a 5 cubic meter masonry septic tank (small) and a 27 cubic meter masonry septic tank (large) (Refer to Drawing Nos 057 – 059) which provide a range of users. Table 18 provides an estimate of the number of daily users that the different size septic tanks can handle, given the different types of toilet. Smaller PVC septic tanks (2 – 3 m^3) are also available from local manufacturers. The size of the septic tank and can be optimised for the known number of users.

Table 18: Advantages and disadvantages of pour flush toilets

	5000 litre Septic tank		27,000 litre Septic tank	
	Pour Flush	Water Closet	Pour Flush	Water Closet
Per capita daily water use (litres)	2.5	10	2.5	10
Retention time (days)	3 - 4	3 - 4	3 - 4	3 - 4
Number of users	500 - 670	125 - 170	2700 - 3600	675 - 900

The capacity of the soak pit should be at least equal to the size of the septic tank. The soak pit is excavated and backfilled with hardcore and ballast. The top 300mm can be covered with a plastic sheet and backfilled with soil. It is also possible to plant a tree adjacent to the soak pit to assist in the uptake of the effluent.

Where soil conditions restrict the size or depth of the soak pit, then shallow infiltration lines can be used. Typically these are 1.0 – 1.5 m deep and 1.0 m wide, sloped at 1 in 200, back filled with hardcore and covered with a minimum of 300mm of soil on top of plastic sheet. The volume of the infiltration line should be at least equal to the volume of the septic tank. Multiple infiltration lines should be used to disperse the effluent.

The sediments/sludge in a septic tank will need to be exhausted periodically. Refer to Section 5.11.2 for guidance on exhausting septic tanks.

5.11.4 Sewer Connection

A sewer connection is a desirable option for schools that are located within reasonable proximity (approximately 300 metres) of a sewer line as the treatment and safe disposal of the sewage becomes the responsibility of the service provider. The school should however be prepared to pay the additional conservancy charges that are applicable with a sewer connection.

The school will need a sewer collection system within the school that gathers the sewage to one point from which it can be conveyed by gravity to the main municipal sewer line.

The design of the sewer system should meet the following requirements:

- Sewers to be minimum 100mm diameter heavy gauge PVC pipe (concrete pipe can also be used), laid a minimum of 500mm below ground surface;
- Sewer slopes to be 1 in 100m. If the sewer gradient is too shallow the solid material will stick and clog the sewer. If the sewer slope is too steep, then the liquid will travel and leave the solid material behind. The sewer gradient is therefore critical to good performance;
- Drop manholes will be required where ground slopes are steeper than 1 in 100;
- No sewer length between manholes to be greater than 50 m as it is difficult to rod and unblock a sewer line that is too long;
- All sewer junctions to be contained in a manhole with an airtight manhole or inspection cover;
- The start and end of all sewer lines to be in a manhole with an airtight manhole or inspection cover;
- Note that air vents are required between the toilet and the start of the sewer line.

The school should seek advice from the water and sanitation service provider regarding the connection to the main municipal sewer line and any wayleaves required to reach the main sewer line.

Chapter 6

Hygiene Facilities and Practices

6.1 Introduction

Hygiene is a broad term that refers to the state of cleanliness at difference levels and covers water, food handling, environment, household/domestic and personal behaviour. It can also be described as those individual practices that affect the health of an individual either positively or negatively. This chapter covers hygiene with a focus on handwashing, solid waste management and menstrual hygiene management.

6.2 Handwashing facilities

Handwashing is a crucial practice in promoting health since it has been proved to reduce the risk of diarrhoea by 42 to 47% and prevent respiratory infections[14]. In order to promote handwashing at critical moments (before eating and after visiting the toilet), there should be a provision for handwashing next to each latrine (suggested one handwashing point per 25 students), food preparation and serving areas. It is also desirable to have a place for pupils to wash their hands by the classroom.

At the least, a hand washing facility should have a basin, a way to pour or run water over the hands, and soap or ash. There are many models for hand washing stations: sinks with taps, buckets with taps, basins with a pour cup, and tippy taps made out of recycled plastic bottles or gourds. The following factors should be considered when providing hand-washing facilities:

1 Reduction of water wastage especially in water scarce areas;
2 Pupils of all ages should have easy access to the hand-washing facilities and be able to reach and use taps;
3 Handwashing basins and sinks should be regularly cleaned;
4 There should be proper drainage of wastewater from the handwashing point;
5 Pupils should be sensitized on the risks of drinking water from the handwashing facility in case the water is unsafe for consumption;
6 Soap should be made available at all hand washing points all the time;
7 Liquid soap can be manufactured cheaply at the school with the participation of the students and is generally easier for the school to sustain. This is explained further in the soap making recipes provided below;

For schools with water shortage, appropriate containers with taps (e.g. Tippy Taps) can be promoted however the choice and number of containers should factor durability and the number of users. In schools with adequate water supply, permanent handwashing facilities should be provided such as sinks with taps and multiple hand-washing stations.

14 Curtis, V., and Cairncross, S (2003). Effect of washing hands with soap on diarrhea risk in the community: A systematic review. The Lancet, 3(5): 275-281

Recipes for preparing soap

Simple soap

Materials: Large bowl, 3 Cups of Soap Flakes, 1 to 1-1/2 cups water, food coloring, vegetable oil and a few drops of essential oil (such as lavender) Steps:

1 Mix the soap flakes with the water in a large bowl. Add the water slowly so that the mixture is the consistency of play dough.
2 Add a few drops of food coloring.
3 Add a few drops of lavender oil.
4 Coat each child's hands with a small amount of vegetable oil and allow them to manipulate the mixture with their hands into fun shapes or into molds (more about that later).
5 Allow the soap shapes to dry overnight

Melted Glycerin Soap

Materials: Several bars of differently colored glycerin soap, sharp knife, microwave safe bowl and wooden spoon Steps

1 Allow children to choose which colors of glycerin they would like to combine together to create their own bar of soap.
2 Cut the glycerin into one inch-chunks and combine the chunks in a bowl.
3 Microwave the glycerin chunks until it melts into a clay or play dough consistency. Stir with a wooden spoon.
4 Be very careful when handling the melted glycerin, as it can be quite hot!
5 This type of soap is ideally poured into molds.

Liquid soap

Materials: 16.5 oz. Sunflower Oil, 7 oz. Coconut Oil, 5.5 oz. Potassium Hydroxide KOH, 16.5 oz. Distilled Water for the Lye Mixture, 40 oz. Distilled Water to dilute the soap paste, Either 2 oz. of boric acid or 3 oz. of borax mixed into 10 or 6 oz. of water, Approx. 3 oz. Fragrance or Essential oil, as desired and Soap dye or colorant, if desired Steps

1 Mix the Lye-Water Solution and the Oils for the Liquid Soap
2 Bring the Soap Paste to Trace
3 Cook the paste for liquid soap
4 Test the liquid soap for done-ness
5 Dilute the liquid soap paste
6 Neutrilize the liquid soap
7 Add fragrance or color to the liquid soap
8 Let the liqud soap rest or 'sequester' for a 1 week
9 Now you can use the soap

Note: 1 ounce (oz) is 6 teaspoons

The Tippy Tap consists of a 5 liter container hanging on a horizontal stick. The container can be tipped by pulling a rope through the cap. The rope is attached to a stick lying on the ground, which is pushed down by foot. As only the soap is touched during hand washing, the device is very hygienic.

Making a Tippy Tap

Materials needed in making the tippy tap include 2 wooden branches of 2 meter length, with Y-shaped end, 2 thinner sticks of ~1 meter length, a saw to cut the wood, nails, a pair of pliers, a lighter, a shovel, two lengths of rope (0.5 m and 1 m), a 5 liter plastic container, a piece of soap, a screwdriver and a bag of gravel. Below are the steps in making the tippy tap:

1. Cut two branches of wood of ~2 meter length, which have a Y-shape at the end. Cut two thinner branches, each of ~1 meter length. Attache a piece of string of ~1 meter length to one of the sticks.
2. Mark the location for the hole on the container around 12cm below the cap.
3. Hold the nail with a pair of pliers and heat up its end with the lighter.
4. With the hot nail, make the holes on the cap and the marked side of the container.
5. Put the rope which is attached to the stick through the hole in the cap.
6. Make a knot in the rope from the inner side of the cap which cannot pass through the hole.
7. Screw the cap back on the container. The stick is now connected to the container with the rope.
8. Using a screwdriver, make a hole through the soap by slowly rotating and pushing the screwdriver through the soap.
9. Put the second piece of rope through the hole in the soap, and tie a piece of wood to it.
10. Fill the container with water, up to the level of the hole.
11. Using a shovel, put the poles in the ground to a depth of 50cm. The distance should be about 70 cm.
12. Put the stick through the handle of the container, and put the stick between the poles. Adjust the length of the rope such that the tied end of the stick is about 15cm above the ground.
13. Tie the rope with the soap to the stick.
14. Between the two poles, below the container, dig a hole of 40 x 40 cm, and 10 cm deep. Fill the hole with gravel. The water soaks away in the hole, and prevents a stagnant water from collecting and keeps mosquitos from breeding.
15. Push the stick down with your foot. This tips the container, which makes water run out of the hole. Wet your hands and release the stick. Apply soap to your hands. Push the stick down again and clean your hands.

Figure 24: Pupils using a tippy tap for handwashing

6.3 Menstrual hygiene management

Strides have been made in recent years both globally and nationally in addressing the menstrual needs of school girls. The sanitation component of MHM consists of access to culturally acceptable sanitary pads and towels, availability of private changing rooms for girls and mechanisms for collection and disposal of used sanitary pads. The main challenge faced by most schools is how to appropriately dispose of the sanitary pads.

The absence of clean private sanitation facilities that allow for menstrual hygiene may discourage girls from attending school during their menses. Poor sanitation facilities for MHM also affect female teachers by leading to reduced teachers' instruction time. In order to effectively provide MHM, there is need for a safe, private space to change sanitary materials, clean water for bathing and washing used cloths and provision for safe disposal of used materials or a place to dry them if reusable. Failing to provide proper disposal facilities for used sanitary materials can result in quick filling up of latrine pits and makes them difficult to exhaust.[15]

It is recommended that at least one cubicle in each girls' toilet block be equipped with a foot operated pedal bin for disposal of used sanitary pads. These bins should be emptied at least once per week and the material fully incinerated at a designated area and preferably through the use of a proper incinerator.

For further guidance, please refer to the Minimum Package of Menstrual Hygiene Management for WASH in Schools.

6.4 Solid waste management

Solid waste management is a common challenge in most schools. According to the National School Health Guidelines provision should be made in all schools for waste collection (sorted), storage, appropriate disposal and/ or recycling. Schools should strive to have or provide appropriate containers for waste collection at specific sites. The school administration should ensure that the compound is well kept by organizing daily clean up.

Effective management of solid waste should be done in the following manner:
1. Segregation of solid waste at the point of collection (biodegradable and non-biodegradable);
2. Reuse of non-biodegradable waste at school level to the extent possible;
3. Decomposition of biodegradable waste (e.g. composting, vermi composting, biogas plant).

The design of the solid waste collection bins should factor in mechanisms for emptying them when they get filled up to be transported to the final disposal sites.

The final site for dumping the collected solid waste should be properly located and fenced with controlled access to eliminate any possibility of hazards arising from the site and to reduce breeding of vermin. The size of the pit should be proportional to the amount of waste generated. Compost pits for biodegradable wastes should have a depth of about 1m. In unstable soil profiles, the pit may need to be lined.

15 House, S.;Mahon,T.; Cavill,S. (2012): Menstrual Hygiene Matters. A resource for improving menstrual hygiene around the world. London: WaterAid

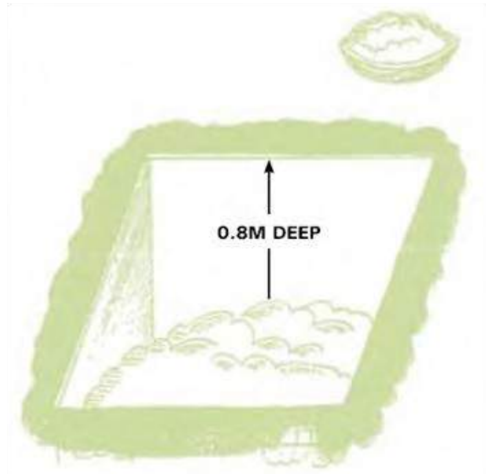


Figure 25: Compost pit for biodegradable wastes

6.5 Incineration

Incineration is one method of treating human created waste (HCW) by high-temperature burning prior to final disposal. It reduces the volume of the waste and eliminates pathogens. It is more efficient than open-air burning, and is preferable if a good quality incinerator is available with a well-trained operator. In the school set up, incineration of used sanitary pads is recommended as a hygienic way of their final disposal.

An incinerator is an enclosed structure used for burning and reducing the volume of waste under controlled temperatures of over 300°C depending on their efficiency. In a school setting, incineration can be done for wastes containing organic materials such as used sanitary pads and polythene bags.

This document provides materials on two types of small-scale incinerator: De Montfort and Waste Disposal Units (WDU) (e.g. "burn barrel"). When operating the burn barrel or De Montfort Incinerator caution should be taken not to insert certain wastes such as aerosol cans, sealed containers such as paint cans or jars since they can explode and cause potential harm. Waste paper and plastics can be inserted in the fire chamber to enhance the combustion of the waste. From time to time the ash in the fire chamber should be emptied. This can be done by use of a small shovel or removable ash pan.

Incinerators should be sited at least 30m away from school buildings such as classrooms and boarding facilities and should also be fenced off to limit access particularly for safety purposes.

6.5.1 Improved burn barrel

A burn barrel or drum incinerator is a 200litre metallic drum, modified to burn solid waste safely and hygienically. It consists of a drum elevated on metal legs, with an airflow grate in the bottom, access door to the fire chamber, an access lid to the incinerator chamber, and a chimney. This design is robust and has a lifespan of between 5-8 years depending on the rate of use and maintenance quality. In this design the fuel (wood, paper, cardboard, etc.) is placed in the fire chamber and lit from the bottom. The access door should be closed to allow the fire to catch. Once the fire is lit, the access door is used to control airflow through the barrel and should be opened to increase the burn intensity and temperature. Using the access lid at the top of the barrel, sanitary pads and other waste can be dropped into the burn barrel to be incinerated (this should only be done after the fire has been burning for at least 30 minutes). Once cooled after use, the ashes can be removed through the fire chamber access door (See Drawing No. 054).

6.5.2 De Montfort Incinerator

The De Montfort incinerator (Drawing Nos. 055 -056) is made of firebricks and pre-fabricated metal components which can be manufactured locally. The structure is assembled and built at the site using refractory cement to bond the firebricks and ordinary Portland cement for other works. No specialized tools are required. The incinerator comprises of two combustion chambers:

- Primary chamber -The burning zone of the primary chamber is accessible through a door at the front of the incinerator. The door lets air in and allows the operator to light the fire and remove the ash. The waste is dropped in through a loading door above the primary chamber;
- Secondary chamber -The secondary chamber, which is inaccessible to the operator, is separated from the primary chamber by a brick column with an opening at the bottom to induce a cross-draft during operation. Additional air is drawn into the secondary chamber through a small opening in the lower section of the rear wall of the secondary chamber. The air mixes with the partially burnt flue gas from the primary chamber and causes secondary combustion;
- Stovepipe/chimney (4m). A high chimney mounted above the secondary combustion chamber releases the flue gases into the atmosphere. A stovepipe thermocouple mounted at the neck of the chimney indicates the temperature inside the secondary chamber and is a useful guide for the operator as to when to when the waste should be loaded.

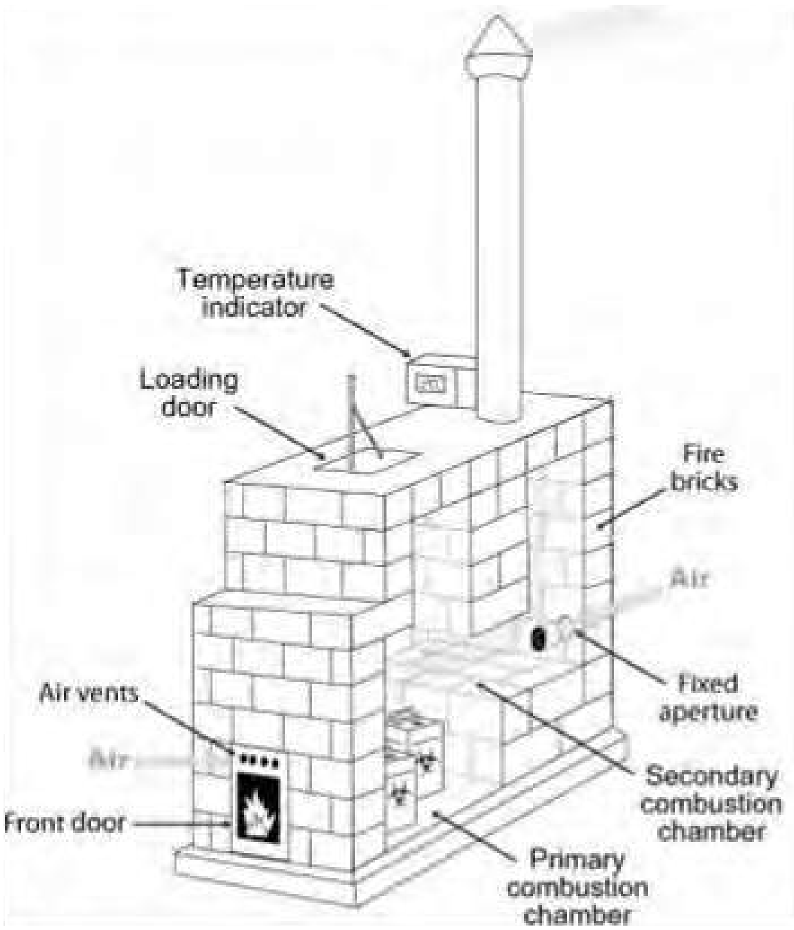


Figure 26 : De Montfort Incinerator

The appropriate amount of waste to be incinerated is placed in the waste chamber through the loading door above the combustion chamber. Thereafter, the fuel is ignited for combustion to take place. Under temperatures of over 300°C the incinerated waste is reduced to ashes and flue gas. The ash emanating from the incinerator can be disposed of in a refuse pit since it is less harmful.

6.6 Hygiene awareness and training

Provision of proper WASH infrastructure alone does not result in healthy outcomes unless it is accompanied by healthy behaviour among pupils. Therefore, in order to inculcate healthy behaviour among pupils, effective hygiene promotion should be undertaken with pupils and staff.

Hygiene promotion should be pupil-centred and an on-going process whose spill-over effect from the schools to homes will positively influence behaviour change.[16] Each school should develop adequate knowledge, attitudes and skills on good hygiene behaviour through life skills-based hygiene education and child participation.

In order to have a harmonized approach which addresses the key hygiene concerns among school children, UNICEF in partnership with the Ministry of Education, Ministry of Health and other sector actors developed a Minimum Package of School Hygiene (MPOSH) promotion. This package consists of lower primary hygiene promotion sessions, upper primary hygiene promotion sessions and supportive activities for sustainable hygiene promotion.[17] This package takes into consideration the learning differences of various stages of child development and uses tools that are tailored to the specific age groups.

Effective hygiene education for pupils is not only about teaching children the facts about health risks of bad hygiene practices. It should also focus on changing child hygiene behaviour and that of the community. Hygiene education therefore should focus on:

1 Knowledge of practical and theoretical information on hygiene;
2 Attitudes and individual opinions about hygiene that influence actions and response to unhygienic situations;
3 Practical skills to demonstrate or carry out specific hygiene behaviour

Hygiene education will have a great impact if it focusses on a limited number of risky behaviour. The key hygiene behaviour among pupils that should be addressed by hygiene education activities include:

1 Safe use of toilets and urinals;
2 Personal hygiene;
3 Hand washing with soap;
4 Male and female hygiene (MHM for adolescents);
5 Waste management and water drainage;
6 Water treatment, handling and storage;
7 Food hygiene.

In order for hygiene education to be effective, it should employ methods that promote active child participation. This can be achieved through the following two ways:

- Through participatory teaching methods used by teachers or through special hygiene teachers in schools, during school hours as part of the regular curriculum;
- Through school health clubs within the school and other hygiene and environmental clubs outside the school.

16 Government of Kenya, Ministry of Public Health and Ministry of Education (2009) National School Health Policy

17 Government of Kenya, DFID and UNICEF, *Minimum Package of School Hygiene Promotion:* A Guide book for teachers (Unpublished)

6.7 Talking walls

Talking walls are paintings on strategic parts of the school walls which effectively convey some key hygiene messages to pupils, such as washing hands after toilet use. Talking messages can be placed on any appropriate wall or surface although if they are placed near the toilets they can act as a reminder to children as they go to the toilet. Appropriate colours, clear pictorials, clear graphics and minimal readable text messages should be designed to effectively communicate to children key WASH messages (handwashing at critical moments and proper use of toilet). Children should be consulted on the formulation of messages, design and production of the talking walls. The graphics should be child friendly and reflect the local context. The talking walls can also make the toilets be seen as attractive structures to reduce the stigmatisation of the structures. For the messages to be clearly seen, there is need for adequate space for putting up the talking walls.

Figure 27: Talking wall on a school latrine

Chapter 7

Management and Sustainability of School WASH Facilities

7.1 Introduction

Sustainability of WASH in Schools addresses the decisions and systems that are set up to ensure that the school WASH infrastructure is functional for a long period of time. Infrastructure planning often focuses on pre-construction and construction activities with insufficient attention and budget allocated to the operation and maintenance activities. It should be emphasised that it is the quality of the operation and maintenance activities that will deliver long term services from the infrastructure and consequently the health and educational impacts that are desired.

Well designed and constructed school WASH facilities and effective WASH education do not necessarily guarantee proper use of the facilities or effective maintenance. Management, operation and maintenance of School WASH facilities is thus another key component of WASH in schools that forms a critical aspect of the sustainability of school WASH facilities.

Poorly maintained sanitation facilities can even cause a greater health risk than the absence of such facilities. For example, stagnant water around tap stands and in blocked drainage channels attracts rodents and forms a breeding place for mosquitoes; unclean toilets promote open defecation; uncollected and managed waste attracts rodents, flies and noxious odours. It is therefore important that roles and responsibilities are specified, arrangements and schedules for maintenance activities are prepared and enforced, training is undertaken, funds allocated, spares acquired and ready to use and an overall plan for the operation and maintenance of the facilities is made and followed.

This chapter provides a general guide on the key stakeholders in the management and sustainability of School WASH facilities and their roles and responsibilities. It also provides a general guide on operation and maintenance, monitoring and inspection as well as the financing of School WASH programs, all geared towards ensuring sustainability of school WASH facilities.

7.2 O&M of School WASH Facilities

O&M of School WASH facilities serves to ensure proper use, upkeep and sustainability of the school WASH facilities. Under the Education Act, school management committees now referred to as the Board of Management (BOM) are mandated to provide management of school infrastructure and thus are the overall managers of the water and sanitation infrastructure in the school. The BOM implements this mandate through the SIC sub-committee. Their role and that of other stakeholders in the management of School WASH facilities is covered in Section 7.3

The BOM can adopt one of the following O & M models for their School WASH facilities:

a) **O&M by School:** The school entirely operates and maintains the WASH facilities by allocating human resources, equipment, materials and financial resources. This is the most common O&M model in many schools in Kenya. O&M by the school is often done through:
   - **A health club under its patron(s).** While quite popular, this option may restrict participation in WASH activities to the members of the club. It is important that the whole student population is involved at relevant stages of school WASH activities and that club members play a positive role in coordinating WASH activities for all students;
   - **By classes on a rotational basis,** with or without a reward mechanism. This promotes learning good individual WASH behaviour;
   - **By individual students.** This must not be used as a form of punishment because it dissuades children from participating in WASH activities and learning good WASH behaviour;
   - **By support staff** employed by the school.

b) **O&M by a Private Entity:** In this case, the school engages a private firm who specialise in providing the required services to undertake the day to day operation and maintenance of the WASH facilities. This option can appear more costly but is easier to enforce and requires less management resources from the school. For example, a number of rural schools have contracted specialised firms to undertake the maintenance of their water supply handpumps and some urban schools in Kenya have contracted firms to handle cleaning latrines and disposing of waste. The aspect of involving pupils and staff in the maintenance activities is one way of instilling good WASH behaviour. It is therefore recommended that schools frame the details of the contract in such a way that the children are given an opportunity to participate in the school WASH activities. Schools that opt for this model must follow the stipulated procurement guidelines.

7.3 Stakeholder Roles and Responsibilities

Sustainability of school WASH facilities is a collective responsibility that involves various stakeholders as detailed in Table 19.

Table 19: School WASH Facilities Management Stakeholders

Stakeholder	Roles and Responsibilities
Board of Management	• Overall responsibility of the WASH infrastructure • Mobilizing and allocation of resources • Planning & Budget preparations • Monitoring and overall supervision
School Infrastructure Committee	• Preliminary and subsequent periodical inspection of school WASH infrastructure • Preparation and ensuring implementation of School Strategic Infastructure maintenance plan
Head Teacher	• Co-ordination between the SIC and school staff • Allocation and supervision of tasks to staff • Communication with SIC and BOM • Trouble shooting

Stakeholder	Roles and Responsibilities
Teachers/staff	• Day to day monitoring of state and use of WASH facilities • Organize for care and maintenance of facilites e.g. preparation of cleaning rotas • Provide hygiene education
Pupils	• Cleaning of sanitation facilities. This can either be done by classes on a rotational basis or by assigned students for a particular period of time e.g. one school term • Reporting faults as and when noticed • Proper use of the facilities
School Health Clubs	• Mobilization and coordination of pupils for WASH O & M Activities • Income generating activities to support WASH O & M budget • Monitoring use of school WASH facilities • Sensitise other students on good WASH behaviour
MoE SIMU	• Quality of Works Supervision • Funding of Capital Costs
MoE QAS	• Routine inspections
MoE SIMMU	• Funding of O&M activities (RMI)
MoH	• Periodic inspection of school WASH facilities • Support establishment of O&M plan
MWI	• Technical backstopping on WASH O&M activities (e.g. water quality)
Development & NGO Partners	• Techncial and financial support to improve infrastructure facilities and use
Private Sector	• Provision of specialised WASH operation and maintenance services; • Honour terms of contracts • Ensure quality service delivery • Support School WASH infrastructure development through partnerships and CSR activities
Parents	• Contribute in the financing of school WASH facilities • Lobby for improvements throught PTA

7.4 O&M Planning

The WASH Scorecard presented in Appendix A can be used to assess existing WASH facilities once each term. The results can be used to not only determine WASH Infrastructure development plans as described in Section 3.4 but also to prepare improved operation and maintenance plans.

It is important to note that the operation and maintenance of school WASH infrastructure is part of the larger school infrastructure operation and maintenance plan. This document is therefore not suggesting an entirely separate WASH infrastructure O & M plan but rather emphasizing the need to adequately address WASH infrastructure within the main school infrastructure O & M plan.

For new WASH facilities, it is expected that towards the completion of the construction of the facilities, an operation and maintenance plan for the new facilities will be prepared by the SIC and updated on the overall school infrastructure operation and management plan.

It is also important that the assessment for both the new and existing WASH facilities continues to be undertaken and the plan updated periodically.

7.5 Routine Tasks, Repairs and Maintenance

Operation and maintenance is designed to keep School WASH facilities functional and in a condition that makes pupils and staff willing to use the facilities.

Operation refers to the everyday running and handling of the WASH systems and facilities so that they can continue to provide the intended service and desired benefits continuously to its users. Operational tasks typically involve daily activities such as:

- Operating water supply system;
- Preparing drinking water;
- Cleaning latrines;
- Emptying bins and incinerating waste;
- Restocking hand-wash stations with water and soap.

These tasks typically require equipment such as gloves, brooms, push brushes; buckets and necessary supplies such as detergents, disinfectants, sanitary pads and toilet paper.

Maintenance refers to the activities required to sustain the facility in a proper working condition. Maintenance can be divided into:

- Preventive maintenance -regular inspection and servicing to preserve assets and minimize breakdowns;
- Corrective maintenance -minor repair and replacement of broken and worn out parts to sustain reliable facilities;
- Crisis maintenance -unplanned responses to emergency breakdowns and user complaints to restore a failed system.

Maintenance costs money and adopting a crisis maintenance approach may appear cheap in the short term but in the long run will lead to frequent breakdowns, an unreliable supply, poor service levels, and a lack of user confidence. It may also ultimately lead to complete system failure. Therefore, focus should be on preventative and corrective maintenance which also comes with the advantage of being planned in advance.

The reality within the school setup is that funds available for operation and maintenance are limited and schools therefore need to be more creative with measures to reduce the cost of repair and maintenance and by promptly attending to minor repairs as soon as need arises.

One strategy that the school can adopt is to ensure that a small supply of repair materials is kept for both the water and sanitation facilities to enable prompt minor repairs. Engaging in small income generating activities to support O & M activities can also prove beneficial.

Appendix C provides a Schedule of O & M Tasks which can be customised by a school for its situation.

7.6 O&M Budget for School WASH Facilities

Each school has different WASH facilities and costs. However it is important for the BOM to develop a realistic budget for the O&M tasks associated with maintaining the school WASH facilities independent of the availability of resources. The financing gap will only become apparent if the budget has been developed on the basis of need. Table 20 provides a list of the items that should be considered and budgeted.

Table 20: O&M Budget

Sector	Item	Items to be considered
Water Facilities	Tools	Pipe wrench, hacksaw, paint brush, spade
	Supplies	Disinfectant for drinking water, plumbing tape, PVC glue, pipe sections
	General maintenance supplies	Paint, sand paper, cement, sand, ballast, paint
	Fittings	Taps, washers, gate valves,
	Power/fuel	Electric bill, fuel for generator or pump
	Utility Bill	Water from WSP
	Labour	Plumber
Sanitation Facilities	Tools	Floor brush, Brooms, Bucket, Sponge, floor cloths, toilet brush, paint brush, spade, mattock, screw driver, hammer, wood saw
	PPE	Gloves, overalls, face mask,
	Maintenance supplies	Door hinges, paint, paint brushes, anti-termite treatment
	Cleaning supplies	Disinfectant (bleach)
	Exhausting	Exhauster services
	Labour	Cleaners
Hygiene Facilities	Tools	Paint brush
	Supplies	Soap, paint
	Maintenance supplies	Washers and taps for HWS (check Water Section in case of duplication)
	Labour	Painter for talking walls

To guide schools with estimating the various costs for operation and maintenance, reference can be made to Table 21 below which has been partially reproduced (costs for toilet paper and security guard have been ommited from the table) from the results of Kenyan study[18]. Schools could also generate similar estimates based on past expenditure to come up with more specific estimates for each respective school.

18 Alexander et al, 2016 *The Life Cycle Costs of School Water, Sanitation and Hygiene Access in Kenyan Primary Schools.* International Journal of Environmental Research and Public Health.

Table 21: Maintenance and recurrent costs per year for a school with 400 pupils

Item	Average Cost per Year (Ksh.)	Average Cost per Student per Year (Ksh.)
Maintenance cost (Major Repairs)		
General repairs to water hardware	4,000	10
General repairs to sanitation hardware	4,800	12
General repairs to handwashing hardware	2,800	7
Maitenance of source	5,000	12.5
Latrine Pit Emptying (Proposed designs in this document are to be emptied every five years)	3,400	8.5
Cleaning of storage tanks	4,000	10
Sub-total	**24,000**	**60**
Maintenance cost (Minor Repairs		
Taps, pipes or gutters	4,000	10
Locks, Hinges, Vent Pipes, doors	5,400	13.5
Buckets and brooms	1,800	4.5
Handwashing taps	800	2
Sub-total	**11,911**	**30**
Recurrent costs		
Water Treatment	3,600	9
Detergent and Disinfectant	10,800	27
Soap for Handwashing	5,400	13.5
Sanitary Pads	5,400	13.5
Sub-total	25,000	63
GRAND TOTAL	**61,000**	**153**

7.7 Financing School WASH Program

Typical questions about funding WASH programs include:

- How much is needed to finance the capital development of new infrastructure?
- What exactly are funds needed for?
- How to raise funds for Operation and Maintenance?
- What funds are needed to recover capital and recurrent costs?

Important issues to be considered are: what has to be paid and who could contribute? As WASH facilities are an essential part of schools, the cost of their construction and O&M must be included in the school annual budget. However, construction of facilities and O & M activities are usually not included in a school's annual plan and therefore do not appear in the budget.

It is important that schools and communities contribute as much as possible to the capital and O&M costs since:

- It will increase their feeling of responsibility and ownership of facilities;
- It will motivate them to maintain the facilities;
- If the amount of external financing being sought is kept low, government and donors can support more schools.

It is important in this regard to distinguish between capital costs and O&M costs. Schools and communities may get some government or donor support to cover the capital cost, although it is best when the school also contributes to cover these costs. To make school WASH programmes sustainable most O&M costs should be covered by schools and communities, in consultation with all stakeholders. To avoid any misunderstanding it is best to make this clear in advance.

Possible funding options are:

- Contributions from parents and school alumni;
- Donations from well-wishers;
- Use the FPE allocation from government (RMI, EWC and Environment and Sanitation vote heads);
- Organize income-generating activities (e.g. making and selling soap, charging community to use latrines).

It is critical that the BOM is fully transparent as to the source and utilisation of funds for the School WASH facilities to avoid misuse or misunderstandings.

Appendix

APPENDIX A

School WASH Score Card

The School WASH Score Card (Table A) is intended to provide the school with a tool that helps to assess the WASH infrastructure and WASH services enjoyed in the school. The tool provides a method to allocate points or a score against a variety of different criteria for water and sanitation separately. The points can be compare the maximum number of points possible to gain a percentage score. By reference to Table B, the percentage can be converted to a grade and the results kept in Table C.

How to Use the School WASH Score card

1 Assess the school water infrastructure and services for each criteria and allocate a score (0 to 5). Note to select the criteria relevant to the conditions at the school e.g. piped water, rainwater etc.
2 Determine the sum of the score
3 Determine the maximum score possible (each relevant criteria has a maximum of 5 points);
4 Determine the percentage and by refering to Table B, determine the grade.
5 Repeat 1 – 4 for sanitation infrastructure and services;
6 Repeat 1 – 4 for hygiene facilities.
7 Update Table C with result
8 Repeat exercise once per year.

Table A: School WASH Score Card

Water (Primary Source)					
	Assessed School Condition				**Score**
Criteria	**A- Excellent**	**B - Good**	**C - Poor**	**D - Not acceptable**	
Points	**5**	**4**	**2**	**0**	
Quantity	100% Daily requirement fully met	>75% Daily requirement fully met	>30% Daily requirement fully met	30% Daily requirement fully met	
Reliability	Supply never fails	Supply fails <10 days per Term	Supply fails <30 days per Term	Supply fails >30 days per Term	
Source Quality	Treated water	Protected source (handpump, borehole, rainwater)	Non-protected but known sources (e.g. shallow well)	Unknown source (dam, river, etc)	
Access	Water supply within school compound and distributed to all latrines, shower blocks, kitchen & dining room.	Water supply within school compound but limited or no distribution	Water supply within a 1 Km from the school compound	No water supply within 1 Km of school compound	
Water security Piped Water	Storage > 5 days	Storage > 2 days	Storage > 1 days	Storage < 1 days	
Water Security for RWH systems	Storage > 60 Days	Storage > 45 days	Storage > 30 days	Storage < 30 days	
Water available for drinking	Treated water > 3 l/p/day	Treated water > 1 l/p/day	Treated water < 1 l/p/day	No treated water provided	
				Total Points for Water Supply	
				Max Number of Points	
				Percentage Score	
				Grade for Water Supply	

Table A: School WASH Score Card (continued)

Sanitation Facilities					
	Assessed School Condition				Score
Criteria	**A- Excellent**	**B - Good**	**C - Poor**	**D - Not acceptable**	
Points	**5**	**4**	**2**	**0**	
Quantity of latrines	Meets PTR standard for both boys (35) & girls (25), condition good	PTR <50	PRT>75	None	
Functionality	>80% of cubicles are being used	60 - 79% are being used	40 - 59% are being used	<40% are being used	
Quality of substructure	>80% adequate for multiple exhausting cycles	60 - 79% adequate for multiple exhausting cycles	40 - 59% adequate for multiple exhausting cycles	<40% adequate for multiple exhausting cycles	
Quality of superstructure (floor slab, walling, dimensions, footrests, doors, roof)	See Table B Meets design standards, condition excellent	See Table B Meets design standards, condition good but minor repairs required	See Table B Meets design standards, condition fair but substantial repairs needed	See Table B Does not meets basic design standards, condition dangerous	
Access & siting (privacy, visibility, location with respect to classrooms, wind direction)	All structures well sited, accessible, gender separated, ECDE appropriate where relevant	Access and siting meets recommendations for most structures	Most structures poorly sited resulting in restricted use	Inappropriately sited restricting proper use and affecting school health	
PLWD	Good condition, meets standards	Available, meets standards but needs minor repair	Available but needs significant re-fitting and/or repairs to meet standards	Not available	
				Total Points for Sanitation	
				Max Number of Points	
				Percentage Score	
				Grade for Sanitation	

Table A: School WASH Score Card (continued)

Hygiene Facilities					
	Assessed School Condition				Score
Criteria	**A- Excellent**	**B - Good**	**C - Poor**	**D - Not acceptable**	
Points	**5**	**4**	**2**	**0**	
Quantity of HWS	1 HWS for <20 pupils	1 HWS per 20 – 39 pupils	1 HWS per >40 pupils	No HWS	
Reliability of water at HWS	Reliable water at all latrines, dining area & kitchen	Reliable water at restricted points	Unreliable water at restricted points	No water at HWS	
Soap	Soap always available at all HWS	Soap frequently available at HWS (> 50% of school days)	Soap rarely available at HWS (< 50% of school days)	No soap provided	
MHM/Shower	Available, good condition, water available within shower	Available, fair condition, water not available within shower	Available but poor condition & no water	None	
Sanitary Pads Collection Facilities	Peddle bins in >50% of girl cubicles, bins emptied weekly	Bins in >50% of girl cubicles, bins emptied weekly	Bins in <50% of girl cubicles, bins emptied after more than one week	No system in place	
Solid Waste Disposal	Waste separated & safely disposed or recycled (e.g. burned with proper incinerator & pit fenced, or collection services engaged)	Waste safely disposed (e.g burned and trash pit fenced)	Trash pit	No pit, no burning	
				Total Points for Hygiene Facilities	
				Max Number of Points	
				Percentage Score	
				Grade for Hygiene Facilities	

Table B: Rating Details for the Assessment of condition of School WASH Infrastructure

Grade	Score	Description	Details
A	>80%	Excellent	Meets design standards, condition is fit-for-purpose, fully operational, no immediate repairs needed
B	60 – 79%	Acceptable	Mostly meets design standards, condition is fit-forpurpose, fully operational, but minor repairs needed
C	40 – 59%	Poor	Basic design, condition is partially fit-for-purpose, partially operational, and substantial repairs are needed to improve condition
D	< 40%	Dangerous	Design does not meet basic standards, condition is not fit-for-purpose and structure should be decommissioned

Table C: Record of WASH Score card

____________________School, _______________ Sub-County, _______________ County

Date	Water		Sanitation		Hygiene	
	Score	Grade	Score	Grade	Score	Grade

APPENDIX B

FORMS AND CONTRACTS

(Reproduced from the School Infrastructure Management Handbook, MOE, 2007)

Forms

Form 2 Pre-qualified Contractors
Form 3 Description of Work/Materials
Form 4 Request for Quotation
Form 5 Tender Evaluation
Form 6 Local Service Order
Form 7 Local Purchase Order

Contracts

1. Labour Only Contract
2. Labour Only Contract (Swahili version)
3. Full Contract: Labour and Materials

MOE School Infrastructure Development/Improvement Forms

Form 2: List of Pre-Qualified Contractors

SCHOOL INFRASTUCTURE DEVELOPMENT/IMPROVEMENT LIST OF PRE-QUALIFIED CONTRACTORS	
Name of School:	County:
Sub-County:	Zone:

	Name of Contractors Physical	Physical Address and Tel. No.	Remarks (Date premises visited, work reviewed etc. attach contractors promotional materialsif available)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

To be filled by the School Infrastructure Committee:

Prepared By		Designation		Secretary SIC
Checked By		Designation		Parents' Represenatative SIC
Date				

Form 3: Description of Works/Materials

SCHOOL INFRASTUCTURE DEVELOPMENT/IMPROVEMENT DESCRIPTION OF WORKS OR MATERIALS

Name of School:	County:
Sub-County:	Zone:

Description of Works or Materials:

Services/Supply process to be completed by date:……………………………………………………….

Estimated Cost:…………………………………………………………………………………………

SIC Chair Person:……………………………………………………………………………………….

Head:…………………………………………………………………………………..…………………

Form 4: Request for Quotations

SCHOOL INFRASTUCTURE DEVELOPMENT/IMPROVEMENT REQUEST FOR QUOTATION

Name of School:

The School named above requests that you submit a quotation for the provision of the under-listed goods, works or services. The quotations must be submitted in the form and manner specified below:

The quotations must be submitted to the School in clearly marked sealed envelopes by______hrs on Date______

Incomplete quotations or those received after the deadline will not be accepted.

Note: This request for quotation is not an order. An official order will be issued to the selected Supplier immediately the selection process is completed

To be Completed by SIC		To be completed by Contractor or Supplier		
Item or Service Description	Quantity Required	Unit Price (Kshs)	Total Cost (Kshs)	Days to Deliver or Complete
1.				
2.				
3.				
	Total			

Contractor or Supplier's Signature and Stamp:	Date:

To be filled by School Infrastructure Committee:

To be filled by the School Infrastructure Committee:

Prepared By		Designation	Secretary SIC
Checked By		Designation	Parents' Represenatative SIC
Date		Time	

Form 5: Tender Evaluation

SCHOOL INFRASTUCTURE DEVELOPMENT/IMPROVEMENT TENDER EVALUATION FORM

Name of School:

Request for Quotation Form No.		Date	

Item Description		Work or Quantity Required

	Name of Contractor or Supplier	Unit Price	Total Price	Days to Deliver or Complete	Remarks
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

Tender awarded to:

……

…………………………………….. …………………………………….
Date Signed SIC Chair Person

To be filled by the School Infrastructure Committee:

Prepared By		Designation	Secretary SIC
Checked By		Designation	Parents' Represenatative SIC
Date		Time	

Form 6: Local Service Order

LSO No:

SCHOOL LOCAL SERVICE ORDER

Name of School: :..

To:...

Tender/Quotation..............................

Contract...

Requisition......................................

Contact Refs...................................

Date...

Please carry out the services listed below at (Full address of School)

....

on.............................or before ....

and send the invoices immediately to ....

P.O. BOX :...Town/City...

	Description of Service	Amount (Kshs)
1.		
2.		
3.		
4.		
	Totals	

To be filled by the School Infrastructure Committee:

Prepared By Date		Designation	SIC Chairperson
Checked By Date		Designation	SIC Parent's Rep
Approved By Date		Designation	SIC Secretary

Form 7: Local Purchase Order

SCHOOL LOCAL PURCHASE ORDER

Name of School:

To:.. LPO Serial No...

.... Date ....

Please deliver the following goods to...on or before.........................

and submit the invoices without delay to ....

To be filled by the School Infrastructure Committee:

Prepared By Date		Designation	SIC Chairperson
Checked By Date		Designation	Head Teacher
Approved By Date		Designation	SIC Parent's Rep

LABOUR ONLY CONTRACT

For use with the Basic School Infrastructure Improvement Grants OR any other Infrastructure improvement or development Grant (Mostly Category 1 Works up to a maximum of Ksh. 500,000)

Articles of Agreement made on the .... day of .... (month) .... (year). BETWEEN the School Board of Management (BOM) OF .... .Primary School (hereinafter referred to as "The Employer") on the one part and MR(s), MS.. OF P.O Box .... (hereinafter referred to as "The Fundi") on the other part.

The Employer desires to have the following works .... carried out in accordance with the attached written technical details and/or drawings. The Employer will provide all the necessary materials, components and preliminary items and the Fundi will provide labour only.

NOW IT IS HEREBY AGREED BY THE EMPLOYER AND THE FUNDI AS FOLLOWS:

Amount of labour contract	1.	The Fundi will execute and complete the works detailed in the only attached drawings and/or written specifications to the levels of workmanship of the respective kinds described in the specifications for the sum of ....
Possession of site Completion date	2.	Possession of the site (or premises) will given to the Fundi on or and before the ....He shall begin the works immediately after such possession and shall regularly proceed with them, and shall complete the same by the …………………... subject nevertheless to the provisions for extension of time hereafter contained
Damages for delay	3.	If the Fundi fails or neglects to complete the works on or before the date stated in clause 2 herein or by any extension of time given by the Employer, the Fundi hereby agrees to pay or allow the Employer as and by way of liquidated damages (in cash) and not by way of penalty, sum to be calculated at 10% of the value of any uncompleted sections.
Extension of time	4.	If the works are delayed through any cause not under the control of the Fundi, the Employer shall make a fair and reasonable extension of time for completion of the works.
Fair Wages	5.	The Fundi shall pay rates and wages and observe hours and conditions of labour not less favourable than the minimum rates of payment/ remuneration and minimum conditions of employment applicable in Kenya. The Fundi shall comply with the Regulation of Wages and Conditions of Employment Act , Building and Construction Industry Wages Council. Should a claim be made to the Employer alleging the Fundi's default in payment of Fair Wages of any Workman employed on the Contract and if proof thereof satisfactory to the Employer is furnished by the Labour Department, the Employer may, failing payment by the Fundi, pay the claim out of any monies due or which may become due to the Fundi under the Contract. The Fundi shall furnish to the Employer if called upon to do so such particular of the rates of wages, hours and conditions of labour referred to above.
Overtime	6.	The Fundi shall be responsible for any extra costs for overtime working which he considers will be necessary in order to complete the work within the Contract Period.
Site safety and first aid facilities	7.	The Fundi shall institute and maintain such site safety measures as required by virtue of the Works, and shall comply fully with all regulations, by-laws and the like concerning or touching on the Works.
Environmental Protection	8.	The Fundi shall take every precaution to protect all sources of water supply, existing trees and shrubs as well as protecting agaiinst any form of erosion within the vicinity of the site. He shall also make every effort to dispose of all construction related rubbish in a manner that will not create any form of public inconvinience or do damage to the surrounding environment.

Variations	9. The Employer and Fundi agree that no variation shall vitiate (cancel) the contract but that all variations involving additional expenditure shall be estimated by the Fundi and the estimate approved by the Employer before the work is executed.
Defects	10. The Fundi shall make good at his own expense any defects, shrinkages, and other faults which may appear within six months from the completion of the works arising from workmanship not inaccordance with the contract.
Payment	11. The Employer will pay to the Fundi the sum mentioned in clause 1 or such other sums as shall become payable after successful completion of the agreed stage(s) has been executed in accordance with the contract. Payments shall be made in stages/phases as per the work accomplished. The final payment shall be made at the rate of 95%, the balance to be paid within six months after the works have been finally completed and all defects made good, whichever shall last happen. NOTE: NO FORM OF ADVANCE PAYMENT IS PERMITTED UNDERWHATEVER CIRCUMSTANCES.
Prevention of nuisance	12. The Works and such sections of the site necessary for the execution of the Works shall be under the entire care and control of the Fundi during the whole period of the Contract who shall take all possible precautions to prevent any nuisance, inconvenience or injury to the holders or occupiers of the site or adjacent and neighbouring properties and to the public generally, and shall use proper precautions to ensure the safety of all pedestrians.
Prevention of noise	13. The Fundi shall keep the noise emanating (arising) from the site of operations to a minimum. He shall take all- necessary steps to muffle the noise from his tools, equipment and workmen to the reasonable satisfaction of the Employer.
Removal of plant, etc.	14. The Fundi shall, on completion of the Works, remove and clear away all rubbish and unused materials, and shall leave the whole of the site of the works in a clean and tidy state to the satisfaction of the Employer. He shall also remove all rubbish and dirt from the site at weekly intervals or as directed by the Employer during the progress of the works.
Arbitration	15. The Employer and Fundi agree that should any dispute or difference arise between them touching on any matter concerning the works , then either party shall forthwith give to the other notice of such dispute or difference and the same shall be referred foremost to the County Infrastructure Coordinating Team (CICT) for resolution. The CICT may negotiate with both the Employer and/or the Fundi in an effort to resolve the dispute amicably. If the CICT is unable for whatever reason to resolve the dispute, the same shall be referred to a third party agreeable to both the Employer and the Fundi whose award shall be final and binding on all parties concerned

AS WITNEESS our hands this (Date) ....

Signatures and Identification Numbers

Employer (Chair Person of BOM) ....

Head Teacher ....

BOM Parent's Representative ....

Fundi..

Witness for Fundi ....

MAKUBALIANO YA UFUNDI PEKEE

Kutumika kwa Ufadhili wa Kuboresha Mijengo ya Kimsingi ya Shule AU ufadhili wowote wa kuboresha au kujenga mijengo. (Hasa kikundi cha 1 cha kazi cha hadi Ksh. 500,000)

Sehemu za Makubaliano haya yanayofanyika tarehe .... Mwezi .... Mwaka................. . KATI ya Kamati ya Usimamizi wa Shule (BOM) ya Msingi ya .... (inayojulikana katika makubaliano haya kama "Mwajiri") kwenye upande moja na BW./BI.. WA S.L.P .... (anayejulikana katika makubaliano haya kama "Fundi") kwa upande mwingine.

Mwajiri anataka kufanyiwa kazi ya .... kulingana na maelezo ya kiufundi na/ au mchoro ambao umeambatanishwa. Mwajiri atapeana vitu vinavyohitajika kujenga, vifaa, na mahali pa kujenga naye Fundi atapeana ufundi pekee .

SASA INAKUBALIWA IFUATAVYO KATI YA MWAJIRI NA FUNDI:

Makubaliano ya Kiasi cha Kazi	1. Fundi atafanya na kukamilisha ujenzi kulingana na michoro na/au maelezo maalum yaliyoambatanishwa kwa viwango vya ubora maalum ulioelezwa kwa jumla ya shilingi ....
Umiliki wa Sehemu ya Ujenzi na Tarehe ya Kukamilisha Ujenzi	2. Fundi atapewa umiliki wa sehemu ya ujenzi tarehe au kabla ya tarehe .... Ataanza ujenzi mara moja baada ya umilikaji huo na ataendelea moja kwa moja na kazi hiyo, na ataikamilisha kufikia tarehe................................... ikitegemea kuongeza kwa muda ziada kulingana na inavyoelezwa hapa
Athari za Kazi Kuchelewa	3. Ikiwa Fundi atachelewa au atapuuza kumaliza kazi tarehe au kabla ya tarehe iliyotajwa katika kifungu cha 2 hapa juu au kwa muda alioongezewa na Mwajiri, Fundi anakubali atalipa au ataruhusu Mwajiri kama au kwa njia ya pesa za kuchelewa kukamilisha kazi kwa wakati au kufanya kazi duni (pesa taslimu) na sio kwa njia ya penalti/adhabu, jumla ya pesa zitakazohesabiwa kwa asilimia kumi (10%) ya gharama ya malipo ya sehemu ambayo itakuwa haijakamilika.
Kuongezwa kwa Muda	4. Ikiwa kazi itacheleweshwa kwa sababu ambazo zinazidi uwezo wa Fundi, Mwajiri atapeana muda ziada wa kutosha na nafuu wa kukamilisha ujenzi.
Malipo Kadiri	5. Fundi atalipa malipo na ujira na atazingatia masaa na hali ya kazi isiyopungua viwango vya chini vya malipo/marupurupu na viwango vya chini vya kuajiriwa vinavyohusika nchini Kenya. Fundi atazingatia Sheria ya Kuratibu Ujira na Hali ya Kuajiriwa, Kamati ya Usimamizi wa Ujira wa Ujenzi. Ikiwa mashtaka yataletwa kwa Mwajiri yakidai kuwa Fundi amekosa au kuchelewa kumlipa malipo kadiri mwajiriwa yeyote aliyeajiriwa kwa makubaliano haya na ikiwa ushahidi wa kuridhisha Mwajiri utatolewa na Idara ya Kazi, Mwajiri anaweza, kutokana na Fundi kukosa kulipa, akalipa deni kutoka kwa pesa zozote anazofaa au atakazofaa kulipa Fundi kulingana na Makubaliano haya. Fundi atahitajika kumjulisha na kumpa Mwajiri maelezo ya kiwango cha malipo, masaa na hali ya kazi inayorejelewa hapa.
Masaa ya Ziada	6. Fundi atagharamikia fedha za ziada zinazotokana na kufanya kazi muda wa ziada ikiwa ataonelea inahitajika ili kukamilisha ujenzi kwa muda wa makubaliano haya.
Vifaa vya Usalama na Huduma ya Kwanza	7. Fundi ataweka na kusimamia hatua za kiusalama katika eneo la ujenzi kama inavyomhitaji kwa masharti ya ujenzi, na atazingatia kikamilifu masharti yote, sheria na mahitaji mengine yanahusika na ujenzi.

Uhifadhi wa Mazingira	8. Fundi atachukua hatua zote zile kulinda chemichemi za maji, miti iliyoko na misitu midogo na pia kuzuia aina yoyote ya mmomonyoko wa udongo katika sehemu za karibu na ujenzi. Pia, atachukua hatua zote ili kutupa taka yote inayotokana na ujenzi kwa njia ambayo haitaleta madhara kwa umma au kuharibu mazingira.
Mabadiliko	9. Mwajiri na Fundi wanakubaliana kuwa hakuna mabadiliko yatakayoyafutilia mbali makubaliano haya lakini mabadiliko kuhusu gharama za ziada yatapendekeza na Fundi naye Mwajiri athibitishe kabla ya ujenzi kufanyika..
Uharibifu	10. Fundi atarekebisha kwa gharama yake uharibifu au makosa yoyote ambayo yatatokea katika muda wa miezi sita baada ya kukamilisha kazi ya ujenzi na yanayotokana na ufundi ambao haujazingatia makubaliano haya.
Malipo	11. Mwajiri atalipa Fundi malipo yaliyotajwa katika kifungu cha 1 au malipo mengine yoyote yatakayohitajika kulipwa baada ya kumaliza vizuri hatua/viwango vilivyokubaliwa na ambavyo vimekamilishwa kulingana na makubaliano haya. Malipo yatafanyika kwa hatua/viwango kulingana na kazi iliyomalizwa. Malipo ya mwisho yatakuwa asilimia tisini na tano (95%), masalio kulipwa miezi sita baada ya aidha, kumaliza kazi kabisa na uharibifu wote kurekebishwa kulingana na ile itafanyika mwisho. ZINGATIA: HAKUNA AINA YOYOTE YA MALIPO YA KABLA YA KAZI YANARUHUSIWA KWA NAMNA YOYOTE ILE.
Kuzuia Kelele	12. Ujenzi na sehemu zote za ujenzi zitakuwa kwa ulinzi wa Fundi kwa muda wote wa Makubaliano haya na atachukua hatua zote zile kuzuia fujo, maudhi au majeraha kwa wanaomiliki au wakazi wa sehemu za ujenzi au ujirani wake na kwa umma kwa jumla, na atachukua hatua zote zile kuhakikisha usalama wa wapita-njia.
Kuzuia Kelele	13. Fundi atahakikisha viwango vya chini iwezekanavyo vya kelele inayotokana na kazi ya ujenzi. Atachukua hatua zote zile zinazohitajika kupunguza kelele kutoka kwa vifaa vyake vya kazi na wafanyikazi wake kwa viwango vya kumridhisha Mwajiri.
Kuondoa Vifaa Vya Kazi, n.k.	14. Baada ya kukamilisha ujenzi, Fundi atazoa na kuondoa taka yote na vitu ambavyo havikutumika, na ataacha sahemu yote ya ujenzi kwa viwango vya usafi vya kumridhisha Mwajiri. Pia, atazoa na kutoa takataka kwa sehemu ya ujenzi kila juma au kulingana na atavyoelekezwa na Mwajiri wakati wa kuendelea na ujenzi.
Usuluhishi (Arbitration)	15. Mwajiri na Fundi wanakubaliana kuwa ikiwa kutakuwa na mzozo/kutokubaliana kokote au tofauti zozote kuzuka kati yao zinazohusiana na mambo yoyote ya ujenzi, basi mmoja wao atampa mwenzake notisi kuhusu mzozo au tofauti hizo na notisi hiyohiyo itapelekwa kwa Kamati ya Kaunti ya Kuratibu Ujenzi ili isuluhishe. Hii kamati ya Kaunti ya Kuratibu Ujezi inaweza kujadiliana na Mwajiri na/au Fundi kama hatua ya kusuluhisha mzozo au tofauti hiyo. Ikiwa kamati haitaweza kusuluhisha mzozo au tofauti hii kwa njia yoyote ile, mzozo au tofauti hii itapelekwa kwa muamuzi wa tatu ambaye anakubalika kwa Mwajiri na Fundi na ambaye uamuzi wake utakuwa wa mwisho na utakaofuatwa na pande zote zinazohusika.

KAMA MASHAHIDI kwa mikono yetu (Tarehe) ....

Sahihi na Nambari ya Kitambulisho

Mwajiri (Mwenyekiti-Kamati ya Usimamizi wa Shule -BOM)..

Mwalimumkuu..

Mwakilishi wa Wazazi - BOM ....

Fundi...

Shahidi wa Fundi ....

FULL CONTRACT: LABOUR and MATERIALS

For use with the Basic and Additional School Infrastructure Improvement Grants and any other infrastructure improvement or development grant (Mostly for use with Category 2 Works in the excess of Ksh. 500,000)

ARTICLES OF AGREEMENT made on the .... day of....................(month) .... (year). BETWEEN the Board of Management (BOM) OF...Primary School (hereinafter referred to as "The Employer") on the one part AND MR(S), MS...OF P.O Box... (herein after referred to as " The Contractor") on the other part .

The Employer desires to have the following works ....carried out in accordance with the written technical details, drawings and the Bill of Quantities attached.

NOW IT IS HEREBY AGREED BY THE EMPLOYER AND THE CONTRACTOR AS FOLLOWS:

Amount of contract	1.	The Contractor will execute and complete the works shown upon the drawings and described in the Bills of Quantities with materials and workmanships of the respective kinds described in the Bills of Quantities and the specifications for the sum of .... The Contract sum shall be deemed to have been calculated to include all taxes and duties on materials to be used in the works
Possession of Site and Completion Date	2.	Possession of the site (or premises) will be given to the contractor on or before the.......... .... He shall begin the works immediately after such possession and shall regularly proceed with them, and shall complete the same by the................................... subject nevertheless to the provisions for extension of time hereafter contained.
Damages for delay	3.	If the contractor fails or neglects to complete the works on or before the date stated in clause 2 herein or by any extension of time given by the Employer, the Contractor hereby agrees to pay or allow the Employer as and by way of liquidated damages (cash) and not by way of penalty, sum to be calculated at 10% of the value of any uncompleted sections.
Extension of time	4.	If the works are delayed through any cause not under the control of the Contractor, the Employer shall make a fair and reasonable extension of time for completion of the works.
Notices and fees	5.	The Contractor shall comply with all rules, regulations and bylaws of any Local Authority, Water and lighting Companies and shall conform to the provisions of any laws relating to the works and he must give all notices required by the said laws, rules, regulations and by-laws and pay all fees legally demandable.
Variations	6.	The Employer and Contractor agree that no variation shall vitiate (cancel) the contract but that all variations involving additional expenditure shall be estimated by the Contractor and the estimate approved by the Employer before the work is executed.
Injury to persons and property	7.	(a) Injury to persons. The Contractor shall be liable for and shall indemnify the Employer against all loss, claims or proceedings whatsoever whether arising in respect or personal injuries to persons whether in his employment or not , arising out of or in the course of the execution of the contract and against all costs and charges incurred in relation to the investigation or settling of such claims. (b) Injury of Property. The Contractor shall be liable for and shall indemnify the Employer in respect of any liability, loss, claim or proceedings and for any injury or damage whatsoever arising out of or in the course of the execution of the contract works to any property, real or personal, due to any negligence, or omission or default of himself, his agents or his servants or of any Sub-Contractor or to any circumstances within his control. (c) The Contractor shall secure the due performance of these indemnities by forthwith entering into proper and sufficient policies of insurance

Environmental Protection	8. The contractor shall take every precaution to protect all sources of water supply, existing trees and shrubs as well as protecting aganist any form of erosion within the vicinity of the site. He shall also make every effort to dispose of all building related rubbish in a manner that will not create any form of public inconvinience or do damage to the surrounding environment..
Defects	9. The contractor shall make good at his own expense any defects, shrinkages, and other faults which may appear within six months from the completion of the works arising from materials or workmanship not in accordance with the contract.
Provisional and prime cost	10. All provisional and prime cost sums included in the Bills of Quantities are for the execution of the works or for the supply of goods specified and are strictly net and intended to be available in full for payment to the parties concerned. Prime cost sums shall include customs duty or other taxes and cost of packing, carriage and delivery. Provisional and Prime Cost sums shall only be expended at the direction of the Employer and if not expended the same shall revert to the Employer.
Payment	11. The Employer will pay to the Contractor the sum mentioned in clause 1 or such other sums as shall become payable after successful completion of the agreed stages(s) has been executed in accordance with the contract. Payments shall be made in stages / phases as per the work accomplished. The final payment shall be made at a rate of 95%, the balance to be paid within six months after the works have been finally completed and all defects made good, whichever shall last happen. NOTE: NO FORM OF ADVANCE PAYMENT IS PERMITTED UNDER WHATEVER CIRCUMSTANCES.
Arbitration	12. The Employer and Contractor agree that should any dispute or difference arise between them touching on any matter concerning the works, then either party shall forthwith give to the other notice of such dispute or difference and the same shall be referred foremost to the County Infrastructure Coordinating Team {CICT) the res pective county for resolution. The CICT may negotiate with both the Employer and the Contractor in an effort to resolve the dispute amicably. If the CICT is unable for whatever reason to resolve the dispute, the same shall be referred to a third party agreeable to both the Employer and the Contract or whose award shall be final and binding on all parties concerned.

AS WITNEESS our hands this (Date) ....

Signatures and Identification Numbers

Employer (Chair Person of BOM) ....

HeadTeacher ....

Parent's Representative on BOM ....

Contractor..

Witness for Contractor ....

APPENDIX C

OPERATION AND MAINTENANCE SCHEDULE

OPERATION AND MAINTENANCE SCHEDULE FOR SCHOOL WASH FACILITIES

Item	O & M Task	Recommended Frequency	Person Responsible
Management			
	Review O & M schedule & duties	Beginning of term	Head teacher and SIC
	Train staff, pupils on duties and tasks	Beginning of term	Maintenance and Teaching staff, pupils
	Inspect school WASH facilities (entire school)	Once per term	Head teacher and SIC
	Enforce O & M Schedule - Ad-hoc inspections	Weekly	Head teacher
	Ensure financial records for WASH services are up-to-date and properly filed	Continuously	School accountant or head teacher
	Record and properly file all equipment manuals	Continuously	Head teacher
	Update site infrastructure & service map	Continuously	Head teacher and SIC
Water Supply System			
Pipeline System	Water meter - Check water meter is operating properly, clean filter if necessary, take meter reading	Once per month	Maintenance staff
	Pay the water bill	Once per month	School accountant
RWH system	Clean tank, roof and gutters of debris	Before rainy season	Maintenance staff
	Repair/replace gutters and downpipes	Before rainy season	School maintenance team
	Repair or replace leaky taps	Immediately	Maintenance staff
	Inspect and drain first flush system	Before rains	Maintenance staff
	Drainage at drawoff point – clean drains	Once per month	Maintenance staff
Handpumps	Check drainage around apron – clear drain	Once per month	Maintenance staff
	Check condition of apron for cracks & repair	Start of term	Maintenance staff
	Replace worn or damaged and quick wearing parts (rods, washers, seals, bearings, etc) as recommended by manufacturer	Holiday period	Maintenance staff or contracted maintenance firm
	Check stock of replacement parts (at local stockist or kept at school) for emergency repairs	Holiday period	Maintenance staff
	Renew maintenance contract with service provider	Once per year	Head teacher
Borehole	Operate pump according to schedule / need	Daily	Pump operator
	Check stock of fuel and re-stock as per schedule	Once per month	Pump operator
	Renew maintenance contract with service provider	Once per year	Head teacher

Spring	Check catchment area and fencing	End of dry season	Maintenance staff
	Check spring protection box for signs of damage – fix as necessary	Beginning of dry season	Maintenance staff
	Check flow rate from spring	End of dry season	Maintenance staff
	Check outlet pipe and pipeline for damage – repair as necessary		
Sand dam	Check wall for signs of damage and repair as necessary	Beginning of dry season	Maintenance staff
	Check drawoff pipe or shallow well/handpump – repair as necessary	Beginning of dry season	Maintenance staff
Tanks	Assess and where possible record level in tank	Once per week	Maintenance staff
	Clean out debris and sediments from tank	End of term	Maintenance staff
	Check tanks for wear and damage – fix as necessary	End of term	Maintenance staff
	Check and repair/replace tank connections & fittings	End of term	Maintenance staff
School distribution system	Check and repair leaks in pipelines	Immediately	Maintenance staff
	Fix/repair leaky taps	Immediately	Maintenance staff
	Check for and recover exposed pipes	Weekly	Maintenance staff
Water treatment	Prepare daily treated drinking water	Daily	Maintenance or teaching staff
	Check stock of chemicals & re-stock	Beginning of term	Maintenance or teaching staff
Sanitation			
Toilets	Clean latrines & urinals – floor, walls, toilet bowls, urinals	Daily	Pupils, Maintenance or teaching staff
	Check doors, roof, walls, ramps, handrails – repair as necessary	Once per month	Maintenance staff
	Renew maintenance contract with cleaning firm	Once per year	Head teacher
	Check level of waste in pits – decommission filled pits that cannot be exhausted	End of term	Maintenance staff
	Exhaust filled pits and dispose waste properly	As necessary	Maintenance staff
Septic Tank	Check sludge level – exhaust as necessary & dispose waste properly	Once per year	Maintenance staff
Soak Pit	Check for any overflows	Continuous, especially in rainy season	Maintenance staff
Sewer connection	Check line to sewer for cracks and leaks – repair as necessary	End of term	Maintenance staff

Hygiene			
HWS	Check hand-washing facilities – re-fill with water & soap	Daily	Maintenance or teaching staff
	Check taps at hand-washing stations – replace/repair as necessary	Once per month	Maintenance staff
	Check drainage – open drains as necessary	Once per week	Maintenance staff
MHM	Check stock of sanitary pads – re-stock as necessary	Once per week	Maintenance or teaching staff
	Empty MHM bins and incinerate waste or ensure collection of MHM waste by contracted firm	Once per week	Maintenance staff
Anal Cleansing	Check stock for anal cleansing materials e.g. toilet paper	Once per week	Maintenance or teaching staff
	Check availability of water and management of containers	Once per week	Maintenance or teaching staff
Waste management	Empty waste bins and incinerate, dispose, recycle waste as appropriate	Once per week	Maintenance staff
	Check fence around waste pit and repair as necessary	Once per week	Maintenance staff
	Check condition of incinerator – repair/replace as necessary	End of term	Maintenance staff

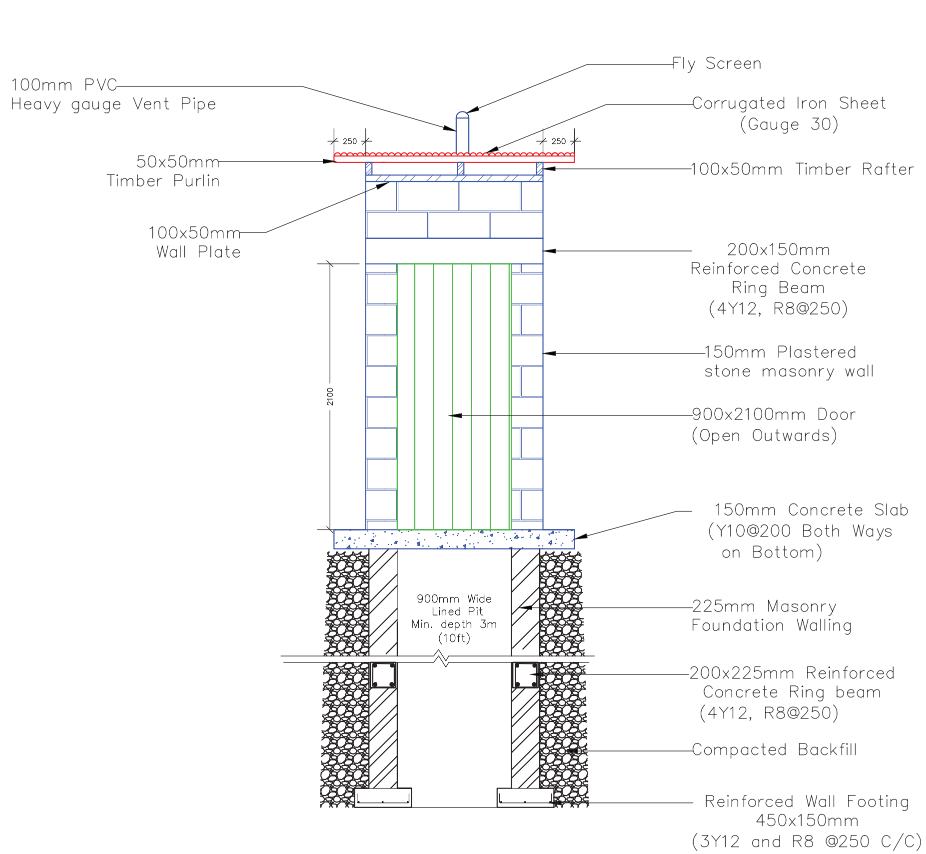
APPENDIX D

SCHEDULE OF DRAWINGS

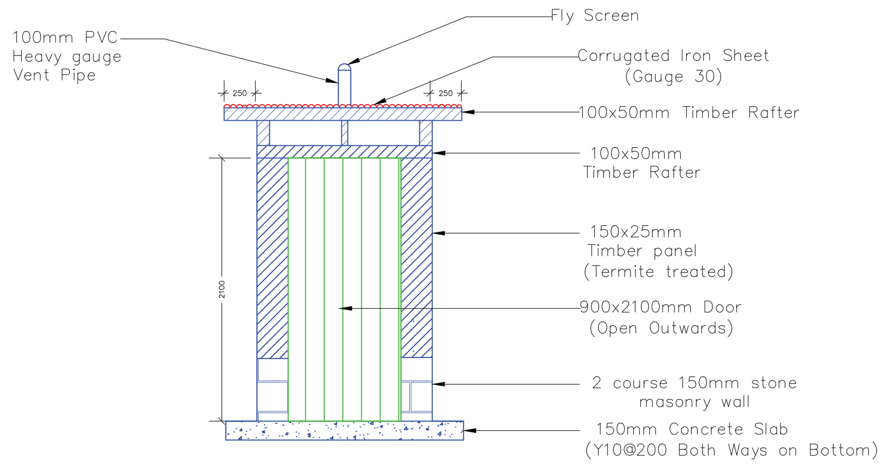
Structure	Drawing ref.	Details	BoQ ref.
SANITATION FACILITIES			
Dry Conditions			
1 DOOR VIP LINED	001	Front elevation details (stone, brick, mabati walls)	B/01
	002	Plan, cross-section, foundation and slab details	
1 DOOR VIP UNLINED	003	Front elevation, foundation, plan and slab details	B/02
	004	Cross-section and foundation details	
1 DOOR PLWD LINED	005	Plan, front elevation and foundation details	B/03
	006	Cross-section and foundation details	
1 DOOR PLWD UNLINED	007	Plan, front elevation and foundation details	B/04
	008	Cross-section and foundation details	
2 DOOR VIP LINED	009	Front elevation details (stone, brick, mabati walls)	B/05
	010	Plan, cross-section, foundation and slab details	
2 DOOR VIP UNLINED	011	Plan, front elevation and foundation details	B/06
	012	Cross-section and foundation details	
2 DOOR VIP UNLINED (NON-EXHAUSTIBLE)	013	Plan, front elevation and foundation details	B/07
	014	Cross-section and foundation details	
2 DOOR VIP LINED ECDE	015	Plan, front elevation and foundation details	B/08
	016	Cross-section and foundation details	
2 DOOR VIP UNLINED ECDE (NONEXHAUSTIBLE)	017	Plan, front elevation and foundation details	B/09
	018	Cross-section and foundation details	
2 DOOR VIP RAISED	019	Plan, cross-section and foundation details	B/10
2 DOOR UDDT	020	Front and side elevation details Plan, cross-section, foundation and slab details	
4 DOOR VIP GIRLS	021	Plan details	B/11
	022	Cross-section details	
	023	Elevation details	
	024	Soak pit details	
	025	Toilet block hand washing station details	B/12
	026	1 m^3 rainwater harvesting tank platform details	B/13
4 DOOR VIP & URINAL BOYS	027	Plan details	B/14
	028	Cross-section details	
	029	Elevation details	
6 DOOR, 1 PLWD, 1 BATHROOM VIP GIRLS BLOCK	030	Plan details	B/15
	031	Side section details	
	032	Front section details	
5 DOOR, URINAL, 1 PLWD, VIP BOYS BLOCK	033	Plan details	B/16
	034	Side section details	
	035	Front section details	

Structure	Drawing ref.	Details	BoQ ref.
4 DOOR, 4 URINAL, 1 BATHROOM VIP GIRLS BLOCK	036	Plan details	B/17
	037	Foundation layout details	
	038	Ring beam section details	
	039	Cross-section details	
	040	Elevation details	
4 DOOR, URINAL, 1 BATHROOM VIP BOYS BLOCK	041	Plan details	B/18
	042	Plan details	
	043	Elevation details	
Wet Conditions			
2 DOOR WATER CLOSET	044	Plan and elevation details	B/19
	045	Cross-section details	
PLWD WATER CLOSET	046	Plan and cross-section details	B/20
	047	Elevation details	
4 DOOR, 4 URINAL, 1 BATHROOM GIRLS WATER CLOSET BLOCK	048	Plan details	B/21
	049	Foundation layout details	
	050	Ring beam section details	
	051	Elevation details	
4 DOOR, URINAL, 1 BATHROOM BOYS WATER CLOSET BLOCK	052	Plan details	B/22
	053	Elevation details	
WASTE MANAGEMENT			
200LTR INCINERATOR DRUM	054	Metallic drum incinerator details	
BRICK INCINERATOR (De Montfort)	055	Brick incinerator plan details	B/23
	056	Brick incinerator cross-section details	
5M³ SEPTIC	057	Septic tank (5M³) plan and cross-section drawings	B/24
27M³ SEPTIC	058	Septic tank (27M³) plan and cross-section drawings	B/25
	059	Septic tank (27M³) reinforcement specifications drawing	
SEWER CONNECTIONS	060	Sewer connection plan and details drawing	
HAND-WASHING FACILITIES			
SINGLE STATION	061	Single container with tap, sink and drain container on metallic stand	
MULTIPLE STATION	062	Masonry block fitted with several taps, sink, drain and plastered area	B/26
WATER SUPPLY			
TAP	063	Stand tap with drain (soak pit) specifications plan details	B/27
	064	Stand tap with drain (soak pit) section drawing	
SHALLOW WELL	065	Detailed plan of shallow well fitted with hand-pump (apron and drain specifications)	B/28
	066	Detailed cross-section of shallow well fitted with handpump (apron and drain specifications)	

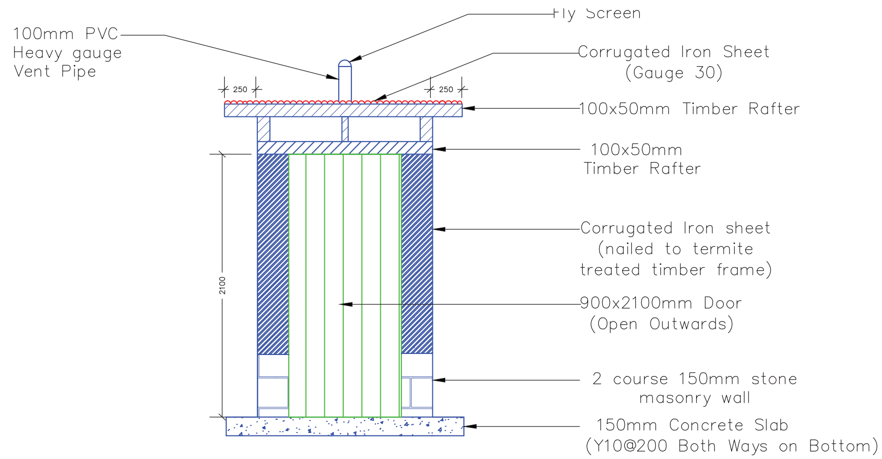
Structure	Drawing ref.	Details	BoQ ref.
25m^3 MASONRY TANK	067	Floor, roof and section details	B/29
	068	Offtake and Scour pipe details	
50m^3 MASONRY TANK	069	Tank roof slab	B/30
	070	Tank floor slab	
	071	Tank cross-section	
	072	Tank pillar section	
	073	Tank section details	
	074	Tank scour and drawoff details	
	075	Tank overflow and inlet details	
10m^3 ELEVATED PVC TANK	076	Elevated 10m^3 plastic tank on concrete platform	B/31
10m^3 ELEVATED PVC TANK	077	Elevated 10m^3 plastic tank on steel platform	B/32
800 L COLLECTION TANK	078	800Ltr collection tank	
RAIN WATER HARVESTING	079	First flush system specifications	
PIPELINE COMPONENTS	080	Pipeline plan details	
	081	Pump components details	



Front Elevation and Foundation
Single VIP Latrines
(Lined)



Front Elevation and Foundation
Single VIP Latrine
Superstructure
(Timber)



Front Elevation and Foundation Single VIP Latrine
Superstructure (Iron sheet)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre primary (L)250mmx(W)130mm
4.All doors are of dimensions: Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 002, 003 and 004

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

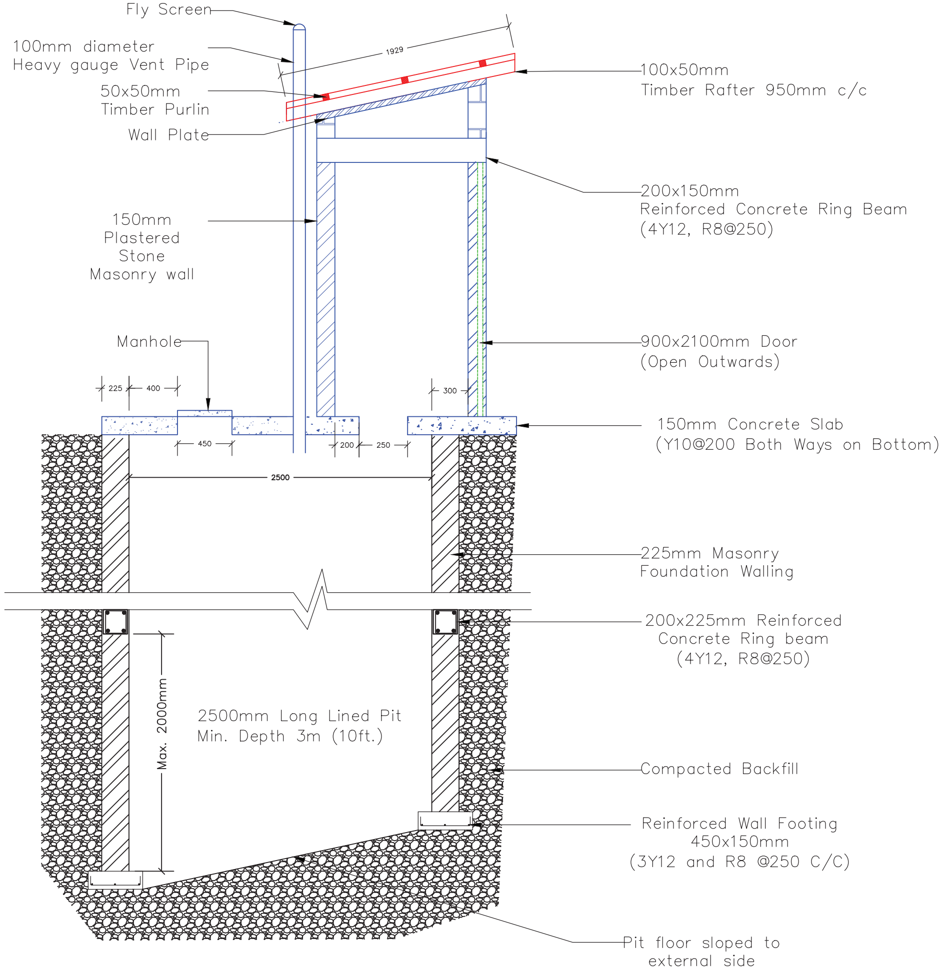
File Name: VIP Latrines Sections & Elevations

Scale: 1:40

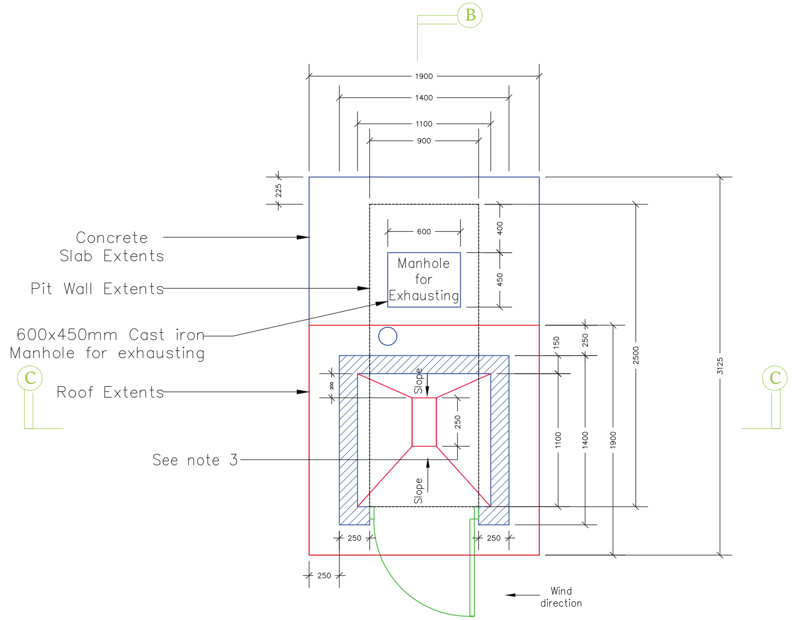
Project:

Drawing Title: Single VIP Lined Latrines

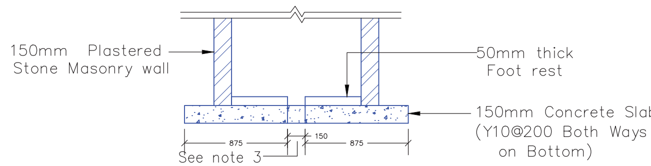
Drawing No:	Rev:	Sheet:
001	A	1/4



Typical Section B–B
Single VIP Foundation
(Lined –Suitable for unstable soils)



Typical SIngle
VIP Latrine
Plan Detail
(Lined)



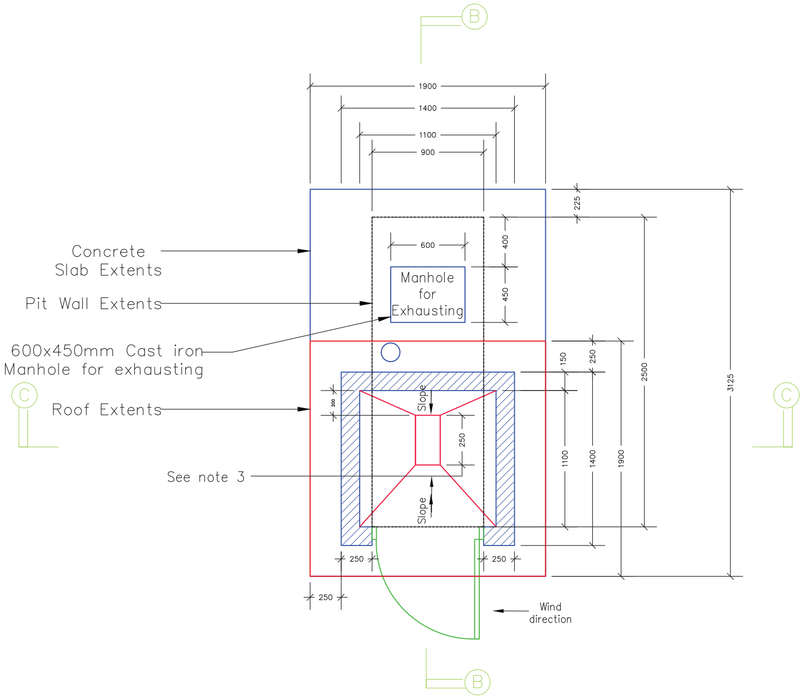
Typical Single
VIP Latrine
Slab Section
C–C

Construction Details:

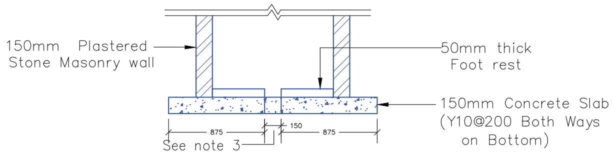
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre primary (L)250mmx(W)130mm
4.All doors are of dimensions: Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no 001.

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

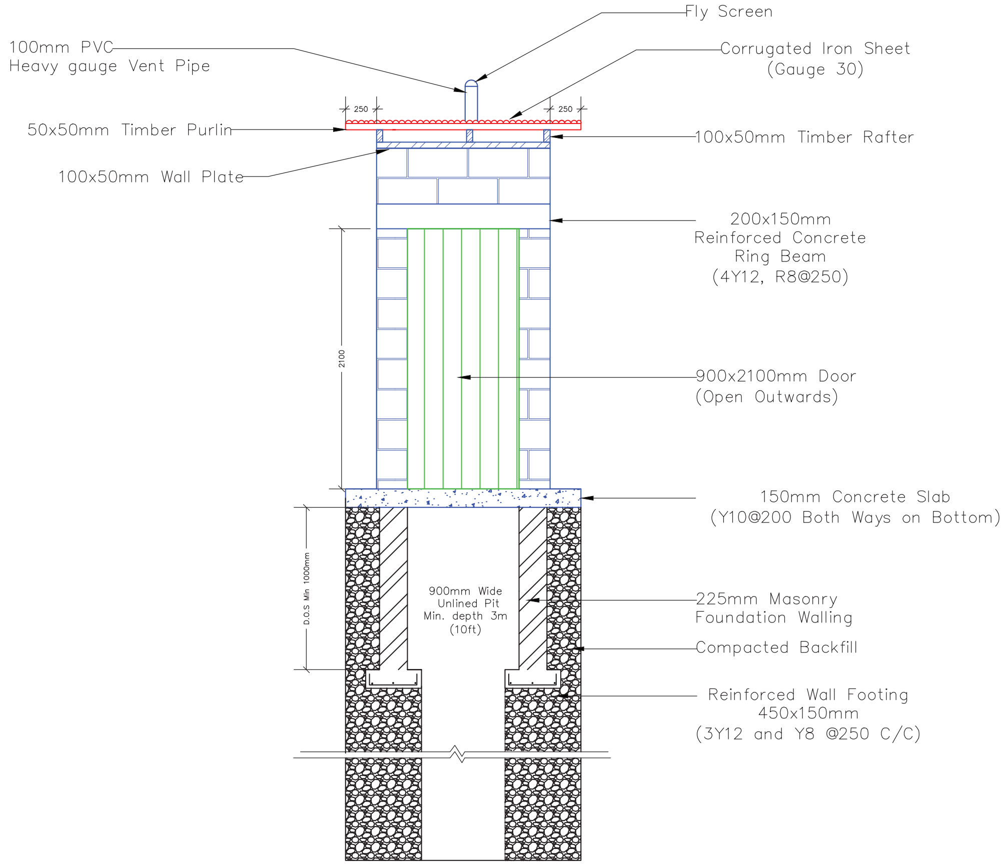
Location:	
File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Project:	
Drawing Title: Single VIP Lined Latrines	
Drawing No: 002	Rev: A
Sheet: 2/4	



Typical SIngle VIP Latrine
Plan Detail (Unlined)



Typical Single
VIP Latrine
Slab Section
C–C



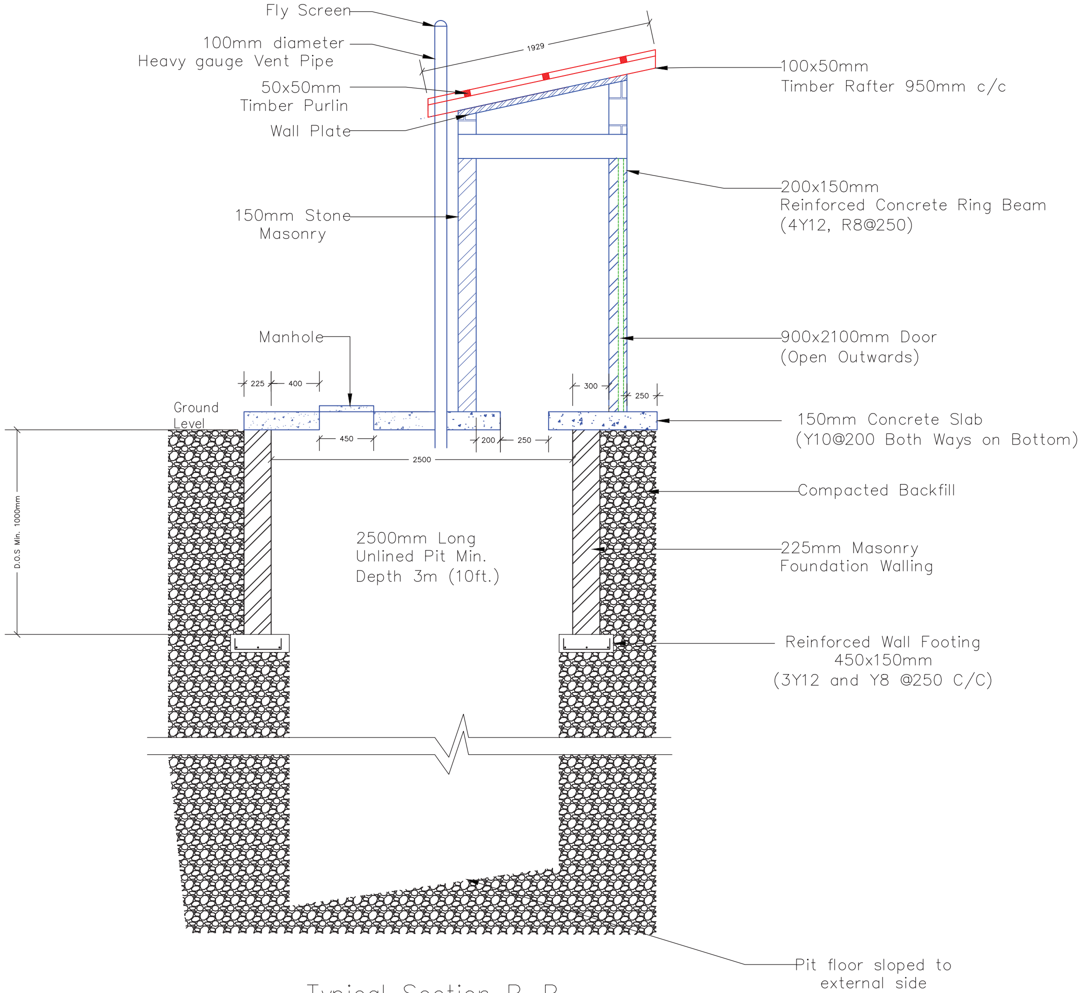
Front Elevation and Foundation
Single VIP Latrines
(Unlined)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre primary (L)250mmx(W)130mm
4.All doors are of dimensions: Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 001 and 004

Client:	MoE	
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:
File Name: VIP Latrines Sections & Elevations
Scale: 1:40
Project:
Drawing Title: Single VIP Unlined Latrines
Drawing No: 003
Rev: A
Sheet: 3/4



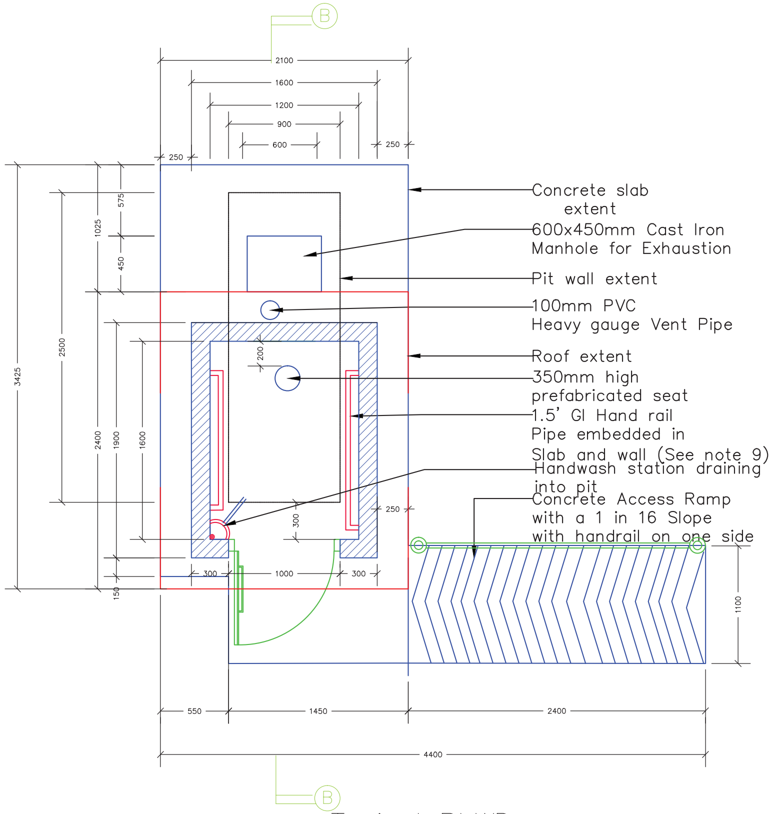
Typical Section B–B
Single VIP Foundation
(Unlined – Suitable for stable soils)

Construction Details:

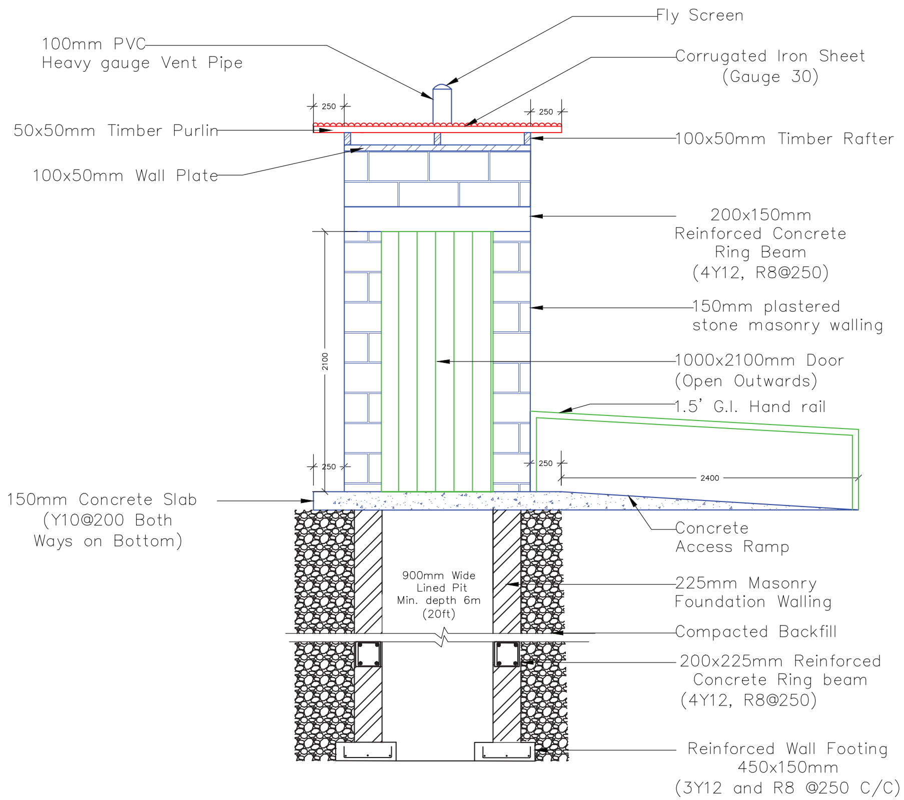
1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down-wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 001 and 003.

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:	
File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Project:	
Drawing Title: Single VIP Unlined Latrines	
Drawing No: 004	Rev: A
Sheet: 4/4	



Typical PLWD VIP Latrine Plan Detail (Lined)

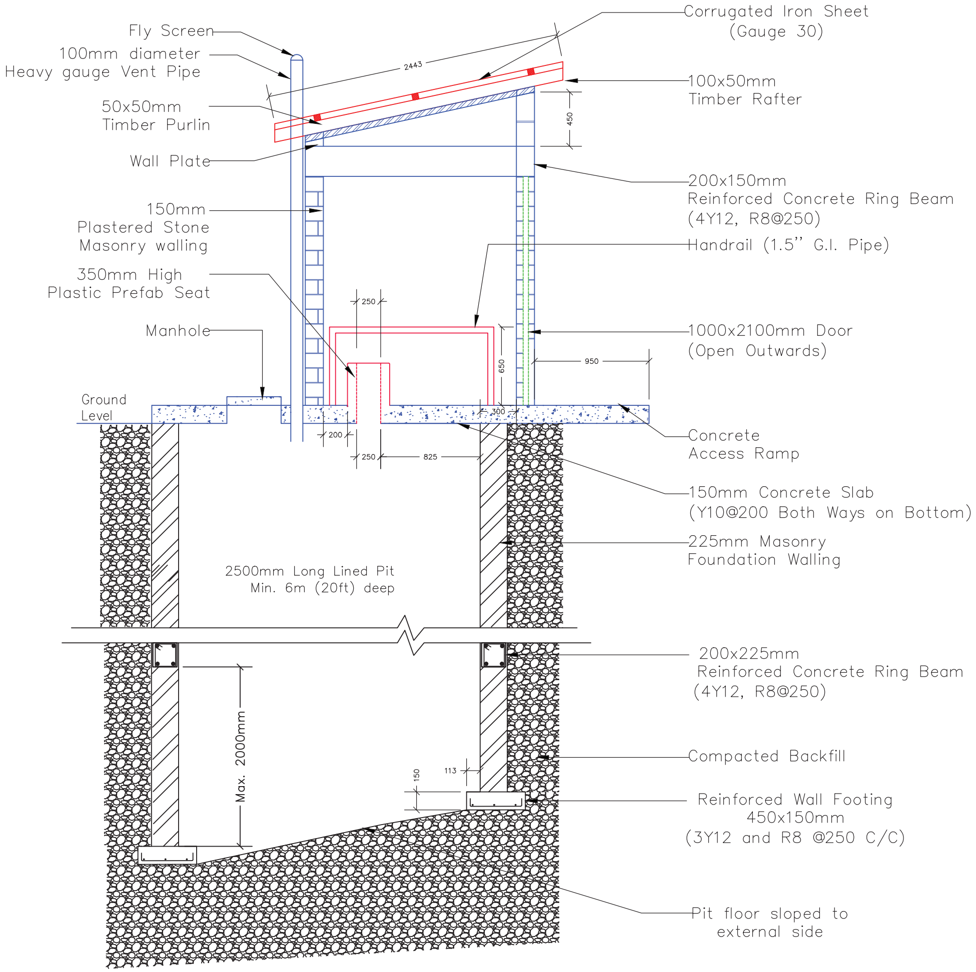


Front Elevation and Foundation PLWD VIP Latrines (Lined)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
4. Height of handrail: 650mm
5. Height of door handles from slab to be at:
   Upper primary – 1000mm
   Pre primary – 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm ad class RC30, specified mix (1:2:3) 7 min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Orientation of access ramp can be towards or to side of the room.
14. Pit designed to be emptied every 5 years.
15. This drawing should be read with dwg. no. 006

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU – MoE	2017	Drawing Title: PLWD VIP Lined Latrines	
Approved By:	SIMU – MoE	2017	Drawing No: 005 · Rev: A	Sheet: 1/2



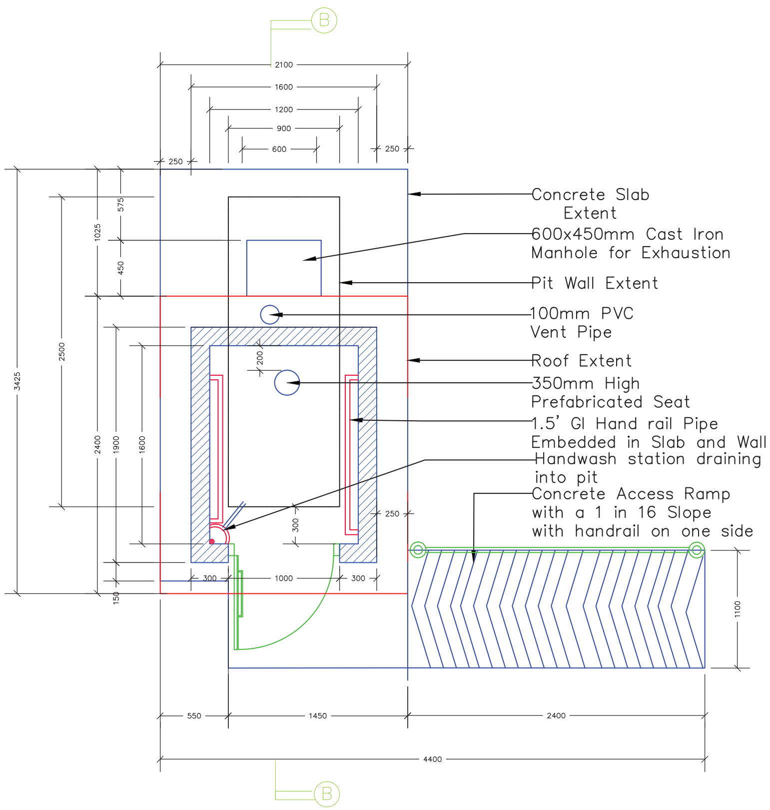
Typical Section B–B
PLWD VIP Foundation
(Lined – Suitable for unstable soils)

Construction Details:

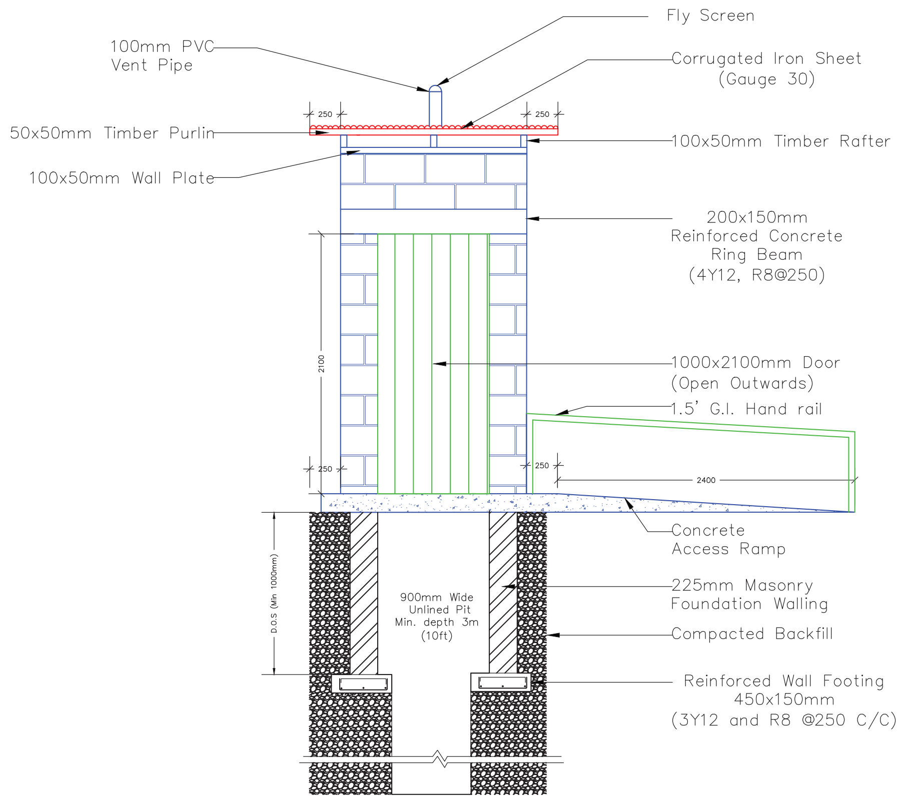
1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
4. Height of handrail: 650mm
5. Height of door handles from slab to be at:
   Upper primary – 1000mm
   Pre primary – 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm ad class RC30, specified mix (1:2:3) 7 min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Orientation of access ramp can be towards or to side of the room.
14. Pit designed to be emptied every 5 years.
15. This drawing should be read with dwg. no. 005

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:		
File Name: VIP Latrines Sections & Elevations	Scale: 1:40	
Project:		
Drawing Title: PLWD VIP Lined Latrines		
Drawing No: 006	Rev: A	Sheet: 2/2



Typical PLWD VIP Latrine Plan Detail (Unlined)

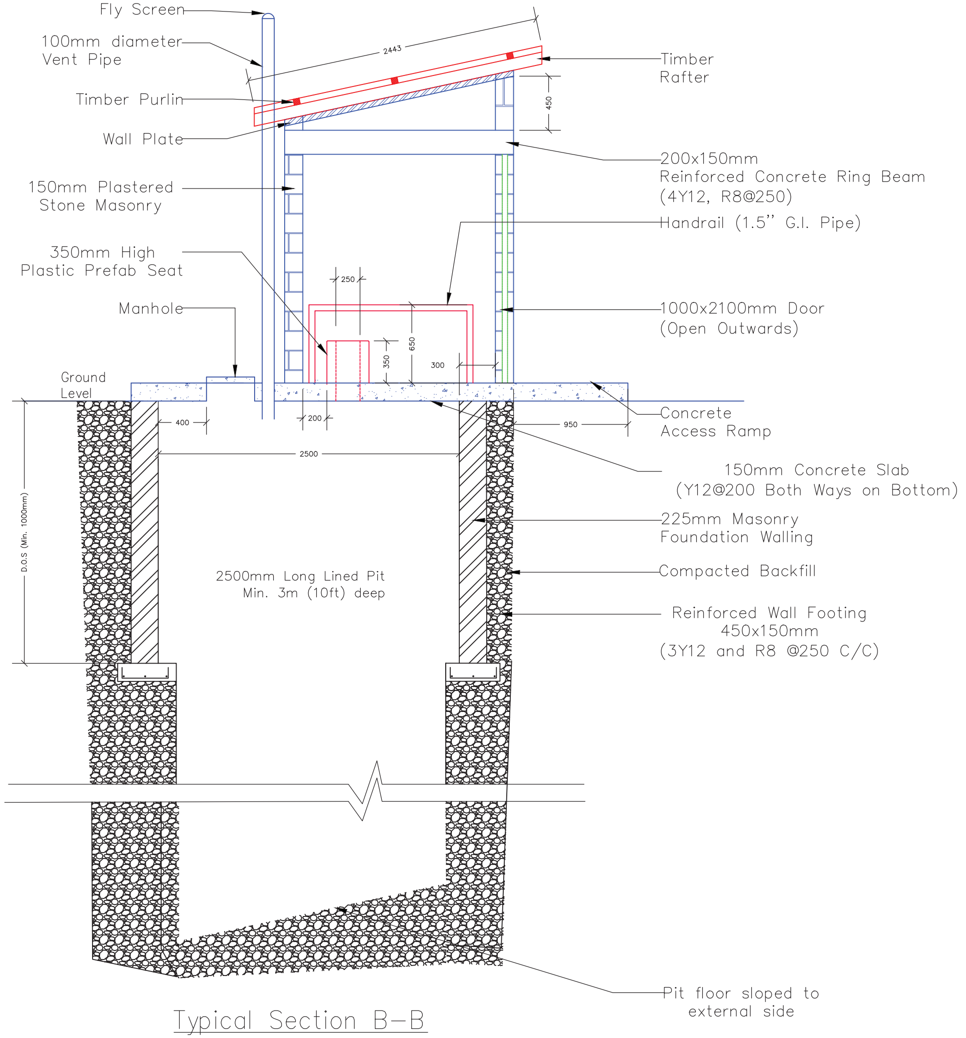


Front Elevation and Foundation PLWD VIP Latrines (Unlined)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
4. Height of handrail: 650mm
5. Height of door handles from slab to be at:
   Upper primary – 1000mm
   Pre primary – 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm ad class RC30, specified mix (1:2:3) 7 min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down-wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Orientation of access ramp can be towards or to side of the room.
14. Pit designed to be emptied every 5 years.
15. This drawing should be read with dwg. no. 008

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU – MoE	2017	Drawing Title: PLWD VIP Unlined Latrines	
Approved By:	SIMU – MoE	2017	Drawing No: 007	Rev: A / Sheet: 1/2



Typical Section B–B
PLWD VIP Foundation
(Unlined – Suitable for stable soils)

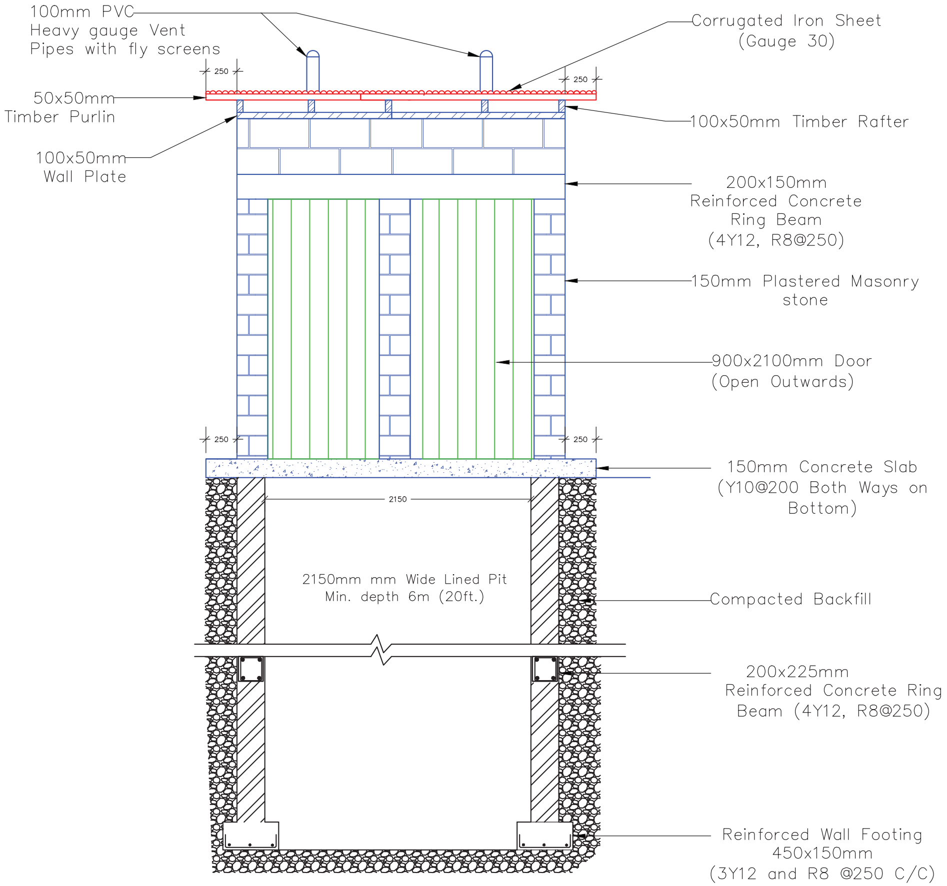
Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
4. Height of handrail: 650mm
5. Height of door handles from slab to be at:
   Upper primary – 1000mm
   Pre primary – 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm ad class RC30, specified mix (1:2:3) 7 min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Orientation of access ramp can be towards or to side of the room.
14. Pit designed to be emptied every 5 years.
15. This drawing should be read with dwg. no. 007

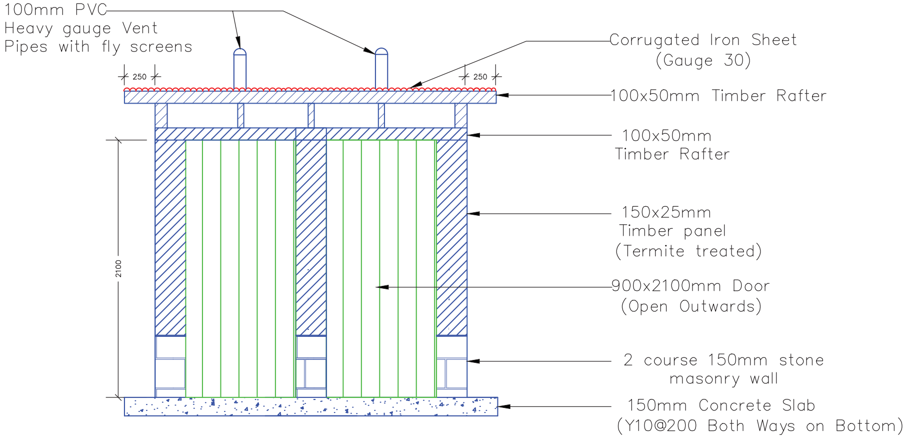
Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

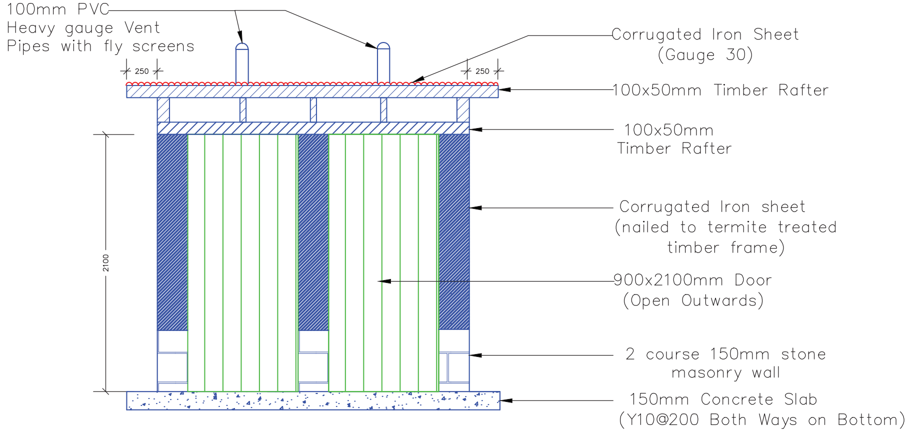
File Name: VIP Latrines Sections & Elevations
Scale: 1:40
Project:
Drawing Title: PLWD VIP Unlined Latrines
Drawing No: 008
Rev: A
Sheet: 2/2



Front Elevation and Foundation
2 VIP Latrines
(Lined)



Front Elevation and Foundation
2 VIP Latrine Superstructure
(Timber)



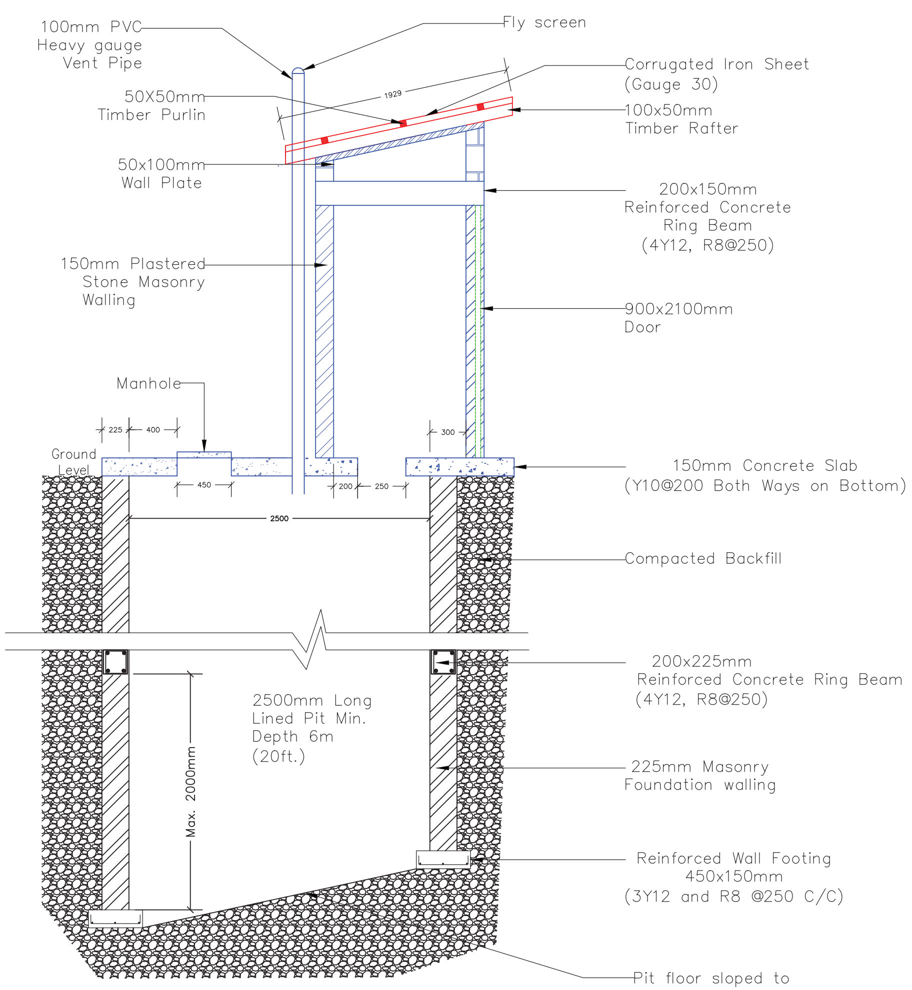
Front Elevation and Foundation
2 VIP Latrine Superstructure
(Iron sheet)

Construction Details:

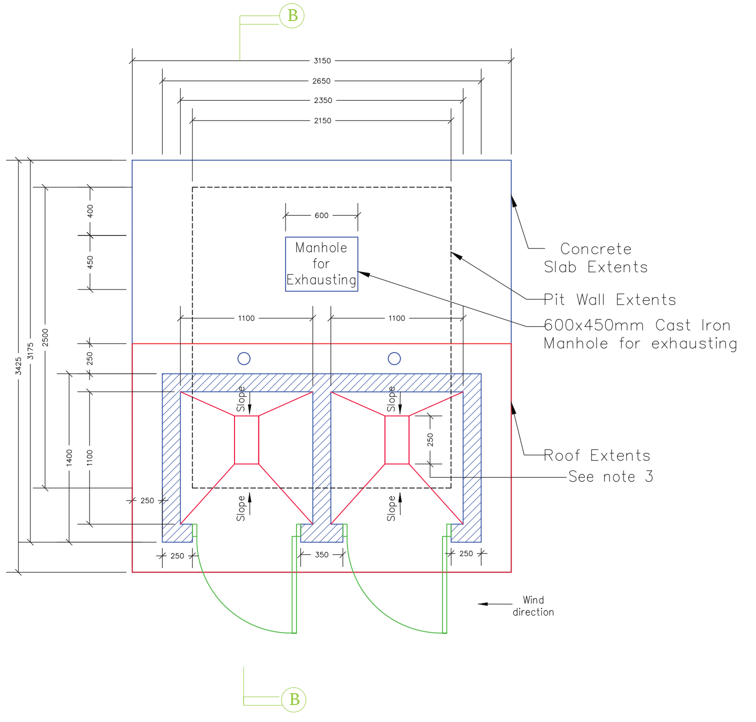
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre primary (L)250mmx(W)130mm
4.All doors are of dimensions: Normal – (L)900mmx(H)2100mm
PWLD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class R25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 010, 011, 012, 013, 014 and 015

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:			
File Name: VIP Latrines Sections & Elevations			Scale: 1:40
Project:			
Drawing Title: 2 VIP Lined Latrines			
Drawing No: 009	Rev: A	Sheet: 1/2	



Typical Section B–B
Typical 2 VIP Foundation
(Lined – Suitable for
unstable soils)



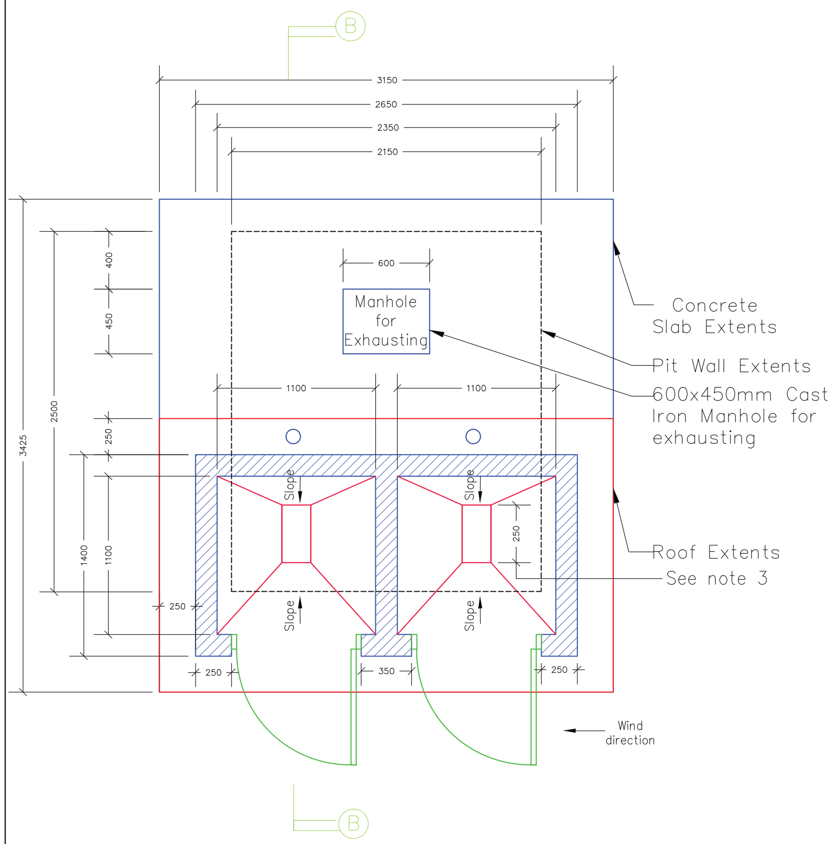
Typical 2 VIP
Latrine Plan Detail
(Lined)

Construction Details:

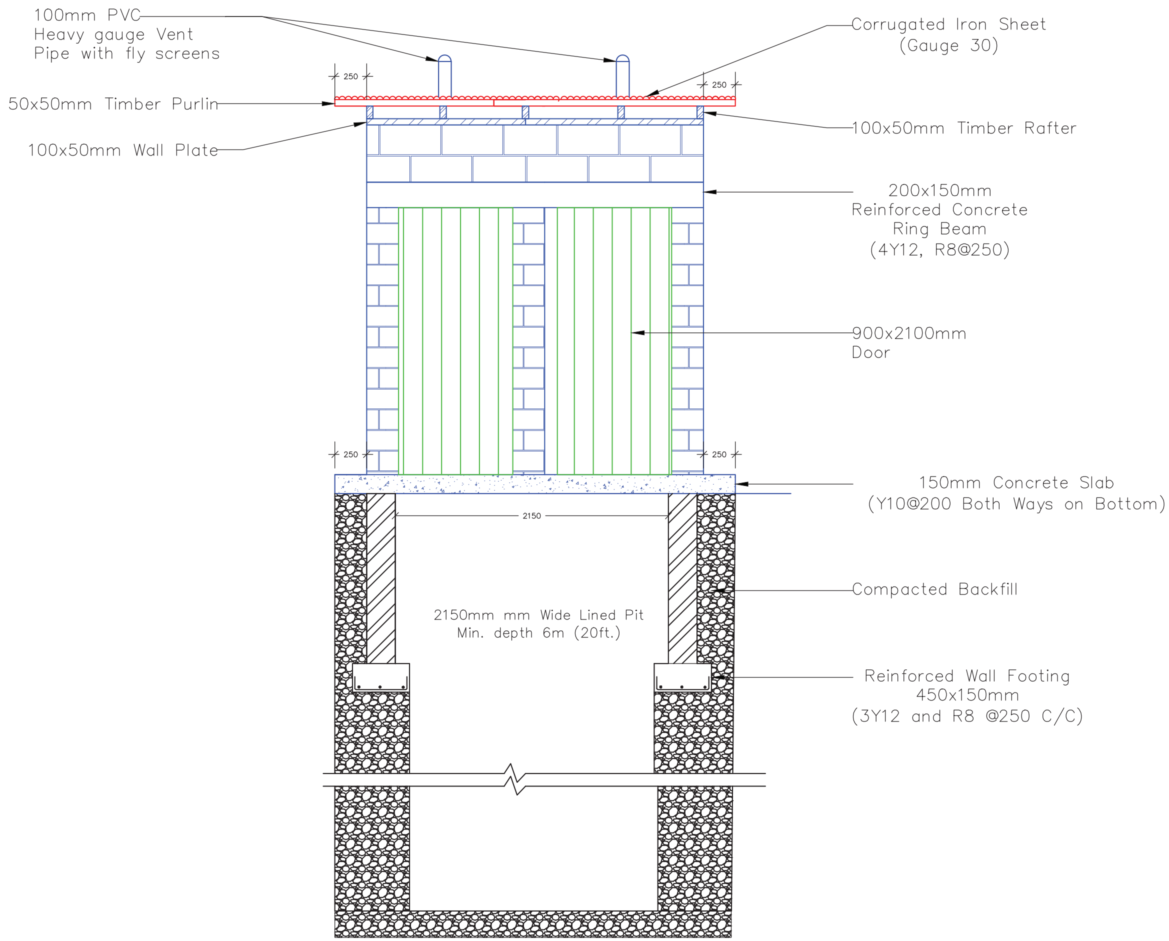
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre primary (L)250mmx(W)130mm
4.All doors are of dimensions: Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no 009

Client: MoE		Location:
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Project:	
Drawing Title: 2 VIP Lined Latrines	
Drawing No: 010	Rev: A
Sheet: 2/2	



Typical 2 VIP Latrine Plan Detail (Unlined)



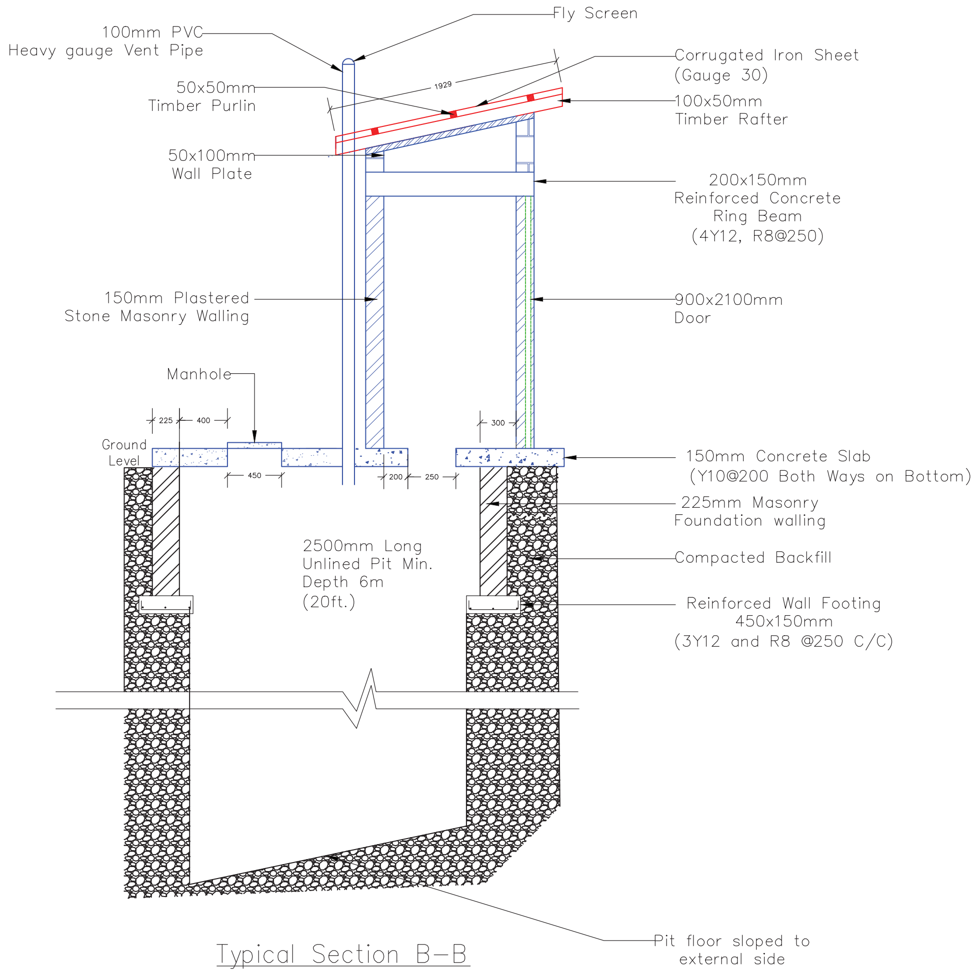
Front Elevation and Foundation 2 VIP Latrines (Unlined)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 012.

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:	
File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Project:	
Drawing Title: 2 VIP Unlined Latrines	
Drawing No: 011	Rev: A
Sheet: 1/2	



Typical Section B–B
Typical 2 VIP Foundation
(Unlined – Suitable for
stable soils)

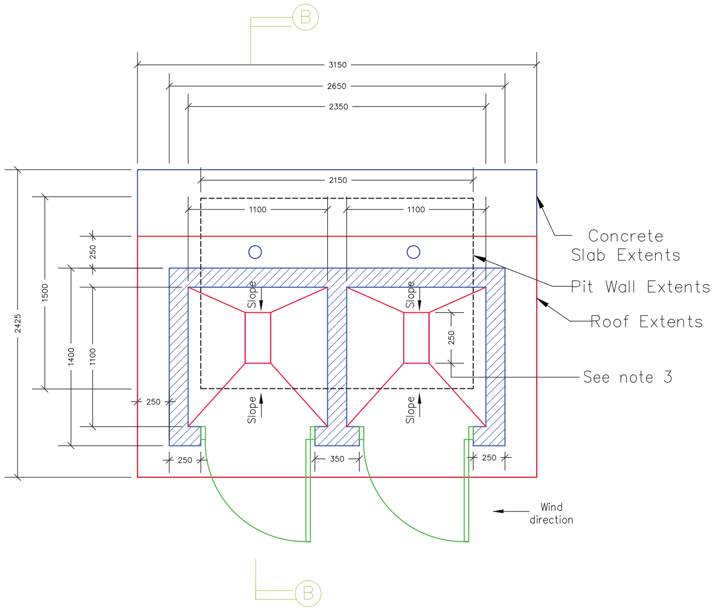
Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre primary (L)250mmx(W)130mm
4.All doors are of dimensions: Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 25 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30 specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 011

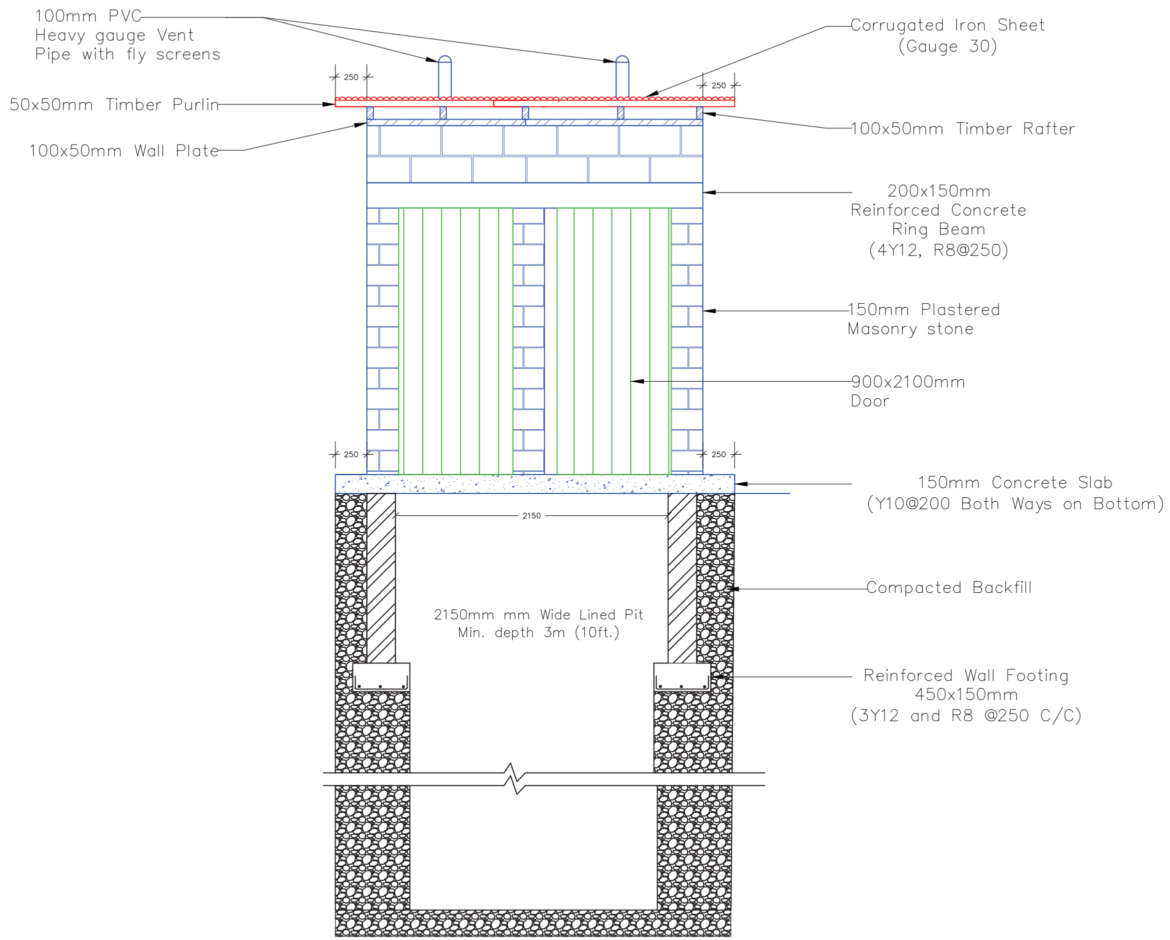
Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

File Name: VIP Latrines Sections & Elevations			Scale: 1:40
Project:			
Drawing Title: 2 VIP Unlined Latrines			
Drawing No: 012	Rev: A	Sheet: 2/2	



Typical 2 VIP Latrine Plan Detail (Unlined & non-exhaustible)

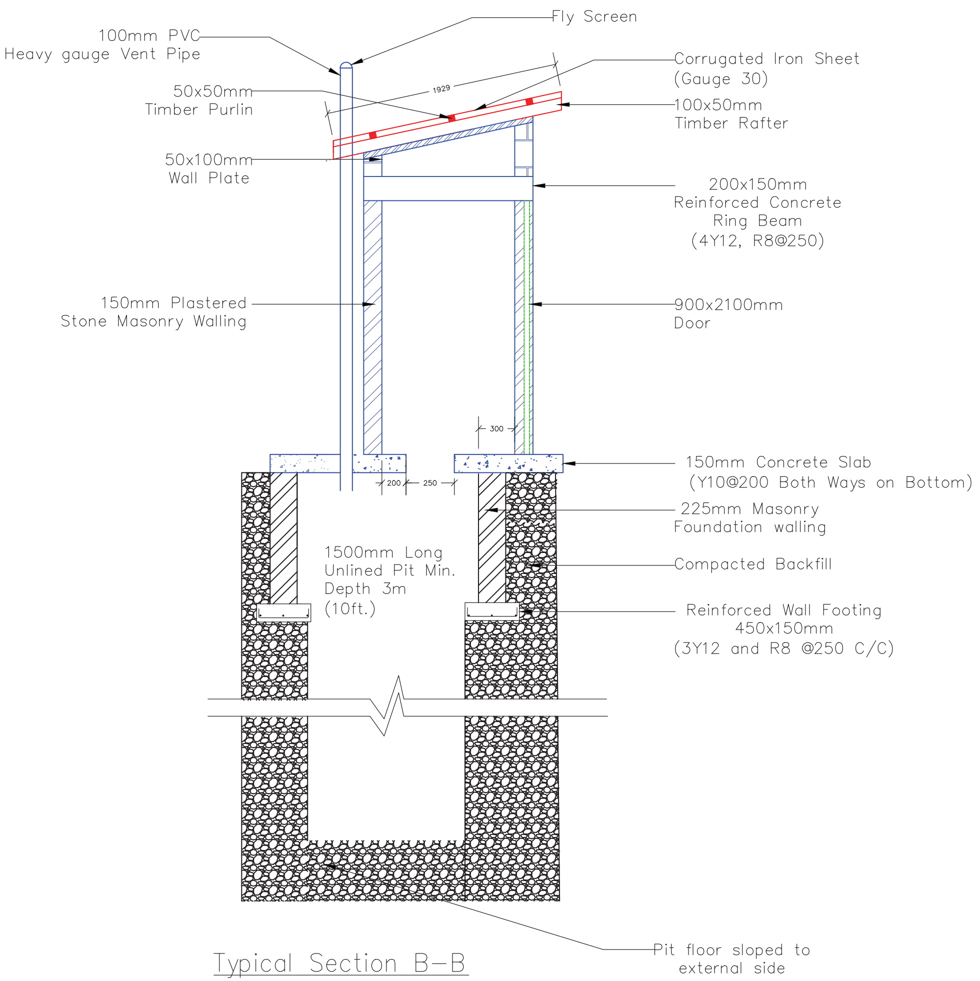


Front Elevation and Foundation 2 VIP Latrines (Unlined & non-exhaustible)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 014.

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: 2 VIP Unlined Latrines	
Checked By:	SIMU – MoE	2017	Drawing No: 013	Rev: A / Sheet: 1/2
Approved By:	SIMU – MoE	2017		



Typical Section B–B
Typical 2 VIP Foundation
(Unlined & non–exhaustible
– Suitable for stable soils)

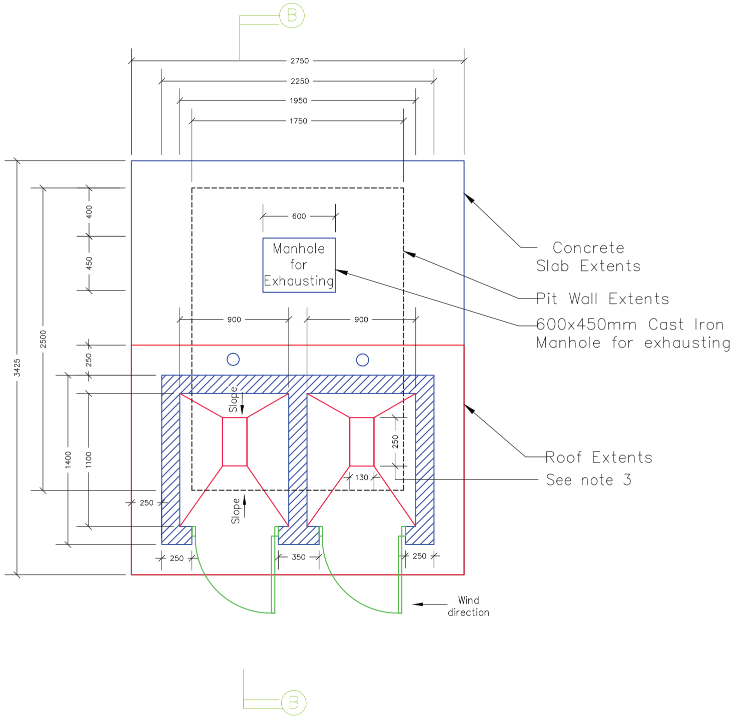
Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches for all doors.
8. All mass concrete to be used is class 25 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30 specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 013

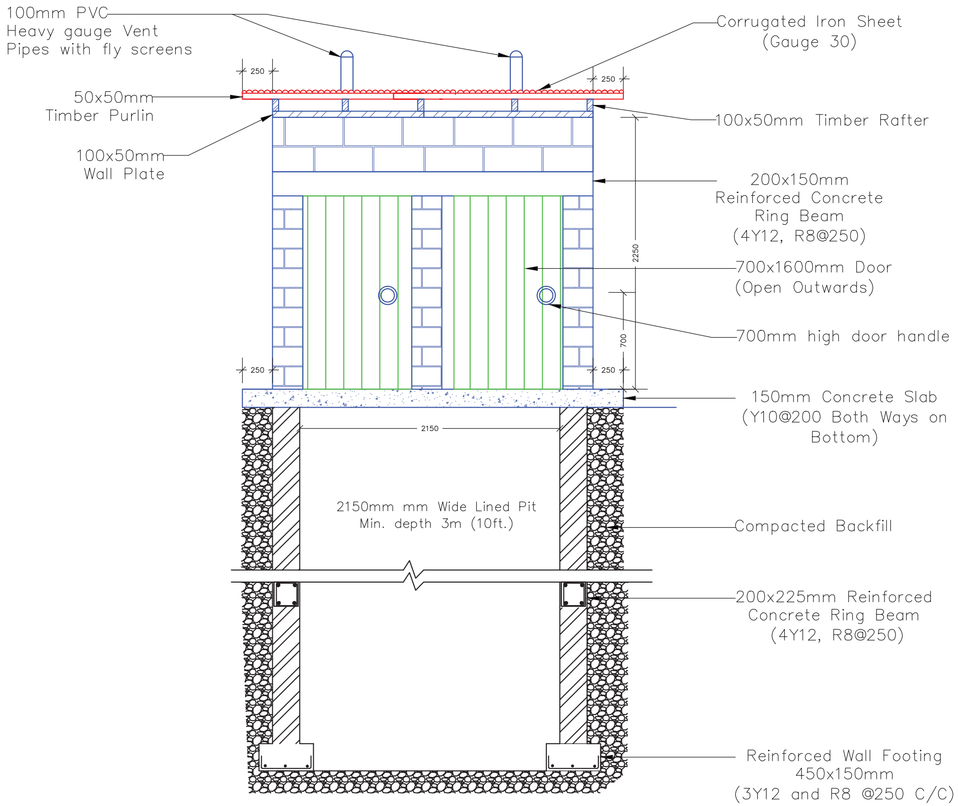
Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Project:	
Drawing Title: 2 VIP Unlined Latrines	
Drawing No: 014	Rev: A
Sheet: 2/2	



Typical 2 VIP Latrine for ECDE Plan Detail (Lined)



Front Elevation and Foundation 2 VIP Latrines for ECDE (Lined)

Construction Details:

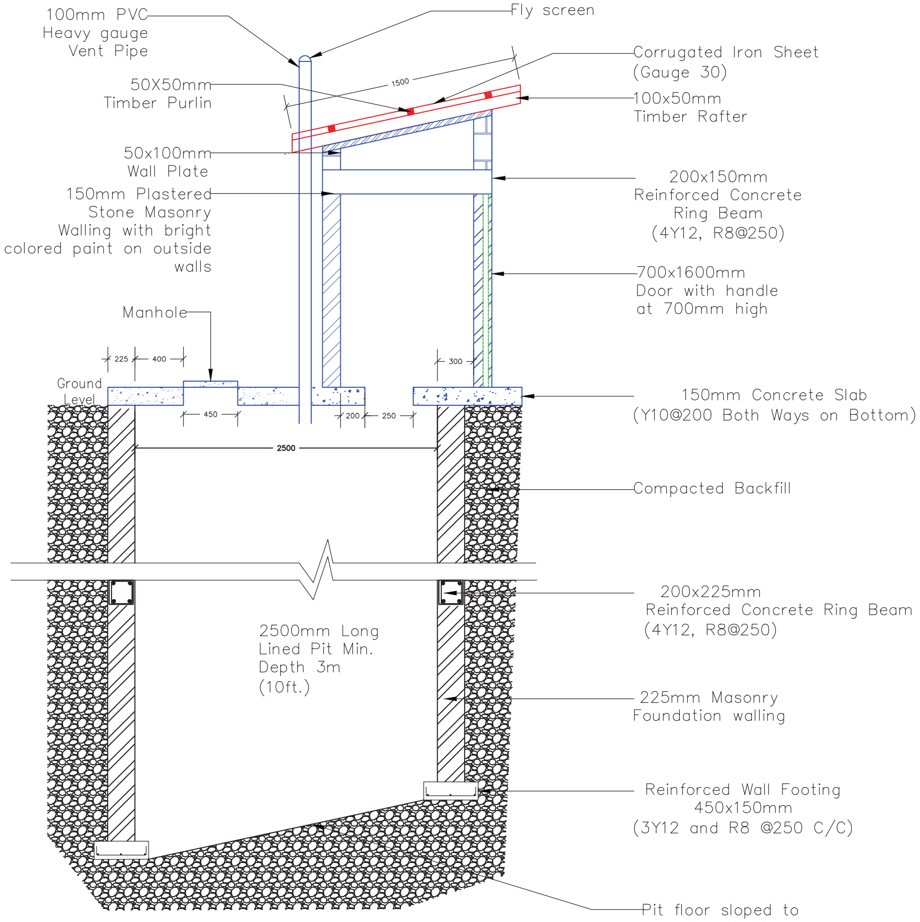
1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 016

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Project:	
Drawing Title: ECDE 2 VIP Lined Latrines	

Drawing No:	Rev:	Sheet:
015	A	1/2



Typical Section B–B
Typical 2 VIP Foundation
for ECDE (Lined – Suitable
for unstable soils)

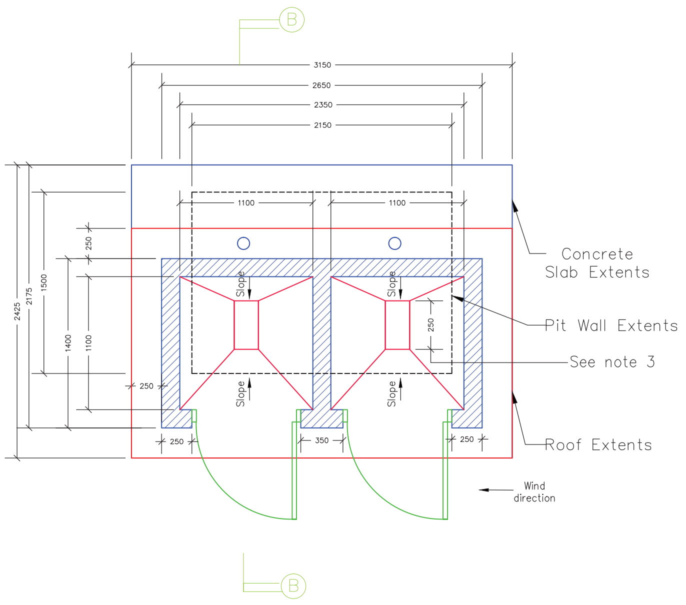
Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide for internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 015

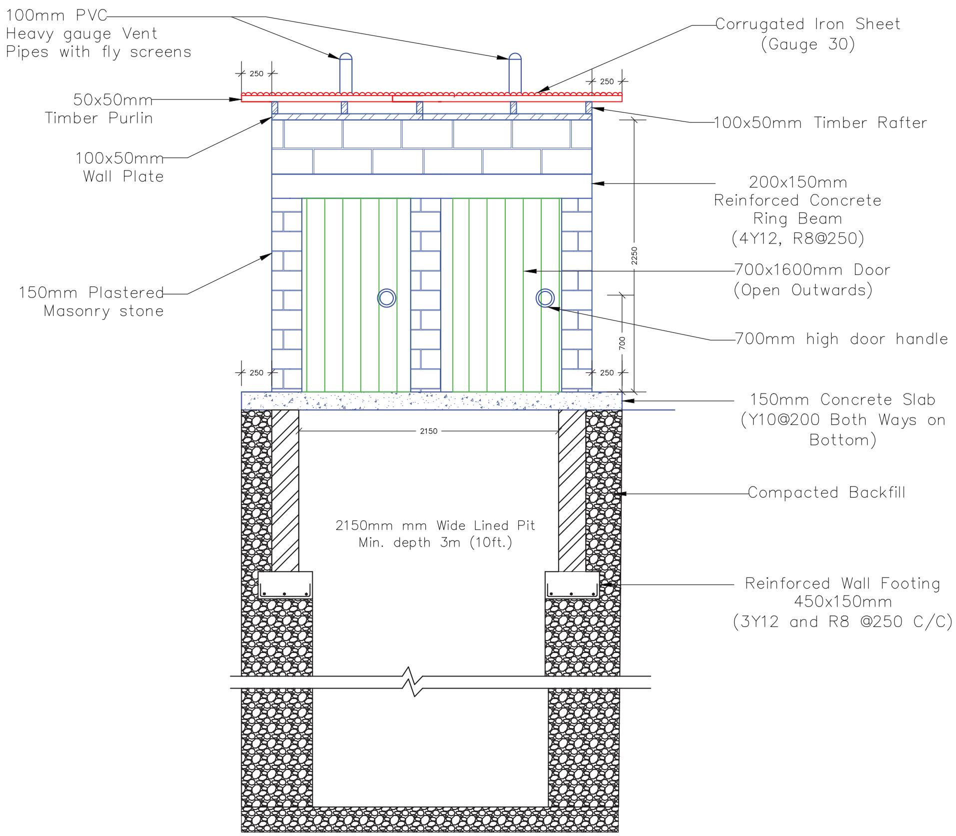
Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

File Name: VIP Latrines Sections & Elevations		Scale: 1:40
Project:		
Drawing Title: ECDE 2 VIP Lined Latrines		
Drawing No: 016	Rev: A	Sheet: 2/2



Typical 2 VIP Latrine for ECDE Plan Detail (Unlined & non-exhaustible)



Front Elevation and Foundation 2 VIP Latrines for ECDE (Unlined & non-exhaustible)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down-wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 018

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

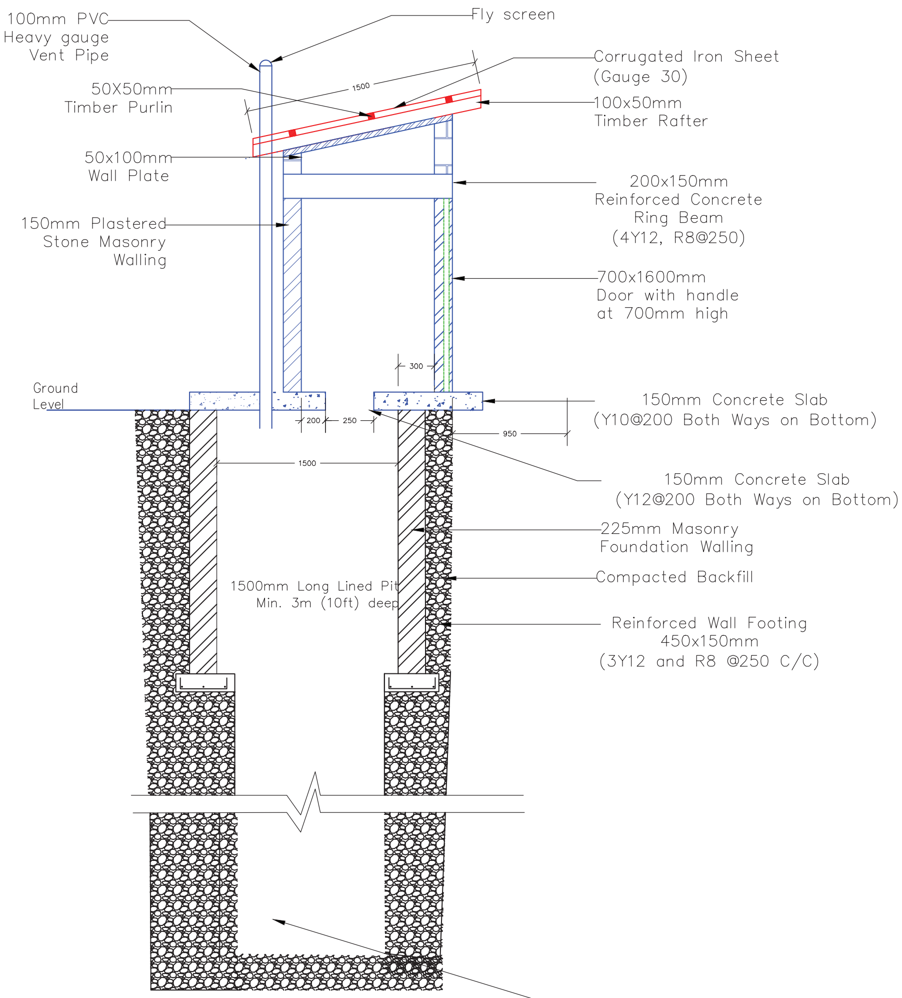
File Name: VIP Latrines Sections & Elevations

Scale: 1:40

Project:

Drawing Title: ECDE 2 VIP Unlined Latrines

Drawing No: 017 | Rev: A | Sheet: 1/2



Typical Section B–B Typical 2 VIP Foundation for ECDE (Unlined & non–exhaustible – Suitable for unstable soils)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. Normal latrine hole dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre primary (L)250mmx(W)130mm
4. All doors are of dimensions: Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)1600mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
6. All doors to open against direction of wind.
7. Provide internal & external latches at height of handles for all doors.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external. foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. Pour flush squat pan can replace pit aperture.
15. This drawing should be read with dwg. no. 009 and 017

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

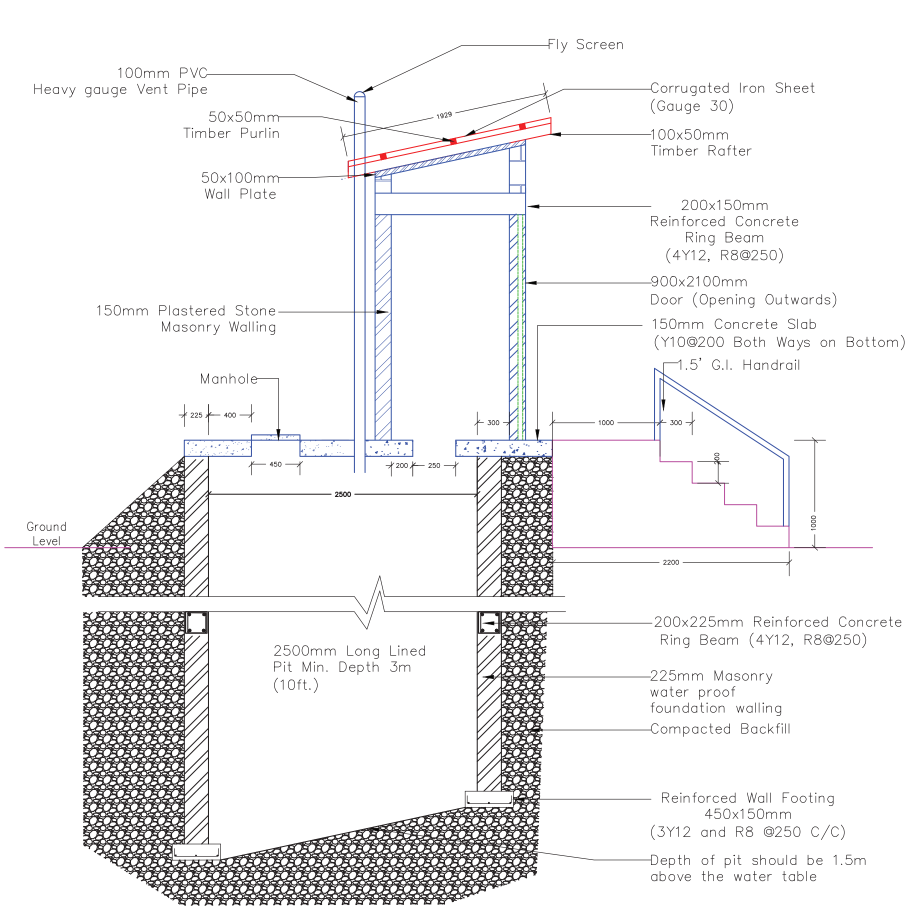
File Name: VIP Latrines Sections & Elevations

Scale: 1:40

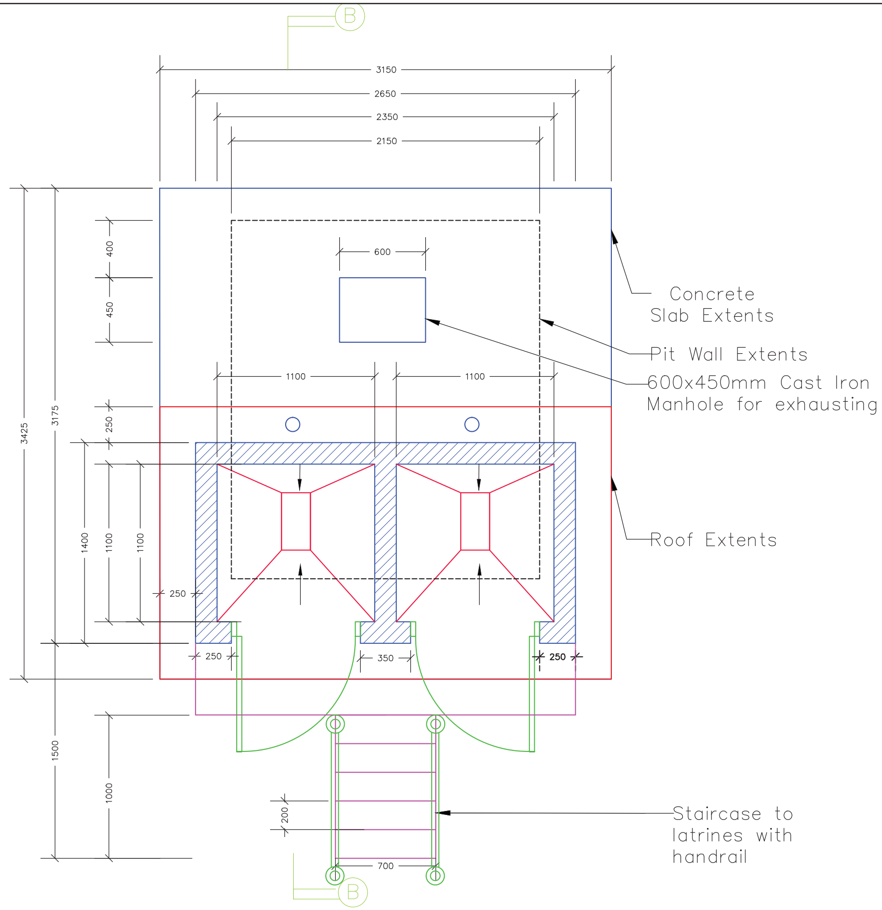
Project:

Drawing Title: ECDE 2 VIP Unlined Latrines

Drawing No: 018 | Rev: A | Sheet: 2/2



Typical Section B–B
Typical 2 VIP Raised Platform
Foundation
(Lined – Suitable for rocky
and high water table areas)

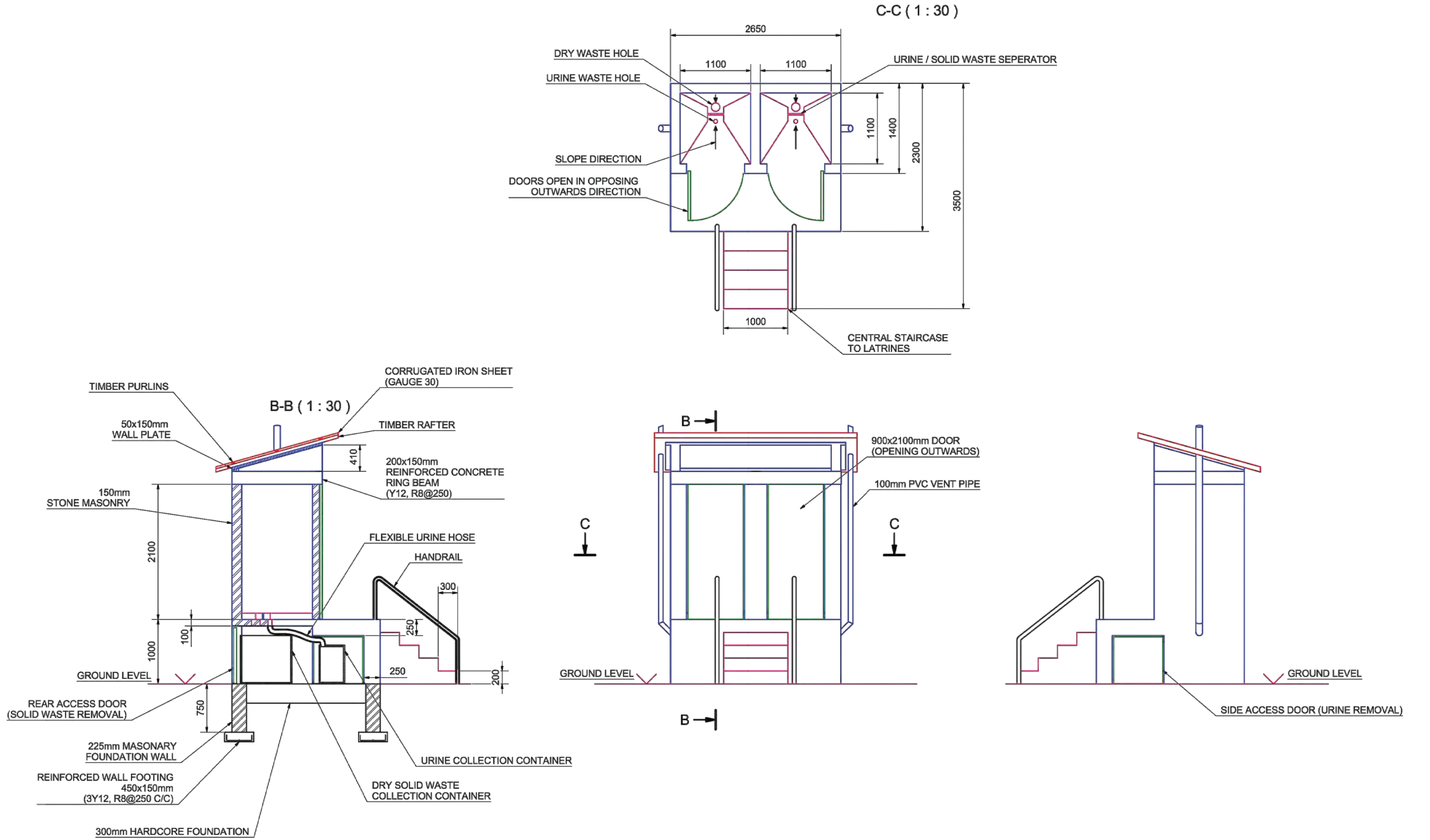


Typical 2 VIP Latrine
Raised Platform
Plan Detail (Lined)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre primary (L)250mmx(W)130mm
4.All doors are of dimensions: Normal – (L)900mmx(H)2100mm
PLWD –(L)1000mmx(H)2100mm, ECDE – (L)700mmx(H)1600mm
5. Height of handrail: 650mm
6. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
7. All doors to open against direction of wind.
8. Provide internal & external latches for all doors.
9. All mass concrete to be used is class 20 (1:2:4)
10. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
11. Standard manhole size (L)600mmx(W)450mm
12. Vent pipe for VIP orientation is down–wind and facing the equator.
13. All soils under slab and around external foundation to be treated for termite control.
14. Pit designed to be emptied every 5 years.
15. Pour flush squat pan can replace pit aperture.
16. This drawing should be read with dwg. no 009.

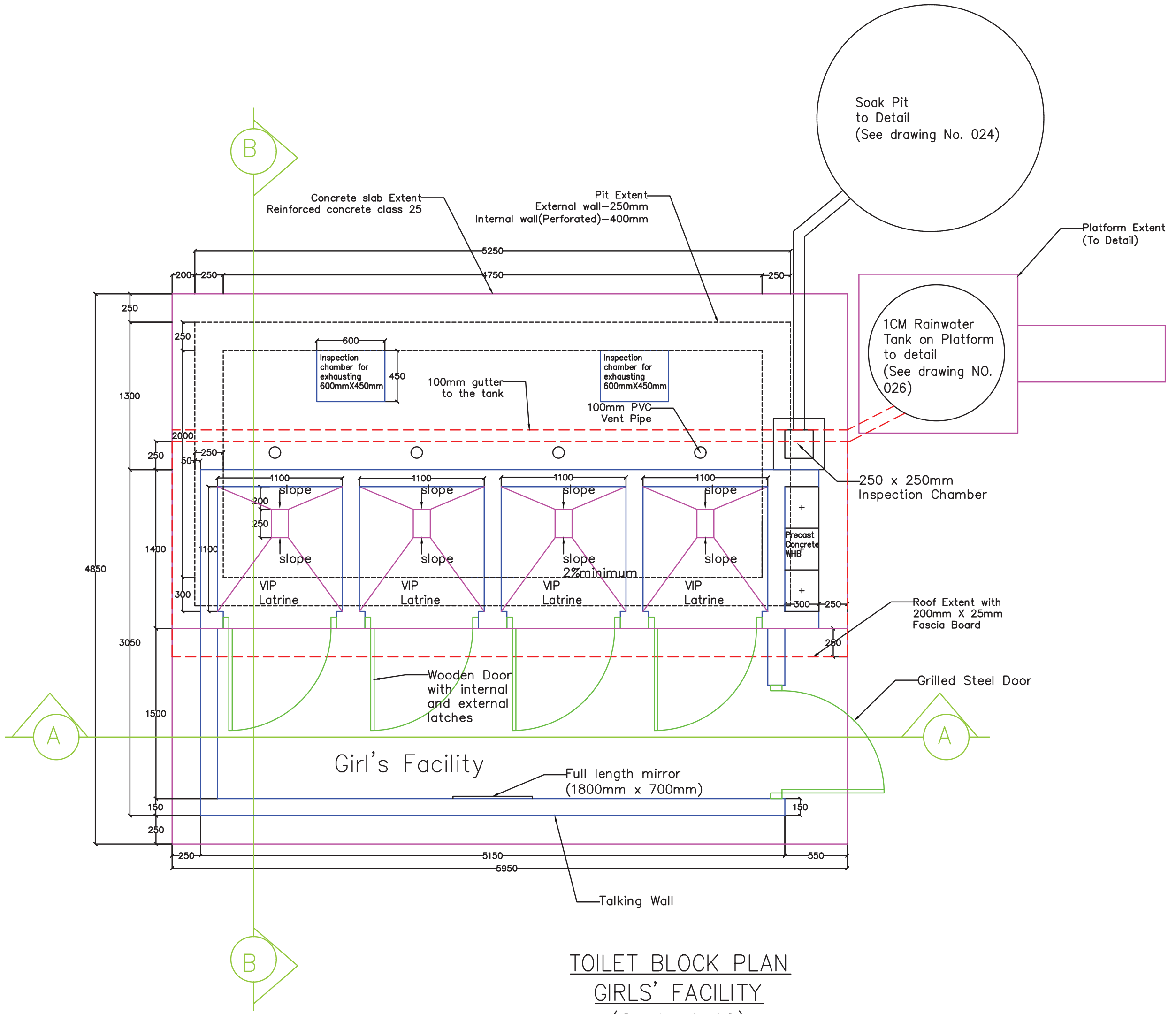
Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Sections & Elevations	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: 2 VIP Raised Platform Latrines	
Checked By:	SIMU – MoE	2017		
Approved By:	SIMU – MoE	2017	Drawing No: 019 / Rev: A	Sheet: 1/1



Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. All doors are of dimensions: Normal –(L)900mmx(H)2100mm PLWD –(L)1000mmx(H)2100mm, ECDE –(L)700mmx(H)1600mm
5. Height of handrail: 650mm
6. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Lower primary 700mm
7. All doors to open against direction of wind.
8. All mass concrete to be used is class 20 (1:2:4)
9. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cove of 35mm.
10. Standard manhole size (L)600mmx(W)450mm
11. Vent pipe for VIP orientation is down–wind and facing the equator.
12. All soils under slab and around external foundation to be treated for termite control.
13. Pit designed to be emptied every 5 years.
14. This drawing should be read with dwg. no. 009 and 017.

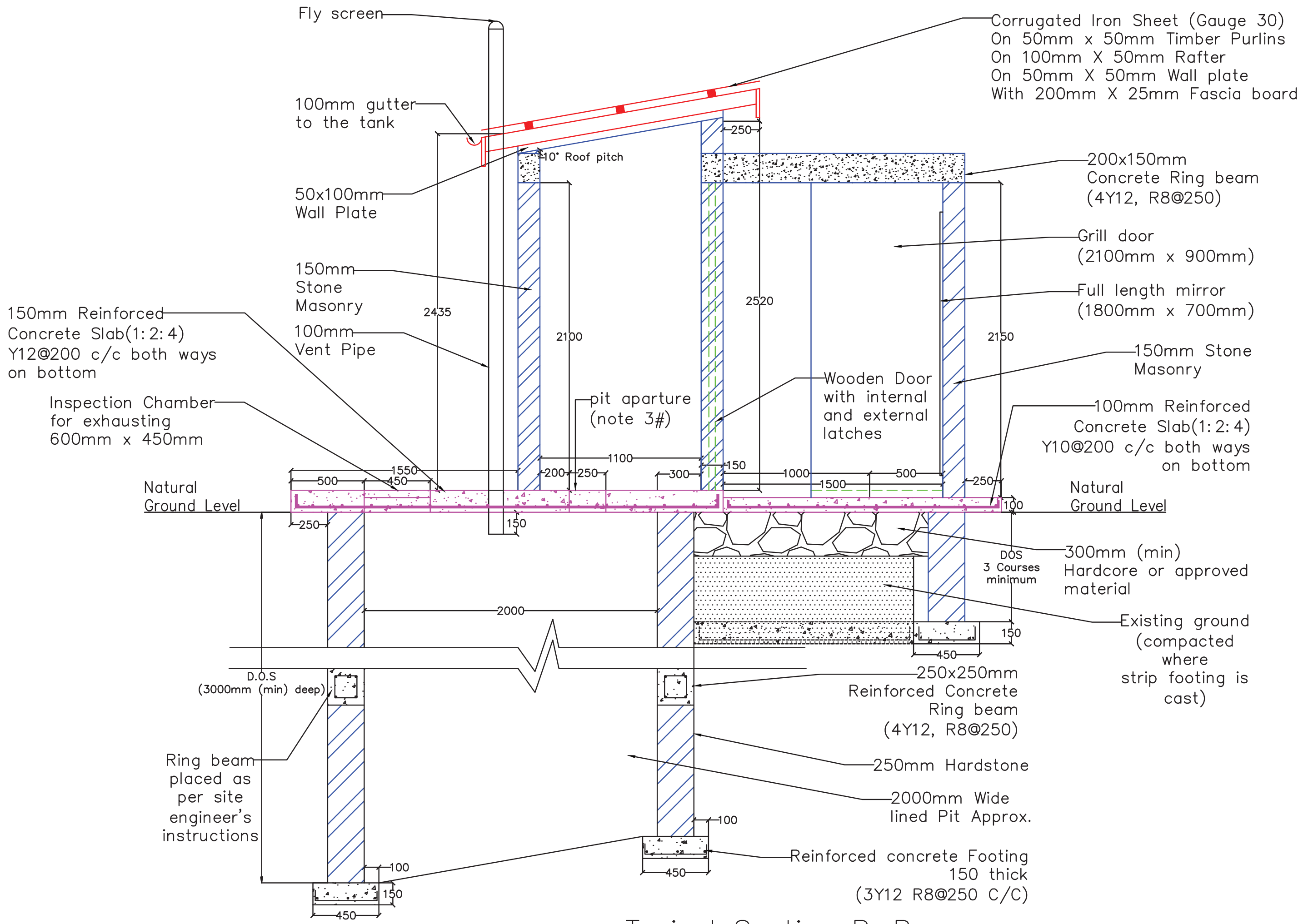
Client: MoE				Location:
Surveyed By:			File Name: UDDT Toilet Sections & Elevations	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: UDDT Raised Platform Toilet	
Checked By:	SIMU – MoE	2017		
Approved By:	SIMU – MoE	2017	Drawing No: 020	Rev: A / Sheet: 1/1



TOILET BLOCK PLAN
GIRLS' FACILITY
(Scale 1:40)

Construction Details:
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine aperture dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre–primary (L)250mmx(W)130mm
4.Pour flush squat pan can replace the pit aperture.
5.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
6.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre–primary 700mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9.provide internal and external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm
11.All mass concrete is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.Vent pipe for VIP orientation is down–wind and facing the equator
14.All soils under slab and around external foundation to be treated for termite control.
15.Pits designed to be emptied every five years
16.Drawing to be read with drawing No. 022, 023, 024, 025, and 026

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU–MoE	2017	Drawing Title: Girls 4 VIP Latrines Block Plan	
Approved By:	SIMU–MoE	2017	Drawing No: 021	Rev: C / Sheet: 1/3

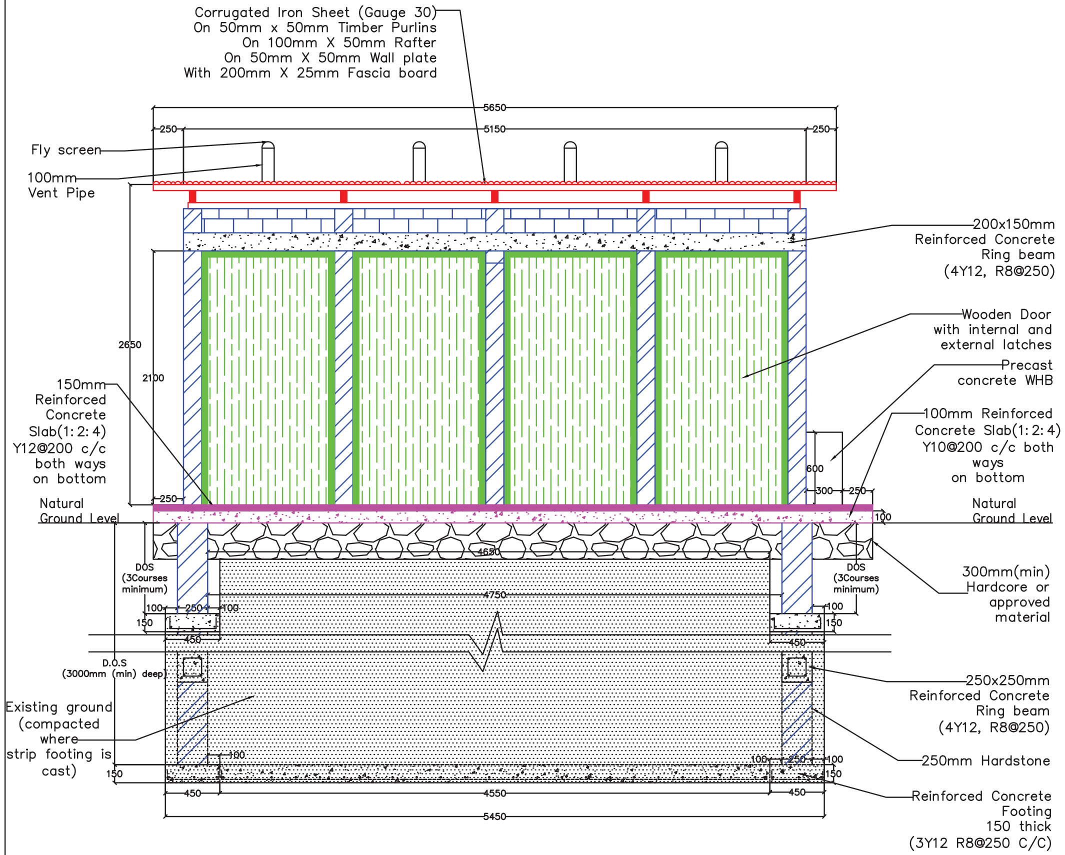


Typical Section B–B
Typical Foundation in Stable Granular Areas
Girls' Facility (Scale 1:30)

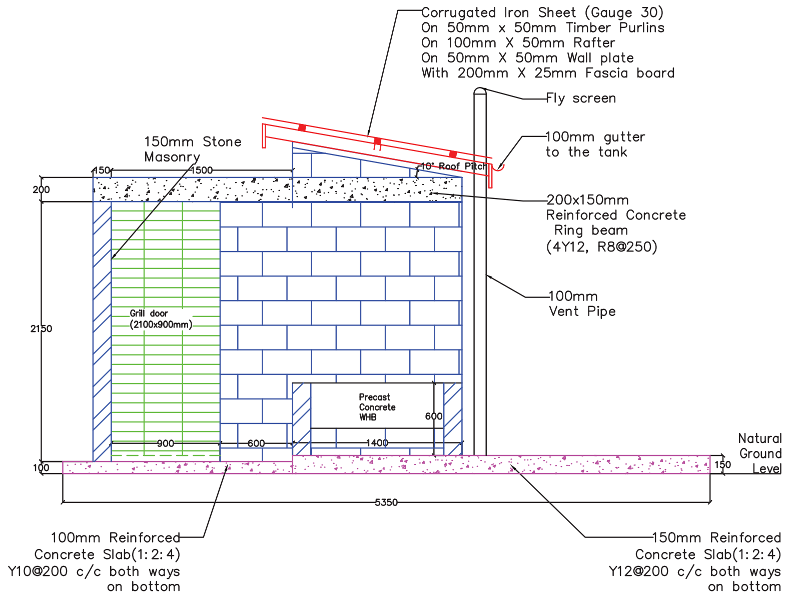
Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine aperture dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre–primary (L)250mmx(W)130mm
4.Pour flush squat pan can replace the pit aperture.
5.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
6.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre–primary 700mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9.provide internal and external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm
11.All mass concrete is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.Vent pipe for VIP orientation is down–wind and facing the equator
14.All soils under slab and around external foundation to be treated for termite control.
15.Pits designed to be emptied every five years
16.Drawing to be read with drawing No. 021, 023, 024, 025, and 026

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block	Scale: 1:30
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU–MoE	2017	Drawing Title: Girls 4 VIP Latrines Block Section B–B	
Approved By:	SIMU–MoE	2017	Drawing No: 022	Rev: C / Sheet: 2/3



Typical Section A–A
Typical Foundation in Stable Granular Areas
Girls' Facility
(Scale 1:40)

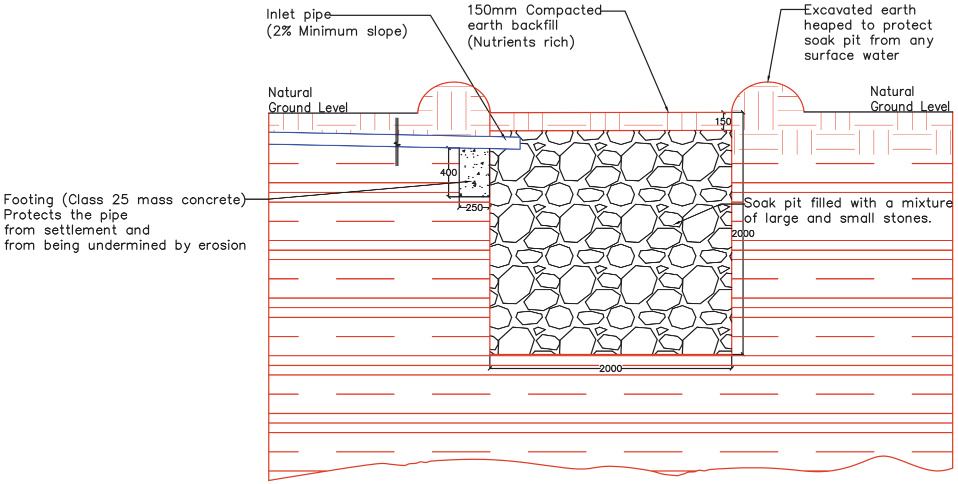


Side View
Girls' Facility
(Scale 1:40)

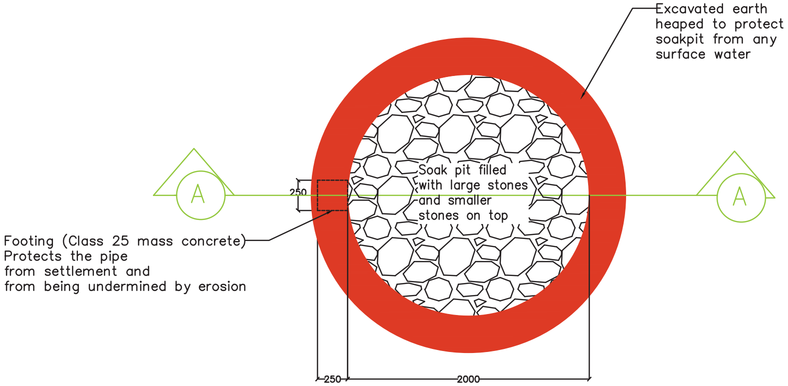
Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aparture dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre–primary (L)250mmx(W)130mm
4. Pour flush squat pan can replace the pit aperture.
5. All door dimensions are:
   Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)2100mm
6. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Pre–primary 700mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. provide internal and external latches for all doors.
10. Standard manhole size (L)600mmx(W)450mm
11. All mass concrete is Class 25, specified mix (1:2:4)
12. All reinforced concrete:
    Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13. Vent pipe for VIP orientation is down–wind and facing the equator
14. All soils under slab and around external foundation to be treated for termite control.
15. Pits designed to be emptied every five years
16. Drawing to be read with drawing No. 021, 022, 024, 025, and 026

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU–MoE	2017	Drawing Title: Girls 4 VIP Latrines Block Elevations	
Approved By:	SIMU–MoE	2017	Drawing No: 023	Rev: C / Sheet: 3/3



Typical Section A–A
Soak pit
(Scale 1:40)



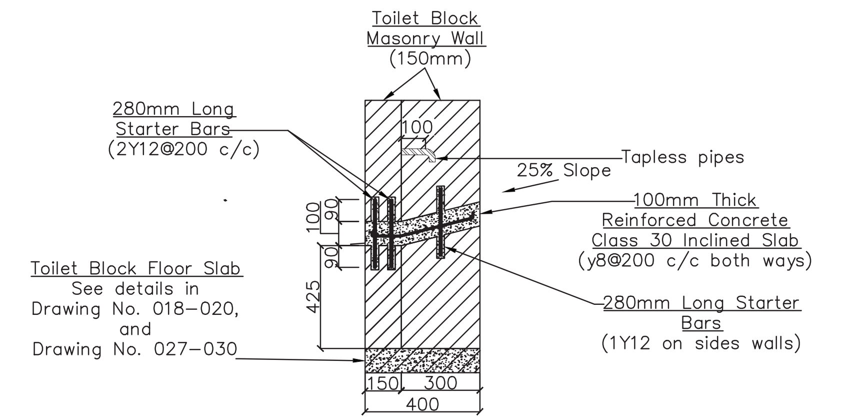
Plan View
Soak pit
(Scale 1:40)

Construction Details:

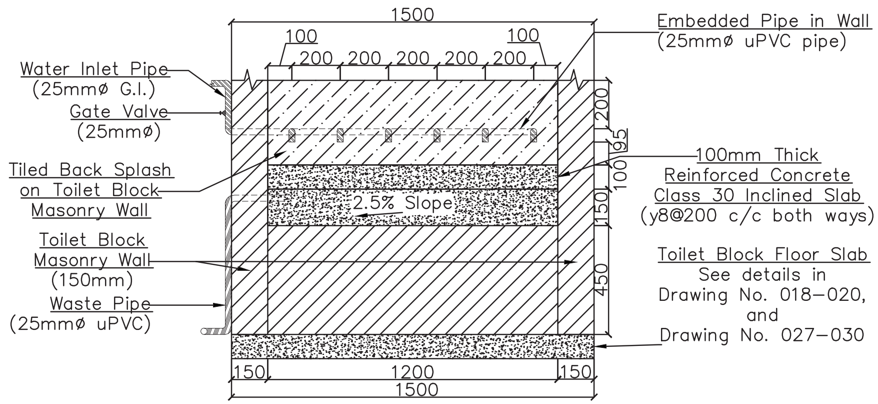
1. All dimensions are in mm unless otherwise stated.
2. Figure dimension to be used, NOT SCALE.
3. Mass concrete to be of class 30 (1:2:3)
4. Provide 25mm cover for the Slab, beams And 50mm for the strip footing.
5. Site soak pit 3000mm from latrines
5. Drawing to be read with drawing No. 021, 022 ,023, 025, 027, 028, 029, 030, 031, 032, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042, 043, 048, 049, 050, 051, 052, and 053.

Client: MOE			Location:	
Surveyed By:			File Name: SOAK PIT	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: Soak Pit Details	
Checked By:	SIMU–MoE	2017		
Approved By:	SIMU–MoE	2017	Drawing No: 024	Rev: C / Sheet: 1/1

TOILET BLOCK HAND WASHING FACILITIES



Section A–A
Scale 1:20



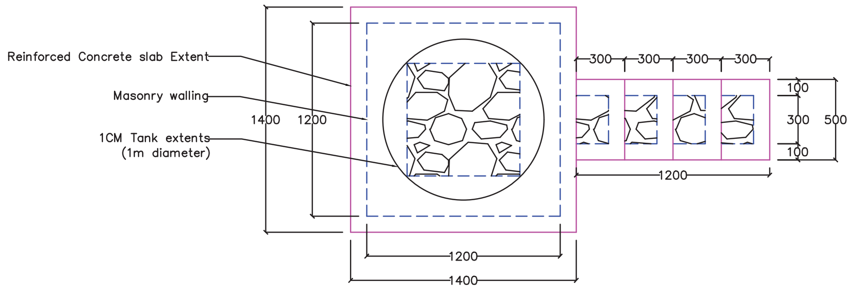
Section B–B
Scale 1:20

Construction Details:

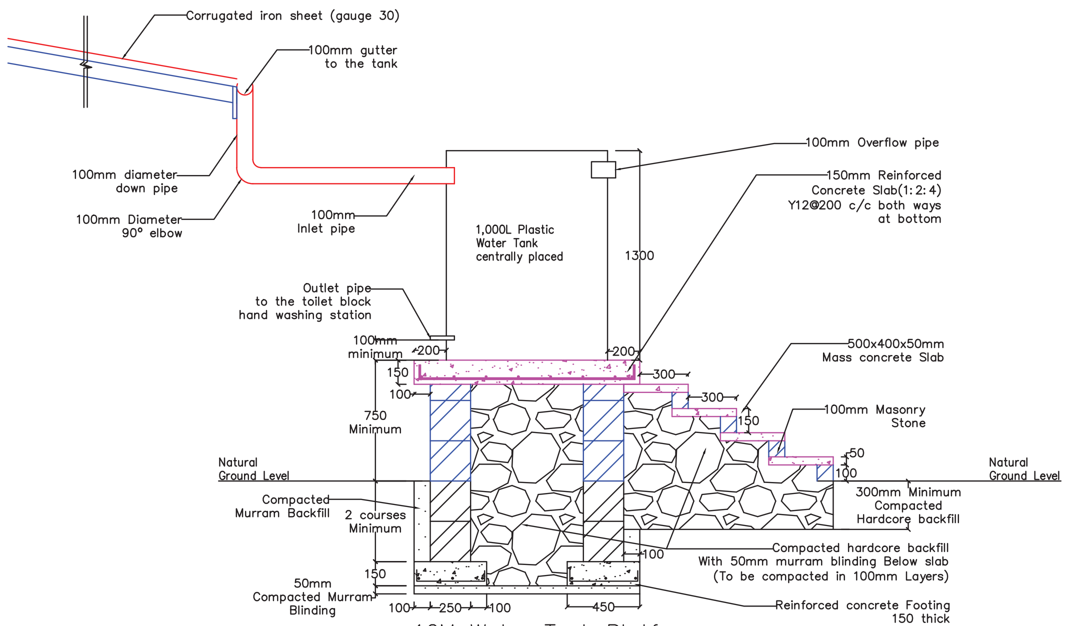
1.Alldimmensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.All mass concrete to be used is C25 (1:2:4)
4.All reinforced concrete:
Class RC25, specified mix (1:2:4) & Minimum cover of 25mm
Class RC30, specified mix (1:2:3) & Minimum cover of 35mm
5.Vent pipe for VIP orientation is down–wind and facing the equator
6.All soils under slab and around external foundation to be treated for termite control.
7.Water source shall be from 1m³ elevated rainwater harvesting tank. Details of tank and platform can be seen in drawing No. 026
8.Drawing to be read with drawing No. 026, 036, 041, 048, and 052

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name: Mass Handwashing Facilities Rev. 2	Scale: As Shown (A3)
Project:	
Drawing Title: Toilet Block Hand Washing Facilites	
Drawing No: 025	Rev: C
Sheet: 1	



1CM Water Tank Platform
Plan view
(Scale 1:30)



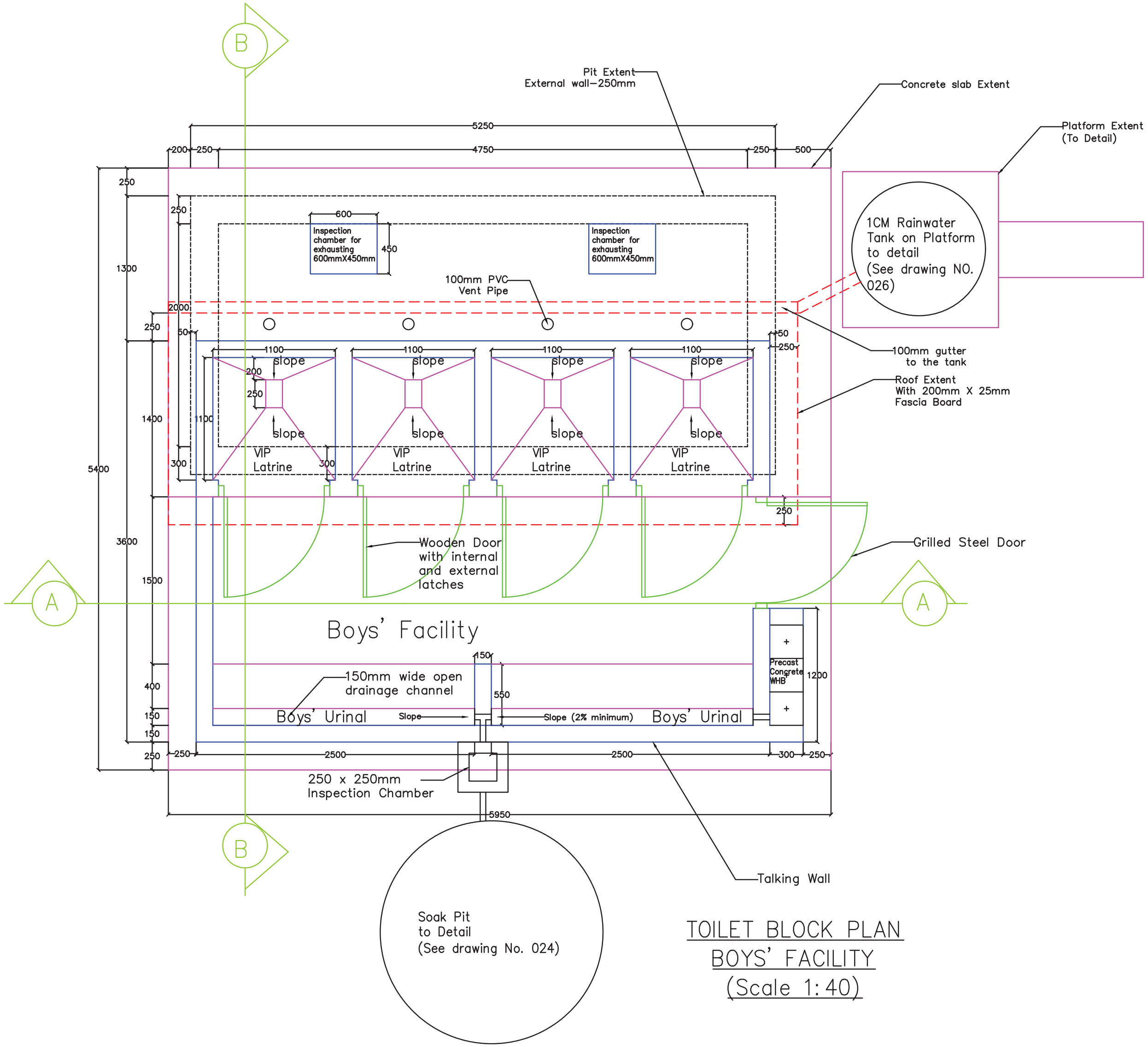
1CM Water Tank Platform
Section
(Scale 1:30)

Construction Details:

1. All dimensions are in mm unless otherwise stated.
2. Figure dimension to be used, NOT SCALE.
3. Mass concrete to be of class 30 (1:2:3)
4. Provide 25mm cover for the Slab, beams And 50mm for the strip footing.
5. Drawing to be read with drawing No. 021, 022 ,023, 025, 027, 028, 029, 030, 031, 032, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042, 043, 048, 049, 050, 051, 052, and 053.

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name: 1CM Tank Platform	Scale: 1:30
Project:	
Drawing Title: 1m^3 Rainwater Harvesting Tank Platform Details	
Drawing No: 026	Rev: C; Sheet: 1/1



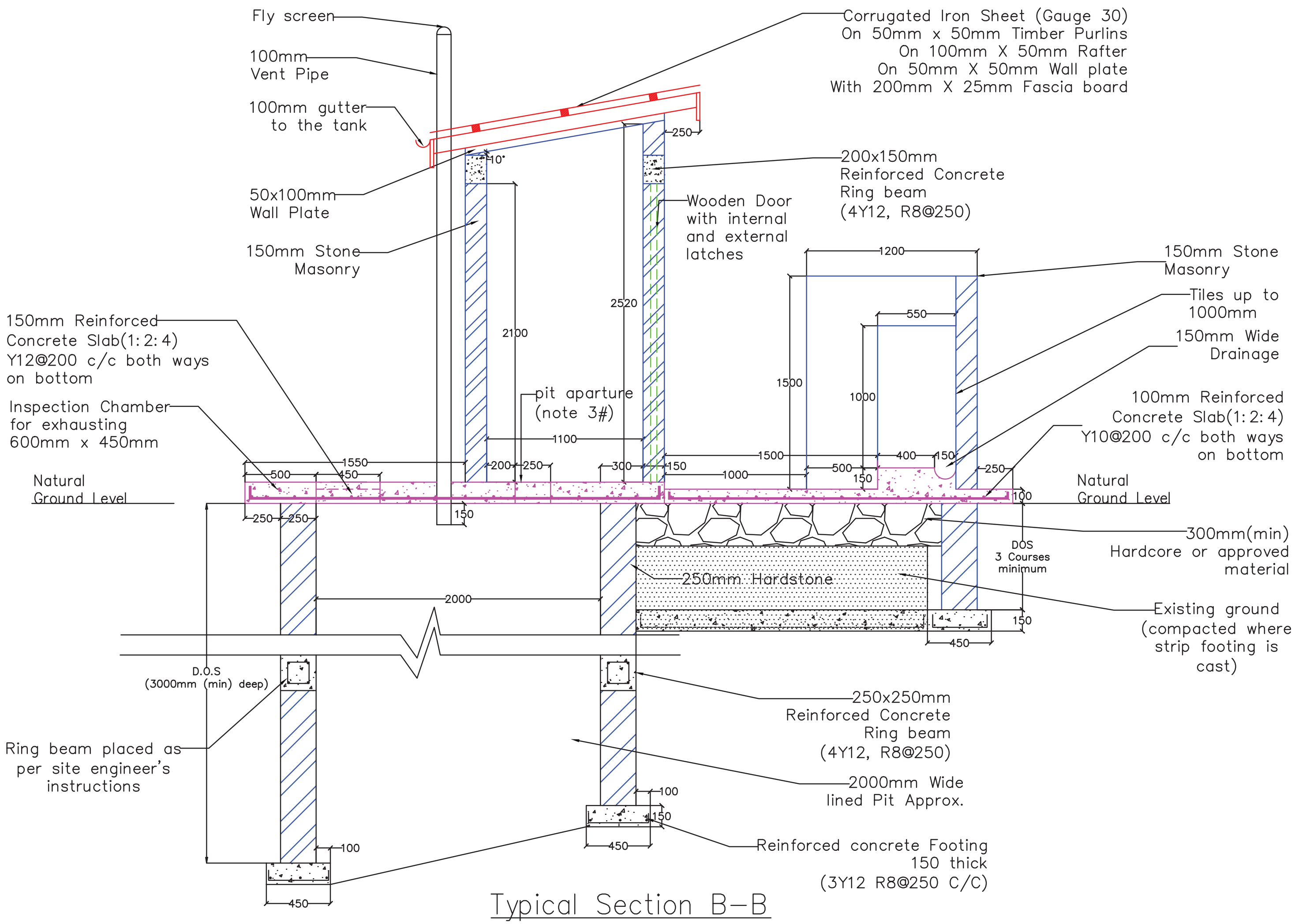
TOILET BLOCK PLAN
BOYS' FACILITY
(Scale 1:40)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aperture dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre–primary (L)250mmx(W)130mm
4. Pour flush squat pan can replace the pit aperture.
5. All door dimensions are:
   Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)2100mm
6. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Pre–primary 700mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. provide internal and external latches for all doors.
10. Standard manhole size (L)600mmx(W)450mm
11. All mass concrete is Class 25, specified mix (1:2:4)
12. All reinforced concrete:
    Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13. Vent pipe for VIP orientation is down–wind and facing the equator
14. All soils under slab and around external foundation to be treated for termite control.
15. Pits designed to be emptied every five years
16. Drawing to be read with drawing No. 024, 025, 026, 028 and 029,

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name: VIP Latrines Block	Scale: 1:40
Project:	
Drawing Title: Boys 4 VIP Latrines Block Plan	
Drawing No: 027	Rev: C · Sheet: 1/3

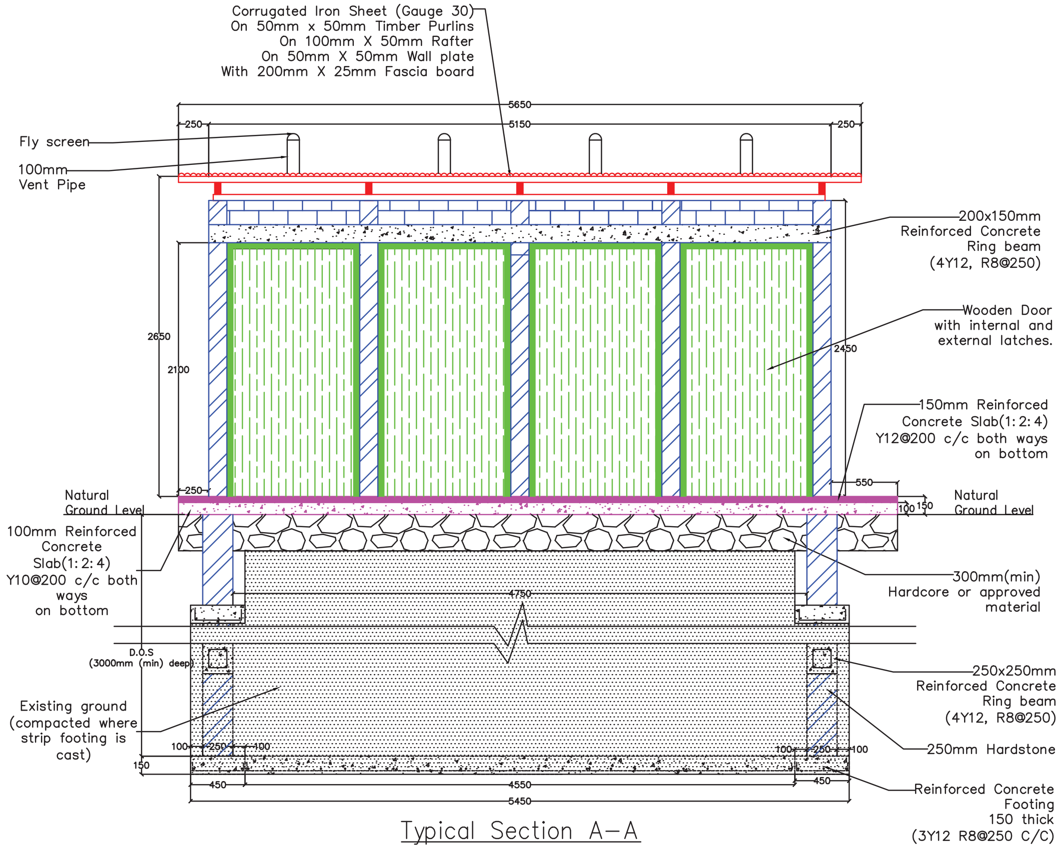


Typical Section B–B
Typical Foundation in Stable Granular Areas
4VIP Boys' Facility (Scale 1:30)

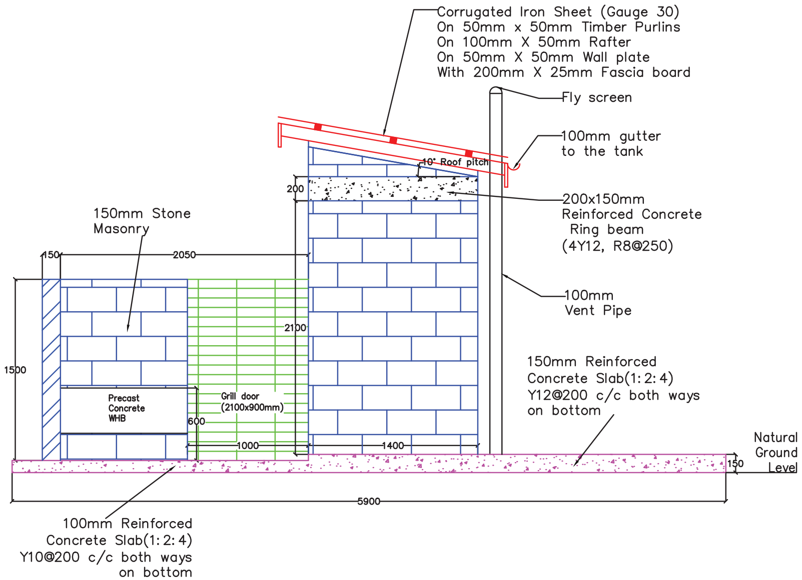
Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aperture dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre–primary (L)250mmx(W)130mm
4. Pour flush squat pan can replace the pit aperture.
5. All door dimensions are:
   Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)2100mm
6. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Pre–primary 700mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. provide internal and external latches for all doors.
10. Standard manhole size (L)600mmx(W)450mm
11. All mass concrete is Class 25, specified mix (1:2:4)
12. All reinforced concrete:
    Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13. Vent pipe for VIP orientation is down–wind and facing the equator
14. All soils under slab and around external foundation to be treated for termite control.
15. Pits designed to be emptied every five years
16. Drawing to be read with drawing No. 024, 025, 026, 027 and 029.

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block	Scale: 1:30
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU–MoE	2017	Drawing Title: Boys 4 VIP Latrines Block Section B–B	
Approved By:	SIMU–MoE	2017	Drawing No: 028	Rev: C / Sheet: 2/3



Typical Section A-A
Typical Foundation in Stable Granular Areas
Boys' 4 VIP Facility
(Scale 1:40)

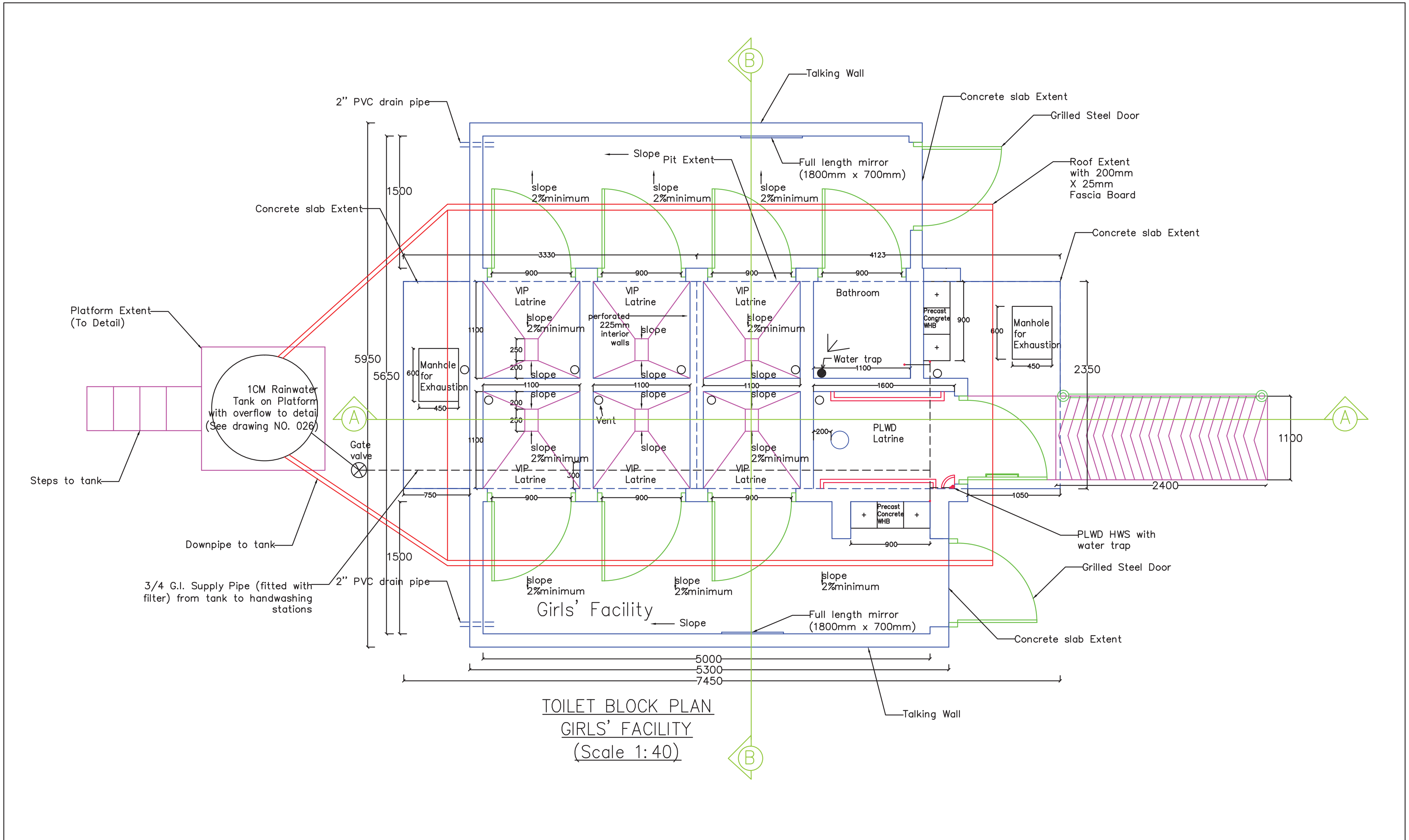


Side view
Boys' 4 VIP Facility
(Scale 1:40)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine aperture dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre-primary (L)250mmx(W)130mm
4.Pour flush squat pan can replace the pit aperture.
5.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
6.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre-primary 700mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9.provide internal and external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm
11.All mass concrete is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.Vent pipe for VIP orientation is down-wind and facing the equator
14.All soils under slab and around external foundation to be treated for termite control.
15.Pits designed to be emptied every five years
16.Drawing to be read with drawing No. 024, 025, 026, 027 and 028.

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: Boys 4 VIP Latrines Block Elevations	
Checked By:	SIMU-MoE	2017		
Approved By:	SIMU-MoE	2017	Drawing No: 029	Rev: C Sheet: 3/3



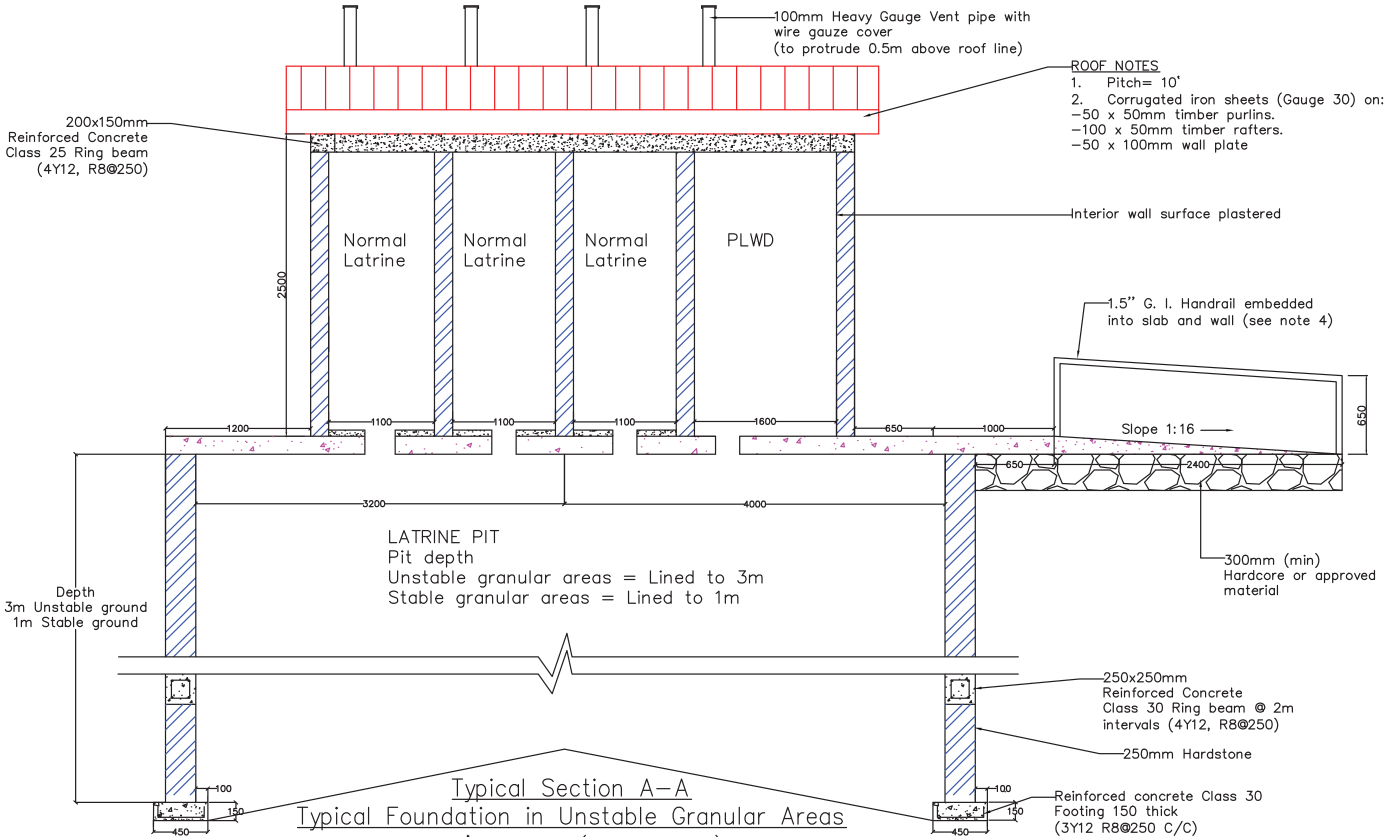
Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre–primary (L)250mmx(W)130mm
4.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre–primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9. Provide internal & external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm
11.All mass concrete is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.Vent pipe for VIP orientation is down–wind and facing the equator
14.All soils under slab and around external foundation to be treated for termite control.
15.Pits designed to be emptied every five years.
16.Pour flush squat pans can replace pit aperture.
17.Drawing to be read with drawing No. 025, 026, 031, and 032

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:

File Name: VIP Latrines Block
Scale: 1:40
Project:
Drawing Title: Girls 6 VIP Latrines Block Plan
Drawing No: 030
Rev: B
Sheet: 1/3



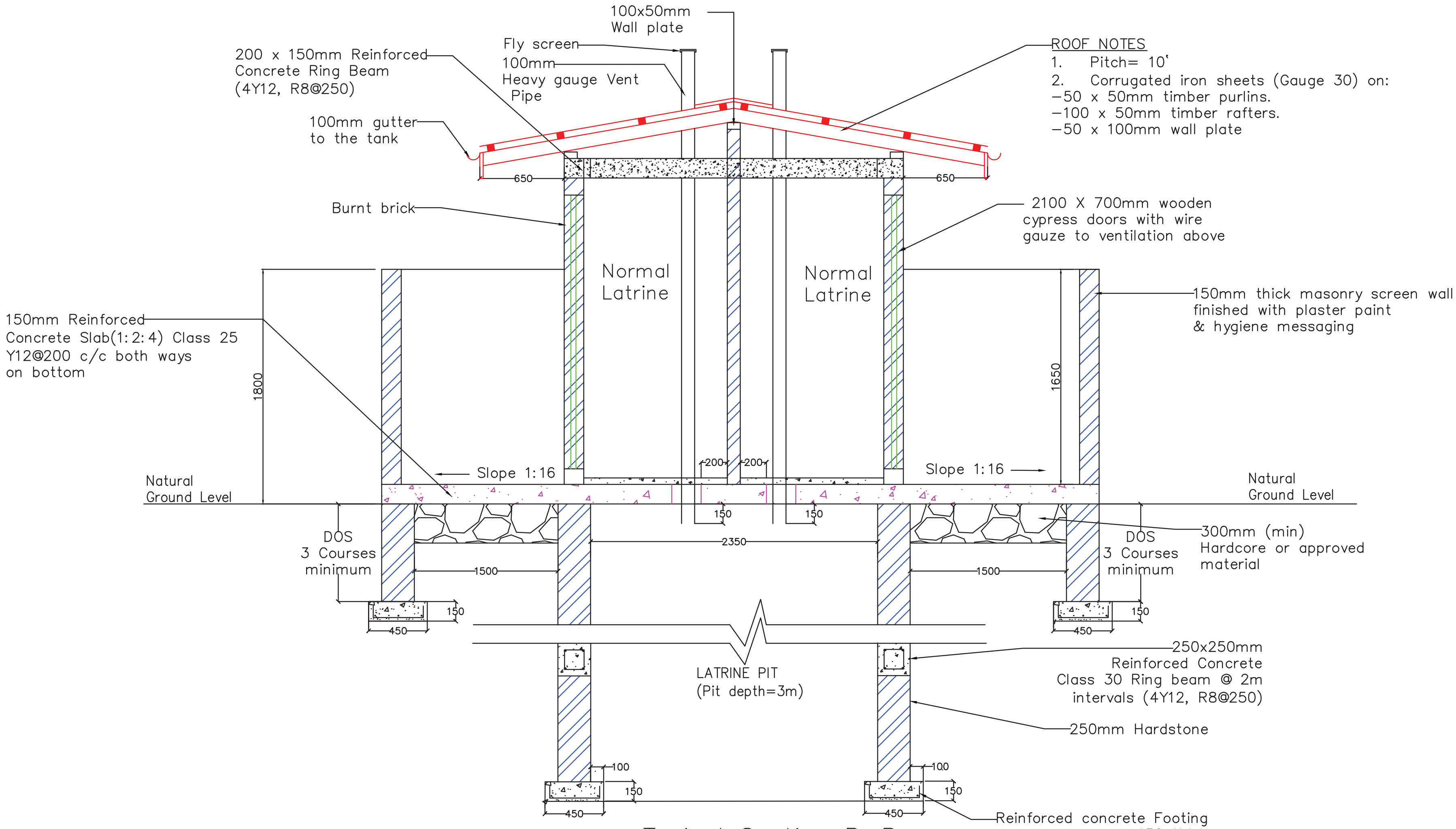
Typical Section A-A
Typical Foundation in Unstable Granular Areas
Girls' Facility (Scale 1:40)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre-primary (L)250mmx(W)130mm
4.All door dimensions are:
Normal - (L)900mmx(H)2100mm
PLWD - (L)1000mmx(H)2100mm
ECDE - (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre-primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9.Standard manhole size (L)600mmx(W)450mm
10.All mass concrete is Class 25, specified mix (1:2:4)
11.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
12.Vent pipe for VIP orientation is down-wind and facing the equator
13.All soils under slab and around external foundation to be treated for termite control.
14.Pits designed to be emptied every five years
15.Drawing to be read with drawing No. 025, 026, 030, and 032

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU - MoE	2017
Approved By:	SIMU - MoE	2017

Location:			
File Name: VIP Latrines Block		Scale: 1:40	
Project:			
Drawing Title: Girls 6 VIP Latrines Block Section A-A			
Drawing No: 031	Rev: B	Sheet: 2/3	



Typical Section B-B

Typical Foundation in Stable Granular Areas

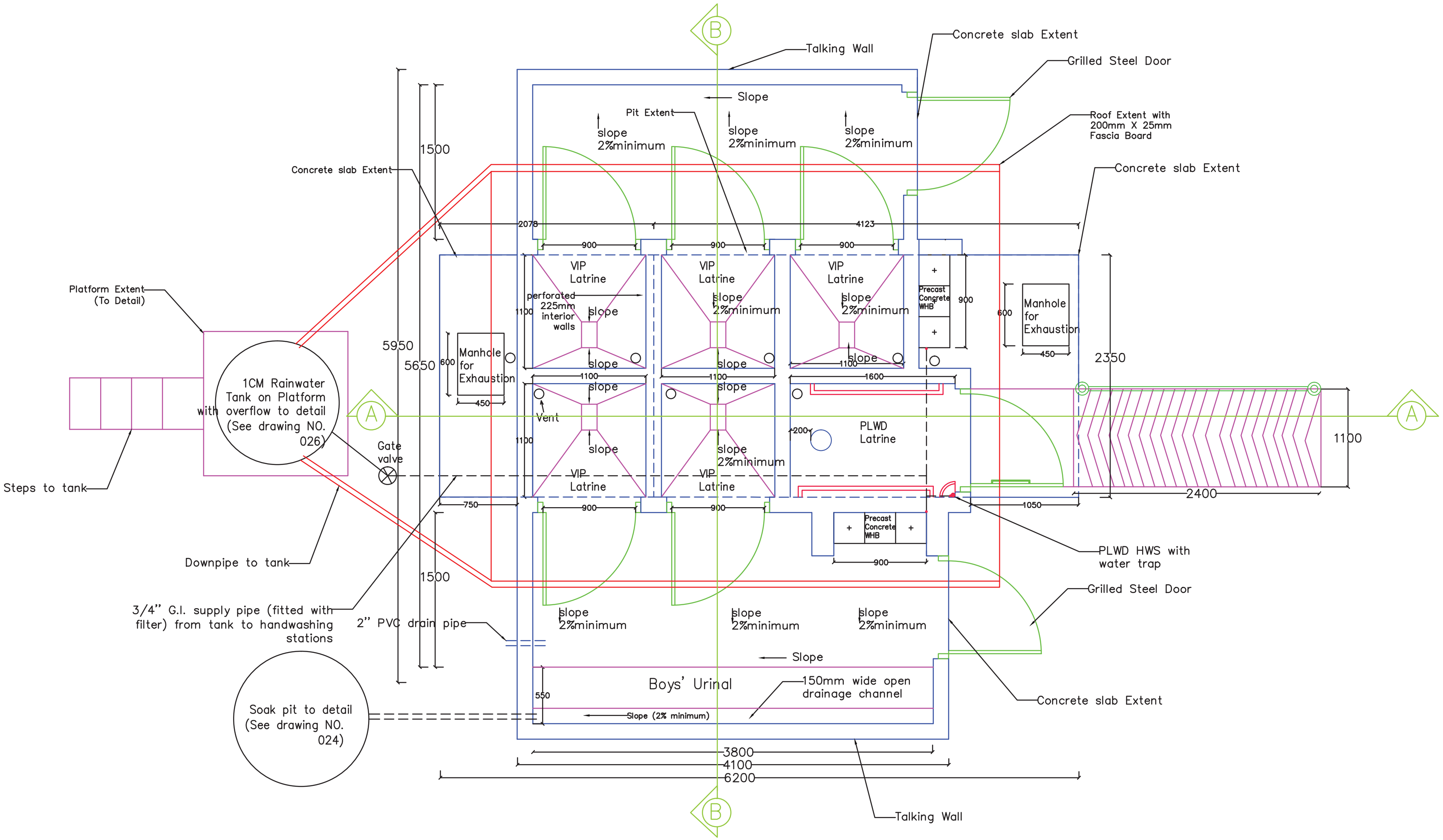
Girls' Facility (Scale 1:40)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre-primary (L)250mmx(W)130mm
4.All door dimensions are:
Normal - (L)900mmx(H)2100mm
PLWD - (L)1000mmx(H)2100mm
ECDE - (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre-primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9. Provide internal & external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm
11.All mass concrete is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.Vent pipe for VIP orientation is down-wind and facing the equator
14.All soils under slab and around external foundation to be treated for termite control.
15.Pits designed to be emptied every five years.
16. Pour flush squat pans can replace the pit aperture.
17.Drawing to be read with drawing No. 024, 025, 026, 030, and 031

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU - MoE	2017
Approved By:	SIMU - MoE	2017

Location:		
File Name: VIP Latrines Block		Scale: 1:30
Project:		
Drawing Title: Girls 6 VIP Latrines Block Section B-B		
Drawing No: 032	Rev: B	Sheet: 3/3

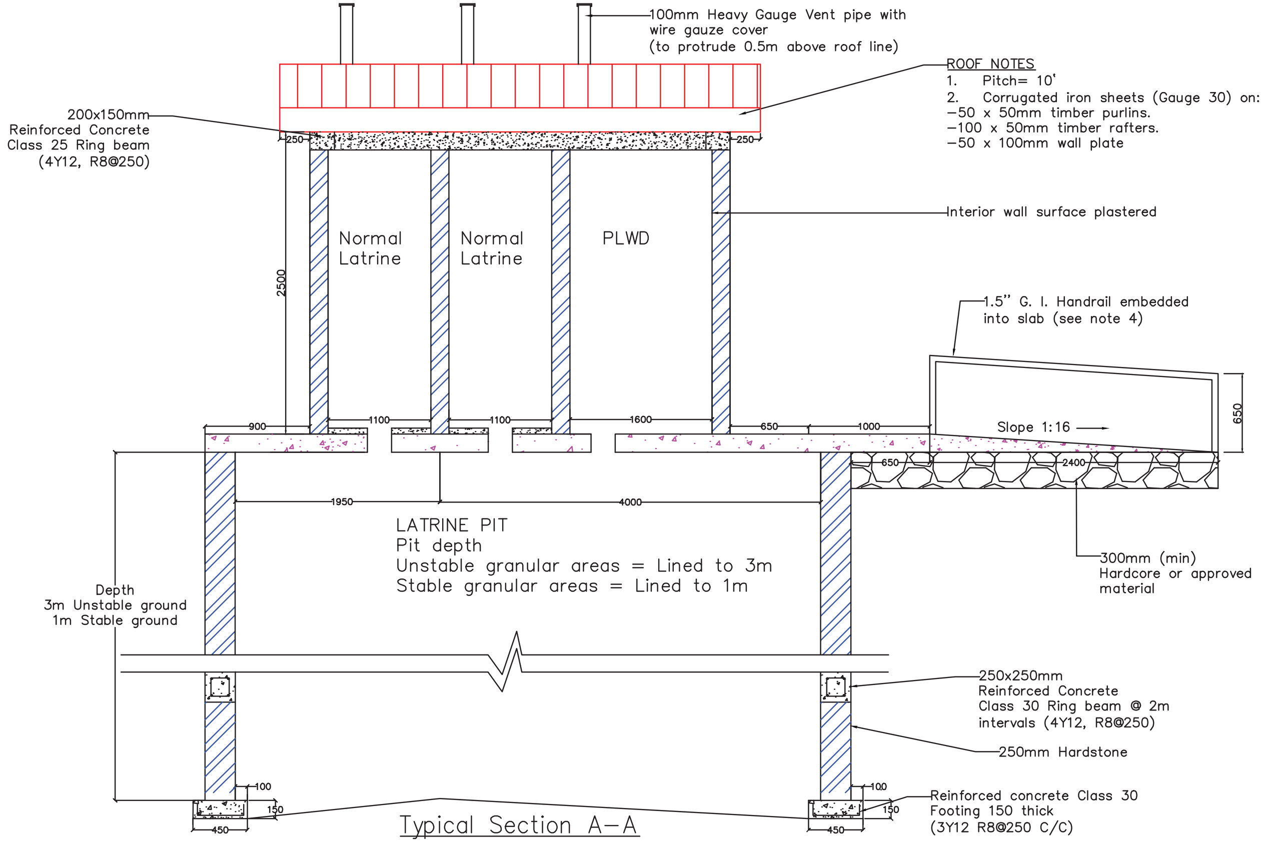


TOILET BLOCK PLAN
BOYS' FACILITY
(Scale 1: 40)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine hole dimensions as follows:
   - Upper primary (L)250mmx(W)150mm
   - Pre-primary (L)250mmx(W)130mm
4. All door dimensions are:
   - Normal – (L)900mmx(H)2100mm
   - PLWD – (L)1000mmx(H)2100mm
   - ECDE – (L)700mmx(H)2100mm
5. Height of Door handles from slab to be at:
   - Upper primary 1000mm
   - Pre-primary 700mm
6. Height of handrail: 650 mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. Provide internal & external latches for all doors.
10. Standard manhole size (L)600mmx(W)450mm
11. All mass concrete is Class 25, specified mix (1:2:4)
12. All reinforced concrete:
    - Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    - Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13. Vent pipe for VIP orientation is down-wind and facing the equator
14. All soils under slab and around external foundation to be treated for termite control.
15. Pits designed to be emptied every five years.
16. Pour flush squat pans can replace the pit aperture.
17. Drawing to be read with drawing No. 024, 025, 026, 034, and 035

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: Boys 5 VIP Latrines Block Plan	
Checked By:	SIMU – MoE	2017		
Approved By:	SIMU – MoE	2017	Drawing No: 033	Rev: B / Sheet: 1/3



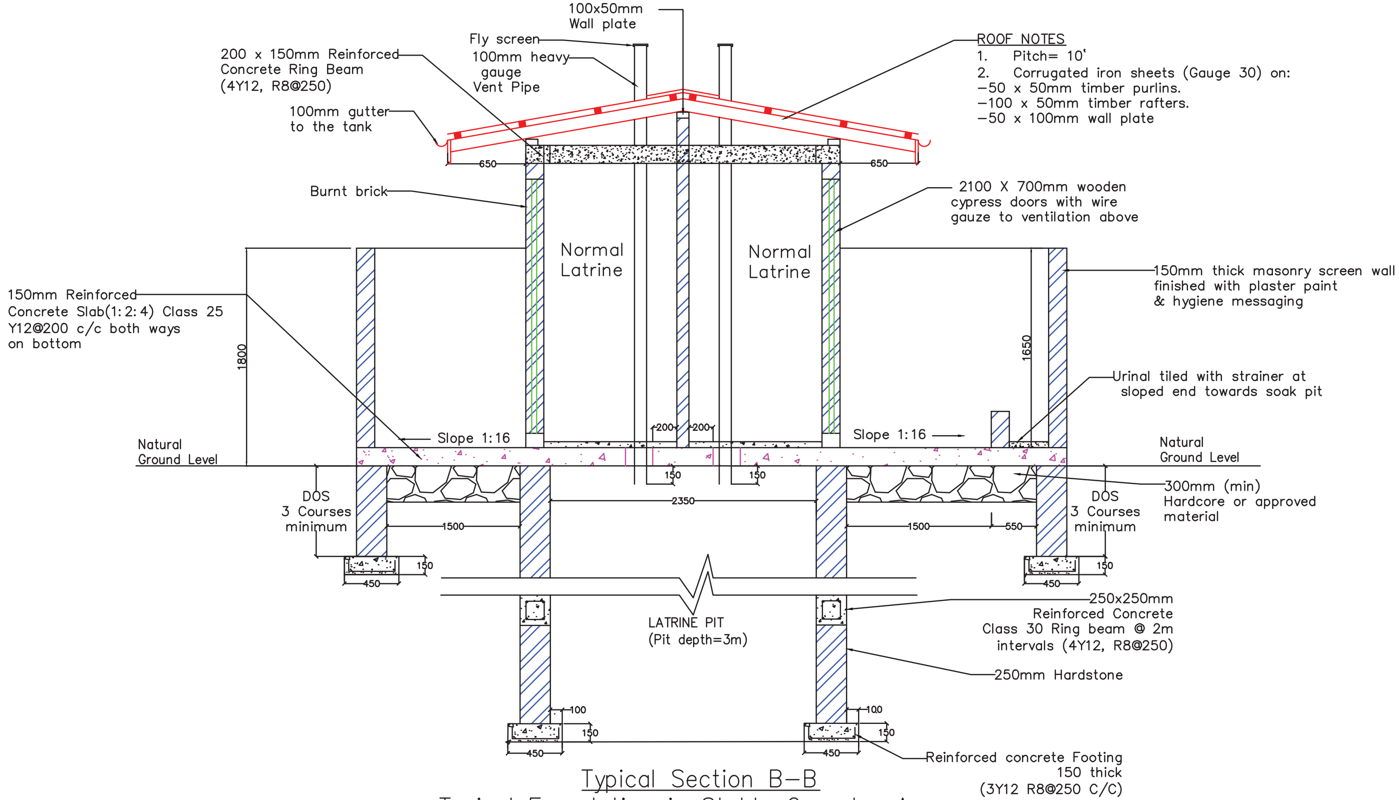
Typical Section A–A
Typical Foundation in Unstable Granular Areas
Boys' Facility (Scale 1:40)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre–primary (L)250mmx(W)130mm
4.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre–primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9. Provide internal & external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm
11.All mass concrete is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.Vent pipe for VIP orientation is down–wind and facing the equator
14.All soils under slab and around external foundation to be treated for termite control.
15.Pits designed to be emptied every five years.
16. Pour flush squat pans can replace the pit aperture.
17.Drawing to be read with drawing No. 024, 025, 026, 033, and 035

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:	
File Name: VIP Latrines Block	Scale: 1:30
Project:	
Drawing Title: Boys 5 VIP Latrines Block Section A–A	
Drawing No: 034	Rev: B
Sheet: 2/3	



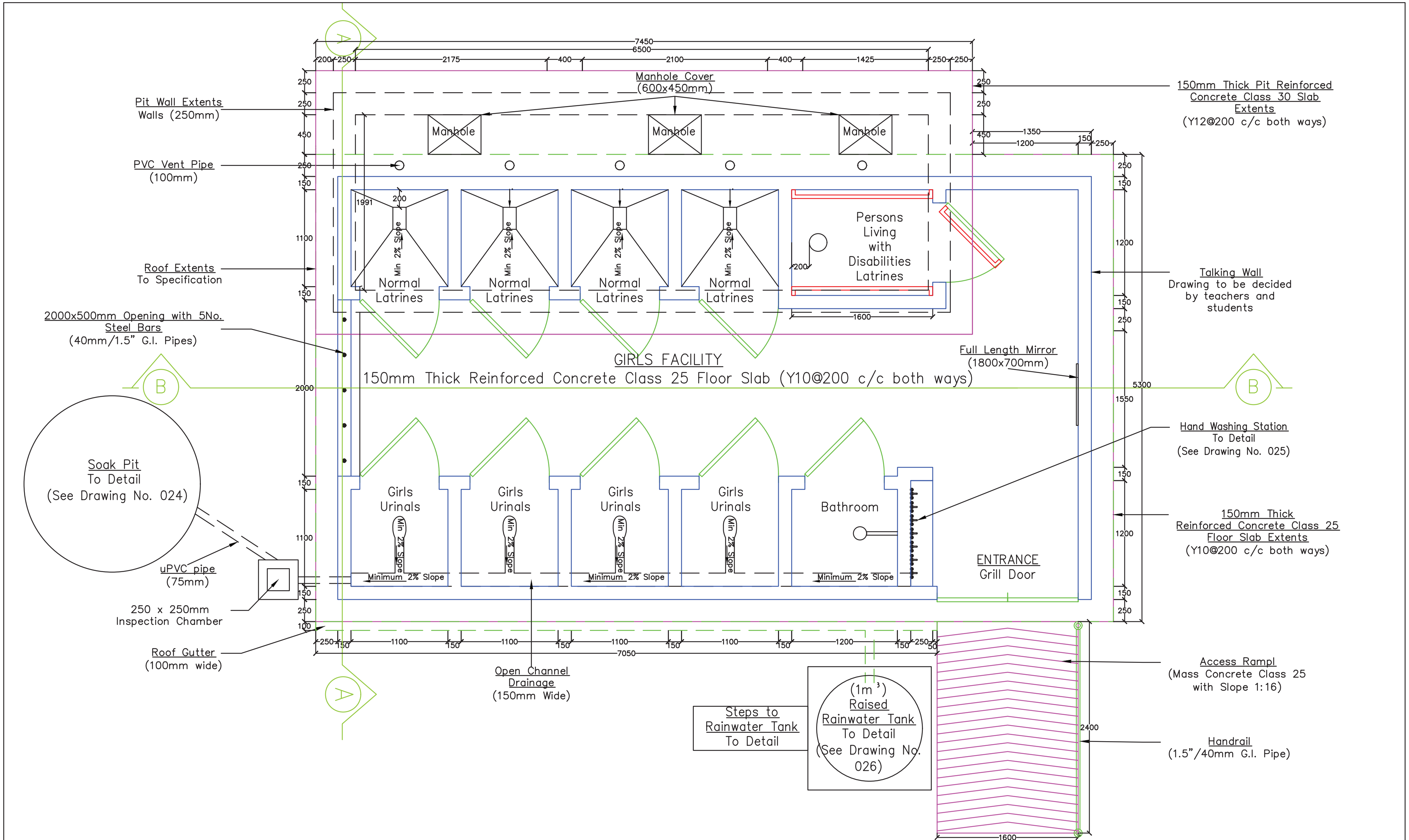
Typical Section B–B
Typical Foundation in Stable Granular Areas
Boys' Facility (Scale 1:40)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine hole dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre–primary (L)250mmx(W)130mm
4.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre–primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9. Provide internal & external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm
11.All mass concrete is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.Vent pipe for VIP orientation is down–wind and facing the equator
14.All soils under slab and around external foundation to be treated for termite control.
15.Pits designed to be emptied every five years.
16. Pour flush squat pans can replace the pit aperture.
17.Drawing to be read with drawing No. 024, 025, 026, 033, and 034

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:		
File Name: VIP Latrines Block		Scale: 1:40
Project:		
Drawing Title: Boys 5 VIP Latrines Block Section B–B		
Drawing No: 035	Rev: B	Sheet: 3/3



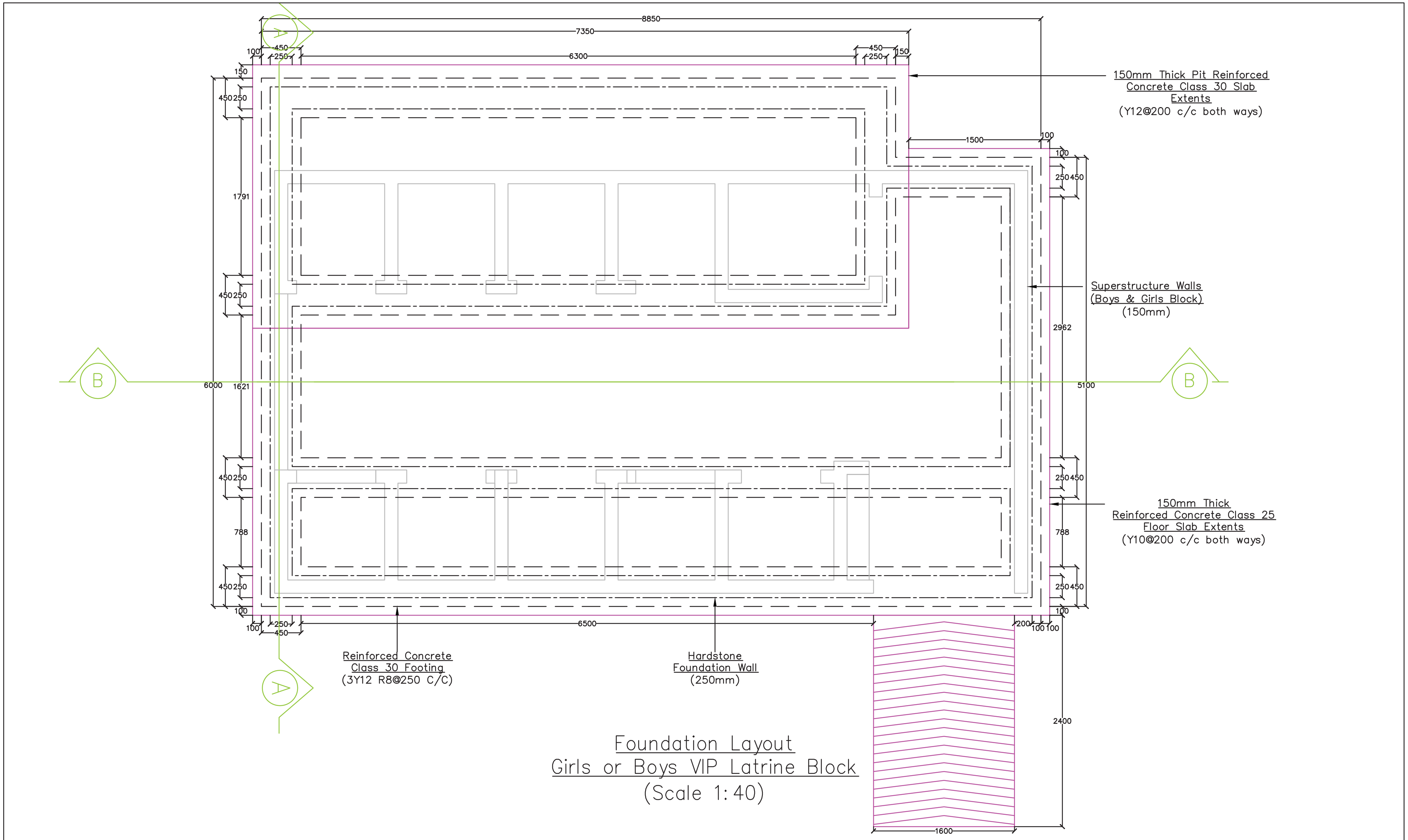
Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine aperture dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre–primary (L)250mmx(W)130mm
4.All door dimensions are:
   Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
   Upper primary 1000mm
   Pre–primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents.
8.Bins should be provided for MHM in Girls Facilities.
9.Pour flush squat pans can replace pit aperture.
10.Provide clothes hooks in bathrooms.
11.Provide internal & external latches for all doors.
12.Standard manhole size (L)600mmx(W)450mm.
13.All mass concrete to be used is Class 25, specified mix (1:2:4)
14.All reinforced concrete:
   Class 25, specified mix (1:2:4) & Minimum cover of 25mm
   Class 30, specified mix (1:2:3) & Minimum cover of 35mm
15.Vent pipe for VIP orientation is down–wind and facing the equator
16.All soils under slab and around external foundation to be treated for termite control.
17.Pits designed to be emptied every 5 years.
18.Drawing to be read with drawing No. 024, 025, 026, 037, 038, 039, and 040

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:

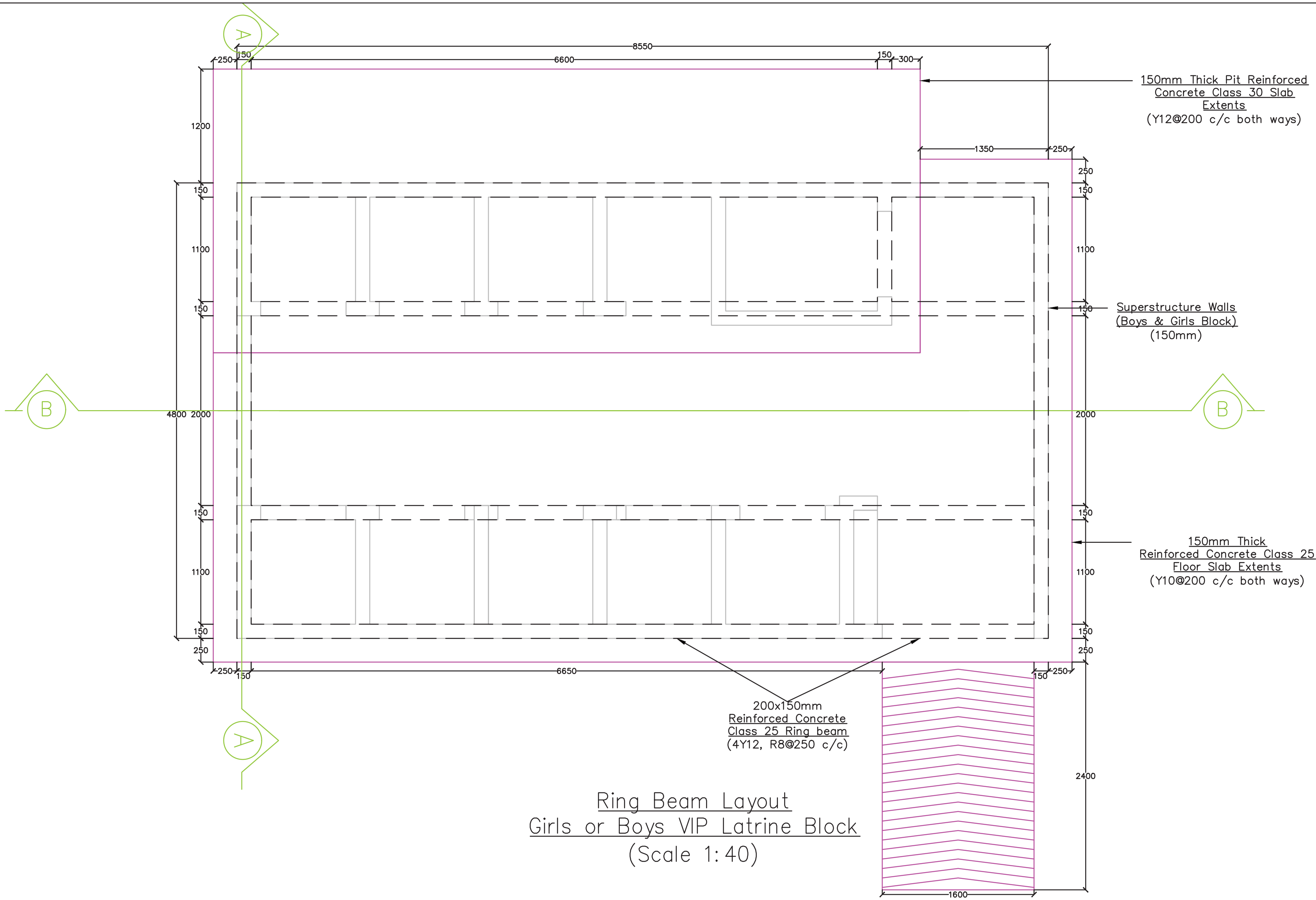
File Name: VIP Latrines Block rev. 7	Scale: 1:40
Project:	
Drawing Title: Girls VIP Latrines Block Plan	
Drawing No: 036	Rev: C
Sheet: 1/5	



Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aperture dimensions as follows: Upper primary (L)250mmx(W)150mm
   Pre–primary (L)250mmx(W)130mm
4. All door dimensions are:
   Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)2100mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Pre–primary 700mm
6. Height of handrail: 650 mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. Pour flush squat pans can replace pit aperture.
10. Provide clothes hooks in bathrooms.
11. Provide internal & external latches for all doors.
12. Standard manhole size (L)600mmx(W)450mm.
13. All mass concrete to be used is Class 25, specified mix (1:2:4)
14. All reinforced concrete:
    Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    Class 30, specified mix (1:2:3) & Minimum cover of 35mm
15. Vent pipe for VIP orientation is down–wind and facing the equator
16. All soils under slab & around external foundation to be treated for termite control.
17. Pits designed to be emptied every 5 years.
18. Foundation layout is IDENTICAL for both Girls and Boys Blocks.
19. Drawing to be read with drawing No. 024, 025, 026, 036, 038, 039, 040, 041, 042,& 043

Client: MoE		Location:
Surveyed By:		File Name: VIP Latrines Block rev. 7 — Scale: 1:40
Drawn By: RFL	2017	Project:
Designed By: RFL	2017	
Checked By: SIMU–MoE	2017	Drawing Title: VIP Latrines Block Foundation Layout
Approved By: SIMU–MoE	2017	Drawing No: 037 — Rev: C — Sheet: 2/5

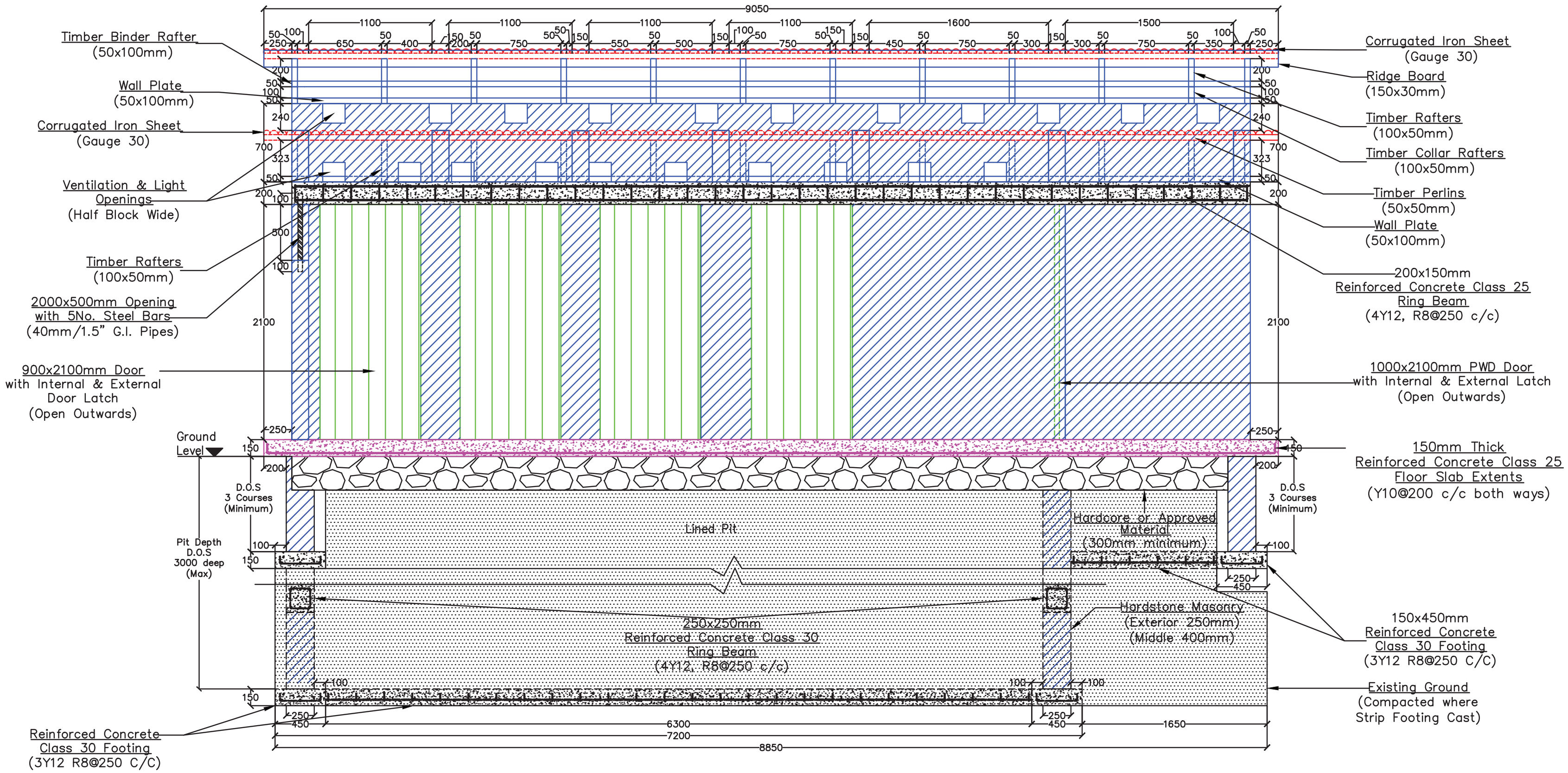


Ring Beam Layout
Girls or Boys VIP Latrine Block
(Scale 1: 40)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aperture dimensions as follows: Upper primary (L)250mmx(W)150mm; Pre–primary (L)250mmx(W)130mm
4. All door dimensions are: Normal – (L)900mmx(H)2100mm; PLWD – (L)1000mmx(H)2100mm; ECDE – (L)700mmx(H)2100mm
5. Height of Door handles from slab to be at: Upper primary 1000mm; Pre–primary 700mm
6. Height of handrail: 650 mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. Pour flush squat pans can replace pit aperture.
10. Provide clothes hooks in bathrooms.
11. Provide internal & external latches for all doors.
12. Standard manhole size (L)600mmx(W)450mm.
13. All mass concrete to be used is Class 25, specified mix (1: 2: 4)
14. All reinforced concrete: Class 25, specified mix (1: 2: 4) & Minimum cover of 25mm; Class 30, specified mix (1: 2: 3) & Minimum cover of 35mm
15. Vent pipe for VIP orientation is down–wind and facing the equator
16. All soils under slab & around external foundation to be treated for termite control.
17. Pits designed to be emptied every 5 years.
18. Ring beam layout is IDENTICAL for both Girls and Boys Blocks.
19. Drawing to be read with drawing No. 024, 025, 026, 036, 037, 039, 040, 041, 042,& 043

Client:	MoE	
Location:		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017
File Name:	VIP Latrines Block rev. 7	
Scale:	1: 40	
Project:		
Drawing Title:	VIP Latrines Block Ring Beam Layout	
Drawing No:	038	
Rev:	C	
Sheet:	3/5	



Typical Section B-B
Girls VIP Latrine Block
Typical Foundation in Stable Granular Areas
(Scale 1:40)

Construction Details:

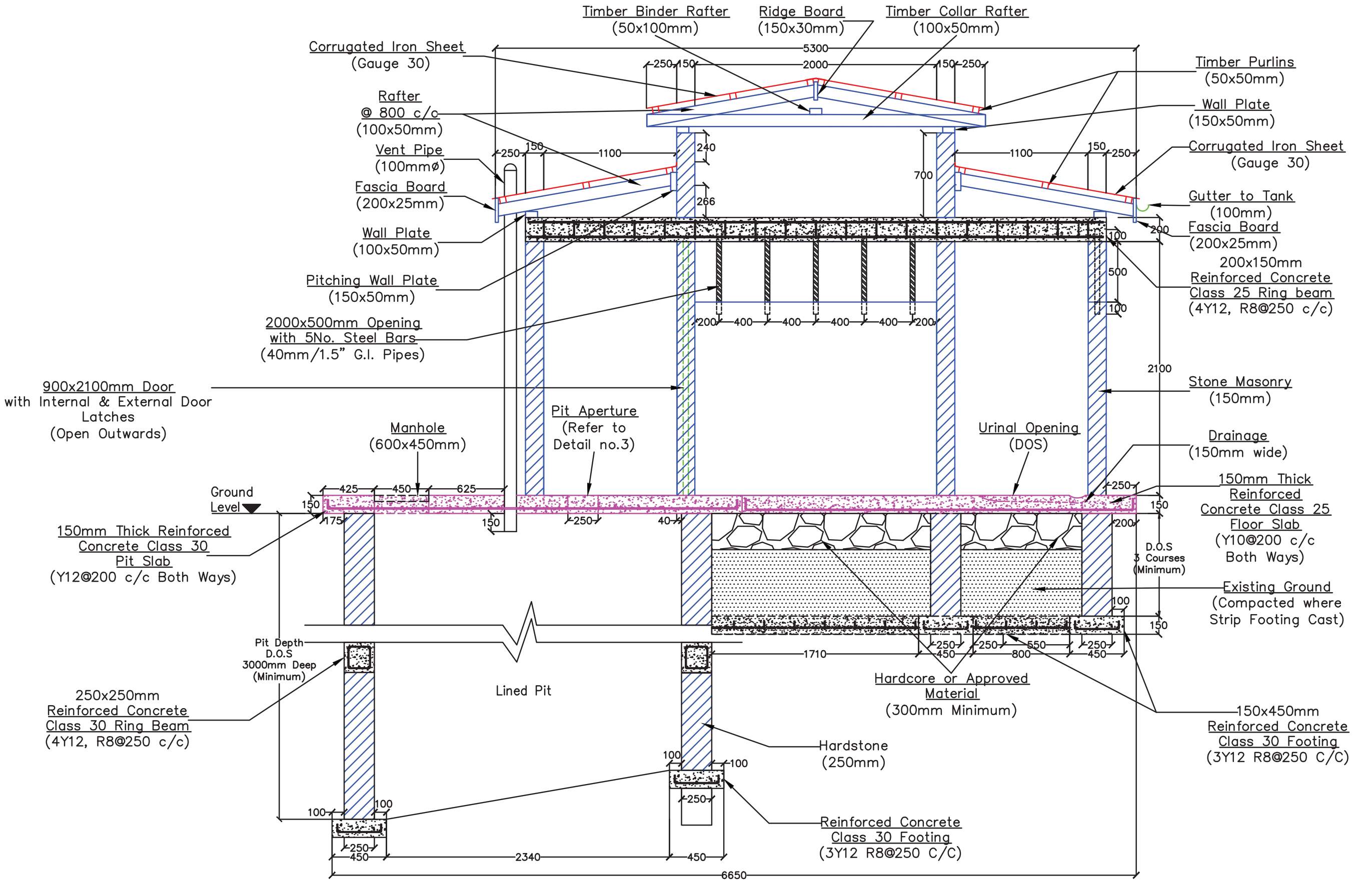
1. Al dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aperture dimensions as follows:
   Upper primary (L)250mmx(W)150mm
   Pre-primary (L)250mmx(W)130mm
4. All door dimensions are:
   Normal – (L)900mmx(H)2100mm
   PLWD – (L)1000mmx(H)2100mm
   ECDE – (L)700mmx(H)2100mm
5. Height of Door handles from slab to be at:
   Upper primary 1000mm
   Pre-primary 700mm
6. Height of handrail: 650 mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. Pour flush squat pans can replace pit aperture.
10. Provide clothes hooks in bathrooms.
11. Provide internal & external latches for all doors.
12. Standard manhole size (L)600mmx(W)450mm.
13. All mass concrete to be used is Class 25, specified mix (1:2:4)
14. All reinforced concrete:
    Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    Class 30, specified mix (1:2:3) & Minimum cover of 35mm
15. Vent pipe for VIP orientation is down–wind and facing the equator
16. All soils under slab and around external foundation to be treated for termite control.
17. Pits designed to be emptied every 5 years.
18. Drawing to be read with drawing No. 024, 025, 026, 036, 037, 038, and 040

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:

File Name: VIP Latrines Block rev. 7	Scale: 1:40
Project:	
Drawing Title: Girls VIP Latrines Block Cross Section	

Drawing No:	Rev:	Sheet:
039	C	4/5

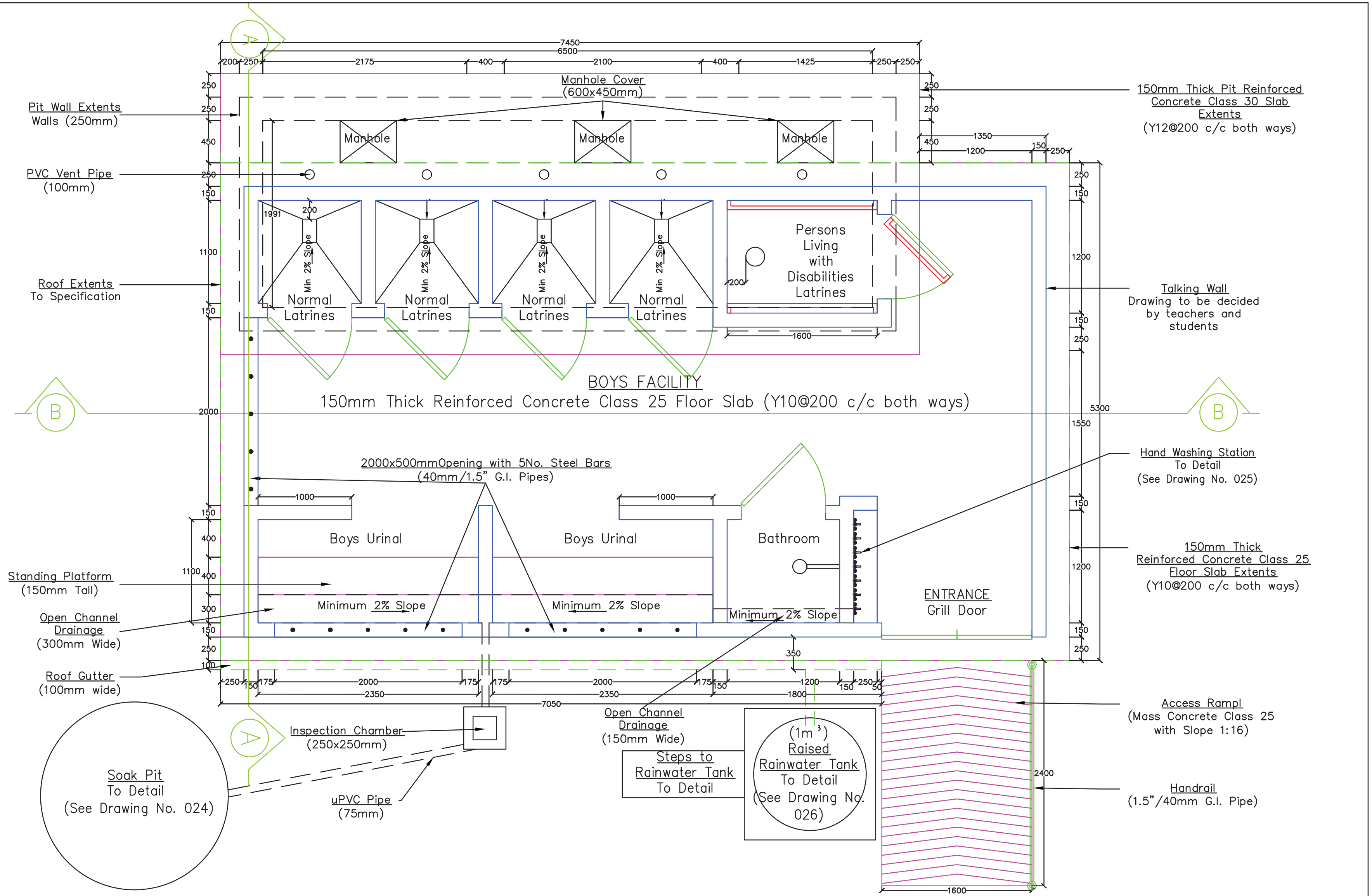


Typical Section A–A
Girls VIP Latrine Block
Typical Foundation in Stable Granular Areas
(Scale 1:40)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aperture dimensions as follows:
   - Upper primary (L)250mmx(W)150mm
   - Pre–primary (L)250mmx(W)130mm
4. All door dimensions are:
   - Normal – (L)900mmx(H)2100mm
   - PLWD – (L)1000mmx(H)2100mm
   - ECDE – (L)700mmx(H)2100mm
5. Height of Door handles from slab to be at:
   - Upper primary 1000mm
   - Pre–primary 700mm
6. Height of handrail: 650 mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. Pour flush squat pans can replace pit aperture.
10. Provide clothes hooks in bathrooms.
11. Provide internal & external latches for all doors.
12. Standard manhole size (L)600mmx(W)450mm.
13. All mass concrete to be used is Class 25, specified mix (1:2:4)
14. All reinforced concrete:
    - Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    - Class 30, specified mix (1:2:3) & Minimum cover of 35mm
15. Vent pipe for VIP orientation is down–wind and facing the equator
16. All soils under slab and around external foundation to be treated for termite control.
17. Pits designed to be emptied every 5 years.
18. Drawing to be read with drawing No. 024, 025, 026, 036, 037, 038, and 039

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block rev. 7	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: Girls VIP Latrines Block Elevation	
Checked By:	SIMU–MoE	2017		
Approved By:	SIMU–MoE	2017	Drawing No: 040	Rev: C / Sheet: 5/5

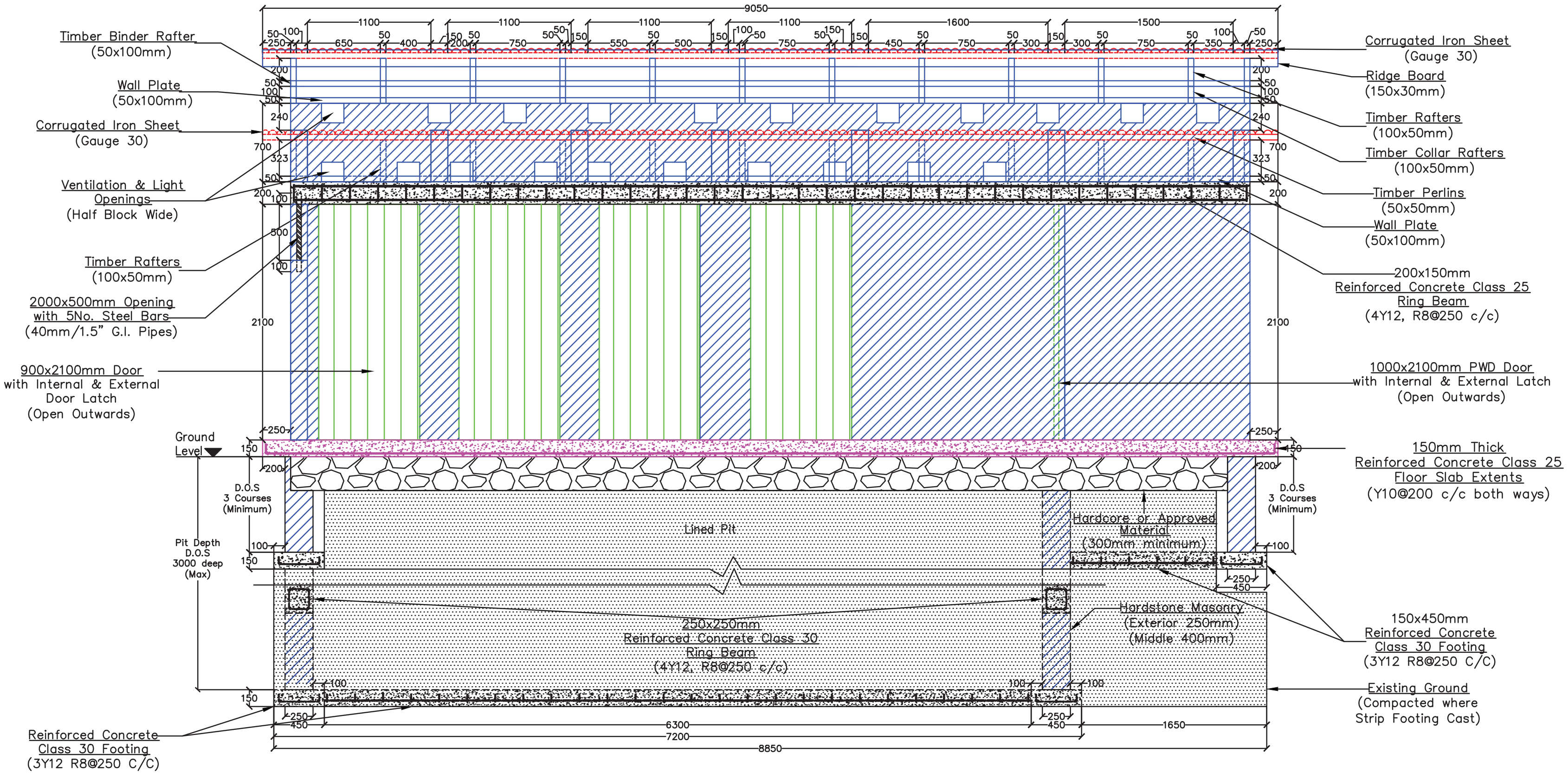


Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine aperture dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre-primary (L)250mmx(W)130mm
4.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre-primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9.Pour flush squat pans can replace pit aperture.
10.Provide clothes hooks in bathrooms.
11.Provide internal & external latches for all doors.
12.Standard manhole size (L)600mmx(W)450mm.
13.All mass concrete to be used is Class 25, specified mix (1:2:4)
14.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
15.Vent pipe for VIP orientation is down–wind and facing the equator
16.All soils under slab and around external foundation to be treated for termite control.
17.Pits designed to be emptied every 5 years.
18.Drawing to be read with drawing No. 024, 025, 026, 037, 038, 042 and 043

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name: VIP Latrines Block rev. 7	Scale: 1:40
Project:	
Drawing Title: Boys VIP Latrines Block Plan	
Drawing No: 041	Rev: C
Sheet: 1/3	

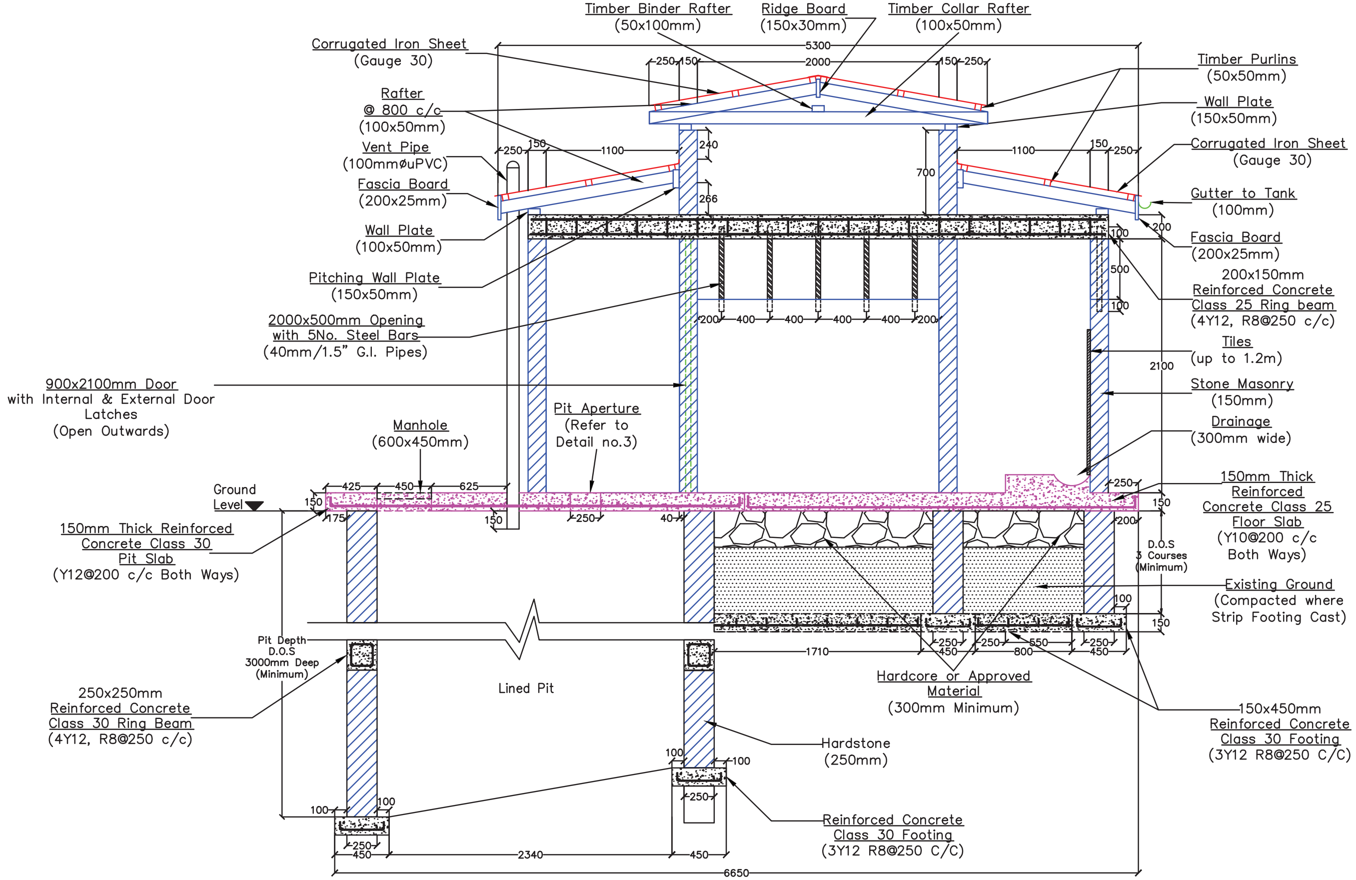


Typical Section B-B
Boys VIP Latrine Block
Typical Foundation in Stable Granular Areas
(Scale 1:40)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Normal latrine aperture dimensions as follows:
Upper primary (L)250mmx(W)150mm
Pre-primary (L)250mmx(W)130mm
4.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
5.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre-primary 700mm
6.Height of handrail: 650 mm
7.Roof slab extents overlap to floor slab extents
8.Bins should be provided for MHM in Girls Facilities.
9.Pour flush squat pans can replace pit aperture.
10.Provide clothes hooks in bathrooms.
11.Provide internal & external latches for all doors.
12.Standard manhole size (L)600mmx(W)450mm.
13.All mass concrete to be used is Class 25, specified mix (1:2:4)
14.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
15.Vent pipe for VIP orientation is down-wind and facing the equator
16.All soils under slab and around external foundation to be treated for termite control.
17.Pits designed to be emptied every 5 years.
18.Drawing to be read with drawing No. 024, 025, 026, 037, 038, 041 and 043

Client: MoE			Location:	
Surveyed By:			File Name: VIP Latrines Block rev. 6	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: Boys VIP Latrines Block Cross Section	
Checked By:	SIMU-MoE	2017		
Approved By:	SIMU-MoE	2017	Drawing No: 042 / Rev: C	Sheet: 2/3



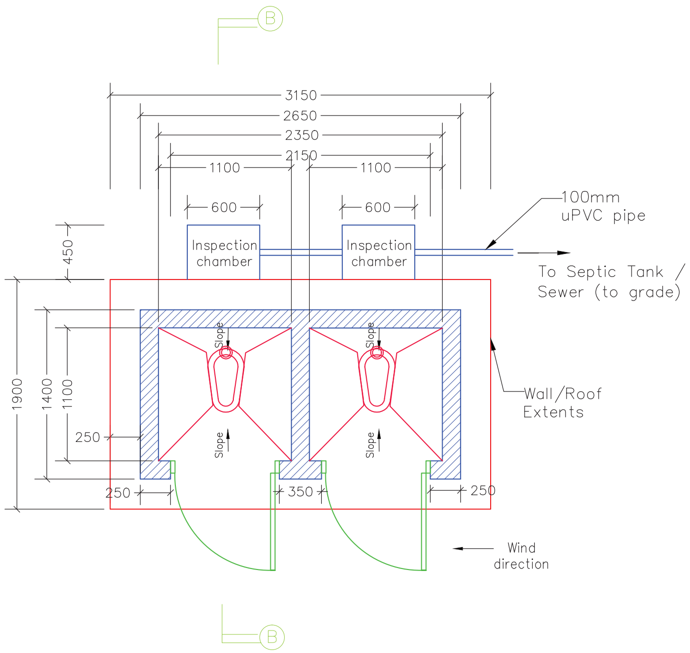
Typical Section A–A
Boys VIP Latrine Block
Typical Foundation in Stable Granular Areas
(Scale 1:40)

Construction Details:

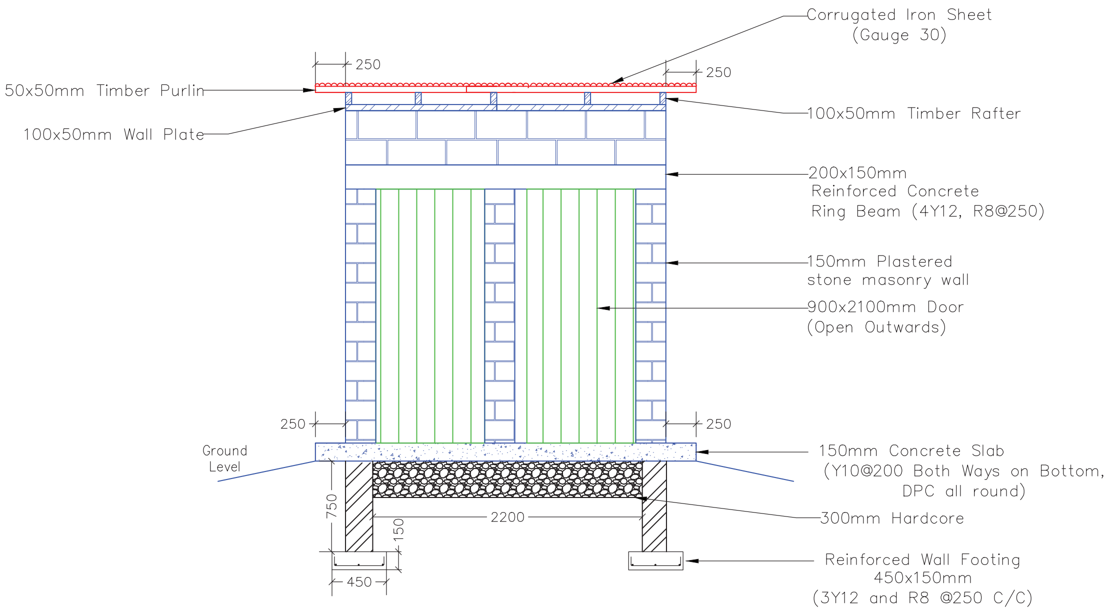
1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. Normal latrine aperture dimensions as follows:
   - Upper primary (L)250mmx(W)150mm
   - Pre–primary (L)250mmx(W)130mm
4. All door dimensions are:
   - Normal – (L)900mmx(H)2100mm
   - PLWD – (L)1000mmx(H)2100mm
   - ECDE – (L)700mmx(H)2100mm
5. Height of Door handles from slab to be at:
   - Upper primary 1000mm
   - Pre–primary 700mm
6. Height of handrail: 650 mm
7. Roof slab extents overlap to floor slab extents
8. Bins should be provided for MHM in Girls Facilities.
9. Pour flush squat pans can replace pit aperture.
10. Provide clothes hooks in bathrooms.
11. Provide internal & external latches for all doors.
12. Standard manhole size (L)600mmx(W)450mm.
13. All mass concrete to be used is Class 25, specified mix (1:2:4)
14. All reinforced concrete:
    - Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    - Class 30, specified mix (1:2:3) & Minimum cover of 35mm
15. Vent pipe for VIP orientation is down–wind and facing the equator
16. All soils under slab and around external foundation to be treated for termite control.
17. Pits designed to be emptied every 5 years.
18. Drawing to be read with drawing No. 024, 025, 026, 037, 038, 041 and 042

Client: MoE		Location:
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

File Name: VIP Latrines Block rev. 7	Scale: 1:40
Project:	
Drawing Title: Boys VIP Latrines Block Elevation	
Drawing No: 043	Rev: C
Sheet: 3/3	



Typical 2 Water Closet Plan Detail



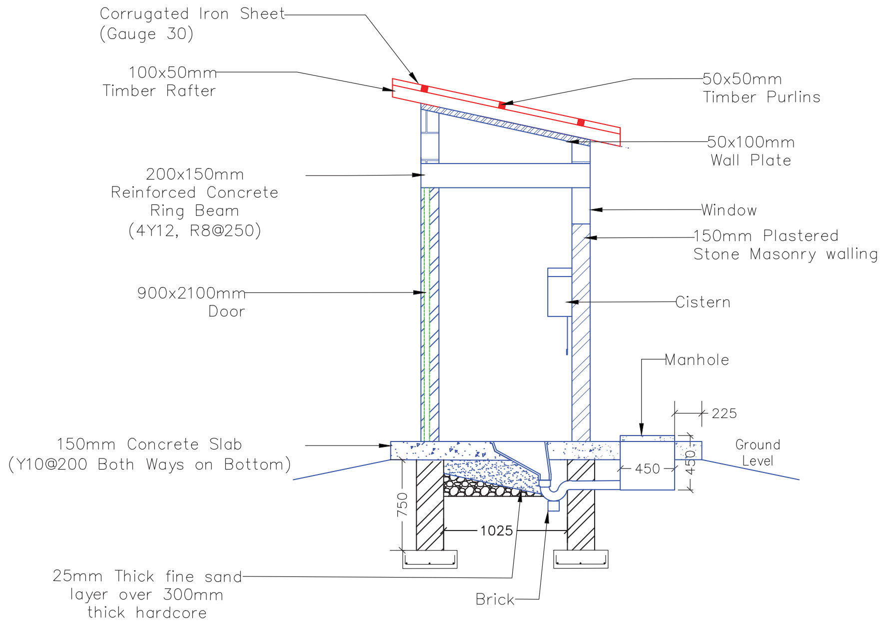
Front Elevation and Foundation 2 Water Closet

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to to use NOT SCALED.
3.All doors are of dimensions: Normal (L)900mmx(H)2100mm
PLWD (L)1000mmx(H)2100mm
ECDE (L)700x(H)1600mm
4.Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
5. Handwashing station to be provided near the toilet.
6. All mass concrete to be used is class 20 (1:2:4)
7. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
8. Standard inspection chamber size (L)600mmx(W)450mm
9. All soils under slab and around external. foundation to be treated for termite control.
10. This drawing should be read with drawing no. 045

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:			
File Name: Flush Toilets Sections & Elevations		Scale: 1:40	
Project:			
Drawing Title: 2 Water Closet Toilets			
Drawing No: 044	Rev: A	Sheet: 1/2	



Typical Section B–B
Typical 2 Water Closet
Foundation

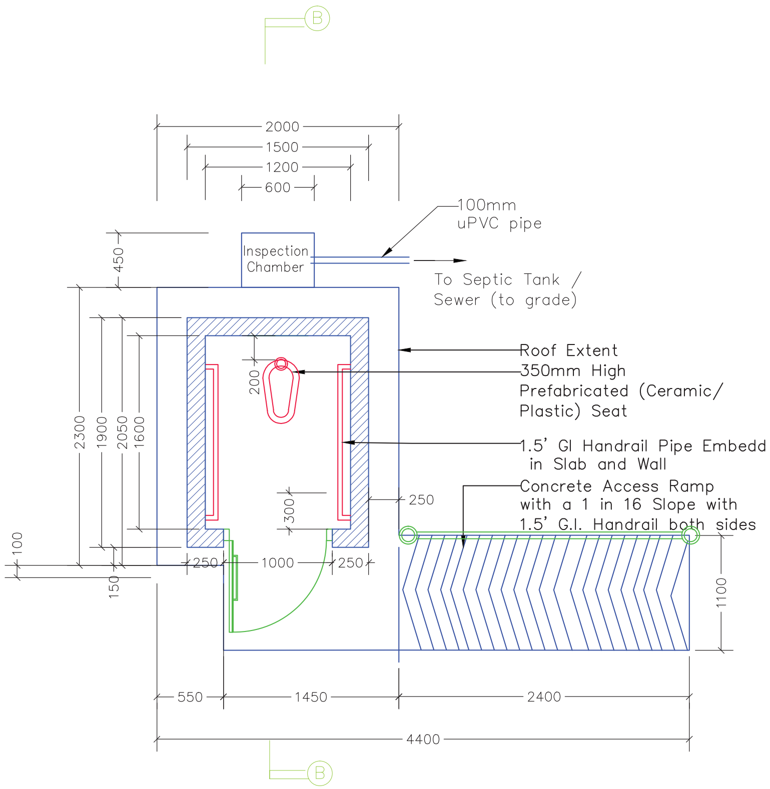
Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to to use NOT SCALED.
3.All doors are of dimensions: Normal (L)900mmx(H)2100mm
PLWD (L)1000mmx(H)2100mm
ECDE (L)700x(H)1600mm
4.Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm

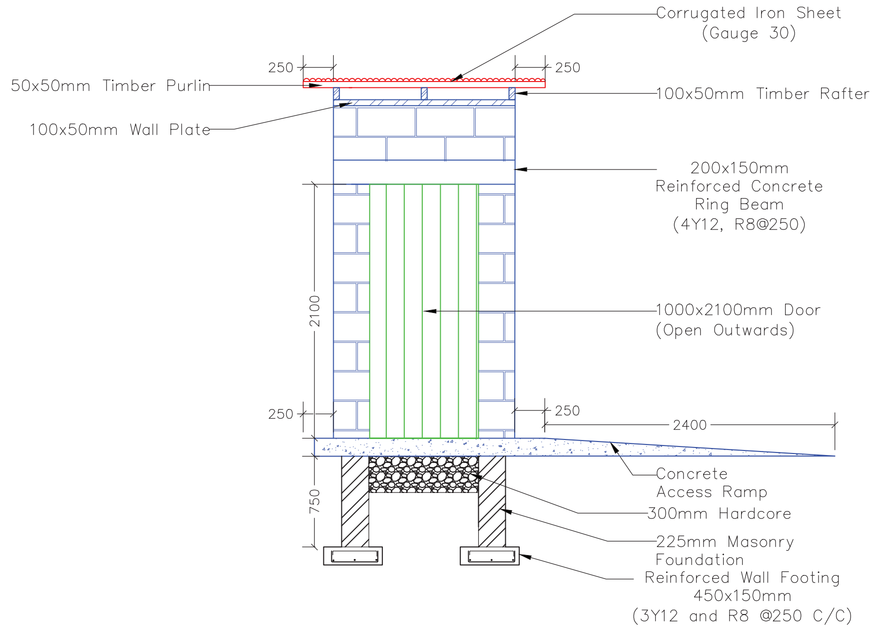
5. Handwashing station to be provided near the toilet.
6. All mass concrete to be used is class 20 (1:2:4)
7. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
8. Standard inspection chamber size (L)600mmx(W)450mm
9. All soils under slab and around external. foundation to be treated for termite control.
10. This drawing should be read with drawing no. 044

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:	
File Name: Flush Toilets Sections & Elevations	Scale: 1:40
Project:	
Drawing Title: 2 Water Closet Toilet	
Drawing No: 045	Rev: A
Sheet: 2/2	



Typical PLWD Water Closet
Plan Detail

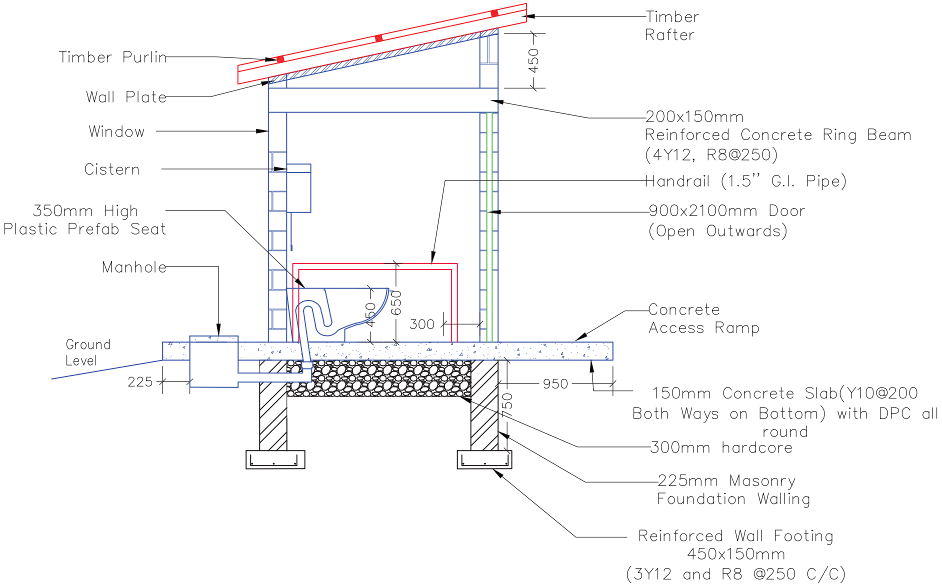


Front Elevation and Foundation
PLWD Water Closet

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to to use NOT SCALED.
3. All doors are of dimensions: Normal (L)900mmx(H)2100mm
PLWD (L)1000mmx(H)2100mm
ECDE (L)700x(H)1600mm
4. Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm
5. Height of hand rail: 650mm
6. Handwashing station to be provided near the toilet.
7. All mass concrete to be used is class 20 (1:2:4)
8. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) 7 min. cover Of 35mm.
9. Standard inspection chamber size (L)600mmx(W)450mm
10. All soils under slab and around external. foundation to be treated for termite control.
11. This drawing should be read with drawing no. 047

Client:	MoE	
Location:		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017
File Name:	Flush Toilet Sections & Elevations	
Scale:	1:40	
Project:		
Drawing Title:	PLWD Water Closet Toilet	
Drawing No:	046	
Rev:	A	
Sheet:	1/2	



Typical Section B–B
PLWD Water Closet
Foundation

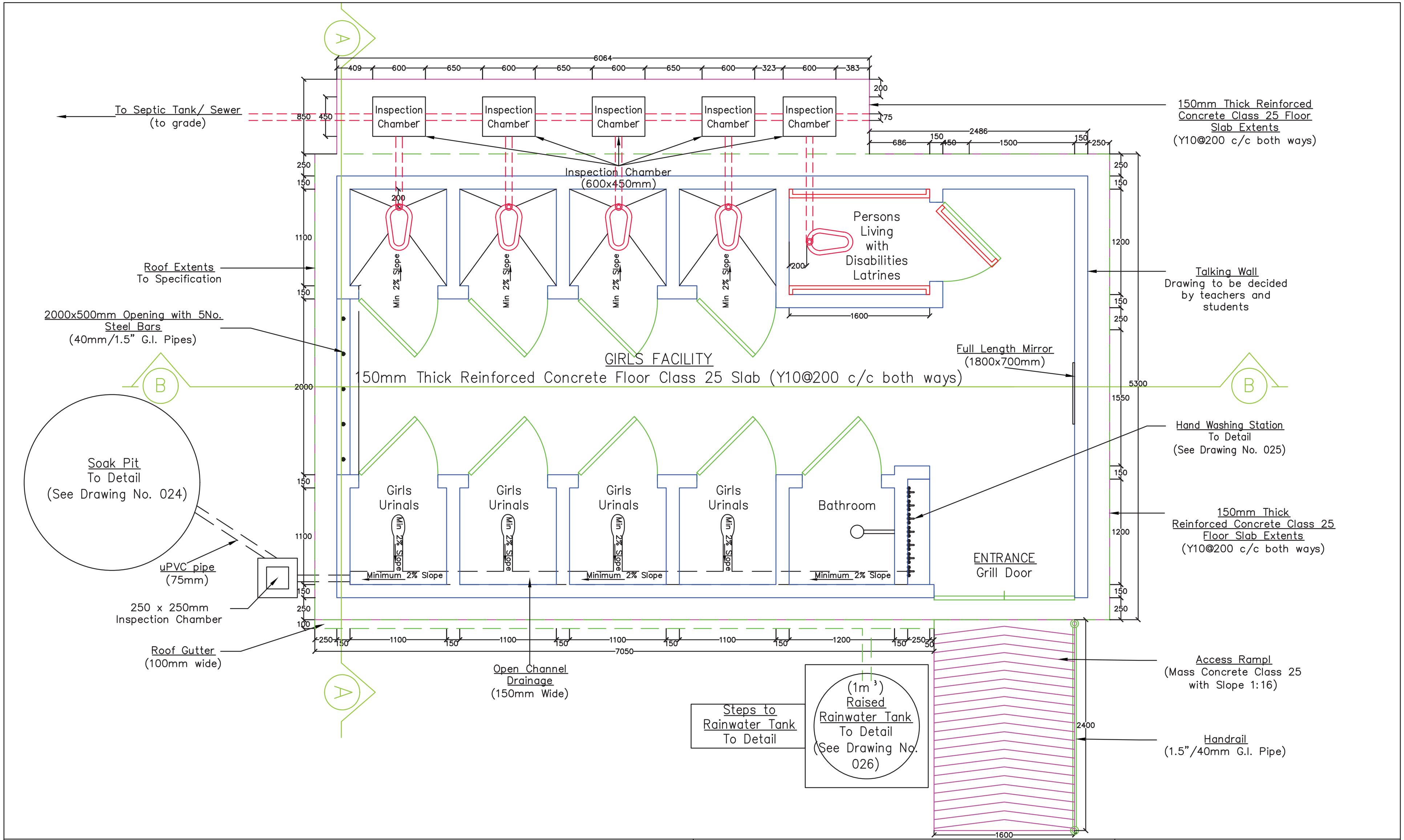
Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to to use NOT SCALED.
3.All doors are of dimensions: Normal (L)900mmx(H)2100mm
PLWD (L)1000mmx(H)2100mm
ECDE (L)700x(H)1600mm
4.Height of Door handles from slab to be at:
Upper primary 1000mm
Lower primary 700mm

5. Height of hand rail: 650mm
6. Handwashing station to be provided near the toilet.
7. All mass concrete to be used is class 20 (1:2:4)
8. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) 7 min. cover of 35mm.
9. Standard inspection chamber size (L)600mmx(W)450mm
10. All soils under slab and around external. foundation to be treated for termite control.
11. This drawing should be read with drawing no. 046

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

Location:		
File Name: Flush Toilet Sections & Elevations		Scale: 1:40
Project:		
Drawing Title: PLWD Water Closet Toilet		
Drawing No: 047	Rev: A	Sheet: 2/2

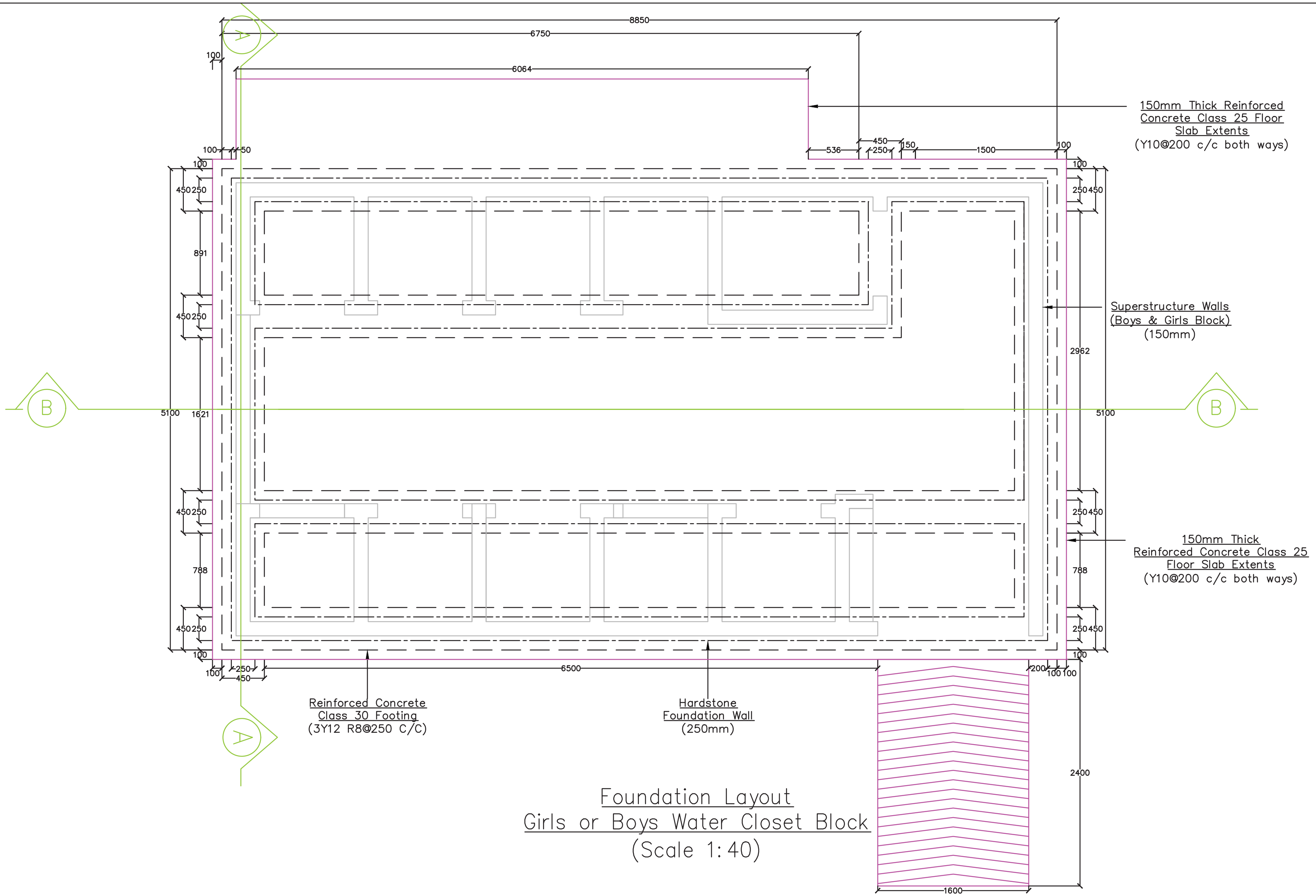


Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
4.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre-primary 700mm
5.Height of handrail: 650 mm
6.Roof slab extents overlap to floor slab extents
7.Bins should be provided for MHM in Girls Facilities.
8.Provide clothes hooks in bathrooms.
9.Provide internal & external latches for all doors.
10.Standard inspection chamber (L)600mmx(W)450mm.
11.All mass concrete to be used is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.All soils under slab and around external foundation to be treated for termite control.
14.Drawing to be read with drawing No. 025, 026, 027, 049, 050, and 051

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name: Water Closet Block	Scale: 1:40
Project:	
Drawing Title: Girls Water Closet Block Plan	
Drawing No: 048	Rev: C
Sheet: 1/4	



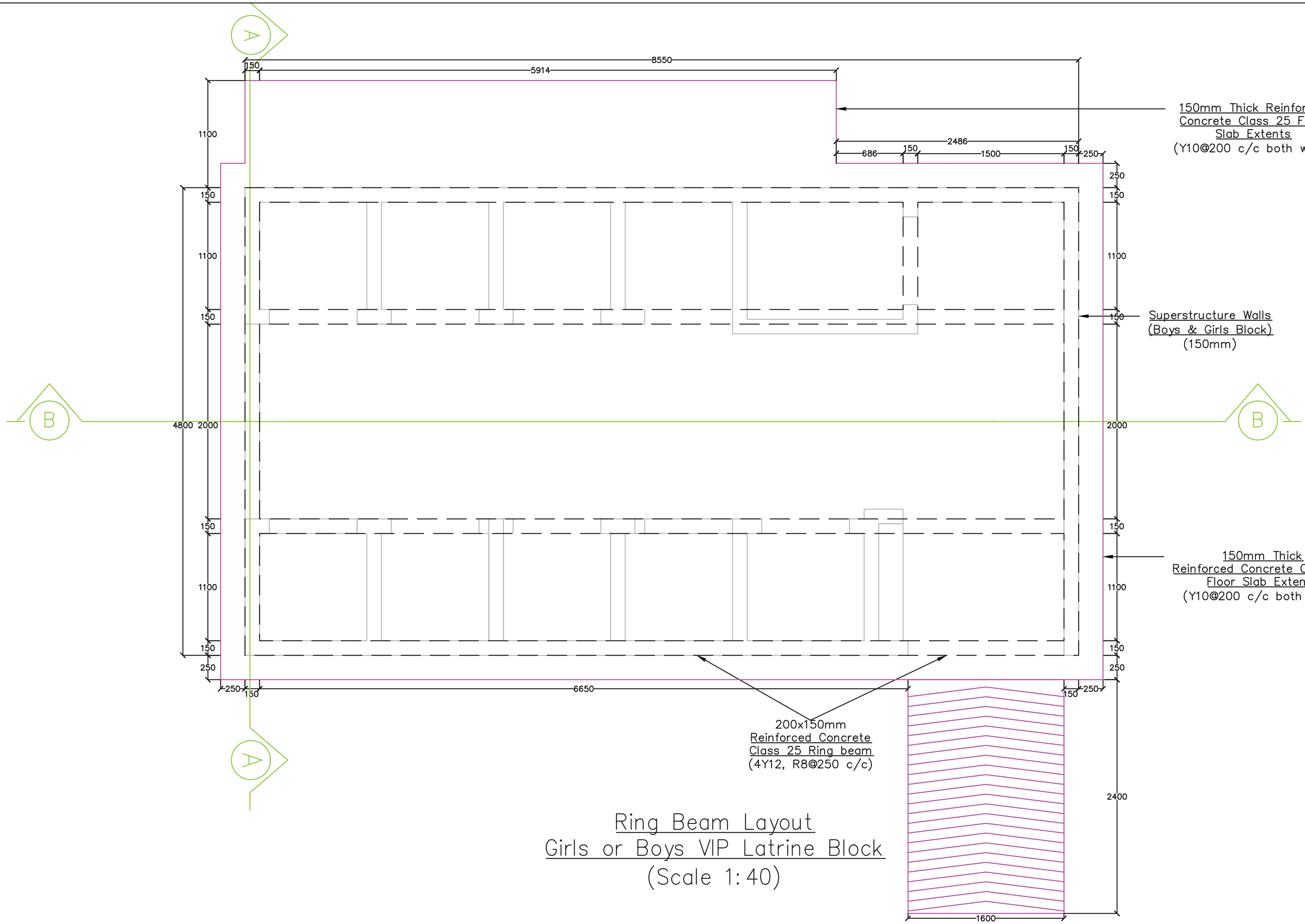
Foundation Layout
Girls or Boys Water Closet Block
(Scale 1:40)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. All door dimensions are:
   - Normal – (L)900mmx(H)2100mm
   - PLWD – (L)1000mmx(H)2100mm
   - ECDE – (L)700mmx(H)2100mm
4. Height of Door handles from slab to be at:
   - Upper primary 1000mm
   - Pre–primary 700mm
5. Height of handrail: 650 mm
6. Roof slab extents overlap to floor slab extents
7. Bins should be provided for MHM in Girls Facilities.
8. Provide clothes hooks in bathrooms.
9. Provide internal & external latches for all doors.
10. Standard manhole size (L)600mmx(W)450mm.
11. All mass concrete to be used is Class 25, specified mix (1:2:4)
12. All reinforced concrete:
    - Class 25, specified mix (1:2:4) & Minimum cover of 25mm
    - Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13. All soils under slab & around external foundation to be treated for termite control.
14. Foundation layout is IDENTICAL for both Girls and Boys Blocks.
15. Drawing to be read with drawing No. 025, 026, 027, 048, 050, and 051

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name: Water Closet Block	Scale: 1:40
Project:	
Drawing Title: Water Closet Block Foundation Layout	
Drawing No: 049	Rev: C
Sheet: 2/4	



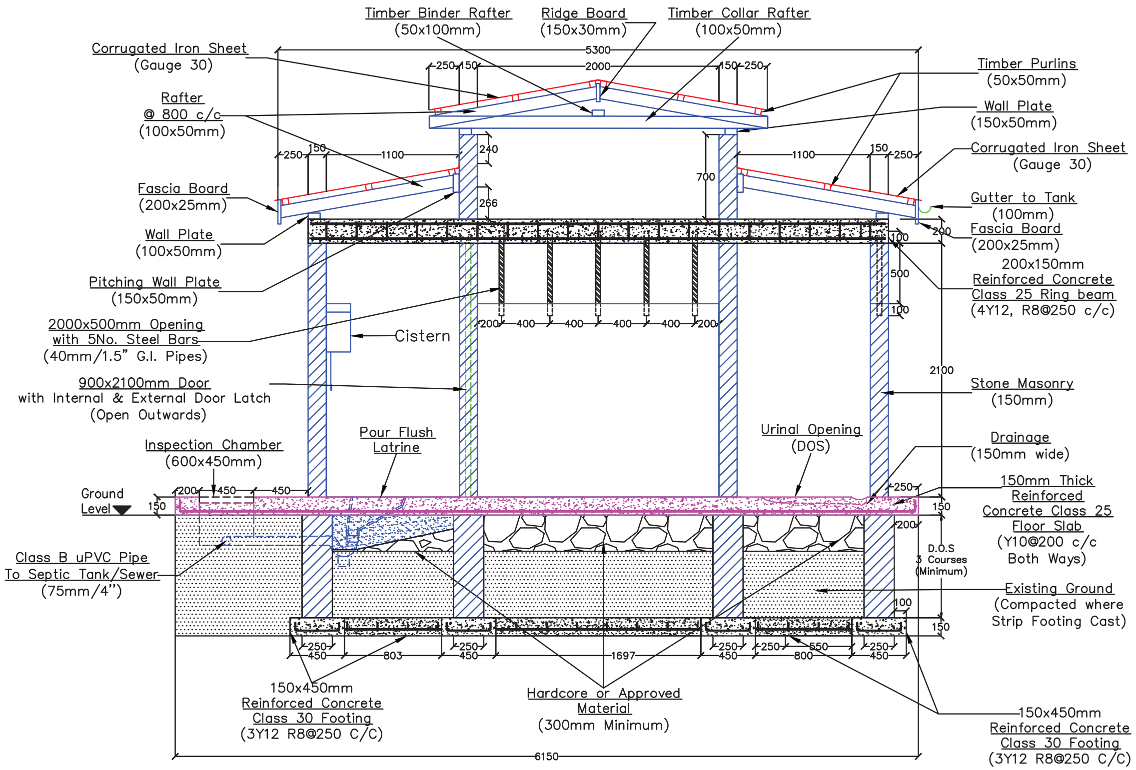
Ring Beam Layout
Girls or Boys VIP Latrine Block
(Scale 1: 40)

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED
3. All door dimensions are:
   - Normal – (L)900mmx(H)2100mm
   - PLWD – (L)1000mmx(H)2100mm
   - ECDE – (L)700mmx(H)2100mm
4. Height of Door handles from slab to be at:
   - Upper primary 1000mm
   - Pre–primary 700mm
5. Height of handrail: 650 mm
6. Roof slab extents overlap to floor slab extents
7. Bins should be provided for MHM in Girls Facilities.
8. Provide clothes hooks in bathrooms.
9. Provide internal & external latches for all doors.
10. Standard manhole size (L)600mmx(W)450mm.
11. All mass concrete to be used is Class 25, specified mix (1: 2: 4)
12. All reinforced concrete:
    - Class 25, specified mix (1: 2: 4) & Minimum cover of 25mm
    - Class 30, specified mix (1: 2: 3) & Minimum cover of 35mm
13. All soils under slab & around external foundation to be treated for termite control.
14. Ring beam layout is IDENTICAL for both Girls and Boys Blocks.
15. Drawing to be read with drawing No. 025, 026, 027, 048, 049, and 051

Client:	MoE	
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name:	Water Closet Block
Scale:	1: 40
Project:	
Drawing Title:	Water Closet Block Ring Beam Layout
Drawing No:	050
Rev:	C
Sheet:	3/4

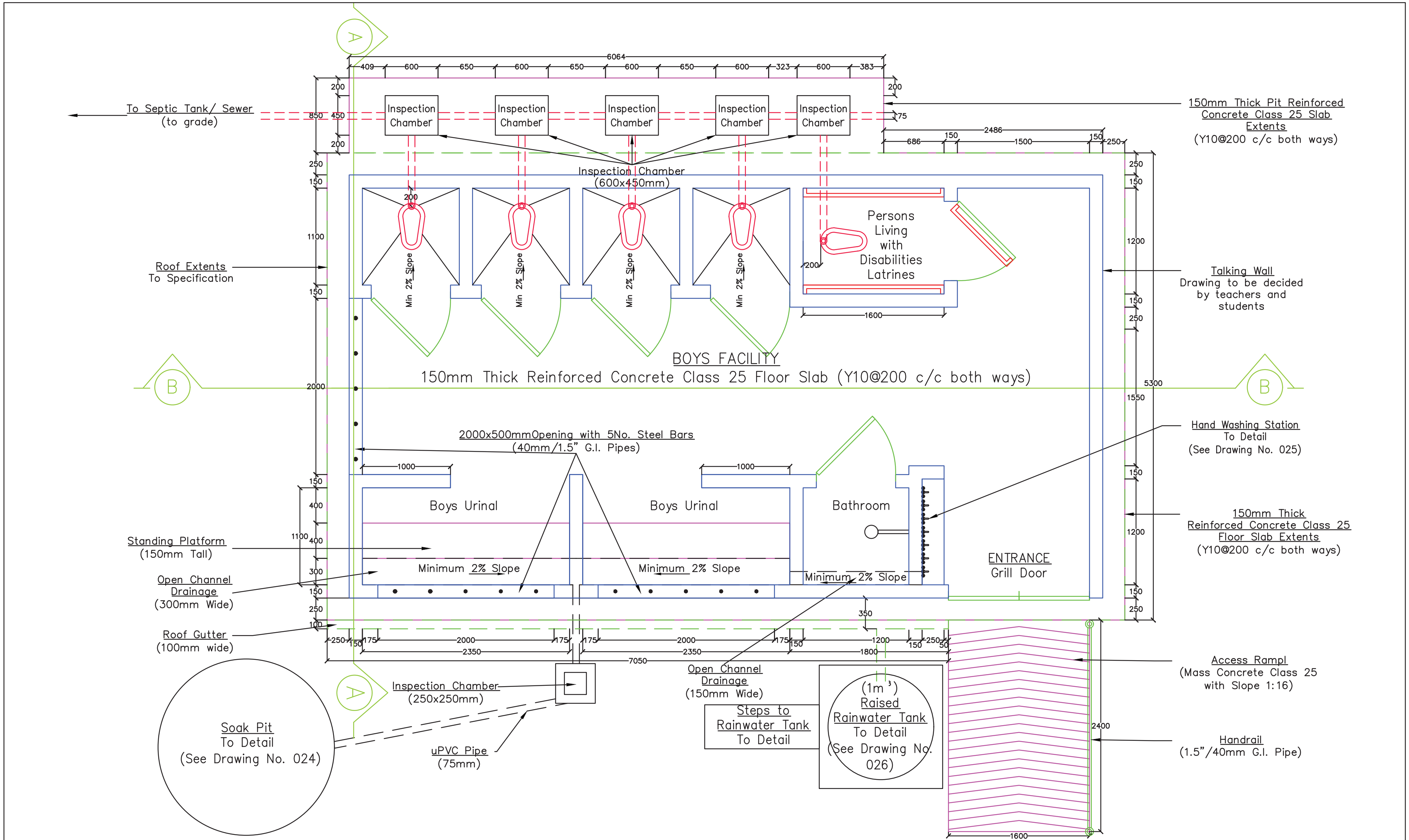


Typical Section A–A
Girls Water Closet Block
Typical Foundation in Stable Granular Areas
(Scale 1:40)

Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
4.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre–primary 700mm
5.Height of handrail: 650 mm
6.Roof slab extents overlap to floor slab extents
7.Bins should be provided for MHM in Girls Facilities.
8.Provide clothes hooks in bathrooms.
9.Provide internal & external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm.
11.All mass concrete to be used is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.All soils under slab and around external foundation to be treated for termite control.
14.Drawing to be read with drawing No. 025, 026, 027, 048, 049, and 050

Client: MoE			Location:	
Surveyed By:			File Name: Water Closet Block	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU–MoE	2017	Drawing Title: Girls Water Closet Block Elevation	
Approved By:	SIMU–MoE	2017	Drawing No: 051	Rev: C / Sheet: 4/4

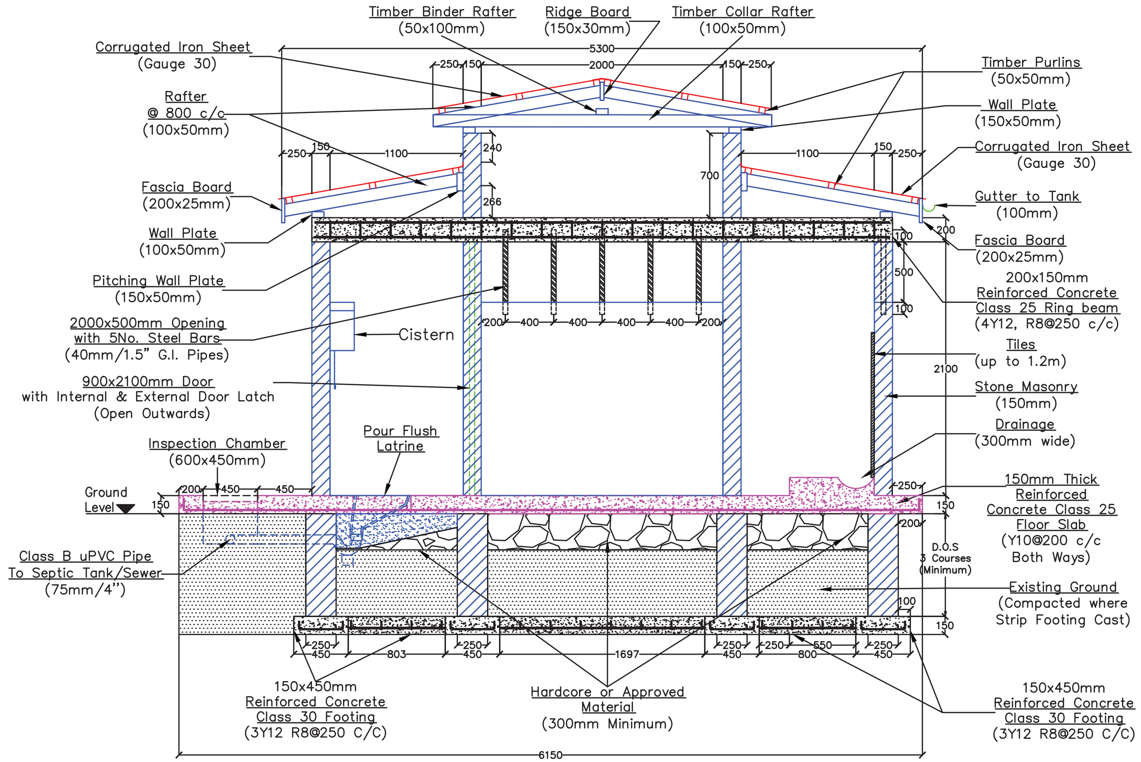


Construction Details:

1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
4.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre-primary 700mm
5.Height of handrail: 650 mm
6.Roof slab extents overlap to floor slab extents
7.Bins should be provided for MHM in Girls Facilities.
8.Provide clothes hooks in bathrooms.
9.Provide internal & external latches for all doors.
10.Standard manhole size (L)600mmx(W)450mm.
11.All mass concrete to be used is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.All soils under slab and around external foundation to be treated for termite control.
14.Drawing to be read with drawing No. 025, 026, 027, 049, 050 and 053

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

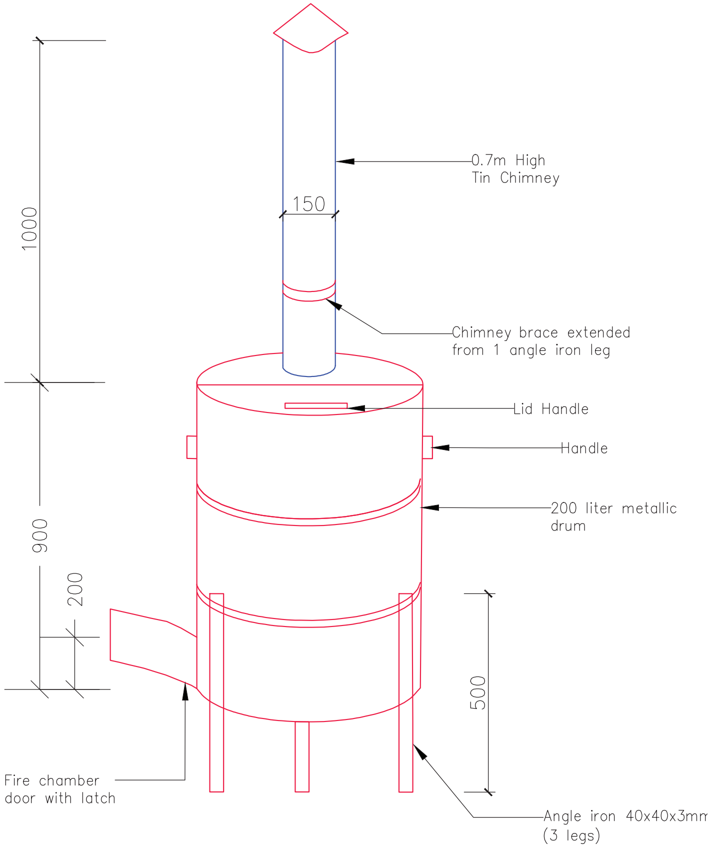
Location:	
File Name: Water Closet Block	Scale: 1:40
Project:	
Drawing Title: Boys Water Closet Block Plan	
Drawing No: 052	Rev: C
Sheet: 1/2	



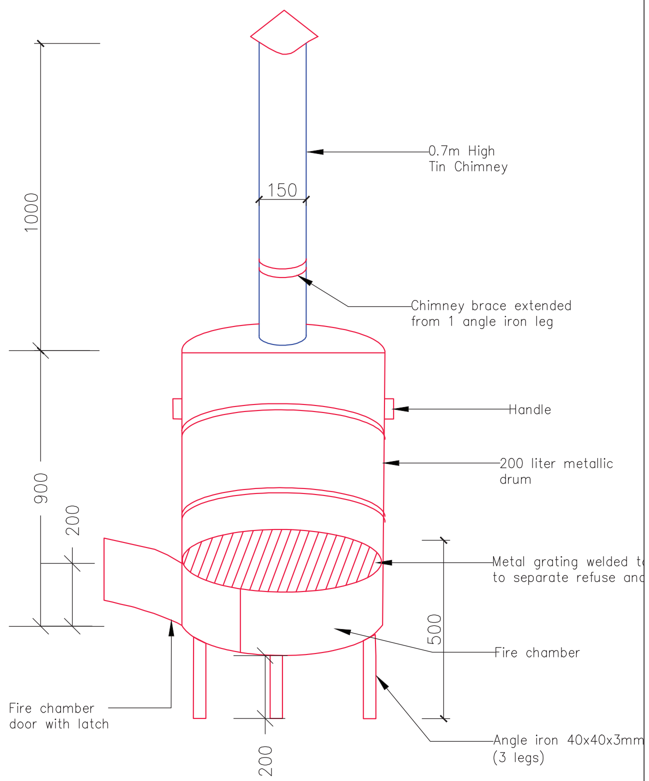
Typical Section A–A
Boys Water Closet Block
Typical Foundation in Stable Granular Areas
(Scale 1:40)

Construction Details:
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.All door dimensions are:
Normal – (L)900mmx(H)2100mm
PLWD – (L)1000mmx(H)2100mm
ECDE – (L)700mmx(H)2100mm
4.Height of Door handles from slab to be at:
Upper primary 1000mm
Pre–primary 700mm
5.Height of handrail: 650 mm
6.Roof slab extents overlap to floor slab extents
7.Bins should be provided for MHM in Girls Facilities.
8.Provide clothes hooks in bathrooms.
9.Provide internal & external latches for all doors.
10.Standard inspection chamber size (L)600mmx(W)450mm.
11.All mass concrete to be used is Class 25, specified mix (1:2:4)
12.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
13.All soils under slab and around external foundation to be treated for termite control.
14.Drawing to be read with drawing No. 025, 026, 027, 049, 050, and 052

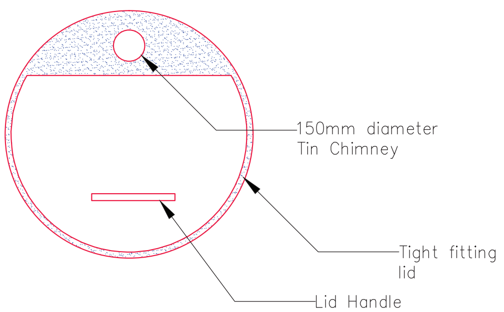
Client: MoE				Location:
Surveyed By:			File Name: Water Closet Block	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU–MoE	2017	Drawing Title: Boys Water Closet Block Elevation	
Approved By:	SIMU–MoE	2017	Drawing No: 053 / Rev: C	Sheet: 2/2



200L METALLIC DRUM
INCINERATOR FRONT ELEVATION



200L METALLIC DRUM
INCINERATOR SECTION

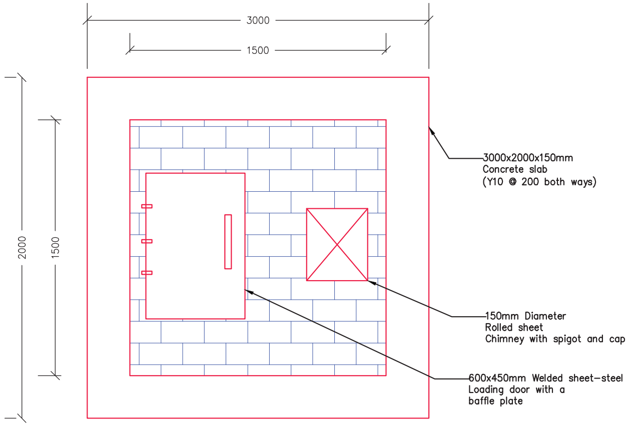


200L METALLIC DRUM
INCINERATOR PLAN

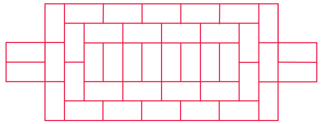
GENERAL NOTES

1. All Dimensions are in Millimetres unless otherwise stated
2. Mass Concrete to be Class 15 (1:3:6)
3. All Mortar used to be of Cement Sand Mix1:3 with all the Stone Walling being laid in 200mm Courses with 12mm joints
4. All Foundations Must be taken to firm bearing strata to engineer's approval

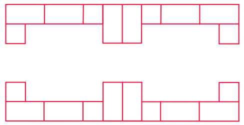
Client: MoE			Location:		
Surveyed By:			File Name: WASTE MANAGEMENT		Scale: 1:20
Drawn By:	RFL	2017	Project:		
Designed By:	RFL	2017	Drawing Title: Metallic Drum Incinerator		
Checked By:	SIMU – MoE	2017			
Approved By:	SIMU – MoE	2017	Drawing No: 054	Rev: A	Sheet: 1/1



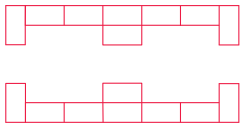
DE MONTFORT INCINERATOR PLAN



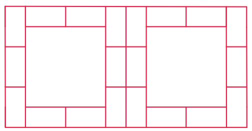
PLAN VIEW OF BASE LAYER



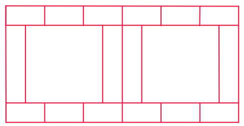
PLAN VIEW OF LAYERS 1 & 3



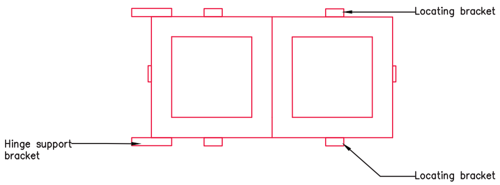
PLAN VIEW OF LAYERS 2 & 4



PLAN VIEW OF LAYERS 6, 8, 10, 12 & 14



PLAN VIEW OF LAYERS 5, 7, 9, 11 & 13

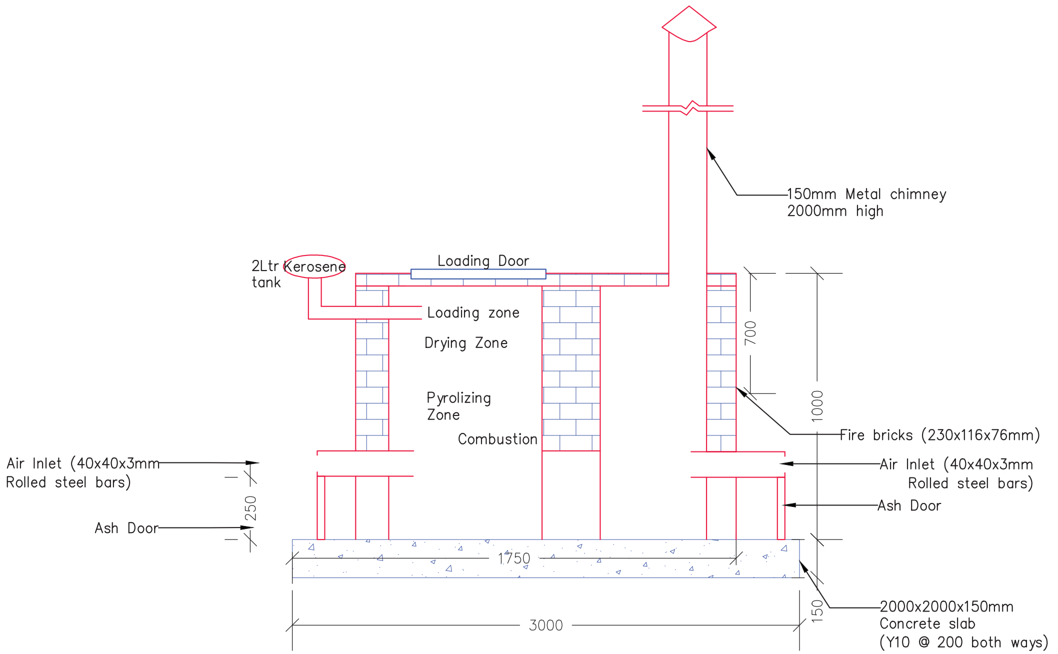


PLAN VIEW OF STEE TOP FRAME

GENERAL NOTES

1. All Dimensions are in Millimetres unless otherwise stated
2. Figured Dimensions to be used not Scaled
3. Mass Concrete to be Class 15 (1:3:6)
4. Standard fire brick dimensions: 230 x 116 x 76mm
5. Fire bricks shall be clamped together to reduce possibility of bricks being misaligned during incineration.
6. The clamp frame shall consist of 4 angle iron uprights at each of the corner sides bolted to horizontal tie bars mid-span and at the top of the incinerator.
7. The top frame will hold the loading door and chimney in position. It shall consist of angle iron with sheet steel gusset plates welded across the corners and 6 vertical hangers, 2 on each of the longer sides and 1 on shorter sides, welded to frame.
8. Hangers shall be bolted to the angle iron rail that is fixed to the side of the outer wall using screws and plugs.
9. Air inlet cross-sectional area to be approximately 4800mm2.
10. Loading door should be hinged to open outwards.
11. Drawing to be read with dwg. no. 056

Client: MoE			Location:	
Surveyed By:			File Name: WASTE MANAGEMENT	Scale: 1:20
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: De Montfort Incinerator	
Checked By:	SIMU – MoE	2017	Drawing No: 055	Rev: A / Sheet: 1/2
Approved By:	SIMU – MoE	2017		

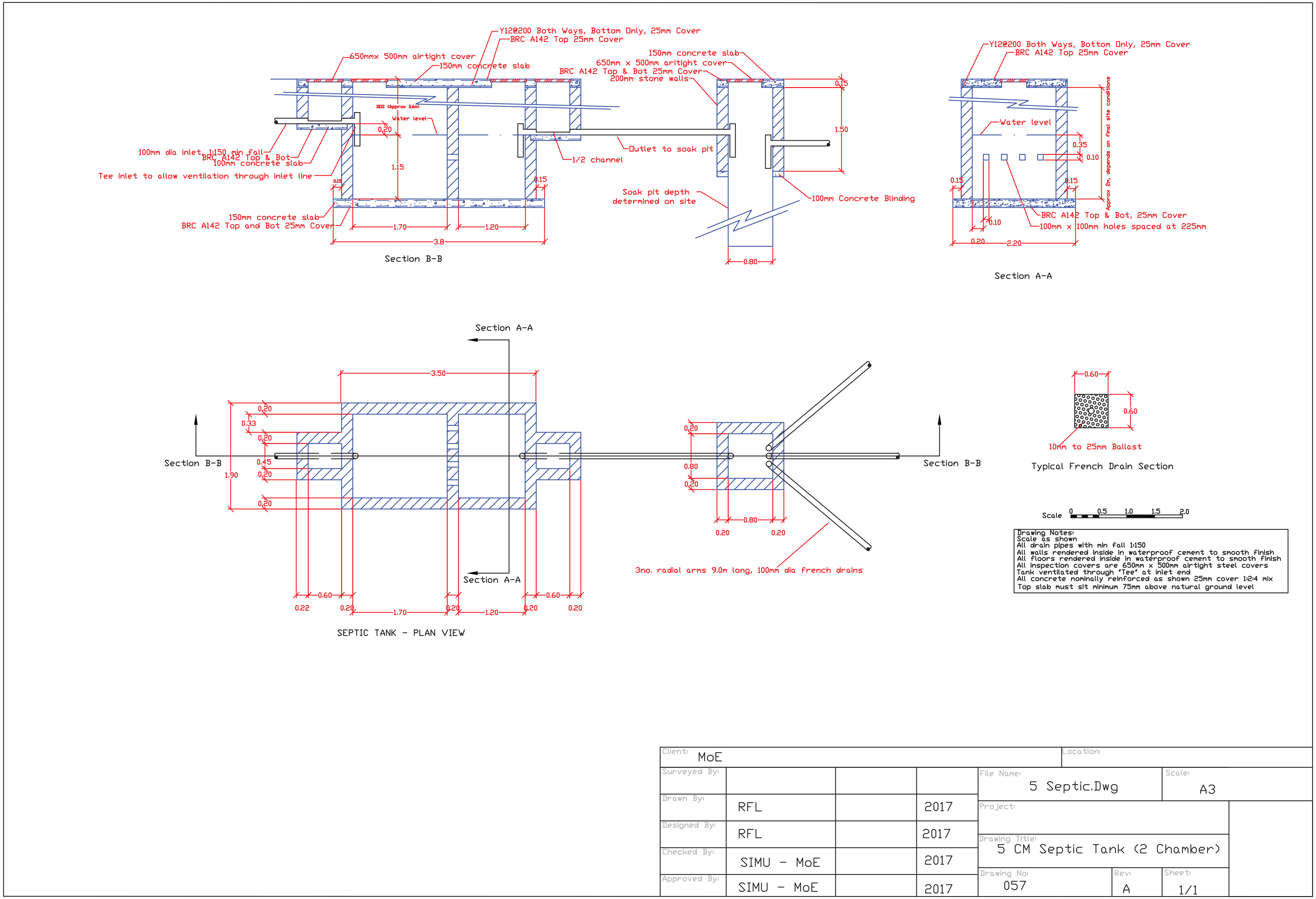


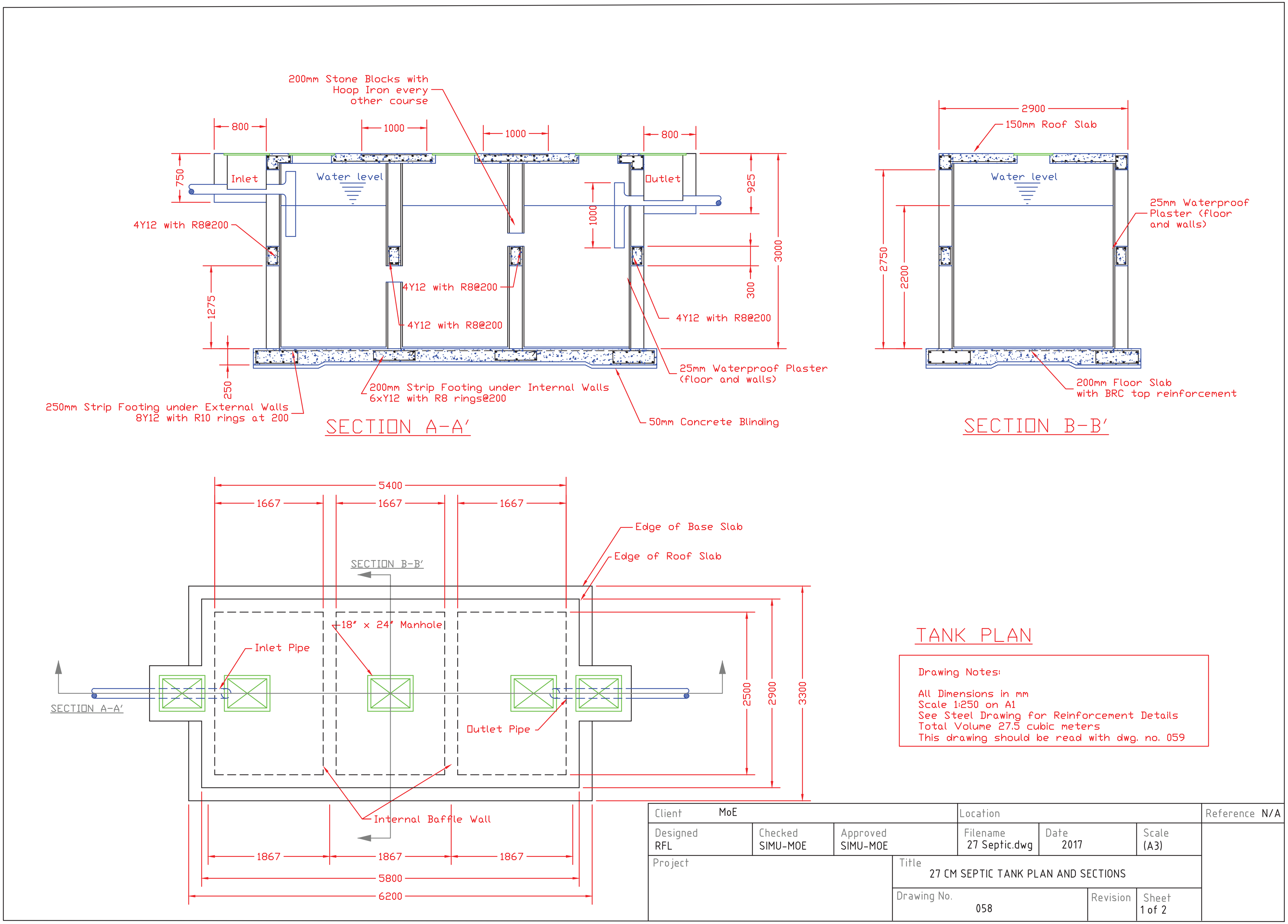
DE MONTFORT INCINERATOR
CROSS–SECTION

GENERAL NOTES

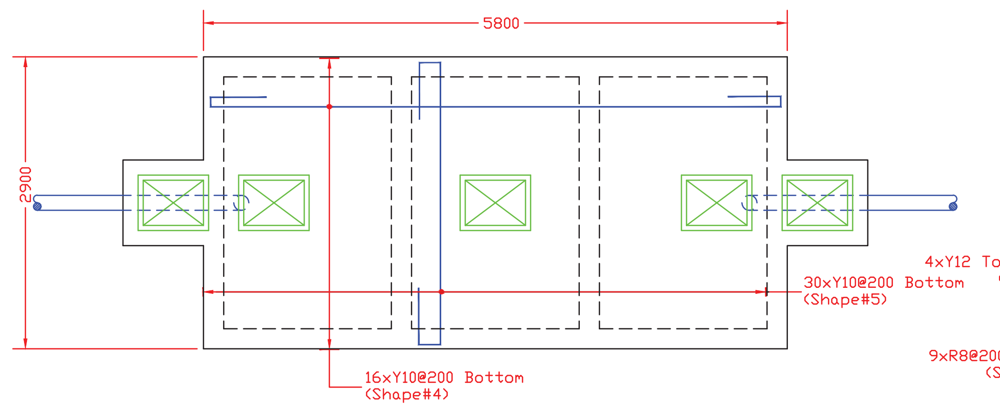
1. All Dimensions are in Millimetres unless otherwise stated
2. Figured Dimensions to be used not Scaled
3. Mass Concrete to be Class 15 (1:3:6)
4. Standard fire brick dimensions: 230 x 116 x 76mm
5. Fire bricks shall be clamped together to reduce possibility of bricks being misaligned during incineration.
6. The clamp frame shall consist of 4 angle iron uprights at each of the corner sides bolted to horizontal tie bars mid–span and at the top of the incinerator.
7. The top frame will hold the loading door and chimney in position. It shall consist of angle iron with sheet steel gusset plates welded across the corners and 6 vertical hangers, 2 on each of the longer sides and 1 on shorter sides, welded to frame.
8. Hangers shall be bolted to the angle iron rail that is fixed to the side of the outer wall using screws and plugs.
9. Air inlet cross–sectional area to be approximately 4800mm2.
10. Loading door should be hinged to open outwards.
11. Drawing to be read with dwg. no. 055.

Client: MoE			Location:	
Surveyed By:			File Name: WASTE MANAGEMENT	Scale: 1:20
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: De Montfort Incinerator	
Checked By:	SIMU – MoE	2017	Drawing No: 056	Rev: A
Approved By:	SIMU – MoE	2017		Sheet: 2/2


Y12@200 Both Ways, Bottom Only, 25mm Cover
BRC A142 Top 25mm Cover
650mmx 500mm airtight cover
150mm concrete slab
150mm concrete slab
650mm x 500mm airtight cover
BRC A142 Top & Bot 25mm Cover
200mm stone walls
Water level
1/2 channel
Outlet to soak pit
100mm dia inlet, 1:150 min fall
BRC A142 Top & Bot
100mm concrete slab
Tee inlet to allow ventilation through inlet line
150mm concrete slab
BRC A142 Top and Bot 25mm Cover
Soak pit depth determined on site
100mm Concrete Blinding
Section B-B
Section A-A
Approx 2m, depends on final site conditions
BRC A142 Top & Bot, 25mm Cover
100mm x 100mm holes spaced at 225mm
10mm to 25mm Ballast
Typical French Drain Section
3no. radial arms 9.0m long, 100mm dia french drains
SEPTIC TANK - PLAN VIEW
Scale 0 0.5 1.0 1.5 2.0
Drawing Notes:
Scale as shown
All drain pipes with min fall 1:150
All walls rendered inside in waterproof cement to smooth finish
All floors rendered inside in waterproof cement to smooth finish
All inspection covers are 650mm x 500mm airtight steel covers
Tank ventilated through 'Tee' at inlet end
All concrete nominally reinforced as shown 25mm cover 1:2:4 mix
Top slab must sit minimum 75mm above natural ground level
Client: MoE
Location:
Surveyed By:
Drawn By: RFL 2017
Designed By: RFL 2017
Checked By: SIMU - MoE 2017
Approved By: SIMU - MoE 2017
File Name: 5 Septic.Dwg
Scale: A3
Project:
Drawing Title: 5 CM Septic Tank (2 Chamber)
Drawing No: 057
Rev: A
Sheet: 1/1



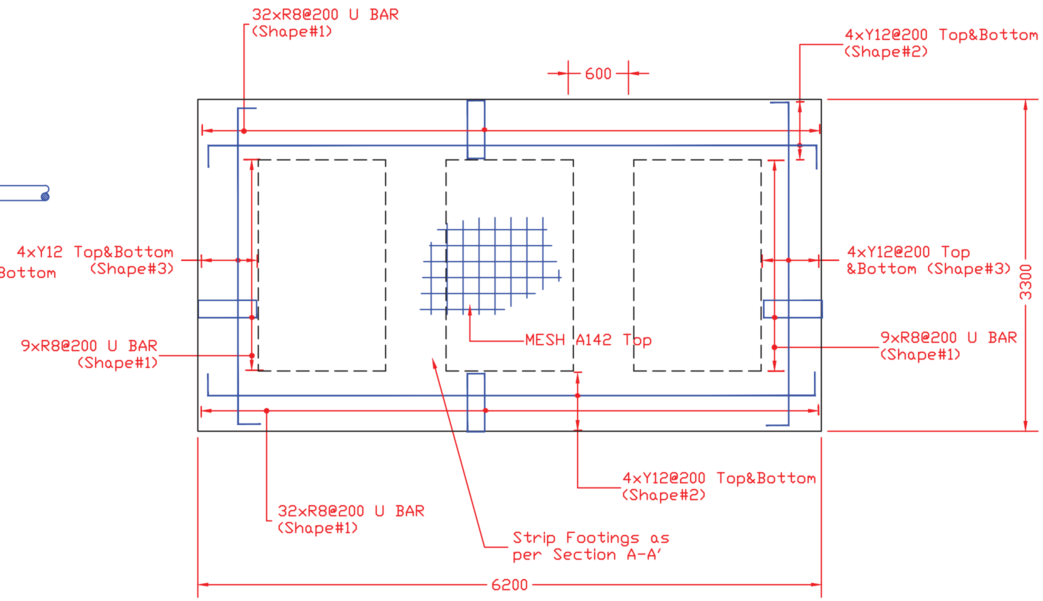
200mm Stone Blocks with Hoop Iron every other course
800
1000
1000
800
750
Inlet
Water level
Outlet
925
1000
4Y12 with R8@200
1275
4Y12 with R8@200
4Y12 with R8@200
4Y12 with R8@200
300
3000
250
25mm Waterproof Plaster (floor and walls)
200mm Strip Footing under Internal Walls 6xY12 with R8 rings@200
250mm Strip Footing under External Walls 8Y12 with R10 rings at 200
50mm Concrete Blinding
SECTION A-A'
2900
150mm Roof Slab
Water level
25mm Waterproof Plaster (floor and walls)
2750
2200
200mm Floor Slab with BRC top reinforcement
SECTION B-B'
5400
1667
1667
1667
Edge of Base Slab
Edge of Roof Slab
SECTION B-B'
18" x 24" Manhole
Inlet Pipe
SECTION A-A'
Outlet Pipe
2500
2900
3300
Internal Baffle Wall
1867
1867
1867
5800
6200
TANK PLAN
Drawing Notes:
All Dimensions in mm
Scale 1:250 on A1
See Steel Drawing for Reinforcement Details
Total Volume 27.5 cubic meters
This drawing should be read with dwg. no. 059
Client MoE
Location
Reference N/A
Designed RFL
Checked SIMU-MOE
Approved SIMU-MOE
Filename 27 Septic.dwg
Date 2017
Scale (A3)
Project
Title 27 CM SEPTIC TANK PLAN AND SECTIONS
Drawing No. 058
Revision
Sheet 1 of 2



ROOF SLAB STEEL INFORMATION
(Bottom of Slab Steel)

Drawing Notes:

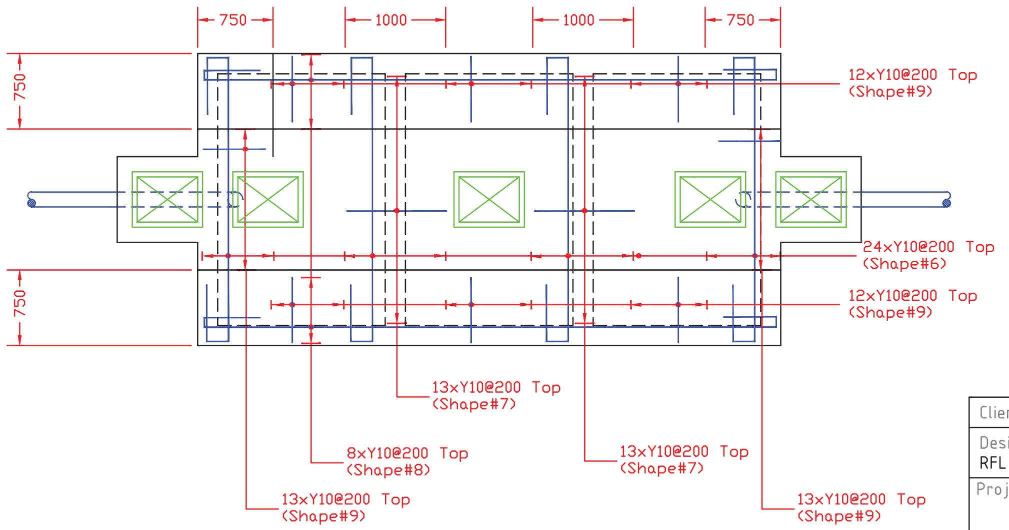
All Dimensions in mm
Scale 1:250 on A1
All Concrete 1:2:4 Mix (Class25)
All Steel 25mm Cover
Cut and 'U' bend steel for hatches
All manhole openings surrounded with
Y12 top & bottom



BASE SLAB STEEL INFORMATION

Drawing Notes:

All Dimensions in mm
Scale 1:250 on A1
All Concrete 1:2:4 Mix (Class25)
All Steel 25mm Cover

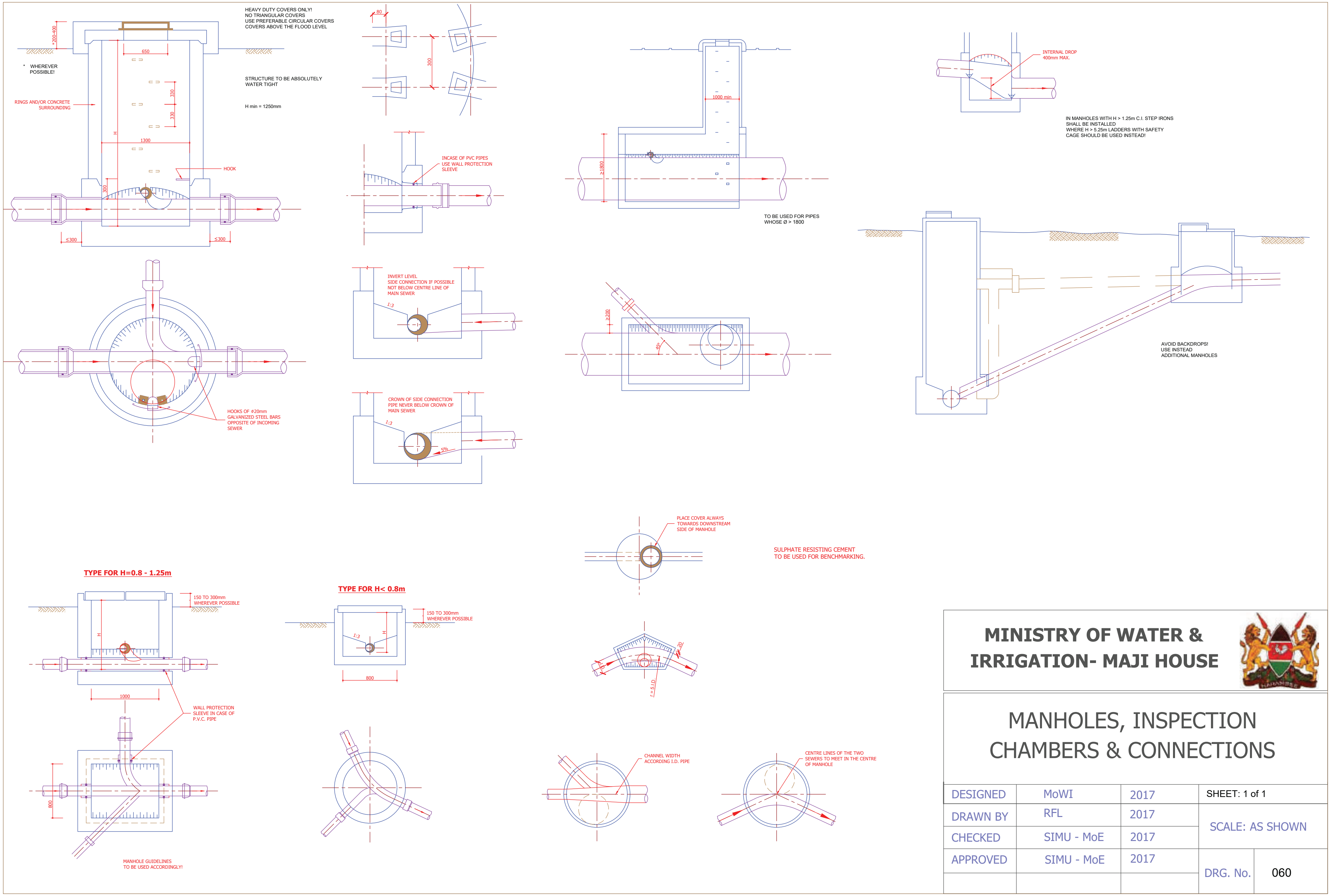


ROOF SLAB STEEL INFORMATION
(Top of Slab Steel)

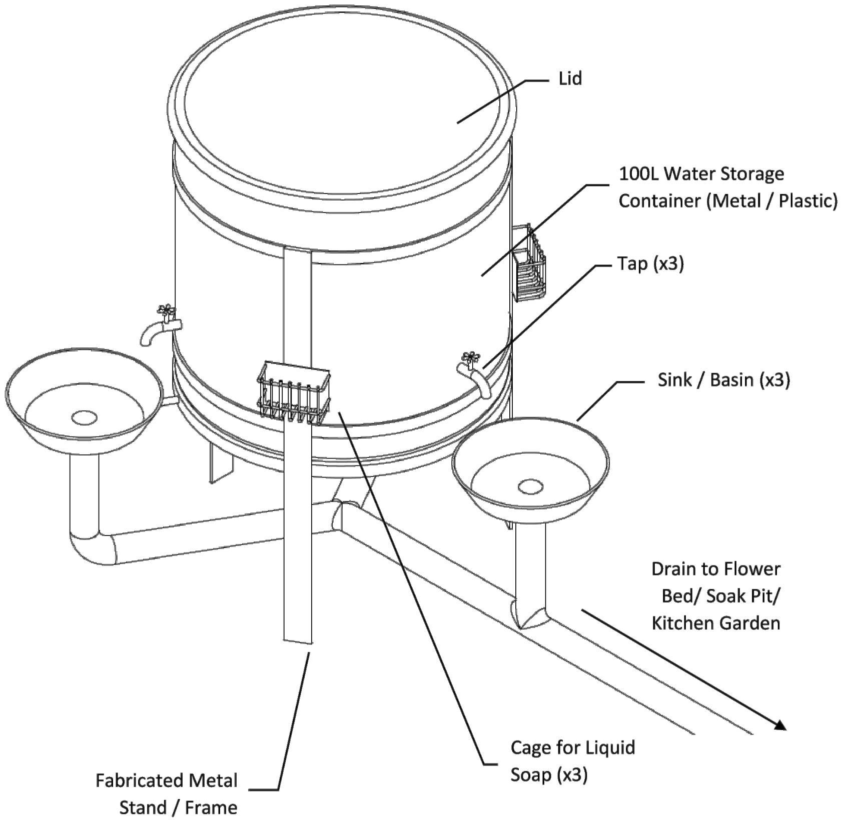
Drawing Notes:

All Dimensions in mm
Scale 1:250 on A1
All Concrete 1:2:4 Mix (Class25)
All Steel 25mm Cover
Cut and 'U' bend steel for hatches
All manhole openings surrounded with
Y12 top & bottom
This drawing should be read with dwg. no. 058

Client MoE			Location			Reference N/A
Designed RFL	Checked SIMU-MOE	Approved SIMU-MOE	Filename 27 SEPTIC	Date 2017	Scale (A3)	
Project		Title 27 CM SEPTIC TANK STEEL DETAILS				
		Drawing No. 059		Revision	Sheet 2 of 2	


HEAVY DUTY COVERS ONLY!
NO TRIANGULAR COVERS
USE PREFERABLE CIRCULAR COVERS
COVERS ABOVE THE FLOOD LEVEL
STRUCTURE TO BE ABSOLUTELY WATER TIGHT
H min = 1250mm
* WHEREVER POSSIBLE!
RINGS AND/OR CONCRETE SURROUNDING
HOOK
650
1300
330
300
≤300
INCASE OF PVC PIPES USE WALL PROTECTION SLEEVE
≥1800
1000 min
TO BE USED FOR PIPES WHOSE Ø > 1800
INTERNAL DROP 400mm MAX.
IN MANHOLES WITH H > 1.25m C.I. STEP IRONS SHALL BE INSTALLED
WHERE H > 5.25m LADDERS WITH SAFETY CAGE SHOULD BE USED INSTEAD!
HOOKS OF Ø20mm GALVANIZED STEEL BARS OPPOSITE OF INCOMING SEWER
INVERT LEVEL SIDE CONNECTION IF POSSIBLE NOT BELOW CENTRE LINE OF MAIN SEWER
CROWN OF SIDE CONNECTION PIPE NEVER BELOW CROWN OF MAIN SEWER
1:3
≥200
45°
AVOID BACKDROPS!
USE INSTEAD ADDITIONAL MANHOLES
PLACE COVER ALWAYS TOWARDS DOWNSTREAM SIDE OF MANHOLE
SULPHATE RESISTING CEMENT TO BE USED FOR BENCHMARKING.
TYPE FOR H=0.8 - 1.25m
150 TO 300mm WHEREVER POSSIBLE
1000
800
WALL PROTECTION SLEEVE IN CASE OF P.V.C. PIPE
MANHOLE GUIDELINES TO BE USED ACCORDINGLY!
TYPE FOR H< 0.8m
CHANNEL WIDTH ACCORDING I.D. PIPE
CENTRE LINES OF THE TWO SEWERS TO MEET IN THE CENTRE OF MANHOLE
MINISTRY OF WATER & IRRIGATION- MAJI HOUSE
MANHOLES, INSPECTION CHAMBERS & CONNECTIONS
DESIGNED MoWI 2017
DRAWN BY RFL 2017
CHECKED SIMU - MoE 2017
APPROVED SIMU - MoE 2017
SHEET: 1 of 1
SCALE: AS SHOWN
DRG. No. 060

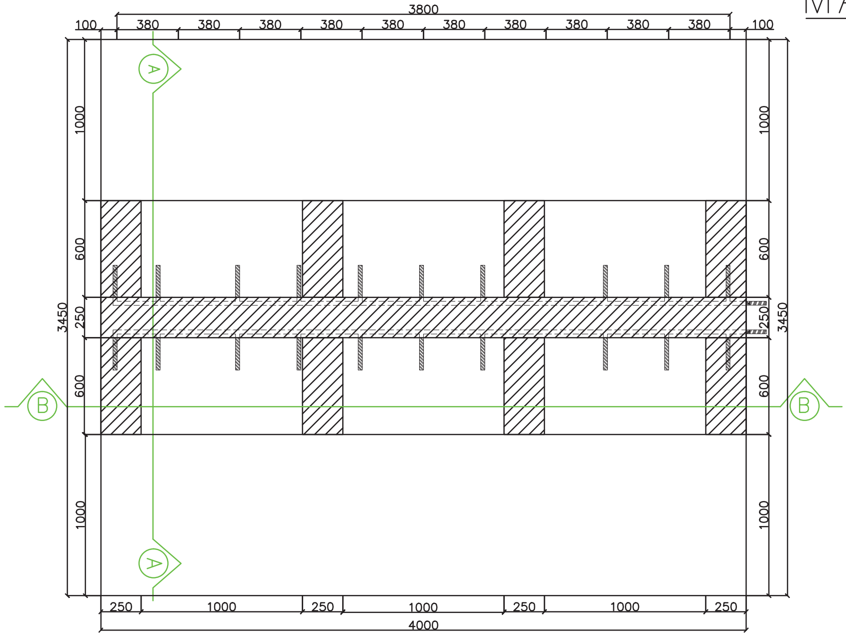
Hand-wash Station



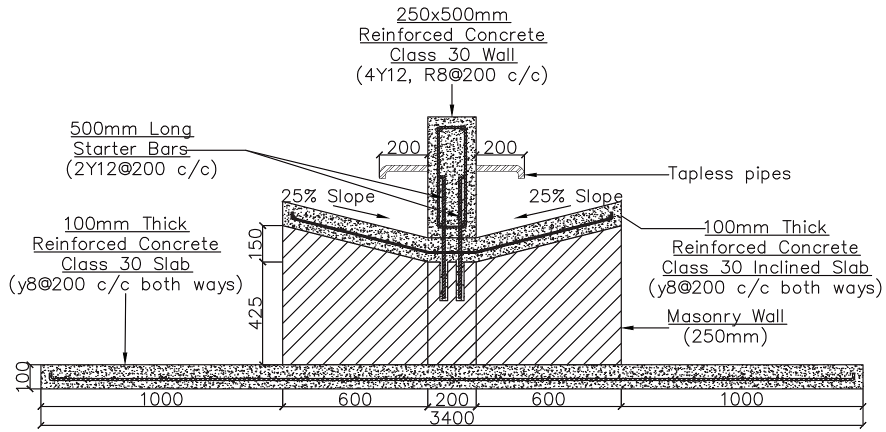
Construction Details:
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED.

Client: MoE				Location:			
Surveyed By:			File Name: RAINWATER HARVESTING SYSTEM			Scale: 1:40	
Drawn By:	RFL	2017	Project:				
Designed By:	RFL	2017	Drawing Title: Single container HWS				
Checked By:	SIMU – MoE	2017					
Approved By:	SIMU – MoE	2017	Drawing No: 061	Rev: A	Sheet: 1/1		

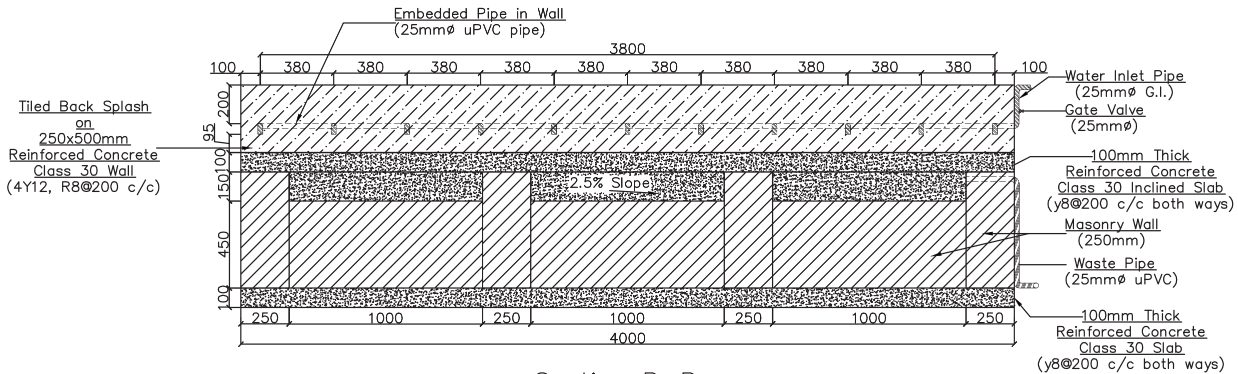
MASS HAND WASHING FACILITIES



Plan
Scale 1: 30



Section A–A
Scale 1: 20



Section B–B
Scale 1: 25

Construction Details:

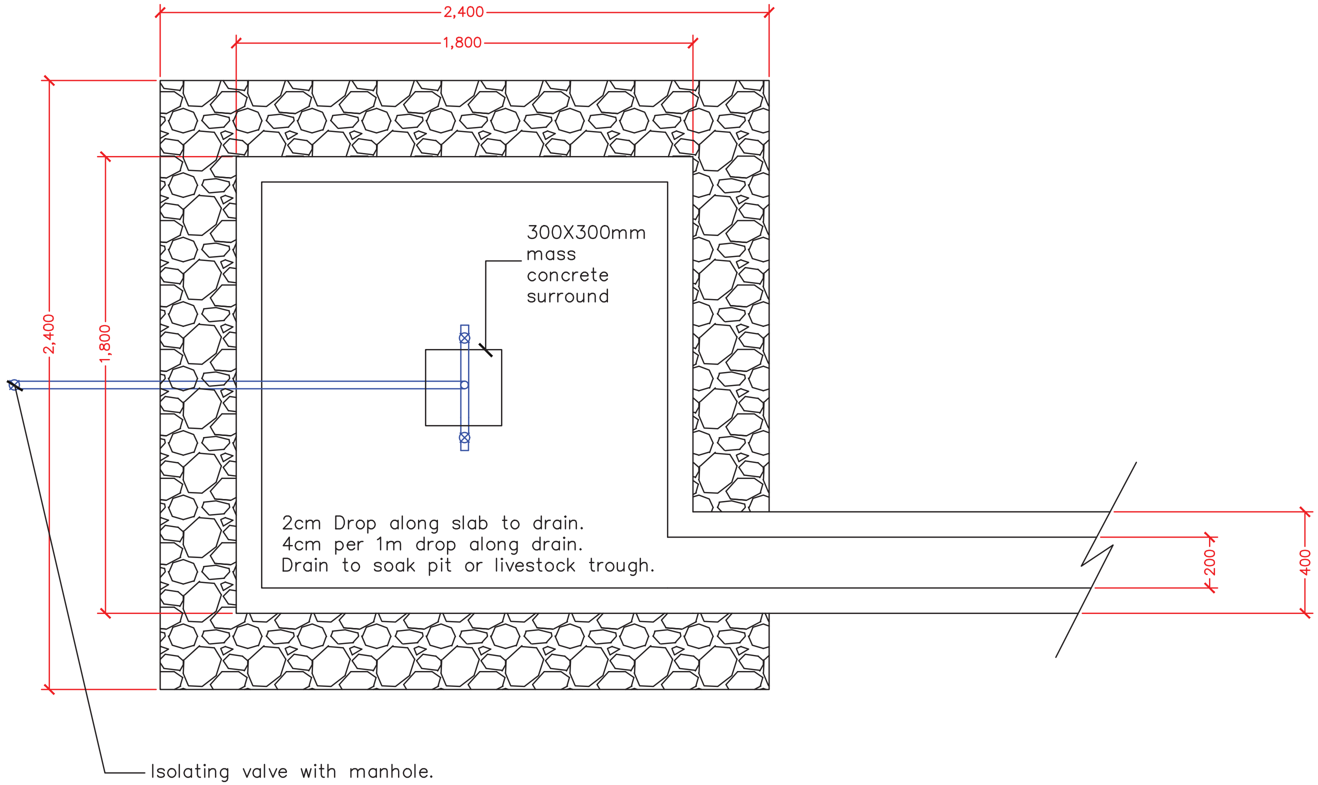
1.Alldimmensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.All mass concrete to be used is C25 (1:2:4)
4.All reinforced concrete:
Class RC25, specified mix (1:2:4) & Minimum cover of 25mm
Class RC30, specified mix (1:2:3) & Minimum cover of 35mm
5.Vent pipe for VIP orientation is down–wind and facing the equator
6.All soils under slab and around external foundation to be treated for termite control.
7.Water source shall be from $1m^3$ elevated rainwater harvesting tank. Details of tank and platform can be seen in drawing No. 026
8.Drawing to be read with drawing No. 026

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:

File Name: Mass Handwashing Facilities Rev. 2	Scale: As Shown (A3)
Project:	
Drawing Title: Mass Hand Washing Facilites	

Drawing No:	Rev:	Sheet:
062	C	1



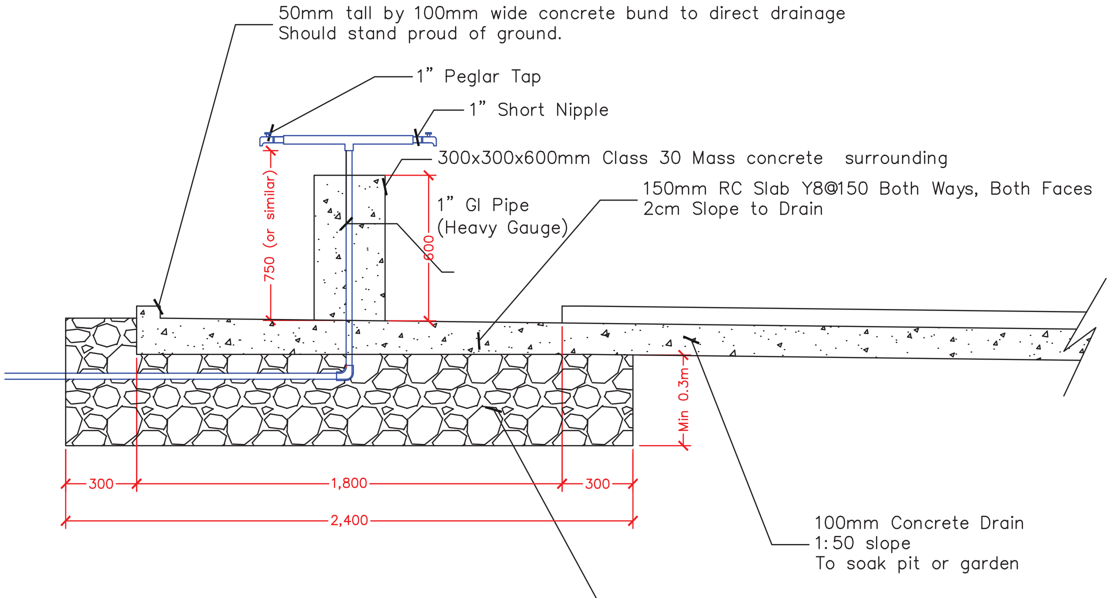
STAND PIPE PLAN VIEW

SCALE 1:20

Construction Details:

1. All dimensions are in mm unless otherwise stated.
2. Figure dimension to be used, NOT SCALE.
3. Mass concrete to be of class 25 (1:2:4)
4. Construct apron so that it can drain easily: allow a minimum slope of 1:50 for the slab.
5. Provide an alternative drinking point for animal away from pump.
6. Consider providing washing washing and bathing facilities nearby.
7. All soils under slab and around external foundations to be treated for termite control.
8. Protect water point from erosion by placing gravel on the ground around the slab.
9. Protect water point against theft and vandalism by constructing a fence around the site.
10. Drawing to be read with drawing No. 064.

Client: MoE			Location:	
Surveyed By:			File Name: Stand Tap	Scale: 1:20
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU–MoE	2017	Drawing Title: Stand Tap with Soak Pit Plan	
Approved By:	SIMU–MoE	2017	Drawing No: 063	Rev: C / Sheet: 1/2



STAND PIPE SECTION AA

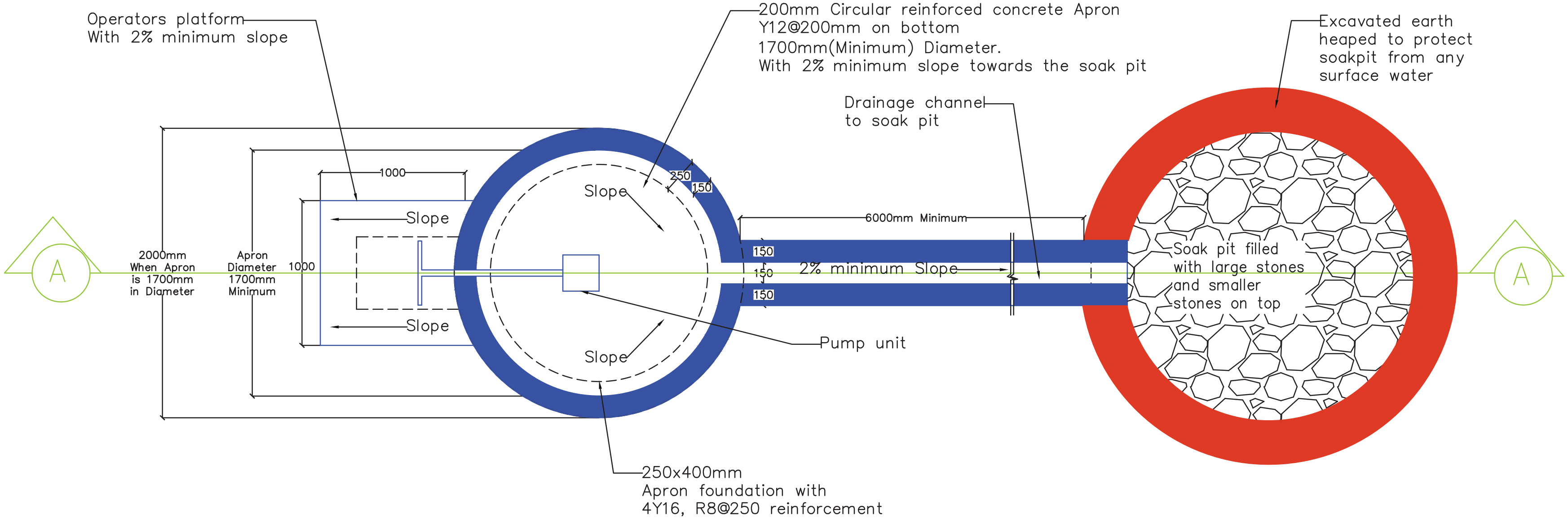
SCALE 1:20

Construction Details:

1. All dimensions are in mm unless otherwise stated.
2. Figure dimension to be used, NOT SCALE.
3. Mass concrete to be of class 25 (1:2:4)
4. Construct apron so that it can drain easily: allow a minimum slope of 1:50 for the slab.
5. Provide an alternative drinking point for animal away from pump.
6. Consider providing washing washing and bathing facilities nearby.
7. All soils under slab and around external foundations to be treated for termite control.
8. Protect water point from erosion by placing gravel on the ground around the slab.
9. Protect water point against theft and vandalism by constructing a fence around the site.
10. Drawing to be read with drawing No. 063.

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:	
File Name: Stand Tap	Scale: 1:20
Project:	
Drawing Title: Stand Tap with Soak Pit Section AA	
Drawing No: 064	Rev: C / Sheet: 2/2



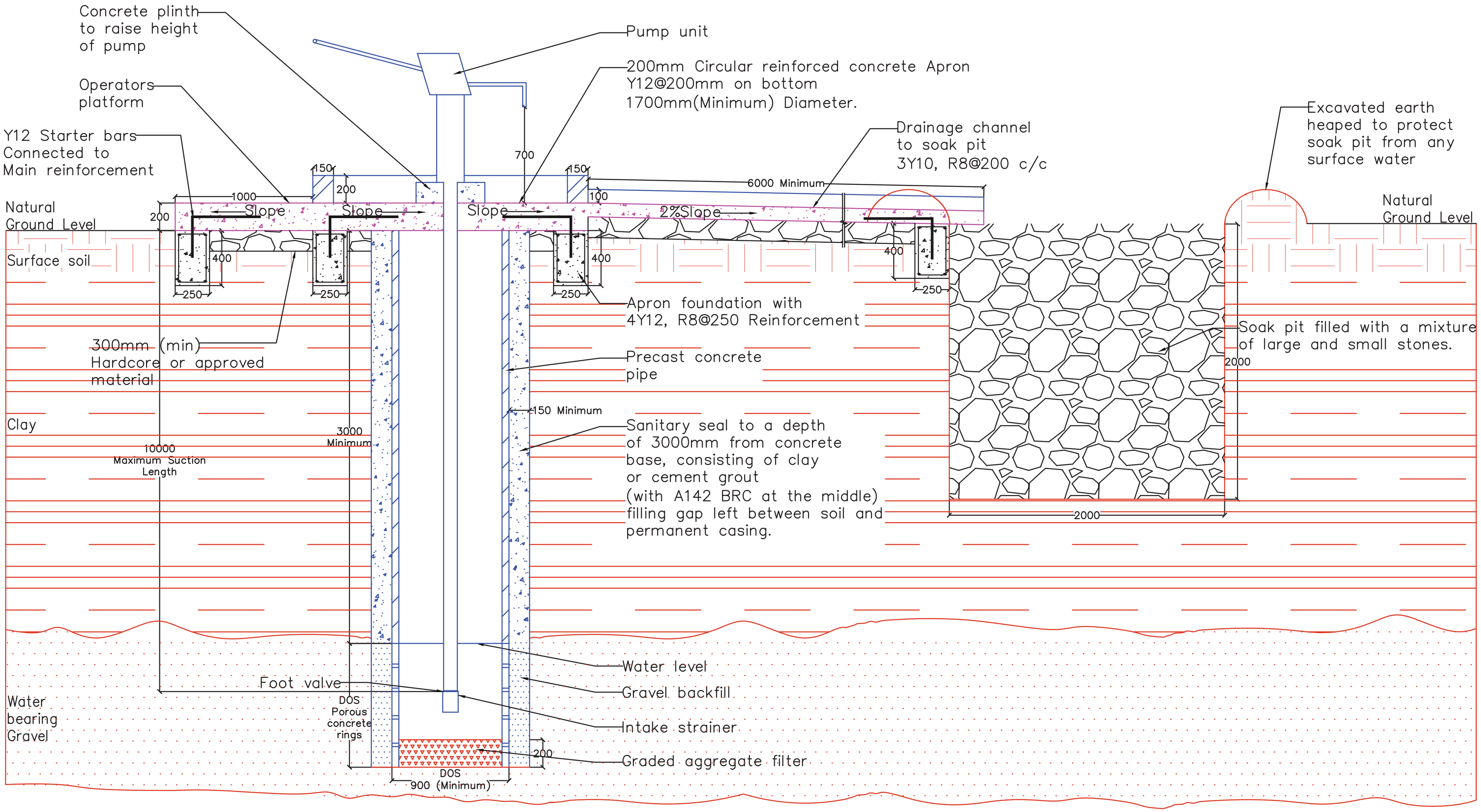
Shallow Well Fitted with a Handpump
Plan View
(Scale 1:30)

Construction Details:

1. All dimensions are in mm unless otherwise stated.
2. Figure dimension to be used, NOT SCALE.
3. Mass concrete to be of class 25 (1:2:4)
4. Construct apron so that it can drain easily: allow a minimum slope of 1:50 for the slab.
5. Provide an alternative drinking point for animal away from pump.
6. Consider providing washing washing and bathing facilities nearby.
7. All soils under slab and around external foundations to be treated for termite control.
8. Protect water point from erosion by placing gravel on the ground around the slab.
9. Protect water point against theft and vandalism by constructing a fence around the site.
10. Drawing to be read with drawing No. 066.

Client:	MoE	
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:			
File Name: Shallow Well	Scale: 1:30		
Project:			
Drawing Title: Shallow Well Plan			
Drawing No: 065	Rev: C	Sheet: 1/2	



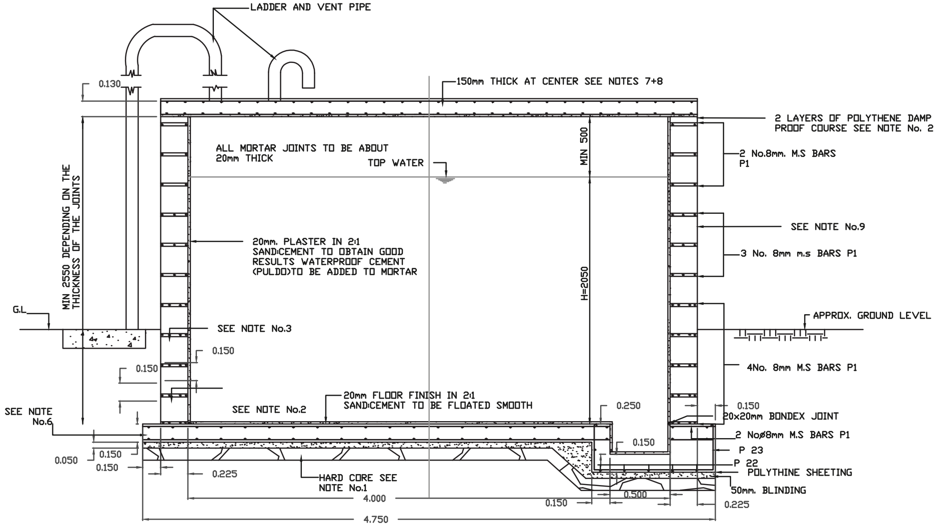
Typical Section A–A Shallow Well Fitted with a Handpump
(Scale 1: 30)

Construction Details:

1. All dimensions are in mm unless otherwise stated.
2. Figure dimension to be used, NOT SCALE.
3. Mass concrete to be of class 25 (1:2:4)
4. Construct apron so that it can drain easily: allow a minimum slope of 1:50 for the slab.
5. Provide an alternative drinking point for animal away from pump.
6. Consider providing washing washing and bathing facilities nearby.
7. All soils under slab and around external foundations to be treated for termite control.
8. Protect water point from erosion by placing gravel on the ground around the slab.
9. Protect water point against theft and vandalism by constructing a fence around the site.
10. Drawing to be read with drawing No. 065.

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU–MoE	2017
Approved By:	SIMU–MoE	2017

Location:			
File Name: Shallow Well	Scale: 1: 30		
Project:			
Drawing Title: Shallow Well Section AA			
Drawing No: 066	Rev: C	Sheet: 2/2	



SECTION A-A
SCALE 1:40

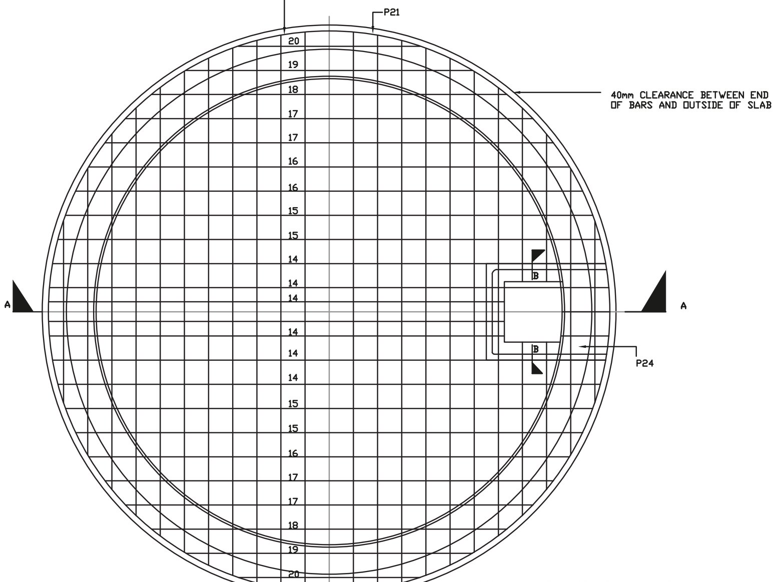
NOTES
ACTUAL FOUNDATION LOADING ALLOWING FOR FULL TANK ROOF AND SUPERIMPOSED LOAD ON ROOF OF 100KG/M2 IS 0.4KG/CM2

BAR BENDING SCHEDULE									
LOCATION	BAR MARK	BAR DIAM mm	TOTAL NO	LENGTH A mm	LENGTH B mm	CUT LENGTH mm	TOTAL LENGTH M	TYPE OF SHAPE	SKETCH OF BAR SHAPE
WALL	1	8		AS REQUIRED		12000	576.0	A	
ROOF	2		10	4370		4570	45.7	B	Ⓐ
	3		8	4230		4430	23.5	B	
	4		8	4010		4210	33.7	B	
	5		8	3690		3890	31.2	B	
	6		4	3470		3670	14.7	B	
	7	10	4	3220		3420	13.7	B	Ⓑ
	8		4	2910		3110	12.5	B	
	9		4	2530		2730	11.0	B	
	10		4	2040		2240	9.0	B	
	11		4	1310		1510	6.1	B	
	12		8	1700		1900	15.2	B	
	13		2	7800		8000	16.0	A	
FLOOR	14		24	4560		4760	114.3	B	Ⓒ
	15		16	4300		4500	72.0	B	
	16		16	3880		4080	65.3	B	
	17		16	3250		3450	55.2	B	
	18		8	2700		2900	23.2	B	
	19		8	2000		2200	17.6	B	
	20		8	1200		1400	11.2	B	
	21	8	4	7800		8000	32.0	A	
FLOOR SEE NOTE 11	14A		12	4560		4760	57.2	B	
	15A		8	4300		4500	36.0	B	-SEE NOTE 12.
	16A		8	3880		4080	32.7	B	
	17A		8	3250		3450	27.6	B	
	18A		4	2700		2900	11.6	B	
	19A		4	2000		2200	8.8	B	
	20A		4	1200		1400	5.6	B	
	14B		12	4560		4860	58.3	B	
	15B		8	4300		4600	36.8	B	
	16B		8	3880		4180	33.5	B	
	17B	16	8	3250		3550	28.4	B	
	18B		4	2700		3000	12.0	B	
	19B		4	2000		2300	9.2	B	
	20B		4	1200		1500	6.0	B	
	21		4	7800		8000	32.0	A	
SUMP	22		5	720	320	1560	7.8	C	
	23	8	4	940	310	1760	7.1	C	
	24		1	700	940	2780	2.8	C	
SUMMARY (length in meters)	BAR DIAMETER						8	10	16
	TANK SITED ON NORMAL SOIL CONDITIONS						1002	234	-
	TANK SITED ON BLACK COTTON OR SIMILAR SOIL CONDITIONS						822	234	186

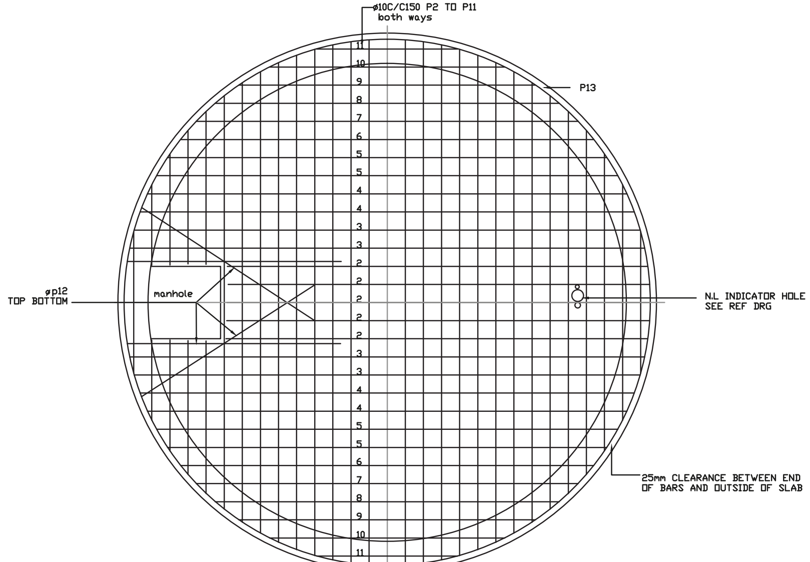
NOTES

1. THE HARDCORE LAYER THICKNESS SHALL BE DETERMINED BY THE THE SITE ENGINEER BUTNOT LESS THAN 200mm
2. THE MASONRY WALL SHALL NOT BE CONNECTED TO EITHER THE FLOOR SLAB NOR THE ROOF SLAB. THE WALL SUPPORTING AREA OF THE FLOOR SLAB AS WELL AS THE TOP OF THE WALL SHALL BE TROWEL FINISHED,AND BE PAINTED WITH THREE COATS OF BITUMINIOUS PAINT
3. THE MASONRY WALL SHALL BE BUILT OF GOOD QUALITY LOCAL BUILDING STONES OR CONCRETE BLOCKS. THE SIZE OF THE STONE SHALL BE:
   WIDTH- NOT LESS THAN 225mm
   LENGTH- BETWEEN 200 AND 300mm
   HEIGHT- NOT MORE THAN 150mm
   THE STONES SHALL BE SOAKED IN WATER FOR 24 HOURS BEFORE BEING BUILT INTO THE WALL PARTICULAR CARE MUST BE TAKEN TO FILL ALL THE JOINTS COMPLETELY WITH MORTAR (MORTAR MIXTURE 3:1-SAND:CEMENT)
4. CONCRETE CONCRETE CLASS 20/20 (MIXTURE 1:3:6) FOR BLINDING
5. REINFORCEMENT: MILD STEEL BARS ARE TO BE 4445. MINIMUM CONCRETE COVER OF REINFORCED 40mm
6. THE FLOOR SLAB OF THE TANK MUST BE 200MM IF THE TANK IS SITED ON BLACK COTTON OR SIMILAR SOIL CONDITIONS REINFORCEMENT MUST BE DAM 16mm BARS C/C200 ON THE TOP AND DIAM. 8mmBARS C/C 200 ON THE BOTTOM) AS PER BAR BENDING SCHEDULE.
7. CONSTRUCTION JOINTS ARE NOT PERMITTED THE SLAB MUST BE CASTED IN ONE TUSS
8. 'THE FRAMEWORK FOR THE ROOF SLAB MUST HAVE A CHAMBER OF 20MM AT THE CENTER
9. THE EXTERIOR SURFACE OF THE TANK SHALL RECEIVE ONE COAT OF CEMENT WASH
10. THE INTERIOR SURFACE OF THE TANK SHALL BE PLASTERED, THICKNESS IS 15mm WITH A MORTAR MIXTURE 2:1 (SAND :CEMENT) TO OBTAIN A WATERPROOF PLASTERING PULDO CEMENT SHOULD BE ADDED
11. REINFORCEMENT FOR BLACK COTTON SOIL OF SIMILAR SOIL CONDITIONS. A DENOTES FOR BOTTOM REINFORCEMENT. B DENOTES FOR TOP REINFORCEMENT. FLOOR THICKNESS = 200mm.
12. HOOK ALLOWANCE BAR DIAMETER 8+10, 2X150mm. MIN. OVERLAP DIAMETER 8mm 320mm. LAPS IN CIRCUMFERENTIAL BARS ARE TO BE STAGGERED

SOIL CONDITIONS.	REINFORCEMENT (BOTH WAYS) top	REINFORCEMENT (BOTH WAYS) bottom	SLAB THICKNESS
-NORMAL	Ø8C/C P14 TO P20	Ø8C/C 200 P14 TO P20	150mm
-BLACK COTTON	Ø16 C/C 200 P14TO P20	Ø8C/C 200 P14 TO P20	200mm

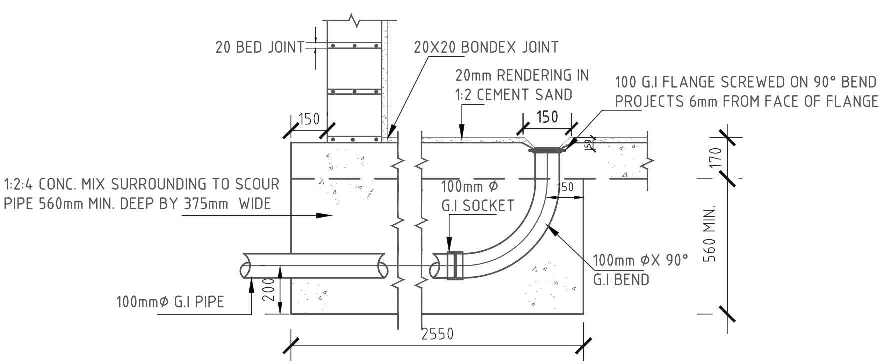


FLOOR REINFORCEMENT
SCALE 1:40



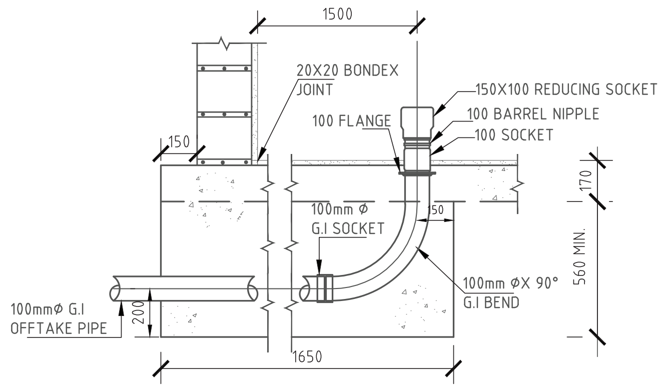
ROOF REINFORCEMENT
SCALE 1:40

Client: MoE		Location:	
Surveyed By:		Filename: 25 TANK LAYOUT	Scale: AS SHOWN (A3)
Designed By: MOWI		Project:	
Drawn By: MOWI		Drawing Title: 25M3 STORAGE TANK	
Checked By: S.I.M.U. / M.O.E.		Drawing Number: 067	Rev: A / Sheet: 1/2
TRACED BY			



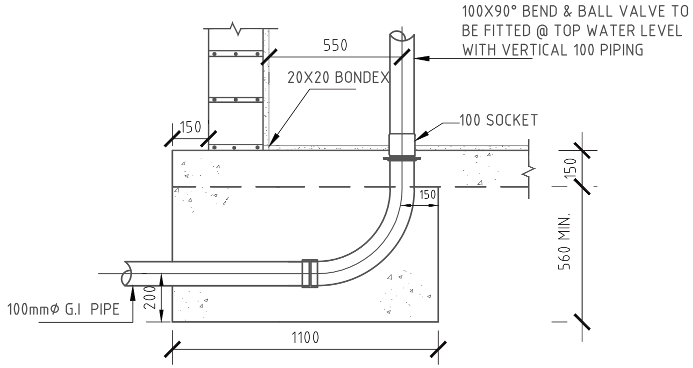
SCOUR PIPE DETAIL

SCALE 1:25



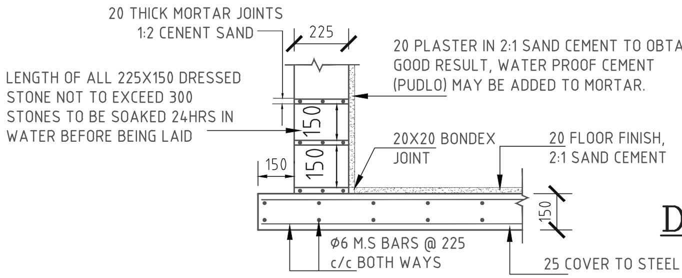
OFFTAKE DETAIL

SCALE 1:25



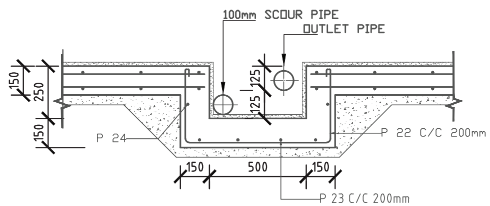
DETAIL OF INTAKE OR OVERFLOW

SCALE 1:25



DETAIL AT FOOT OF WALL

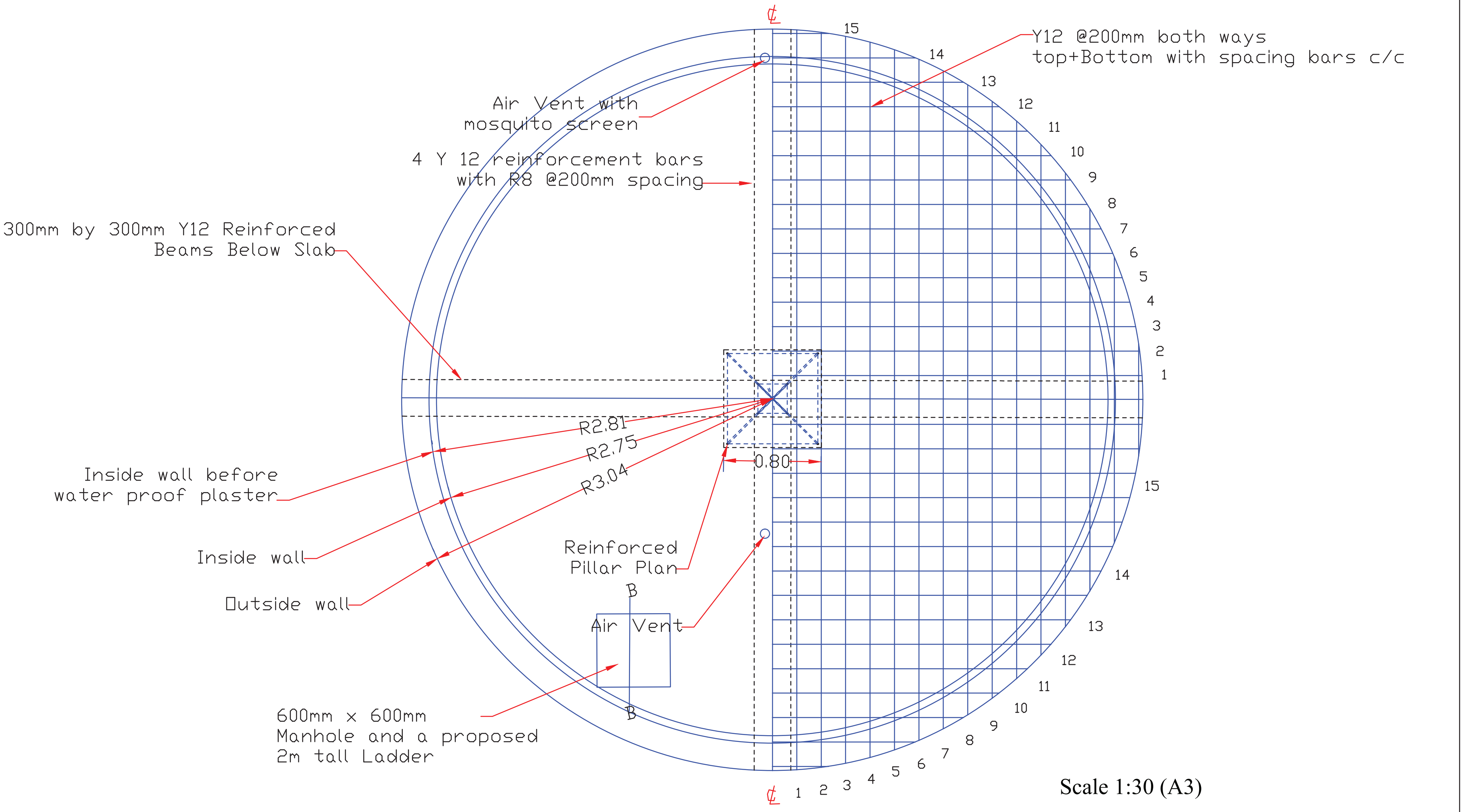
SCALE 1:25



SECTION B–B

SCALE 1:25

MINISTRY OF WATER & IRRIGATION- MAJI HOUSE			
TYPE 25 m^3 STORAGE TANK ALL DIMENSIONS IN MILLIMETERS			
PROJECT		SHEET	2 OF 2
DESIGNED	MOWI	SCALE	AS SHOWN
DIGITIZED	MOWI	DRG. NO.	068
CHECKED	S.I.M.U. / M.O.E.		
APPROVED	S.I.M.U. / M.O.E.		

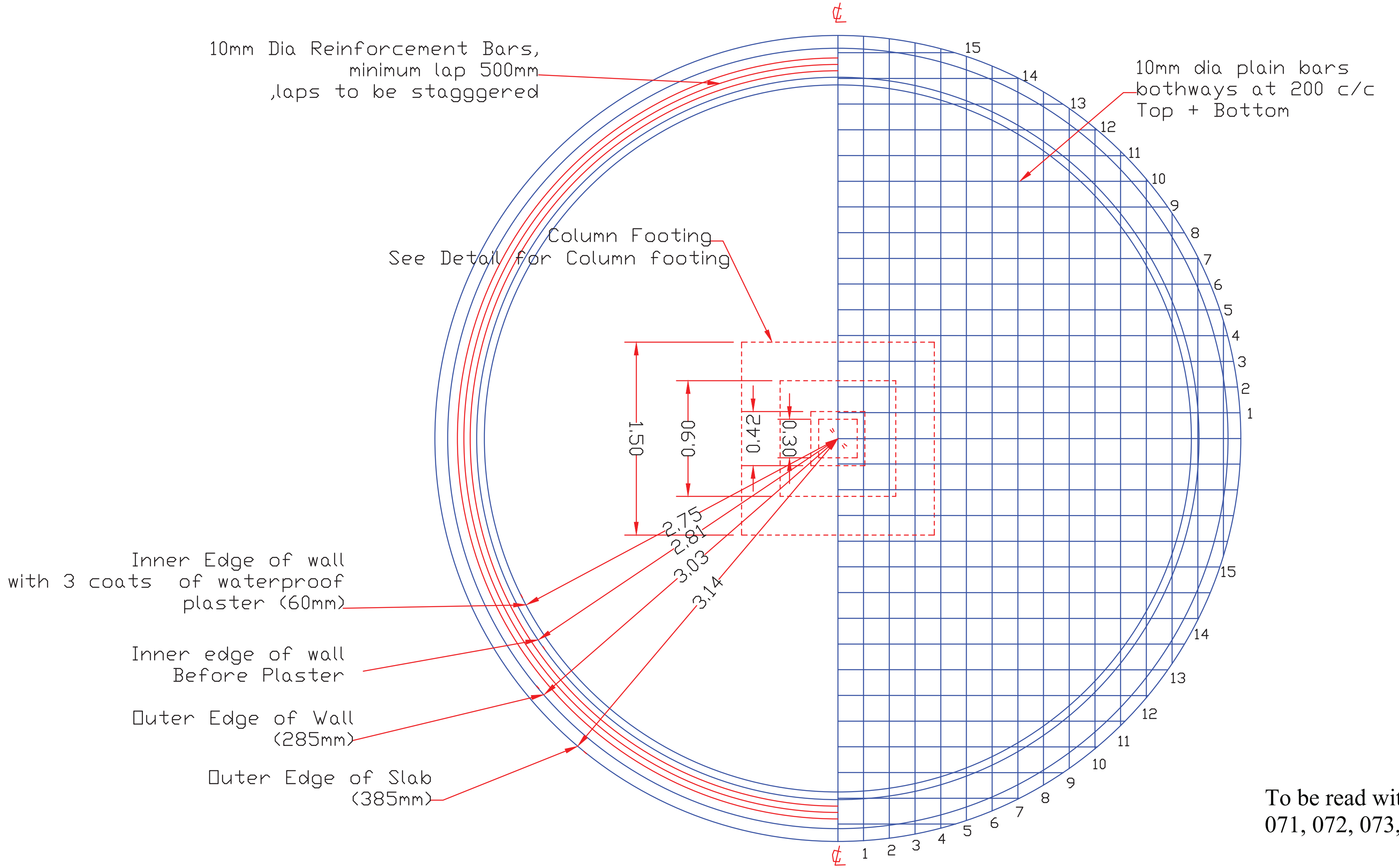


Scale 1:30 (A3)

ROOF PLAN WITH BEAMS AND COLUMN SHOWN

To be read with dwg no. 070, 071, 072, 073, 074,& 075

Client: MoE			Location:	
Surveyed By:			File Name: 50CM tank	Scale: As shown (A3)
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017		
Checked By:	SIMU - MoE	2017	Drawing Title: Roof Slab and column plan	
Approved By:	SIMU - MoE	2017	Drawing No: 069 / Rev: A	Sheet: 1/7

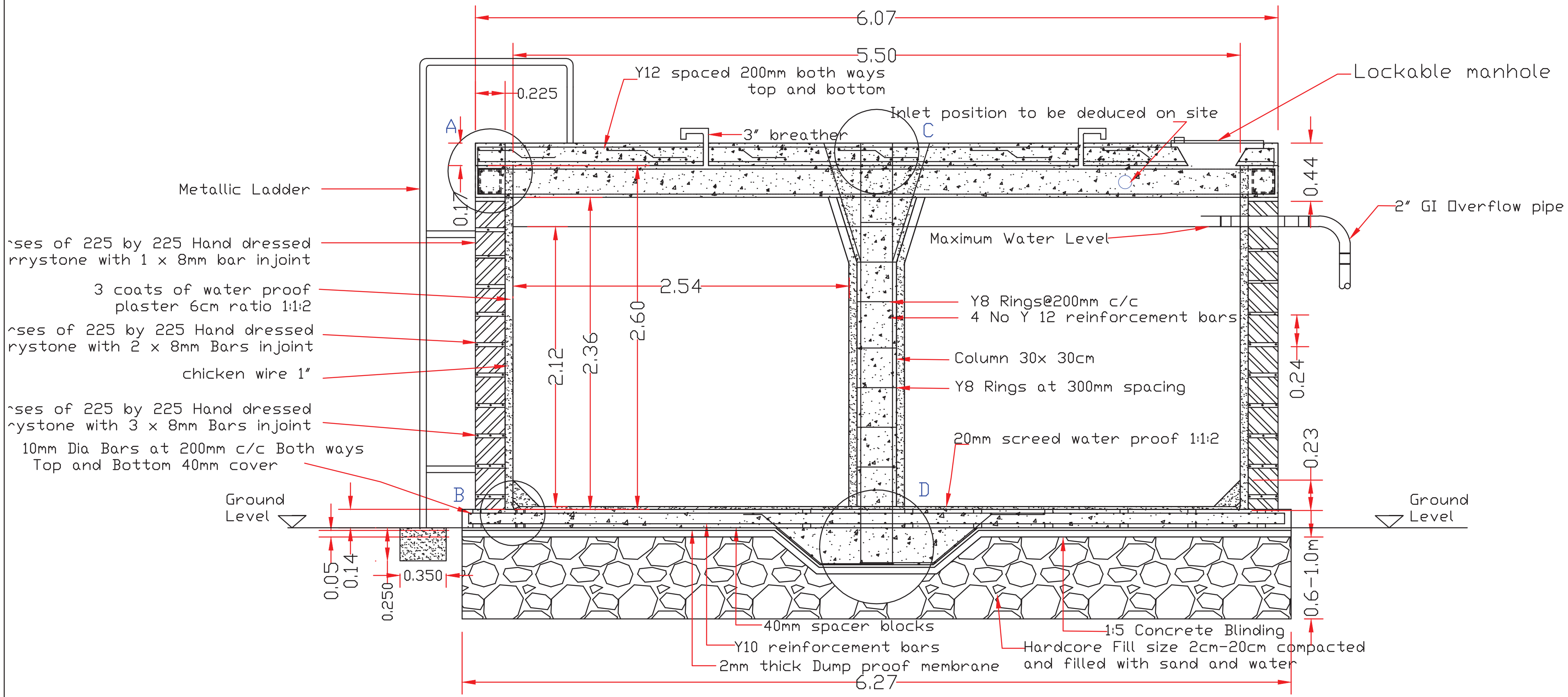


To be read with dwg. no. 069, 071, 072, 073, 074 & 075

FLOOR SLAB PLAN SHOWING COLUMN FOOTING AND STEEL

Scale 1:35 (A3)

Client: MoE			Location:	
Surveyed By:			File Name: 50CM tank	Scale: As Shown (A3)
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: Floor and column footing plan	
Checked By:	SIMU - MoE	2017	Drawing No: 070	Rev: A
Approved By:	SIMU - MoE	2017		Sheet: 2/7

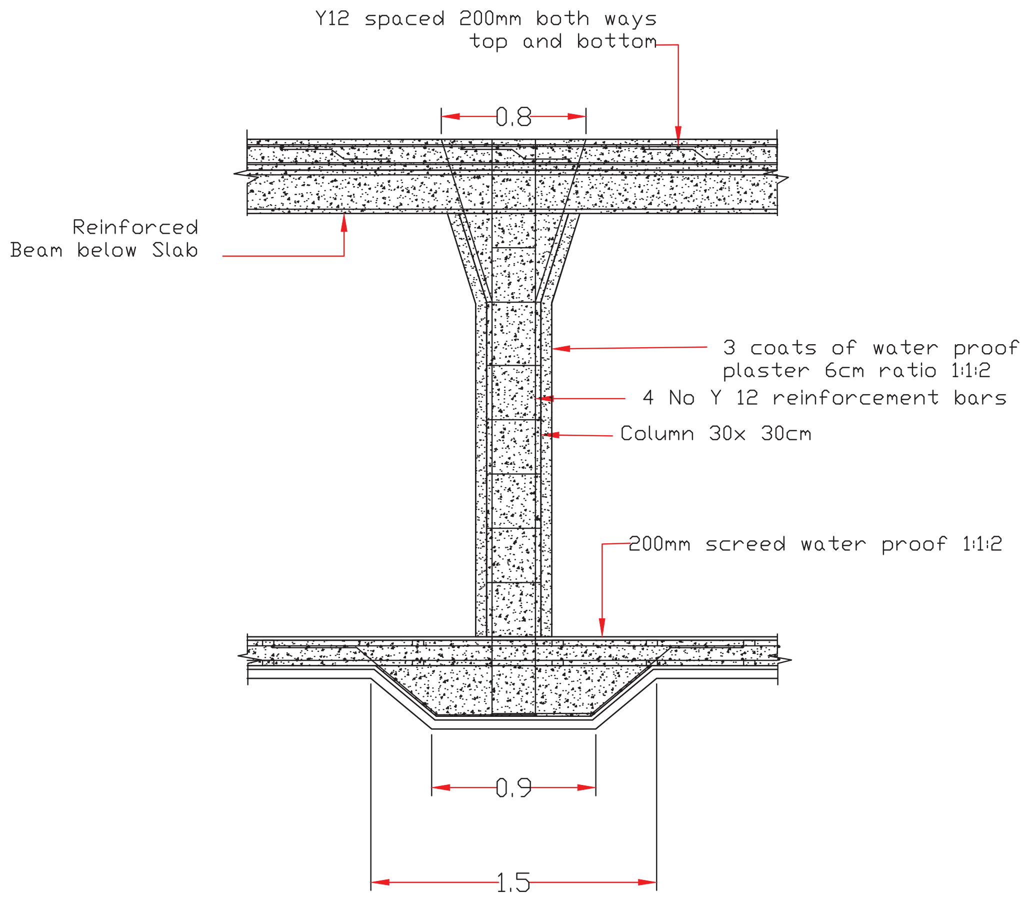


TANK SECTION X-X

Scale 1:30 (A3)

To be read with dwg. no 069, 070, 072, 073, 074 & 075

Client:	MoE		Location:	
Surveyed By:			File Name: 50CM tank	Scale: As Shown (A3)
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: Tank Cross section	
Checked By:	SIMU - MoE	2017		
Approved By:	SIMU - MoE	2017	Drawing No: 071 / Rev: A	Sheet: 3/7

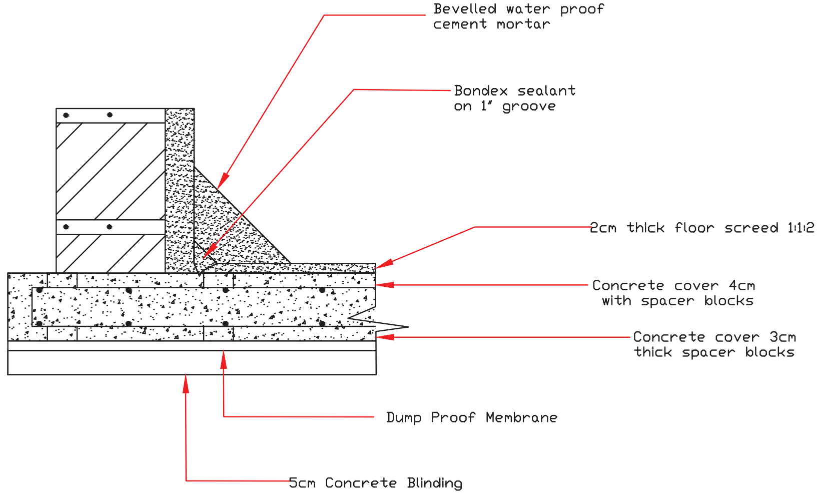


PILLAR SECTION C-C

To be read with dwg. no 069, 070, 071, 073, 074 & 075

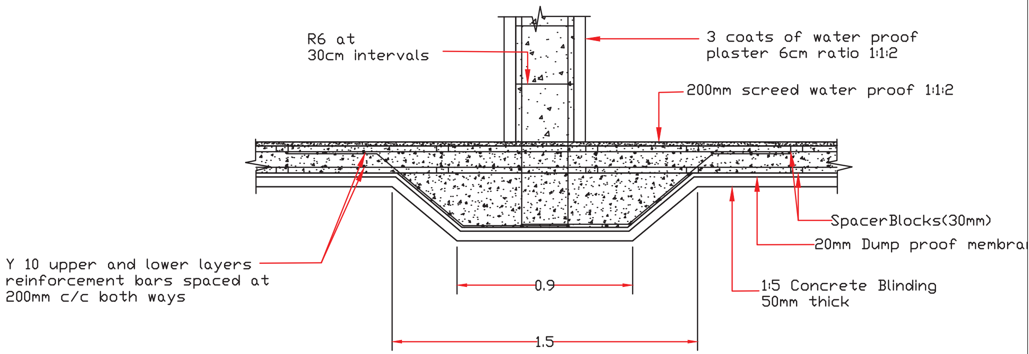
Scale 1:50 (A3)

Client: MoE				Location:	
Surveyed By:			File Name: 50CM tank		Scale: As Shown (A3)
Drawn By:	RFL	2017	Project:		
Designed By:	RFL	2017	Drawing Title: COLUMN		
Checked By:	SIMU - MoE	2017			
Approved By:	SIMU - MoE	2017	Drawing No: 072	Rev: A	Sheet: 4/7



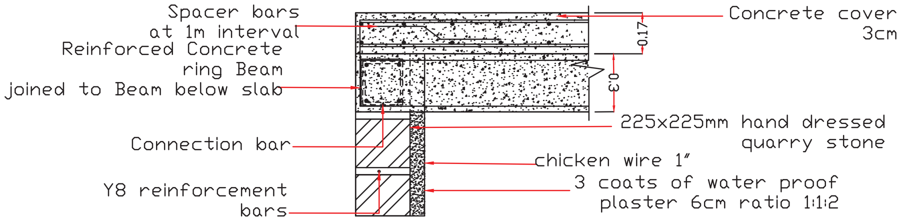
SECTION DETAIL B

Scale 1:40 (A3)



SECTION DETAIL D

Scale 1:50 (A3)

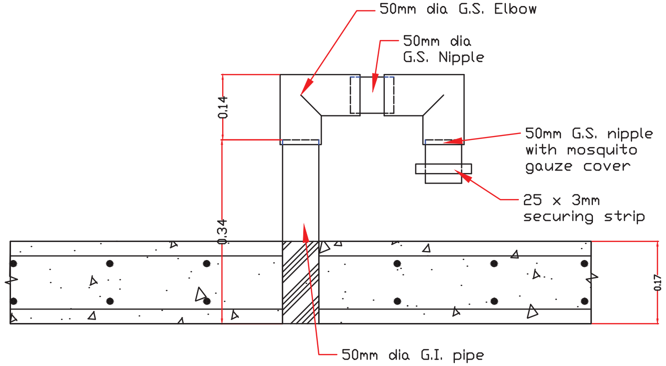


SECTION DETAIL A

Scale 1:80 (A3)

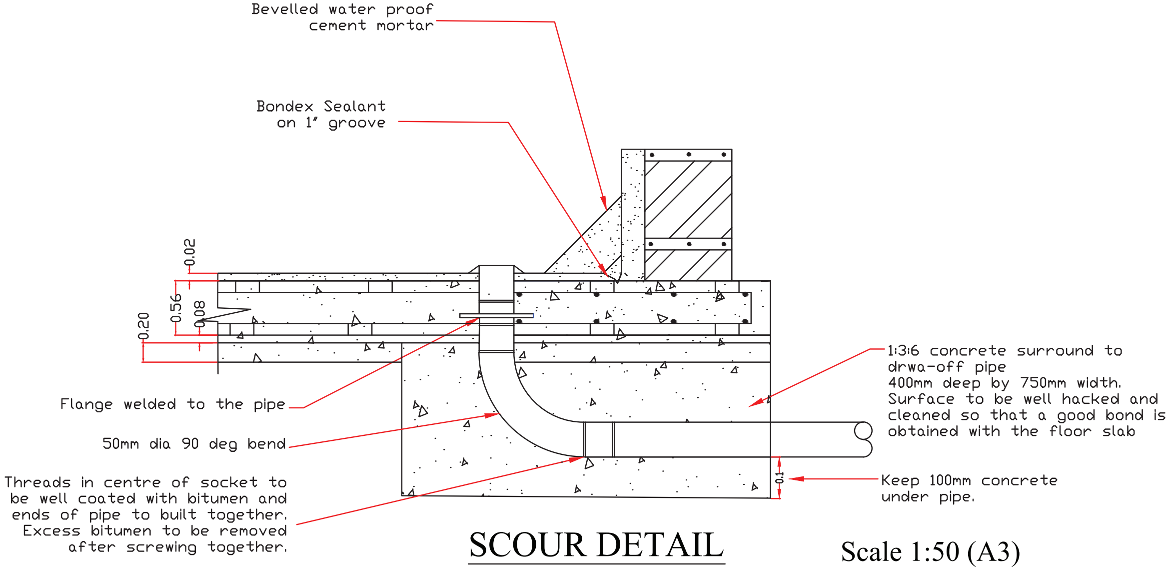
To be read with dwg. no 069, 070, 071, 072, 074 & 075

Client: MoE			Location:	
Surveyed By:			File Name: 50CM tank	Scale: As Shown (A3)
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: 50 cm tank and other details	
Checked By:	SIMU - MoE	2017		
Approved By:	SIMU - MoE	2017	Drawing No: 073	Rev: A / Sheet: 5/7



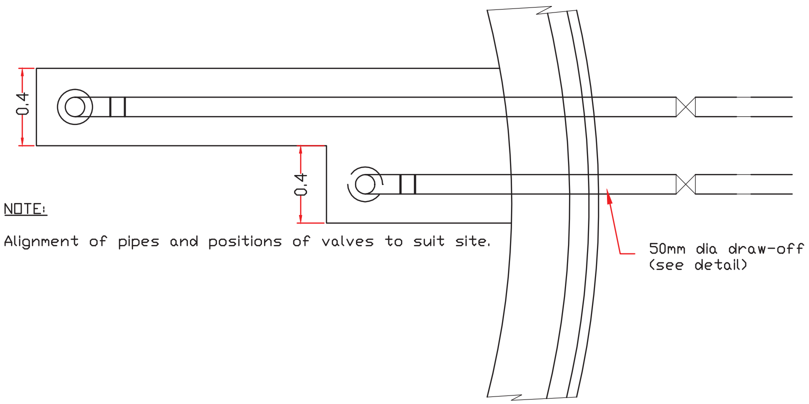
AIR VENT

Scale 1:40 (A3)



SCOUR DETAIL

Scale 1:50 (A3)

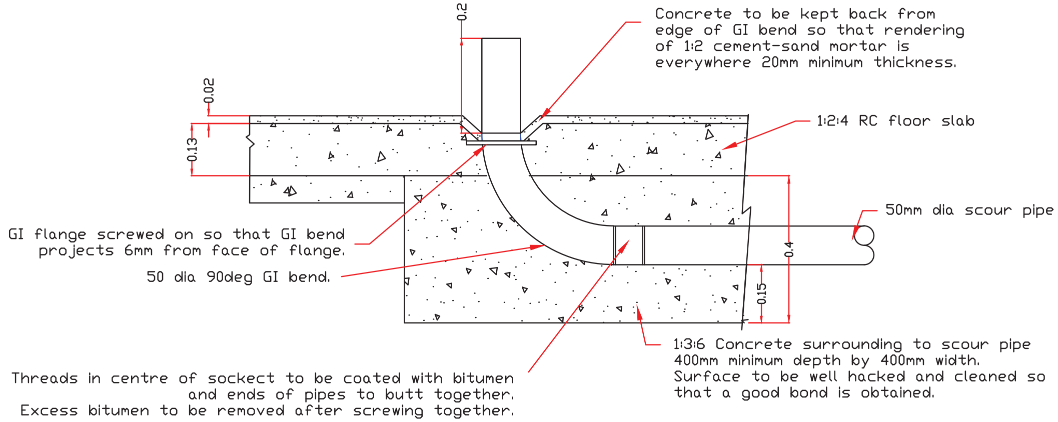


NOTE:

Alignment of pipes and positions of valves to suit site.

PIPING ARRANGEMENT

Scale 1:50 (A3)

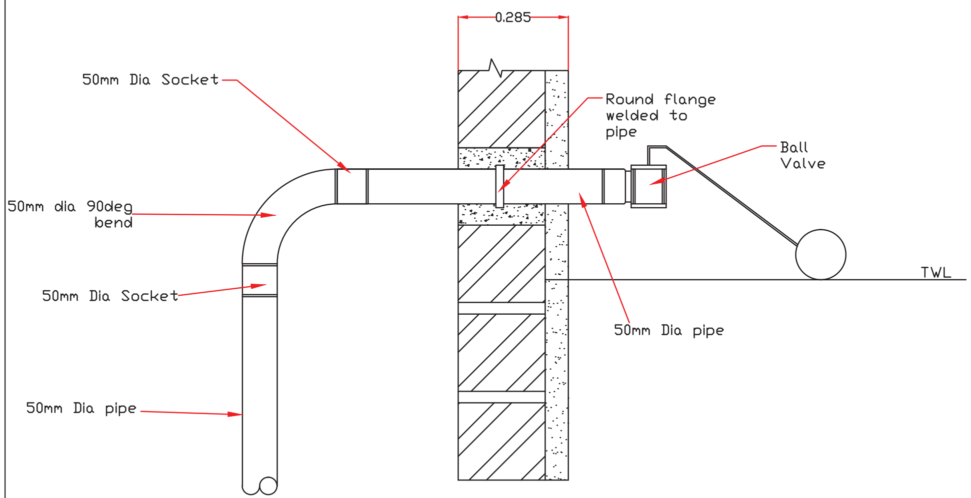


DRAW-OFF DETAIL

Scale 1:50 (A3)

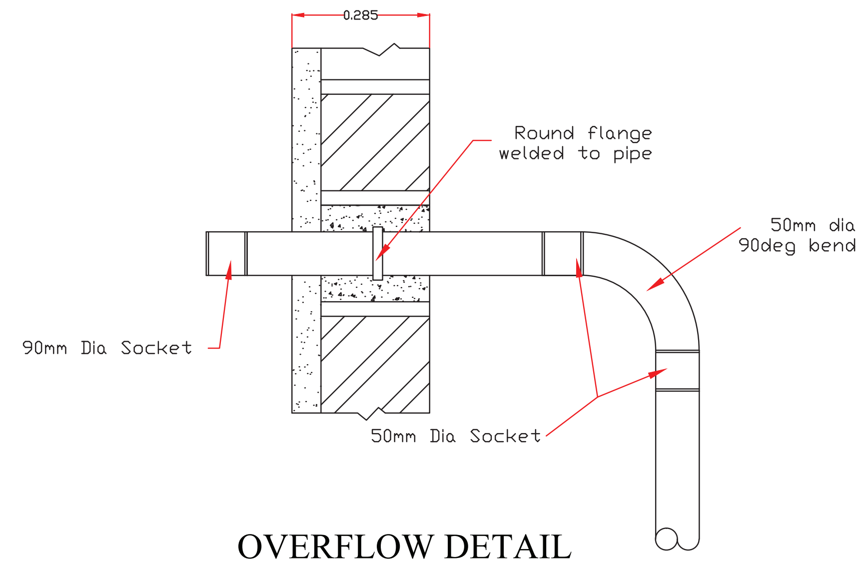
To be read with dwg. no 069, 070, 071, 072, 073 & 075

Client: MoE				Location:		
Surveyed By:			File Name: 50CM tank		Scale: As Shown (A3)	
Drawn By:	RFL	2017	Project:			
Designed By:	RFL	2017	Drawing Title: 50 cm tank and other details			
Checked By:	SIMU - MoE	2017	Drawing No: 074	Rev: A	Sheet: 6/7	
Approved By:	SIMU - MoE	2017				



INLET DETAIL

Scale 1:50 (A3)

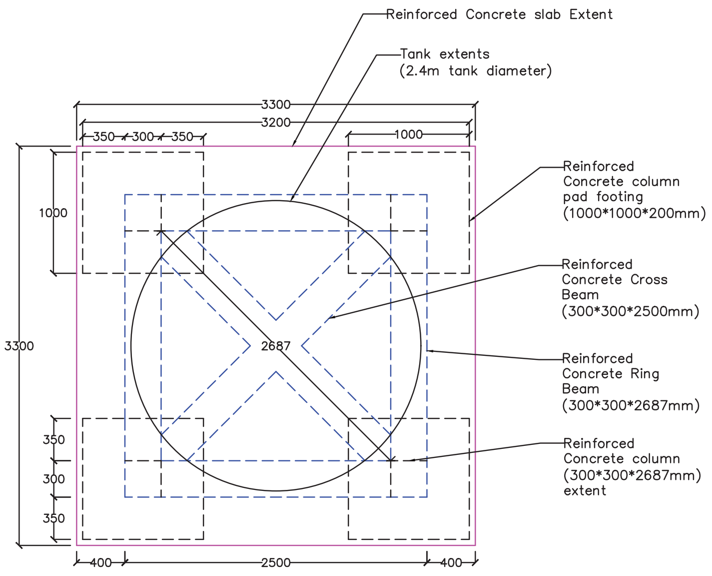


OVERFLOW DETAIL

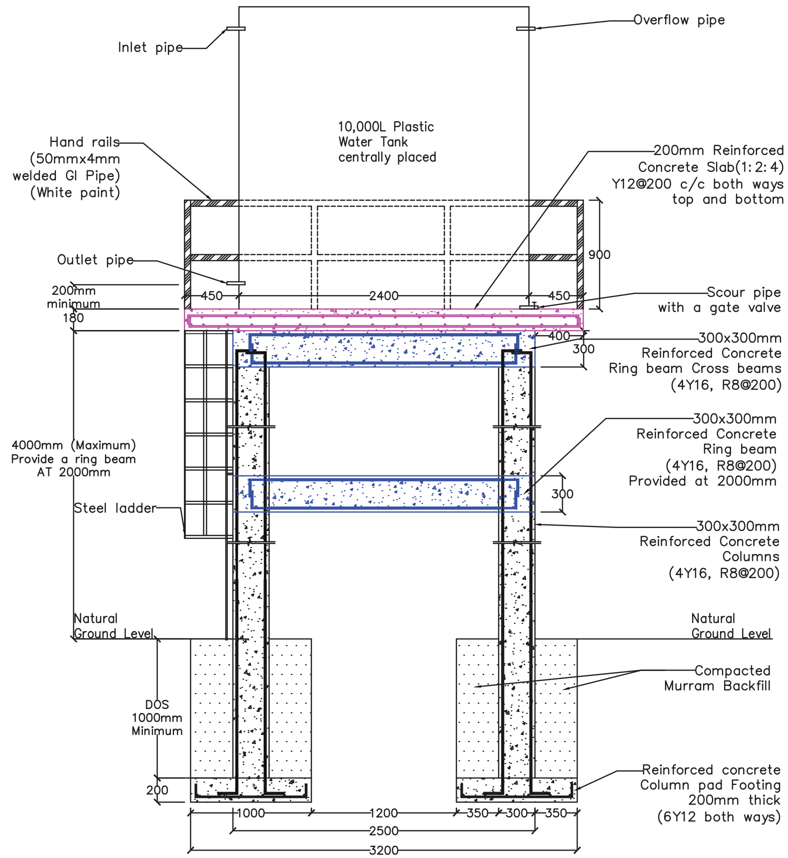
Scale 1:40 (A3)

To be read with dwg. no 069, 070, 071, 072, 073 & 074

Client: MoE			Location:	
Surveyed By:			File Name: 50CM tank	Scale: As Shown (A3)
Drawn By:	RFL	2017	Project:	
Designed By:	RFL	2017	Drawing Title: 50 cm tank and other details	
Checked By:	SIMU - MoE	2017	Drawing No: 075	Rev: A Sheet: 7/7
Approved By:	SIMU - MoE	2017		



10CM Water Tank Tower
Plan view
(Scale 1:40)

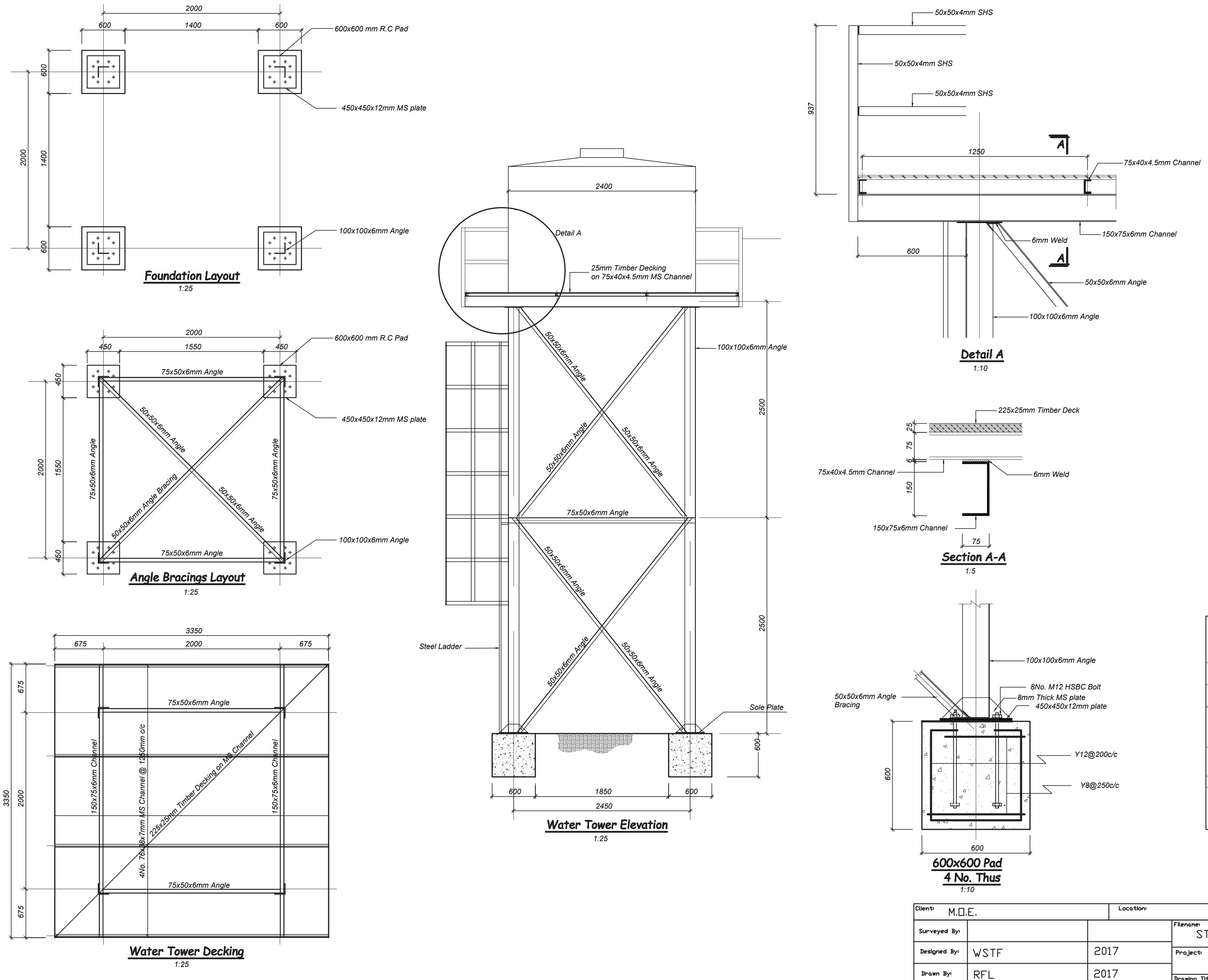


10CM Water Tank Tower
Typical Section
(Scale 1:40)

Construction Details:

1. All dimensions are in mm unless otherwise stated.
2. Figure dimension to be used, NOT SCALE.
3. Mass concrete to be of class RC25/30 (1:2:3)
4. Provide 25mm cover for the Slab, beams And 50mm for the Columns and column pad footing.
5. In windy places, add a course of 250mm stone around the tank to prevent it from being blown away.

Client: MoE			Location:	
Surveyed By:			File Name: 10CM Tank Platform	Scale: 1:40
Drawn By:	RFL	2017	Project:	
Designed By:	WSTF		Drawing Title: Elevated 10m³ Plastic Tank on Concrete Platform	
Checked By:	SIMU–MoE	2017		
Approved By:	SIMU–MoE	2017	Drawing No: 076	Rev: C; Sheet: 1/1



Construction Details

GENERAL

1.This drawing to be read in conjuction with all relevant Engineer's and Architects drawings

2. The contractor shall check all dimensions on site, any error & or ommisions shall be reported to the Engineer before work is commensed.

3.The latest amendment or revision shall superceed all other issues which shall be destroyed.

CONCRETE

1. Blinding under pad foundation to be1:4:8 mix.
2. All reinforced concrete to be grade 25 (1:1.5:3) mix giving a minimum crushing strength of 17N/mm2 and 25N/mm2 of 7 and 28 days respectively.
3. Cement shall be portland cement to comply with BS12.
4. Maximum aggregate size shall be 20mm unless otherwise stated

REINFORCEMENT

1. R indicate hot rolled mild steel to BS4449.
2. Y indicate cold rolled high tensile steel to BS4461
3. Fabric reinforcement shall be to BS4483.
4. All reinforcement shall be presented to the Engineer prior to concreting.

COVER

Unless otherwise stated cover to main steel shall be as follows:

1. 50mm to all steel below ground level.
2. 40mm to columns above ground level.
3. 25mm to steel in beams.
4. 20mm to steel in slabs & staircase.

WORKMANSHIP

1. All concrete work to be in accordance with BS8110.
2. All reinforced concrete to be mechanically vibrated.
3. All load bearing blockwork shall be in accordance with CP111

EXCAVATIONS

1. All excavations for foundation shall be presented to the Engineer for his approval prior to placing of blinding.
2. Depth of foundation on all drawing are provisional & the Enginee shall be consulted before final depth is arrived at during constructio

GROUND FLOOR SLAB

1. Ground floor slab to be cast on compacted & approved hardcore as per specifications & to be reinforced with mild steel of 8mm dia.a 200mm centres, placed 40mm from top.

LEGEND

2. T2 Top second layer
3. B1 Bottom first layer
4. B2 Bottom second layer

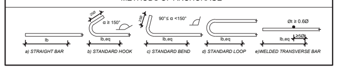
Rev.	Date	Revision

ANCHORAGE AND LAP LENGTHS FOR CONCRETE CLASS C25/30 AND STEEL REINFORCING BARS (YIELD POINT 460N/mm²)

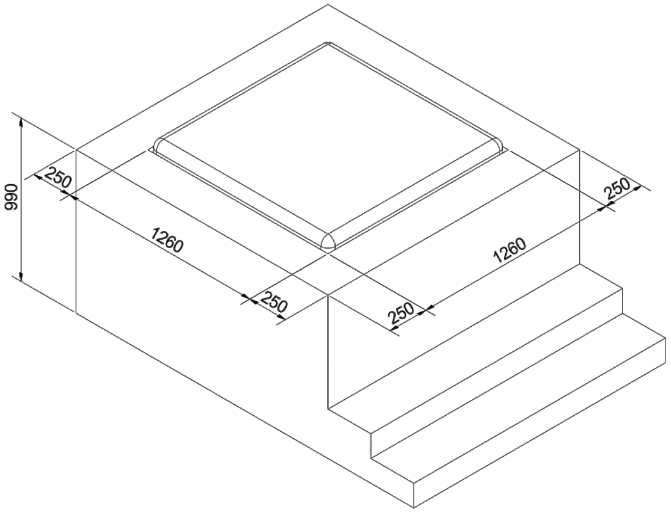
		BOND CONDITION	REINFORCEMENT IN TENSION, BAR DIAMETER, Ø(mm) 8	10	12	16	20	25	REINFORCEMENT IN COMPRESSION
ANCHORAGE LENGTH, Lbd	STRAIGHT BARS ONLY	GOOD	207	288	369	540	702	909	40 Ø
		POOR	297	405	522	765	1008	1305	58 Ø
	OTHER BARS	GOOD	288	369	441	585	729	909	40 Ø
		POOR	414	522	630	837	1044	1305	58 Ø
LAP LENGTH Lo	50% LAPPED IN ONE LOCATION (α6=1.4)	GOOD	288	396	513	747	981	1278	57 Ø
		POOR	414	567	738	1071	1404	1818	81 Ø
	100% LAPPED IN ONE LOCATION (α6=1.5)	GOOD	306	423	549	801	1053	1368	61Ø
		POOR	441	612	783	1143	1503	1953	87 Ø

NOTES:
- NOMINAL COVER TO ALL SIDES ≥ 25 mm. AT LAPS, CLEAR DISTANCE BETWEEN BARS ≤ 50 mm.
- α 1=α 3=α 4=α 5=1.0 FOR BENEFICIAL EFFECTS OF SHAPE OF BAR, COVER AND CONFINEMENT SEE EUROCODE 2, TABLE 8.2
- THE ANCHORAGE AND LAP LENGTHS HAVE BEEN ROUNDED UP TO THE NEAREST10 mm
- WHERE 33% OF BARS ARE LAPPED IN ONE LOCATION, DECREASE THE LAP LENGTHS FOR 50% LAPPED IN ONE LOCATIONBY A FACTOR OF 0.82

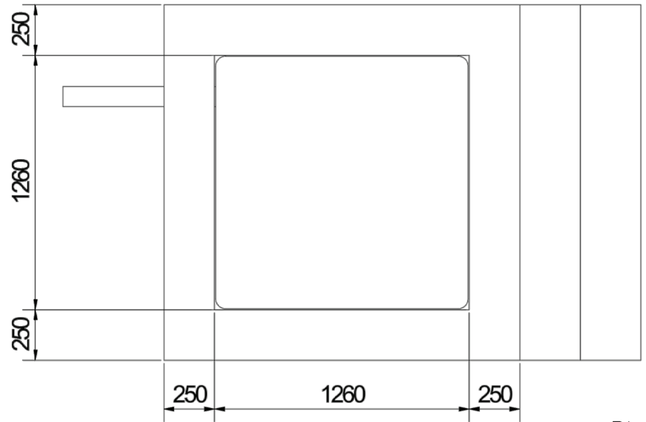
METHODS OF ANCHORAGE



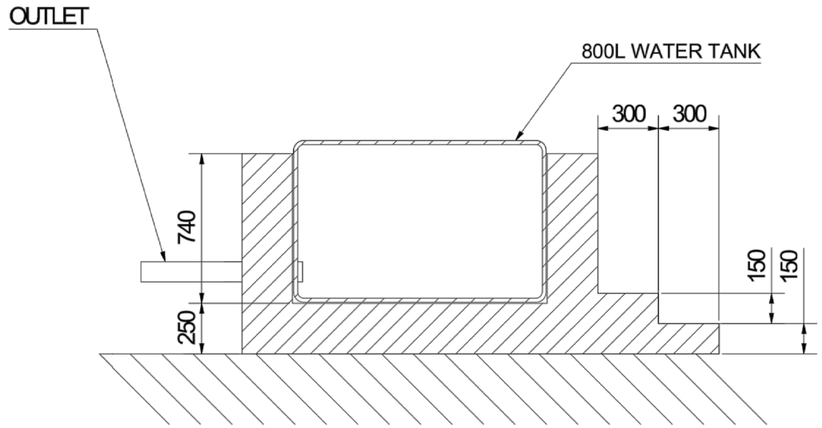
Client: M.O.E.			Location:	
Surveyed By:			Filename: STEEL PLATFORM	Scale: AS SHOWN (A3)
Designed By:	WSTF	2017	Project:	
Drawn By:	RFL	2017	Drawing Title: PLATFROM FOR PLASTIC TANK	
Checked By:	S.I.M.U. / M.O.E.		Drawing Number: 077	Rev: A · Sheet: 1/1
TRACED BY				



PERSPECTIVE VIEW OF COLLECTION TANK



PLAN VIEW



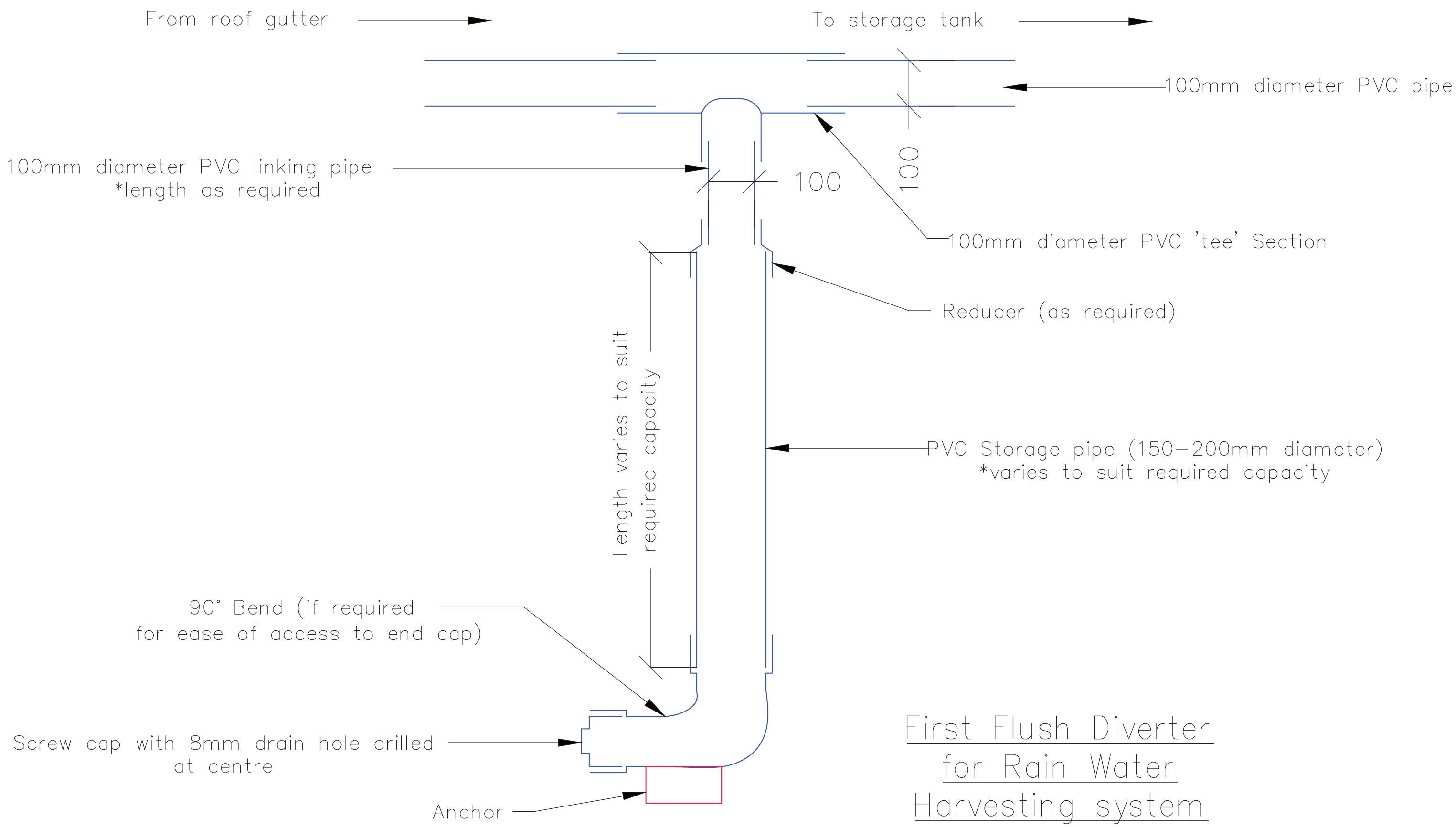
CROSS-SECTION VIEW OF COLLECTION TANK

Construction Details:

1. All dimensions are in millimeters unless otherwise stated.
2. Figure dimensions to use NOT SCALED.
3. The above drawing is a concrete masonry tank enclosure 4 courses tall
4. Alternative material: bricks.
5. All mass concrete to be used is class 20 (1:2:4)
6. All reinforced concrete class RC25, specified mix (1:2:4) & min. cover of 25mm and class RC30, specified mix (1:2:3) & min. cover of 35mm.
7. All soils under slab and around external. foundation to be treated for termite control.

Client: MoE		
Location:		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU – MoE	2017
Approved By:	SIMU – MoE	2017

File Name: TANKS	Scale: 1:40
Project:	
Drawing Title: 800L Tank Enclosure	
Drawing No: 078	Rev: A
Sheet: 1/1	

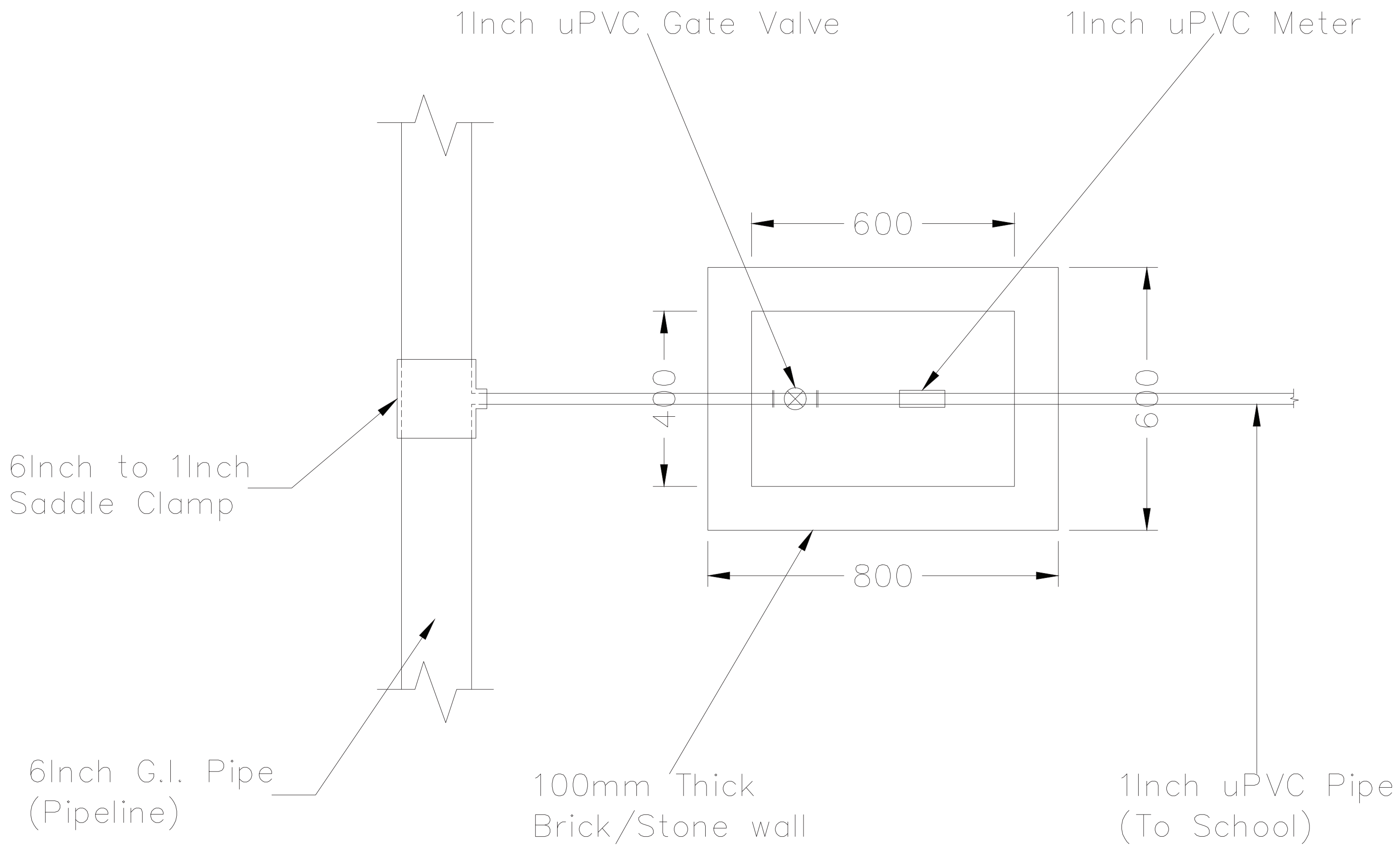


Construction Details:

1.All dimensions are in millimeters unless otherwise stated.

2.Figure dimensions to use NOT SCALED.

Client: MoE					Location:	
Surveyed By:			File Name: RAINWATER HARVESTING SYSTEM		Scale: 1:100	
Drawn By:	RFL	2017	Project:			
Designed By:	RFL	2017	Drawing Title: First Flush Diverter			
Checked By:	SIMU – MoE	2017				
Approved By:	SIMU – MoE	2017	Drawing No: 079	Rev: A	Sheet: 1/1	

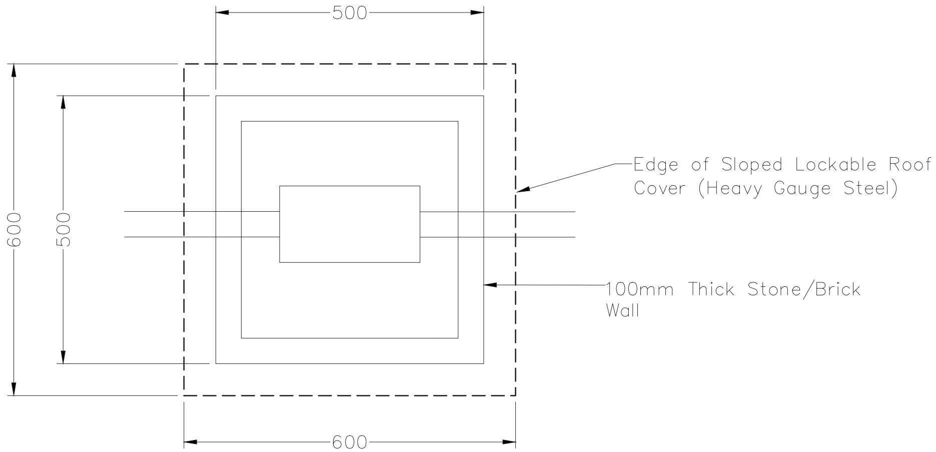


Construction Details:

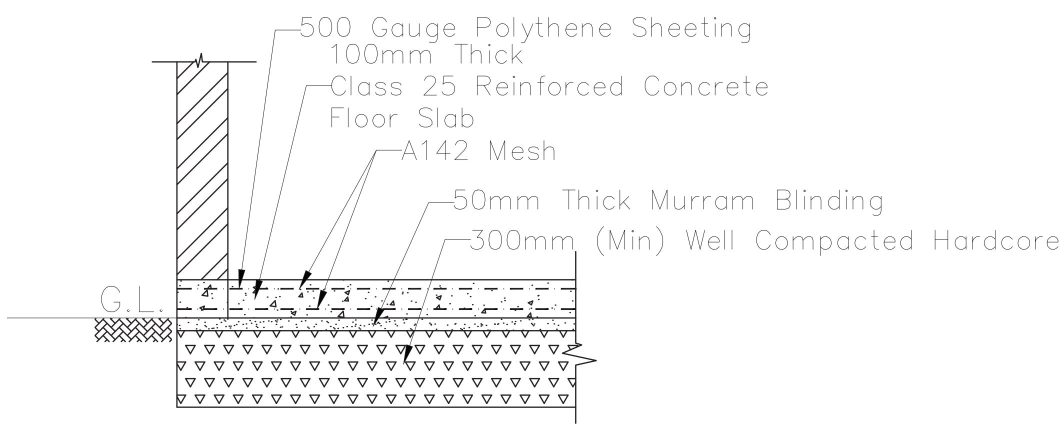
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Standard manhole size (L)600mmx(W)450mm
4.All mass concrete is Class 25, specified mix (1:2:4)
5.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
5.All soils under slab and around external foundation to be treated for termite control.
6.Drawing to be read with drawing No. 081

Client: MoE		Location:
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU/RFL	2017
Approved By:	SIMU/RFL	2017

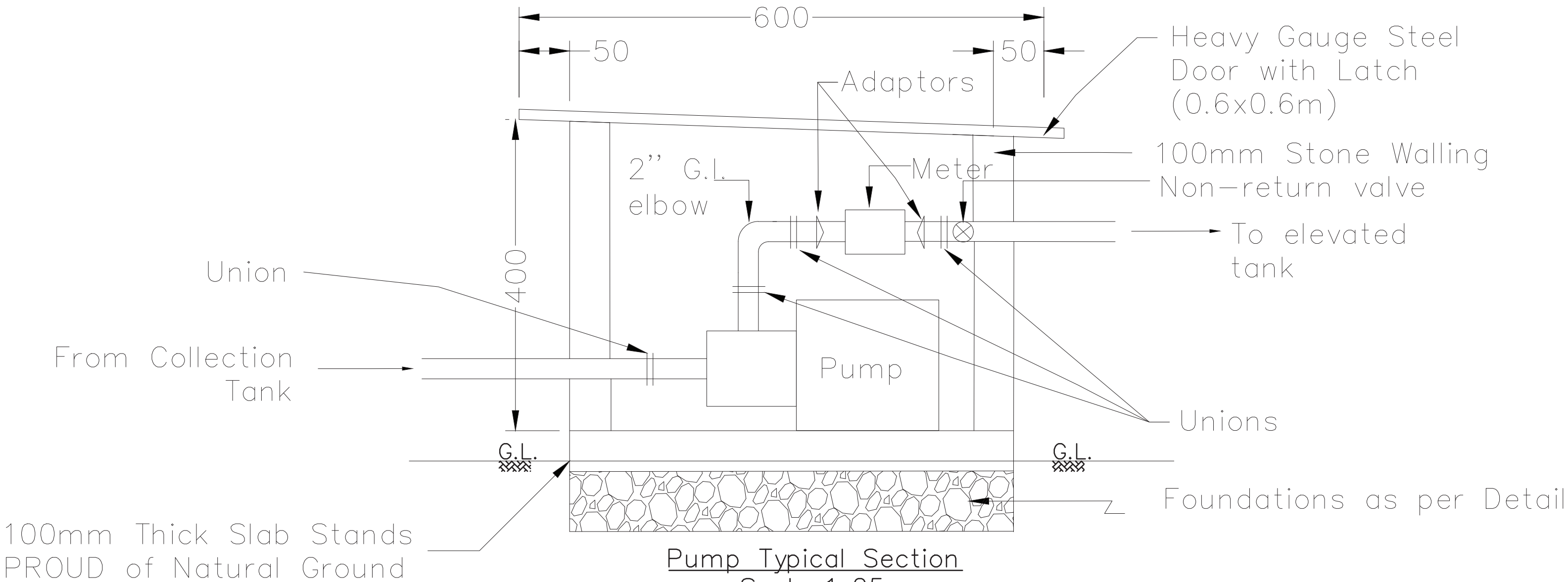
File Name: Pipeline Connections	Scale: 1:10
Project:	
Drawing Title: Pipeline Plan Details	
Drawing No: 080	Rev: C / Sheet: 1



Pump EncolsurePlan View
Scale 1:40



Slab Foundation Detail
Scale 1:20



Pump Typical Section
Scale 1:25

Construction Details:
1.All dimensions are in millimeters unless otherwise stated.
2.Figure dimensions to use NOT SCALED
3.Standard manhole size (L)600mmx(W)450mm
4.All mass concrete is Class 25, specified mix (1:2:4)
5.All reinforced concrete:
Class 25, specified mix (1:2:4) & Minimum cover of 25mm
Class 30, specified mix (1:2:3) & Minimum cover of 35mm
5.All soils under slab and around external foundation to be treated for termite control.
6.Drawing to be read with drawing No. 080

Client: MoE		
Surveyed By:		
Drawn By:	RFL	2017
Designed By:	RFL	2017
Checked By:	SIMU/RFL	2017
Approved By:	SIMU/RFL	2017

Location:
File Name: Pipeline Connections
Scale: As Shown (A3)
Project:
Drawing Title: Pump Components Details
Drawing No: 081
Rev: C
Sheet: 1

APPENDIX E

BILLS OF QUANTITIES AND COST ESTIMATES

	Index price of cement (Kshs)= 750
Price adjustment factor = local price x 100% **Index price**	Local price of cement (Kshs)=
	*Costs inclusive of VAT

No.	Item	DWG. Ref.	BoQ ref.	Material cost	Labour cost (20%)	Transport cost (10%)	Contingency (5%)	Sub total	Adjust-ment factor (%)	Estimated Total Budget
1	Single VIP (lined)	001-002	B/01	130,994	27,509	13,754	6,550	178,806		
2	Single VIP (unlined)	003-004	B/02	108,344	22,752	11,376	5,417	147,889		
3	PLWD VIP (lined)	005-006	B/03	163,785	34,395	17,197	8,189	223,567		
4	PLWD VIP (unlined)	007-008	B/04	141,136	29,638	14,819	7,057	192,650		
5	2 VIP (lined)	009-010	B/05	179,691	37,735	18,868	8,985	245,279		
6	2 VIP (unlined)	011-012	B/06	148,715	31,230	15,615	7,436	202,996		
7	2 VIP (unlined & non-exhaustible)	013-014	B/07	127,628	26,802	13,401	6,381	174,212		
8	2 VIP ECDE (Lined)	015-016	B/08	165,175	34,687	17,343	8,259	225,463		
9	2 VIP ECDE (Unlined & non-exhaustible)	017-018	B/09	150,243	31,551	15,775	7,512	205,081		
10	2 VIP (raised platform)	019	B/10	228,679	48,023	24,011	11,434	312,147		
11	4 VIP Girls (lined)	021-023	B/11	442,746	92,977	46,488	22,137	604,348		
12	Toilet HWS	025	B/12	11,886	-	-	594	12,480		
13	RWH Tank platform	026	B/13	51,546	10,825	5,412	2,577	70,360		
14	4 VIP Boys (lined)	027-029	B/14	453,798	95,298	47,649	22,690	619,434		
15	8 VIP Girls	030-032	B/15	688,527	66,512	69,404	34,426	858,869		
16	6 VIP Boys	033-035	B/16	587,018	73,964	67,801	29,351	758,134		
17	VIP Girls Block	036-040	B/17	1,232,364	258,796	129,398	61,618	1,682,177		

No.	Item	DWG. Ref.	BoQ ref.	Material cost	Labour cost (20%)	Transport cost (10%)	Contingency (5%)	Sub total	Adjust-ment factor (%)	Estimated Total Budget
18	VIP Boys Block	041-043	B/18	1,200,247	252,052	126,026	60,012	1,638,337		
19	2 Pour Flush toilet	044-045	B/19	147,405	30,955	15,478	7,370	201,208		
20	PLWD Pour Flush toilet	046-047	B/20	134,800	28,308	14,154	6,740	184,002		
21	Pour Flush Toilet Girls Block	048-051	B/21	1,001,183	210,248	105,124	50,059	1,366,615		
22	Pour Flush Toilet Boys Block	052-053	B/22	983,781	206,594	103,297	49,189	1,342,861		
23	De Montfort Brick Incinerator	055-056	B/23	201,008	40,202	20,101	10,050	271,361		
24	5m^3 Septic tank	057	B/24	104,937	22,037	11,018	5,247	143,239		
25	27m^3 Septic tank	058-059	B/25	329,354	69,164	34,582	16,468	449,569		
26	Multiple hand-washing stand	063-064	B/26	67,179	14,108	7,054	3,359	91,699		
27	Standpipe		B/27	22,035	4,627	2,314	1,102	30,078		
28	Shallow well fitted with handpump	065-066	B/28	320,522	67,310	33,655	16,026	437,513		
29	25m^3 Masonry tank	067-068	B/29	279,392	58,672	29,336	13,970	381,370		
30	50m^3 Masonry tank	069-075	B/30	705,230	148,098	74,049	35,262	962,639		
31	4m Elevated 10m^3 plastic tank (Concrete)	076	B/31	406,464	85,357	42,679	20,323	554,823		
32	5m Elevated 10m^3 plastic tank (Steel)	077	B/32	393,000	82,530	41,265	19,650	536,445		

Note: Budget may be (+/-) 10% of estimated budget

001 Single VIP Lined BoQ Material Summary - 2017

Project					**UNICEF WASH Schools**
BoQ B/01					**Single VIP Lined Latrine Block**
BoQ by:					**Rural Focus LTD**
Item	**Description**	**Unit**	**Quantity**	**Unit price**	**Total**
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	Excavation				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	73		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	3		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	21		
1.1.2.4	Waterproof cement	Kgs	41		
1.1.2.5	Y12	m	99		
1.1.2.6	R8	m	71		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	75		
1.1.2.10	Water	Litres	673		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	1		
1.2.3	Cement	Bags	6		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	7		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	4.8		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	208.4		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	56		
2.1.2	Bonding Strips	m	56		
2.1.3	Sand	Tons	1		
2.1.4	Ballast	Tons	0.30		
2.1.5	Cement	Bags	8		
2.1.6	Y12	m	25		
2.1.7	R8	m	25		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	1		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	259.8		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	4		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

002 Single VIP Unlined BoQ Material Summary - 2017

Project					**UNICEF WASH Schools**
BoQ B/02					**Single VIP Unlined Latrine Block**
BoQ by:					**Rural Focus LTD**
Item	**Description**	**Unit**	**Quantity**	**Unit price**	**Total**
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	Excavation				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	31		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	2		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	14		
1.1.2.4	Waterproof cement	Kgs	28		
1.1.2.5	Y12	m	99		
1.1.2.6	R8	m	71		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	27		
1.1.2.10	Water	Litres	450		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	1		
1.2.3	Cement	Bags	6		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	7		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	4.8		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	208.4		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	56		
2.1.2	Bonding Strips	m	56		
2.1.3	Sand	Tons	1		
2.1.4	Ballast	Tons	0.30		
2.1.5	Cement	Bags	8		
2.1.6	Y12	m	25		
2.1.7	R8	m	25		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	1		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	259.8		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	4		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

003 PLWD VIP Lined BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ B/03	**PLWD VIP Lined Latrine Block**
BoQ by:	**Rural Focus LTD**

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	Excavation				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	53		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	3		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	21		
1.1.2.4	Waterproof cement	Kgs	41		
1.1.2.5	Y12	m	106		
1.1.2.6	R8	m	77		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	75		
1.1.2.10	Water	Litres	673		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	12		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	7		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	10.9		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	401.1		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	70		
2.1.2	Bonding Strips	m	70		
2.1.3	Sand	Tons	1		
2.1.4	Ballast	Tons	0.38		
2.1.5	Cement	Bags	10		
2.1.6	Y12	m	31		
2.1.7	R8	m	31		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	1		
2.1.10	Prefabricated plastic seat	each	1		
2.1.11	1.5 Inch G.I. Pipe	piece	1		
2.1.12	Fly screen	each	1		
2.1.13	110mm PVC Pipe (Class B)	each	1		
2.1.14	Hand wash station	each	1		
2.1.15	Water	Litres	323.7		
2.1.16	Undercoat	Litres	2		
2.1.17	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	5		
2.2.2	4x2 timber	m	13		
2.2.3	2x2 timber	m	7		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

004 PLWD VIP Unlined BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ B/04	**PLWD VIP Unlined Latrine Block**
BoQ by:	**Rural Focus LTD**

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	31		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	2		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	14		
1.1.2.4	Waterproof cement	Kgs	28		
1.1.2.5	Y12	m	106		
1.1.2.6	R8	m	77		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	27		
1.1.2.10	Water	Litres	450		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	12		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	7		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	10.9		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	401.1		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	70		
2.1.2	Bonding Strips	m	70		
2.1.3	Sand	Tons	1		
2.1.4	Ballast	Tons	0.38		
2.1.5	Cement	Bags	10		
2.1.6	Y12	m	31		
2.1.7	R8	m	31		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	1		
2.1.10	Prefabricated plastic seat	each	1		
2.1.11	1.5 Inch G.I. Pipe	piece	1		
2.1.12	Fly screen	each	1		
2.1.13	110mm PVC Pipe (Class B)	each	1		
2.1.14	Hand wash station	each	1		
2.1.15	Water	Litres	323.7		
2.1.16	Undercoat	Litres	2		
2.1.17	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	5		
2.2.2	4x2 timber	m	13		
2.2.3	2x2 timber	m	7		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

005 2 VIP Lined BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ B/05	**2 VIP Lined Latrine Block**
BoQ by:	**Rural Focus LTD**

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	86		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	5		
1.1.2.2	Ballast	Tons	3		
1.1.2.3	Cement	Bags	28		
1.1.2.4	Waterproof cement	Kgs	57		
1.1.2.5	Y12	m	138		
1.1.2.6	R8	m	98		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	102		
1.1.2.10	Water	Litres	920		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	12		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	9		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	9.6		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	378.7		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	81		
2.1.2	Bonding Strips	m	81		
2.1.3	Sand	Tons	2		
2.1.4	Ballast	Tons	0.44		
2.1.5	Cement	Bags	12		
2.1.6	Y12	m	36		
2.1.7	R8	m	36		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	2		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	373.9		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	7		
2.2.2	4x2 timber	m	13		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

006 2 VIP Unlined BoQ Material Summary - 2017

Project					**UNICEF WASH Schools**
BoQ B/06					**2 VIP Unlined Latrine Block**
BoQ by:					**Rural Focus LTD**
Item	**Description**	**Unit**	**Quantity**	**Unit price**	**Total**
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	56		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	3		
1.1.2.2	Ballast	Tons	3		
1.1.2.3	Cement	Bags	19		
1.1.2.4	Waterproof cement	Kgs	38		
1.1.2.5	Y12	m	138		
1.1.2.6	R8	m	98		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	37		
1.1.2.10	Water	Litres	615		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	12		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	9		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	9.6		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	378.7		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	81		
2.1.2	Bonding Strips	m	81		
2.1.3	Sand	Tons	2		
2.1.4	Ballast	Tons	0.44		
2.1.5	Cement	Bags	12		
2.1.6	Y12	m	36		
2.1.7	R8	m	36		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	2		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	373.9		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	7		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

006 2 VIP Unlined BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ B/07	**2 VIP Unlined (Non-exhaustible) Latrine Block**
BoQ by:	**Rural Focus LTD**

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	53		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	2		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	15		
1.1.2.4	Waterproof cement	Kgs	30		
1.1.2.5	Y12	m	116		
1.1.2.6	R8	m	85		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	29		
1.1.2.10	Water	Litres	483		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	8		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	7		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	6.6		
1.2.8	Water	Litres	268.1		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	81		
2.1.2	Bonding Strips	m	81		
2.1.3	Sand	Tons	2		
2.1.4	Ballast	Tons	0.44		
2.1.5	Cement	Bags	12		
2.1.6	Y12	m	36		
2.1.7	R8	m	36		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	2		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	373.9		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	7		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

008 2 VIP ECDE BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ B/08	**2 VIP ECDE Lined Latrine Block**
BoQ by:	**Rural Focus LTD**

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	68		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	4		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	26		
1.1.2.4	Waterproof cement	Kgs	52		
1.1.2.5	Y12	m	126		
1.1.2.6	R8	m	89		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	94		
1.1.2.10	Water	Litres	841		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	10		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	9		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	8.3		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	330.6		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	73		
2.1.2	Bonding Strips	m	73		
2.1.3	Sand	Tons	1		
2.1.4	Ballast	Tons	0.39		
2.1.5	Cement	Bags	10		
2.1.6	Y12	m	32		
2.1.7	R8	m	32		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	2		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	337.3		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	6		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

009 2 VIP ECDE NE BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ B/09	**2 VIP ECDE Unlined (Non-exhaustible) Latrine Block**
BoQ by:	**Rural Focus LTD**

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	62		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	4		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	22		
1.1.2.4	Waterproof cement	Kgs	44		
1.1.2.5	Y12	m	112		
1.1.2.6	R8	m	81		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	80		
1.1.2.10	Water	Litres	722		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	1		
1.2.3	Cement	Bags	7		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	7		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	5.5		
1.2.8	Water	Litres	234.1		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	73		
2.1.2	Bonding Strips	m	73		
2.1.3	Sand	Tons	1		
2.1.4	Ballast	Tons	0.39		
2.1.5	Cement	Bags	10		
2.1.6	Y12	m	32		
2.1.7	R8	m	32		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	2		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	337.3		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	6		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

010 2 VIP Raised BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ B/10	**2 VIP Raised Latrine Block**
BoQ by:	**Rural Focus LTD**

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	86		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	5		
1.1.2.2	Ballast	Tons	3		
1.1.2.3	Cement	Bags	28		
1.1.2.4	Waterproof cement	Kgs	57		
1.1.2.5	Y12	m	138		
1.1.2.6	R8	m	98		
1.1.2.7	Bonding strips	m	50		
1.1.2.8	Binding Wire	Kgs	20		
1.1.2.9	9 inch hard stone	m	102		
1.1.2.10	Water	Litres	920		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	5		
1.2.2	Ballast	Tons	9		
1.2.3	Cement	Bags	44		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kgs	5		
1.2.6	6x1 Form Work	m	9		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	14.5		
1.2.8	Manhole cover (600*450mm, cast iron, lockable with frame)	No.	1		
1.2.9	Water	Litres	1432.9		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	81		
2.1.2	Bonding Strips	m	81		
2.1.3	Sand	Tons	2		
2.1.4	Ballast	Tons	0.44		
2.1.5	Cement	Bags	12		
2.1.6	Y12	m	36		
2.1.7	R8	m	36		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	2		
2.1.10	Fly screen	each	1		
2.1.11	110mm PVC Pipe (Class B)	each	1		
2.1.12	Water	Litres	373.9		
2.1.13	Undercoat	Litres	2		
2.1.14	Gloss	Litres	1		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	7		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	kg	2		
2.2.5	4 inch Nails	kg	2		
2.2.6	6 inch Nails	kg	2		
2.2.7	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

011 4 VIP Lined Girls Facility brick rev Material Summary- 2017

Project	**UNICEF WASH Schools**
BoQ Title	**2 VIP Raised Latrine Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/10**
	Read with: B/11 and B/12

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	6		
1.1.1.2	Pit and wall excavation	m^3	117		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	9		
1.1.2.2	Ballast	Tons	4		
1.1.2.3	Cement	Bags	51		
1.1.2.4	Water	Litres	1658		
1.1.2.5	Waterproof cement	Kgs	10		
1.1.2.6	Y12	m	146		
1.1.2.7	R8	m	86		
1.1.2.8	Bonding strips	m	198		
1.1.2.9	Binding Wire	Kgs	5		
1.1.2.10	9 inch hard stone	m	102		
1.1.2.10	Hardcore	Tons	6		
1.1.2.11	Murram	m^3	2		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	3		
1.2.2	Ballast	Tons	5		
1.2.3	Cement	Bags	24		
1.2.4	Water	Litres	780		
1.2.5	Y12	m	87		
1.2.6	Y10	m	242		
1.2.7	Binding Wire	Kgs	8		
1.2.8	6x1 Form Work	m	93		
1.2.9	Damp Proof Membrane (gauge 500)	m^2	13		
1.2.10	Manhole cover (600*450mm, plastic)	No.	2		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	Brick	No.	942		
2.1.2	Bonding Strips	m	217		
2.1.3	Sand	Tons	2		
2.1.4	Ballast	Tons	1		
2.1.5	Cement	Bags	7		
2.1.6	Water	Litres	228		
2.1.7	Y12	m	53		
2.1.8	R8	m	55		
2.1.9	Binding Wire	Kgs	2		
2.1.10	Door 1 (2100x900mm)	each	4		
2.1.11	Grill Door (2100x900mm)	each	1		
2.1.12	110mm PVC Pipe (Class B)	each	3		
2.1.13	Hand Washing station	each	1		
2.1.14	Undercoat paint	Litres	2		
2.1.15	Gloss paint	Litres	2		
2.1.16	Anti-termite treatment	Litres	4		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	9		
2.2.2	4x2 timber	m	18		
2.2.3	2x2 timber	m	40		
2.2.4	12x1 timber	m	16		
2.2.5	Gutters (4" PVC)	m	6		
2.2.5.1	Downspouts (4" PVC)	m	2		
2.2.5.2	End piece (4" PVC)	No	2		
2.2.5.3	Down pipe (4" PVC)	m	2		
2.2.5.4	Hangers	No	7		
2.2.6	4 inch Nails	kg	2		
2.2.7	6 inch Nails	kg	2		
2.2.8	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					

3	**Others**				
3.1	Soak pit (Hardcore)	Tons	10		
3.2	Piping & Inspection Chamber (0.25x0.25)				
3.2.1	Cement	Bags	1		
3.2.2	Sand	Tons	0.1		
3.2.3	Ballast	Tons	0.1		
3.2.4	75mm PVC Pipe (Class B)	Pcs	1		
Total for Others					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

011 4 VIP Lined Girls Facility Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Girls' 4 VIP Lined Latrine Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/11**
	Read with: B/12 and B/13

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavation**				
1.1.1.1	Top soil excavation	m^3	6		
1.1.1.2	Pit and wall excavation	m^3	117		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	9		
1.1.2.2	Ballast	Tons	4		
1.1.2.3	Cement	Bags	51		
1.1.2.4	Water	Litres	1658		
1.1.2.5	Waterproof cement	Kgs	10		
1.1.2.6	Y12	m	146		
1.1.2.7	R8	m	86		
1.1.2.8	Bonding strips	m	198		
1.1.2.9	Binding Wire	Kgs	5		
1.1.2.10	9 inch hard stone	m	102		
1.1.2.11	Hardcore	Tons	6		
1.1.2.12	Murram	m^3	2		
Total for foundations					
1.2	**Slab**				
1.2.1	Sand	Tons	3		
1.2.2	Ballast	Tons	5		
1.2.3	Cement	Bags	24		
1.2.4	Water	Litres	780		
1.2.5	Y12	m	87		
1.2.6	Y10	m	242		
1.2.7	Binding Wire	Kgs	8		
1.2.8	6x1 Form Work	m	93		
1.2.9	Damp Proof Membrane (gauge 500)	m^2	13		
1.2.10	Manhole cover (600*450mm, plastic)	No.	2		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	217		
2.1.2	Bonding Strips	m	217		
2.1.3	Sand	Tons	2		
2.1.4	Ballast	Tons	1		
2.1.5	Cement	Bags	26		
2.1.6	Water	Litres	845		
2.1.7	Y12	m	60		
2.1.8	R8	m	75		
2.1.9	Binding Wire	Kgs	2		
2.1.10	Door 1 (2100x900mm)	each	4		
2.1.11	Grill Door (2100x900mm)	each	1		
2.1.12	110mm PVC Vent Pipe (Class B)	each	3		
2.1.13	Fly Screen	each	4		
2.1.14	Undercoat paint	Litres	6		
2.1.15	Gloss paint	Litres	4		
2.1.16	Anti-termite treatment	Litres	4		
Total for Wallling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	9		
2.2.2	4x2 timber	m	18		
2.2.3	2x2 timber	m	40		
2.2.4	12x1 timber	m	16		
2.2.5	Gutters (4” PVC)	m	6		
2.2.5.1	Downspouts (4” PVC)	m	2		
2.2.5.2	End piece (4” PVC)	No	2		
2.2.5.3	Down pipe (4” PVC)	m	1		
2.2.5.4	Hangers (Fascia bracket)	No	7		
2.2.6	4 inch Nails	kg	2		
2.2.7	6 inch Nails	kg	2		
2.2.8	Roofing Nails	kg	2		
Total for Roofing					
Total for Super-structure					
3	**Others**				
3.1	Soak pit (Hardcore)	Tons	10		
3.2	**Piping & Inspection Chamber (0.25x0.25)**				
3.2.1	Cement	Bags	1		
3.2.2	Sand	Tons	0.1		

3.2.3	Ballast	Tons	0.1		
3.2.4	75mm PVC Pipe (Class B)	Pcs	1		
3.3	**Hand Washing Basin**				
3.3.1	Cement	Bags	0.5		
3.3.2	Sand	Tons	0.1		
3.3.3	Ballast	Tons	0.1		
3.3.4	Water	Litres	15.04		
3.3.5	R8	m	2.4		
3.3.6	Y12	m	8.1		
3.3.7	6x1 Timber Formwork	m	4.2		
3.3.8	2x2 Bracing	m	4.2		
3.3.9	Pegglar push taps 1/2”	No.	6		
3.3.10	1inch/25mm Gate Valve	Pcs	1		
3.3.11	9 inch local stone	m	2.1		
				Sub-total	
Total for Others					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

012 Toilet Block Hand Washing Facility Rev. 5 Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Toilet Block Handwashing Facility**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/12**

Item	Description	Unit	Quantity	Cost	Total	Notes
1.0	**Mass Hand Washing Basin**					
1.1.1	Cement	Tons	0.5			
1.1.2	Sand	Tons	0.1			
1.1.3	Ballast	Tons	0.1			
1.1.4	Water	Litres	15			
1.1.5	R8	m	2.4			
1.1.6	Y12	m	8.1			
1.1.7	6''x1'' Timber Formwork	m	4.2			
1.1.8	2''x2'' Timber Bracing	m	4.2			
1.1.9	Pegglar Push Taps 1/2"	No.	6			
1.1.10	1inch/25mm Gate Valve	Pcs	1			
1.1.11	9 inch Local Stone	m	2.1			
		Initial Material Estimate				
	Miscelaneaous (5%)					
	Material Subtotal					
	GRAND TOTAL					

Project	**UNICEF WASH Schools**
BoQ Title	**1CM Water Tank Platform**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/13**

Item	Description	Unit	Quantity	Unit price	Total
1	**Footing**				
1.1	**Excavations**				
1.1.1	Top soil excavation	m^3	1		
1.1.2	Pit and wall excavation	m^3	2		
1.2	**Footing**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	6		
1.2.4	Water	Litres	195		
1.2.5	Y12	m	41		
1.2.6	R8	m	41		
1.2.7	Binding Wire	Kgs	5		
Total for footing					
2	**Walling**				
2.1	Sand	Tons	1		
2.2	Cement	Bags	3		
2.3	Water	Litres	98		
2.4	Bonding Strips	m	33		
2.5	4 inch hard stone	m	9		
2.6	9 inch hard stone	m	24		
2.7	Hardcore	Kgs	4		
2.8	Murram	m^3	1		
2.9	Damp Proof Membrane (gauge 500)	m^2	2		
Total for Walling					
3	**Slab**				
3.1	Sand	Tons	1		
3.2	Ballast	Tons	1		
3.3	Cement	Bags	3		
3.4	Water	Litres	98		
3.5	Y12	m	32		
3.6	6x1 Formwork	m	6		
3.7	2x2 formwork	m	6		
3.8	4 inch Nails	Kgs	1		
Total for Slab					

4	**Accessories**				
4.1	1CM Plastic water tank	No.	1		
Total for Accessories					
				Sub-total	
Total for Others					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

014 4 VIP Lined boys Facility brick rev Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Girls' 4 VIP Lined Latrine Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/10**
	Read with: B/11 and B/12

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavations**				
1.1.1.1	Top soil excavation	m^3	6		
1.1.1.2	Pit and wall excavation	m^3	118		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	10		
1.1.2.2	Ballast	Tons	4		
1.1.2.3	Cement	Bags	52		
1.1.2.4	Water	Litres	1690		
1.1.2.5	Waterproof cement	Kgs	10		
1.1.2.6	Y12	m	149		
1.1.2.7	R8	m	86		
1.1.2.8	Bonding Strips	m	201		
1.1.2.9	Binding Wire	Kgs	5		
1.1.2.10	9 inch hard stone	m	201		
1.1.2.11	Hardcore	Tons	7		
1.1.2.12	Murram	m^3	2		
Total for foundation					
1.2	**Slab**				
1.2.1	Sand	Tons	4		
1.2.2	Ballast	Tons	6		
1.2.3	Cement	Bags	29		
1.2.4	Water	Litres	943		
1.2.5	Y12	m	282		
1.2.6	Y10	m	249		
1.2.7	Binding Wire	Kgs	8		
1.2.8	6x1 Formwork	m	93		
1.2.9	Damp Proof Membrane (gauge 500)	m^2	17		
1.2.10	Manhole cover (600*450mm, plastic)	No.	2		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	Brick	No.	920		
2.1.2	Bonding Strips	m	212		
2.1.3	Sand	Tons	1		
2.1.4	Ballast	Tons	1		
2.1.5	Cement	Bags	8		
2.1.6	Water	Liters	260		
2.1.7	Y12	m	53		
2.1.8	R8	m	55		
2.1.9	Binding Wire	Kgs	2		
2.1.10	Door (2100x900mm)	each	4		
2.1.11	Grill Door (2100x900mm)	each	1		
2.1.12	110mm PVC Pipe (Class B)	each	3		
2.1.13	Hand washing station	each	1		
2.1.14	Undercoat paint	Liters	2		
2.1.15	Gloss Paint	Liters	2		
2.1.16	Anti-termite treatment	Liters	4		
Total for Walling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	9		
2.2.2	4x2 timber	m	18		
2.2.3	2x2 timber	m	40		
2.2.4	12x1 timber	m	16		
2.2.5	Gutters (4" PVC)	m	6		
2.2.5.1	Downspouts (4" PVC)	m	2		
2.2.5.2	End piece (4" PVC)	No.	2		
2.2.5.3	Down pipe (4" PVC)	m	2		
2.2.5.4	Hangers	No.	7		
2.2.6	4 inch Nails	Kg	2		
2.2.7	6 inch Nails	Kg	2		
2.2.8	Roofing Nails	Kg	2		
Total for Roofing					
Total for Super-structure					

3	**Others**				
3.1	Soak pit (Hardcore)	Ton	10		
3.2	**Piping & Inspection Chamber (0.25x0.25m)**				
3.2.1	Cement	Bags	1		
3.2.2	Sand	Tons	0.1		
3.2.3	Ballast	Tons	0.1		
3.2.4	75mm PVC Pipe (Class B)	Pcs	1		
Total for Others					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

014 4 VIP Lined Boys Facility Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Boys' 4 VIP Lined Latrine Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/14**
	Read with: B/12 and B/13

Item	Description	Unit	Quantity	Unit price	Total
1	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavations**				
1.1.1.1	Top soil excavation	m^3	6		
1.1.1.2	Pit and wall excavation	m^3	71		
1.1.2	**Footing and walling**				
1.1.2.1	Sand	Tons	10		
1.1.2.2	Ballast	Tons	4		
1.1.2.3	Cement	Bags	52		
1.1.2.4	Water	Litres	1690		
1.1.2.5	Waterproof cement	Kgs	34		
1.1.2.6	Y12	m	149		
1.1.2.7	R8	m	86		
1.1.2.8	Bonding Strips	m	201		
1.1.2.9	Binding Wire	Kgs	5		
1.1.2.10	9 inch hard stone	m	201		
1.1.2.11	Hardcore	Tons	9		
1.1.2.12	Murram	m^3	2		
Total for foundation					
1.2	**Slab**				
1.2.1	Sand	Tons	4		
1.2.2	Ballast	Tons	6		
1.2.3	Cement	Bags	29		
1.2.4	Water	Litres	943		
1.2.5	Y12	m	282		
1.2.6	Y10	m	257		
1.2.7	Binding Wire	Kgs	8		
1.2.8	6x1 Formwork	m	93		
1.2.9	Damp Proof Membrane (gauge 500)	m^2	17		
1.2.10	Manhole cover (600*450mm, plastic)	No.	2		
Total for Slab					
Total for Sub-structure					

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	212		
2.1.2	Bonding Strips	m	212		
2.1.3	Sand	Tons	2		
2.1.4	Ballast	Tons	1		
2.1.5	Cement	Bags	25		
2.1.6	Water	Liters	813		
2.1.7	Y12	m	53		
2.1.8	R8	m	66		
2.1.9	Binding Wire	Kgs	2		
2.1.10	Door (2100x900mm)	each	4		
2.1.11	Grill Door (2100x900mm)	each	1		
2.1.12	110mm PVC Pipe (Class B)	each	2		
2.1.13	Fly Screen	each	4		
2.1.14	Undercoat paint	Liters	6		
2.1.15	Gloss Paint	Liters	6		
2.1.16	Anti-termite treatment	Liters	4		
Total for Walling					
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	each	9		
2.2.2	4x2 timber	m	18		
2.2.3	2x2 timber	m	38		
2.2.4	12x1 timber	m	16		
2.2.5	Gutters (4” PVC)	m	6		
2.2.5.1	Downspouts (4” PVC)	m	2		
2.2.5.2	End piece (4” PVC)	No.	2		
2.2.5.3	Down pipe (4” PVC)	m	1		
2.2.5.4	Hangers (Fascia bracket)	No.	7		
2.2.6	4 inch Nails	Kg	2		
2.2.7	6 inch Nails	Kg	2		
2.2.8	Roofing Nails	Kg	2		
Total for Roofing					
Total for Super-structure					

3	**Others**				
3.1	Soak pit (Hardcore)	Ton	10		
3.2	**Piping & Inspection Chamber (0.25x0.25m)**				
3.2.1	Cement	Bags	1		
3.2.2	Sand	Tons	0.1		
3.2.3	Ballast	Tons	0.1		
3.2.4	75mm PVC Pipe (Class B)	Pcs	1		
3.3	**Hand Washing Basin**				
3.3.1	Cement	Bags	0.5		
3.3.2	Sand	Tons	0.1		
3.3.3	Ballast	Tons	0.1		
3.3.4	Water	Litres	15.04		
3.3.5	R8	m	2.4		
3.3.6	Y12	m	8.1		
3.3.7	6x1 Timber Formwork	m	4.2		
3.3.8	2x2 Bracing	m	4.2		
3.3.9	Pegglar push taps 1/2”	No.	6		
3.3.10	1 inch/25mm Gate Valve	Pcs	1		
3.3.11	9 inch local stone	m	2.1		
				Sub-total	
Total for Others					
Materials total cost					
Miscellaneous (5%)					
Transport (10%)					
Labour (20%)					
Grand Total					

015 8 VIP Girls Lined Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Girls' VIP 8 Door Toilet Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/15**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Footing and walling**				
1.1.1	Cement	Bags	55.0		
1.1.2	Sand	Tons	6.1		
1.1.3	Ballast	Tons	8.7		
1.1.4	Waterproof cement	Bags	17.0		
1.1.5	Y12	m	241.0		
1.1.6	R8	m	103.0		
1.1.7	Bonding Strips	m	197.0		
1.1.8	6x1 Timber Formwork	m	138.0		
1.1.9	2x2 Bracing	m	138.0		
1.1.10	Hardcore	Tons	12.8		
1.1.11	Murram	m^3	3.4		
1.1.12	4 inch Nails	Kg	20.0		
1.1.13	9 inch local stone	m	216.0		
1.1.14	Binding Wire	Kg	38.0		
1.1.15	Water	Litre	1787.5		
				Sub-total	
Total for foundation					
1.2	**Slab**				
1.2.1	Cement	Bags	43.0		
1.2.2	Sand	Tons	4.7		
1.2.3	Ballast	Tons	9.3		
1.2.4	R8	m	329.0		
1.2.5	Binding Wire	Kg	10.0		
1.2.6	6x1 Timber Formwork	m	35.0		
1.2.7	2x2 Bracing	m	35.0		
1.2.8	Damp Proof Membrane (gauge 30)	m^2	31.8		
1.2.9	Lockable cast iron Manhole Cover with Frame (600x450mm)	No.	1.0		
1.2.10	Water	Litre	1397.5		
				Sub-total	
Total for Sub-structure					

2.0	**Super-structure**				
2.1	**Walls**				
2.1.1	Burnt Brick	No.	3716.0		
2.1.2	Bonding Strips	m	667.0		
2.1.3	Cement	Bags	24.0		
2.1.4	Sand	Tons	2.9		
2.1.5	Ballast	Ton	1.6		
2.1.6	Y12	m	120.0		
2.1.7	R8	m	12.0		
2.1.8	Binding Wire	Kgs	5.0		
2.1.9	110mm PVC Pipe (Class B)	Pcs	4.0		
2.1.10	Vent Caps	Pcs	9.0		
2.1.11	Fly Screen	Pcs	9.0		
2.1.12	Water	Liter	780.0		
				Sub-total	
2.2	**Fixtures and Fittings**				
2.2.1	Interior Doors & Frame (900x2100mm)	No.	7.0		
2.2.2	PLWD Door & Frame	No.	1.0		
2.2.3	PLWD Handles (1.5” Class B GI. Pipe)	No.	1.0		
2.2.4	PLWD Prefabricated Seat	No.	1.0		
2.2.5	External Doors & Frame	No.	2.0		
				Sub-total	
2.3	**Hand Washing Basin**				
2.3.1	Cement	Bags	0.5		
2.3.2	Sand	Tons	0.1		
2.3.3	Ballast	Tons	0.1		
2.3.4	R8	m	2.4		
2.3.5	Y12	m	8.1		
2.3.6	6x1 Timber Formwork	m	4.2		
2.3.7	2x2 Bracing	m	4.2		
2.3.8	Pegglar push taps 1/2”	No.	6.0		
2.3.9	1 inch/25mm Gate Valve	Pcs	1.0		
2.3.10	9 inch local stone	m	2.1		
2.3.11	Water	Litre	15.0		
				Sub-total	

2.4	**Roofing**				
2.4.1	GI 2.0m sheets (Gauge 30)	each	44.0		
2.4.2	Timber Rafters (0.1x0.05m)	m	143.0		
2.4.3	Timber Purlins (0.05x0.05m)	m	99.0		
2.4.4	Timber Fascia Board (0.2x0.02m)	m	12.4		
2.4.5	End cap (4" PVC)	Pcs	2.0		
2.4.6	4 inch Nails	Kg	5.0		
2.4.7	6 inch Nails	Kg	5.0		
2.4.8	Roofing Nails	Kg	5.0		
2.4.9	UPVC Gutters	m	12.2		
2.4.10	UPVC Downpipe & spout	m	4.0		
2.4.11	Ridge board	m	6.1		
				Sub-total	
2.5	**Finishing**				
2.5.1	Cement	Bags	19.0		
2.5.2	Sand	Tons	3.1		
2.5.3	Ballast	Tons	0.9		
2.5.4	Undercoat	Litre	5.0		
2.5.5	Bermuda blue and cream gloss paint	Litre	5.0		
2.5.6	Turpentine	Litre	4.0		
2.5.7	Paint brushes 6", 4" & 2"	Pcs	10.0		
2.5.8	3mm thick Butt Hinges 4"	Pcs	30.0		
2.5.9	Tower bolts	Pcs	8.0		
2.5.10	Anti termite treatment	Litres	8.0		
2.5.11	Sand Paper	Rolls	3.0		
2.5.12	Water	Litre	617.5		
				Sub-total	
Total for Super-structure					
3.0	**Other**				
3.1	**Access Ramp**				
3.1.1	Cement	Bags	2.0		
3.1.2	Sand	Tonnes	0.2		
3.1.3	Ballast	Tonnes	0.3		
3.1.4	6x1 Timber Formwork	m	4.0		
3.1.5	2x2 Bracing	m	4.0		
3.1.6	Water	Litre	65.0		
				Sub-total	
Total for Other					

	Collection				
	Sub-structure				
	Super-structure				
	Other				
	Material Subtotal				
	Labour (Skilled& unskilled)	LS	1		
	Grand Total				

016 6 VIP Boys lined Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Boys' VIP 6 Door Toilet Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/16**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Footing and walling**				
1.1.1	Cement	Bags	42.0		
1.1.2	Sand	Tons	4.7		
1.1.3	Ballast	Tons	6.5		
1.1.4	Waterproof cement (2kg)	Bags	12.5		
1.1.5	Y12	m	156.0		
1.1.6	R8	m	80.0		
1.1.7	Bonding Strips	m	172.0		
1.1.8	6x1 Timber Formwork	m	93.0		
1.1.9	2x2 Bracing	m	93.0		
1.1.10	Hardcore	Tons	13.7		
1.1.11	Murram	m^3	0.9		
1.1.12	4 inch Nails	Kg	20.0		
1.1.13	9 inch local stone	m	189.0		
1.1.14	Binding Wire	Kg	20.0		
1.1.15	Water	Litre	1365.0		
				Sub-total	
Total for foundation					
1.2	**Slab**				
1.2.1	Cement	Bags	33.0		
1.2.2	Sand	Tons	3.6		
1.2.3	Ballast	Tons	7.1		
1.2.4	R8	m	329.0		
1.2.5	Binding Wire	Kg	10.0		
1.2.6	6x1 Timber Formwork	m	29.0		
1.2.7	2x2 Bracing	m	29.0		
1.2.8	Damp Proof Membrane (gauge 30)	m^2	24.2		
1.2.9	Lockable cast iron Manhole Cover with Frame (750x50mm)	No.	1.0		
1.2.10	Water	Litre	1072.5		
				Sub-total	
Total for Sub-structure					

2.0	**Super-structure**				
2.1	**Walls**				
2.1.1	Burnt Brick	No.	3453.0		
2.1.2	Bonding Strips	m	619.0		
2.1.3	Cement	Bags	17.0		
2.1.4	Sand	Tons	2.2		
2.1.5	Ballast	Ton	0.5		
2.1.6	Y12	m	54.0		
2.1.7	R8	m	14.0		
2.1.8	Binding Wire	Kgs	5.0		
2.1.9	110mm PVC Pipe (Class B)	Pcs	4.0		
2.1.10	Vent Caps	Pcs	8.0		
2.1.11	Fly Screen	Pcs	8.0		
2.1.12	Water	Liter	552.5		
				Sub-total	
2.2	**Fixtures and Fittings**				
2.2.1	Interior Doors & Frame (800x2100mm)	No.	7.0		
2.2.2	PLWD Door & Frame (900x2100mm)	No.	1.0		
2.2.3	PLWD Handles (1" Class B GI. Pipe)	No.	1.0		
2.2.4	PLWD Prefabricated Seat	No.	1.0		
				Sub-total	
2.3	**Hand Washing Basin**				
2.3.1	Cement	Bags	0.5		
2.3.2	Sand	Tons	0.05		
2.3.3	Ballast	Tons	0.09		
2.3.4	R8	m	2.4		
2.3.5	Y12	m	8.1		
2.3.6	6x1 Timber Formwork	m	4.2		
2.3.7	2x2 Bracing	m	4.2		
2.3.8	Pegglar push taps 1/2"	No.	6.0		
2.3.9	1 inch/25mm Gate Valve	Pcs	1.0		
2.3.10	Water	Litre	15.0		
				Sub-total	

2.4	**Roofing**				
2.4.1	GI 2.0m sheets (Gauge 30)	Pcs	35.0		
2.4.2	Timber Rafters (0.1x0.05m)	m	148.0		
2.4.3	Timber Purlins (0.05x0.05m)	m	79.0		
2.4.4	Timber Fascia Board (0.2x0.02m)	m	9.9		
2.4.5	End cap (4" PVC)	Pcs	2.0		
2.4.6	4 inch Nails	Kg	5.0		
2.4.7	6 inch Nails	Kg	5.0		
2.4.8	Roofing Nails	Kg	5.0		
2.4.9	UPVC Gutters	m	9.8		
2.4.10	100mm UPVC Downpipe & spout	m	4.0		
2.4.11	Ridge board	m	4.9		
				Sub-total	
2.5	**Finishing**				
2.5.1	Cement	Bags	18.0		
2.5.2	Sand	Tons	2.9		
2.5.3	Ballast	Tons	0.9		
2.5.4	Undercoat	Litre	5.0		
2.5.5	Bermuda blue and cream gloss paint	Litre	5.0		
2.5.6	Turpentine	Litre	4.0		
2.5.7	Paint brushes 6", 4" & 2"	Pcs	10.0		
2.5.8	3mm thick Butt Hinges 4"	Pcs	30.0		
2.5.9	Tower bolts	Pcs	8.0		
2.5.10	Anti termite treatment	Litres	8.0		
2.5.11	Sand Paper	Rolls	3.0		
2.5.12	Water	Litre	585.0		
				Sub-total	
Total for Super-structure					
3.0	**Other**				
3.1	**Access Ramp**				
3.1.1	Cement	Bags	2.0	750	
3.1.2	Sand	Tonnes	0.2	0	
3.1.3	Ballast	Tonnes	0.3	2400	
3.1.4	6x1 Timber Formwork	m	4.0	150	
3.1.5	2x2 Bracing	m	4.0	150	
3.1.6	Water	Litre	65.0	2	
				Sub-total	
Total for Other					

	Collection				
	Sub-structure				
	Super-structure				
	Other				
	Material Sub-total				
	Labour (Skilled& unskilled)	LS	1		
	Grand Total				

017 Girls VIP Latrine Block rev. 5 Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Girls' VIP Toilet Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/17**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Footing and walling**				
1.1.1	Cement	Bags	67.0		
1.1.2	Sand	Tons	7.4		
1.1.3	Ballast	Tons	10.2		
1.1.4	Waterproof cement (2kg)	Bags	20.0		
1.1.5	Y12	m	79.0		
1.1.6	R8	m	158.0		
1.1.7	Bonding Strips	m	284.0		
1.1.8	6"x1" Timber Formwork	m	36.0		
1.1.9	2"x2" Timber Bracing	m	36.0		
1.1.10	Hardcore	Tons	24.6		
1.1.11	Murram	m^3	1.6		
1.1.12	4 inch Nails	Kg	20.0		
1.1.13	9 inch local stone	m	284.0		
1.1.14	Binding Wire	Kg	25.0		
				Sub-total	
				Total for foundation	
1.2	**Pit Slab**				
1.2.1	Cement	Bags	31.0		
1.2.2	Sand	Tons	3.3		
1.2.3	Ballast	Tons	6.6		
1.2.4	Y12	m	275.0		
1.2.5	Binding Wire	Kg	10.0		
1.2.6	6"x1" Timber Formwork	m	21.0		
1.2.7	2"x2" Bracing	m	21.0		
1.2.8	Damp Proof Membrane (gauge 30)	m^2	27.9		
1.2.9	Lockable cast iron Manhole Cover with Frame (650x450mm)	No.	3.0		
				Sub-total	
				Total for Sub-structure	

1.3	**Floor Slab**				
1.3.1	Cement	Bags	45.0		
1.3.2	Sand	Ton	4.8		
1.3.3	Ballast	Ton	9.6		
1.3.4	Y10	m	501.0		
1.3.5	Binding Wire	Kgs	10.0		
1.3.6	6''x1'' Timber Formwork	m	29.0		
1.3.7	2''x2'' Timber Bracing	m	29.0		
1.3.8	Damp Proof Membrane (gauge 30)	m^3	43.3		
				Sub-total	
2.0	**Super-structure**				
2.1	**Walls**				
2.1.1	6 inch local stone	m	771.0		
2.1.2	Bonding Strips	m	771.0		
2.1.3	Cement	Bags	28.0		
2.1.4	Sand	Tonnes	4.3		
2.1.5	Ballast	Tonnes	2.4		
2.1.6	Y12	m	178.0		
2.1.7	R8	m	108.0		
2.1.8	Binding Wire	Kgs	5.0		
2.1.9	100mm PVC Pipe (Class B)	Pcs	3.0		
2.1.10	Fly Screen	Pcs	5.0		
2.1.11	3 inch G.I. Pipe	Pcs	1.0		
				Sub-total	
2.2	**Fixtures and Fittings**				
2.2.1	Interior Doors	No.	9.0		
2.2.2	PLWD Door	No.	1.0		
2.2.3	Exterior Door (Steel)	No.	1.0		
2.2.4	PLWD Handles (1.5" Gi. Pipe)	No.	1.0		
2.2.5	PLWD Prefabricated Seat	No.	1.0		
				Sub-total	

2.3	**Mass Hand Washing Basin**				
2.3.1	Cement	Bags	0.5		
2.3.2	Sand	Tonnes	0.1		
2.3.3	Ballast	Tonnes	0.1		
2.3.4	R8	m	2.4		
2.3.5	Y12	m	8.1		
2.3.6	6''x1'' Timber Formwork	m	4.2		
2.3.7	2''x2'' Timber Bracing	m	4.2		
2.3.8	Pegglar push taps 1/2"	No.	6.0		
2.4.9	1 inch/25mm Gate Valve	Pcs	1.0		
2.4.10	9 inch Local Stone	m	2.1		
				Sub-total	
2.4	**Roofing**				
2.4.1	GI (2.0x0.7m sheets)	Pcs	46.0		
2.4.2	Timber Rafters (0.1x0.05m)	m	66.0		
2.4.3	Timber Perlins (0.05x0.05m)	m	110.0		
2.4.4	Timber Fascia Board (0.2x0.02m)	m	29.0		
2.4.5	Timber Collar Rafters (0.1x0.05m)	m	66.0		
2.4.6	Timber Ridge Board (0.1x0.03m)	m	10.0		
2.4.7	Timber Wall Plate (0.1x0.05m)	m	19.0		
2.4.8	Timber Wall Plate (0.15x0.05m)	m	37.0		
2.4.9	uPVC Gutters (5m)	Pcs	1.6		
2.4.10	End cap (4" uPVC)	Pcs	2.0		
2.4.11	4'' uPVC Down Pipe & Spout (4m)	Pcs	1.0		
2.4.12	100mm Downtake	Pcs	1.0		
2.4.13	Fascia Bracket	No.	6.0		
2.4.14	4 inch Nails	Kg	5.0		
2.4.15	6 inch Nails	Kg	5.0		
2.4.16	Roofing Nails	Kg	5.0		
				Sub-total	

2.5	**Finishing**				
2.5.1	Cement	Bags	20.0		
2.5.2	Sand	Tonnes	3.2		
2.5.3	Ballast	Tonnes	0.9		
2.5.4	Undercoat	Litres	5.0		
2.5.5	Bermuda Blue and Cream Gloss Paint	Litres	5.0		
2.5.6	Turpentine	Litres	4.0		
2.5.7	Paint Brushes 6", 4" & 2"	Pcs	10.0		
2.5.8	3mm Thick Butt Hinges 4"	Pcs	30.0		
2.5.9	Tower Bolts	Pcs	12.0		
2.4.10	Anti-termite Treatment	Litres	8.0		
2.4.11	Sand Paper	Roll	3.0		
				Sub-total	
				SUPER-STRUCTURE TOTAL	
3.0	**Other**				
3.1	**Access Ramp**				
3.1.1	Cement	Bags	4.0		
3.1.2	Sand	Tonnes	0.3		
3.1.3	Ballast	Tonnes	0.6		
3.1.4	6''x1'' Timber Formwork	m	9.0		
3.1.5	2''x2'' Timber Bracing	m	9.0		
				Sub-total	
3.2	**Piping & Inspection Chamber (0.25x0.25m)**				
3.2.1	Cement	Bags	1.0		
3.2.2	Sand	Tonnes	0.1		
3.2.3	Ballast	Tonnes	0.1		
3.2.4	75mm uPVC Pipe (Class B)	Pcs	1.0		
				Sub-total	
3.3	**Soak Pit (2x2m)**				
3.3.1	Hardcore	Tonnes	10		
				Sub-total	
3.4	**Rainwater Collection**				
3.1.1	1m^3 uPVC Rainwater tank	No.	1.0		
3.1.2	Elevated Platform	No.	1.0		
				Sub-total	
				OTHER TOTAL	

	COLLECTION				
	Sub-structure				
	Super-structure				
	Other				
	Initial Material Estimate				
	Miscelaneaous (5%)				
	Material Sub-total				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

018 Boys VIP Latrine Block rev. 5 Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Boys' VIP Toilet Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/18**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Footing and Walling**				
1.1.1	Cement	Bags	67.0		
1.1.2	Sand	Tons	7.4		
1.1.3	Ballast	Tons	10.2		
1.1.4	Waterproof cement (2kg)	Bags	20.0		
1.1.5	Water	Litre	2177.5		
1.1.6	Y12	m	79.0		
1.1.7	R8	m	158.0		
1.1.8	Bonding Strips	m	284.0		
1.1.9	6"x1" Timber Formwork	m	36.0		
1.1.10	2"x2" Timber Bracing	m	36.0		
1.1.11	Hardcore	Tons	24.6		
1.1.12	Murram	m^3	1.6		
1.1.13	4 inch Nails	Kg	20.0		
1.1.14	9 inch local stone	m	284.0		
1.1.15	Binding Wire	Kg	25.0		
				Sub-total	
				Total for foundation	
1.2	**Pit Slab**				
1.2.1	Cement	Bags	31.0		
1.2.2	Sand	Tons	3.3		
1.2.3	Ballast	Tons	6.6		
1.2.4	Water	Litres	1007.5		
1.2.5	Y12	m	275.0		
1.2.6	Binding Wire	Kg	10.0		
1.2.7	6"x1" Timber Formwork	m	21.0		
1.2.8	2"x2" Bracing	m	21.0		
1.2.9	Damp Proof Membrane (gauge 30)	m^2	27.9		
1.2.10	Lockable cast iron Manhole Cover with Frame (650x450mm)	No.	3.0		
				Sub-total	
				SUB-STRUCTURE TOTAL	

1.3	**Floor Slab**				
1.3.1	Cement	Bags	45.0		
1.3.2	Sand	Ton	4.8		
1.3.3	Ballast	Ton	9.6		
1.3.4	Water	Litre	1462.5		
1.3.5	Y10	m	501.0		
1.3.6	Binding Wire	Kgs	10.0		
1.3.7	6''x1'' Timber Formwork	m	29.0		
1.3.8	2''x2'' Timber Bracing	m	29.0		
1.3.9	Damp Proof Membrane (gauge 30)	m^3	43.3		
				Sub-total	
2.0	**Super-structure**				
2.1	**Walls**				
2.1.1	6 inch local stone	m	771.0		
2.1.2	Bonding Strips	m	771.0		
2.1.3	Cement	Bags	28.0		
2.1.4	Sand	Tonnes	4.3		
2.1.5	Ballast	Tonnes	2.4		
2.1.6	Water	Litre	910.0		
2.1.7	Y12	m	178.0		
2.1.8	R8	m	108.0		
2.1.9	Binding Wire	Kgs	5.0		
2.1.10	100mm PVC Pipe (Class B)	Pcs	3.0		
2.1.11	Fly Screen	Pcs	5.0		
2.1.12	3 inch G.I. Pipe	Pcs	1.0		
				Sub-total	
2.2	**Fixtures and Fittings**				
2.2.1	Interior Doors	No.	5.0		
2.2.2	PLWD Door	No.	1.0		
2.2.3	Exterior Door (Steel)	No.	1.0		
2.2.4	PLWD Handles (1.5” Gi. Pipe)	No.	1.0		
2.2.5	PLWD Prefabricated Seat	No.	1.0		
				Sub-total	

2.3	**Mass Hand Washing Basin**				
2.3.1	Cement	Bags	0.5		
2.3.2	Sand	Tonnes	0.1		
2.3.3	Ballast	Tonnes	0.1		
2.3.4	Water	Litre	15.0		
2.3.5	R8	m	2.4		
2.3.6	Y12	m	8.1		
2.3.7	6''x1'' Timber Formwork	m	4.2		
2.3.8	2''x2'' Timber Bracing	m	4.2		
2.4.9	Pegglar push taps 1/2"	No.	6.0		
2.4.10	1 inch/25mm Gate Valve	Pcs	1.0		
2.4.11	9 inch Local Stone	m	2.1		
				Sub-total	
2.4	**Roofing**				
2.4.1	GI (2.0x0.7m sheets)	Pcs	46.0		
2.4.2	Timber Rafters (0.1x0.05m)	m	66.0		
2.4.3	Timber Perlins (0.05x0.05m)	m	110.0		
2.4.4	Timber Fascia Board (0.2x0.02m)	m	29.0		
2.4.5	Timber Collar Rafters (0.1x0.05m)	m	66.0		
2.4.6	Timber Ridge Board (0.1x0.03m)	m	10.0		
2.4.7	Timber Wall Plate (0.1x0.05m)	m	19.0		
2.4.8	Timber Wall Plate (0.15x0.05m)	m	37.0		
2.4.9	uPVC Gutters (5m)	Pcs	1.6		
2.4.10	End cap (4" uPVC)	Pcs	2.0		
2.4.11	4'' uPVC Down Pipe & Spout (4m)	Pcs	1.0		
2.4.12	100mm Downtake	Pcs	1.0		
2.4.13	Fascia Bracket	No.	6.0		
2.4.14	4 inch Nails	Kg	5.0		
2.4.15	6 inch Nails	Kg	5.0		
2.4.16	Roofing Nails	Kg	5.0		
				Sub-total	

2.5	**Finishing**				
2.5.1	Cement	Bags	20.0		
2.5.2	Sand	Tonnes	3.2		
2.5.3	Ballast	Tonnes	0.9		
2.5.4	Water	Litres	617.5		
2.5.5	Undercoat	Litres	5.0		
2.5.6	Bermuda Blue and Cream Gloss Paint	Litres	5.0		
2.5.7	Turpentine	Litres	4.0		
2.5.8	Paint Brushes 6", 4" & 2"	Pcs	10.0		
2.5.9	3mm Thick Butt Hinges 4"	Pcs	20.0		
2.4.10	Tower Bolts	Pcs	8.0		
2.4.11	Anti-termite Treatment	Litres	8.0		
2.4.12	Sand Paper	Roll	3.0		
				Sub-total	
				SUPER-STRUCTURE TOTAL	
3.0	**Other**				
3.1	**Access Ramp**				
3.1.1	Cement	Bags	4.0		
3.1.2	Sand	Tonnes	0.3		
3.1.3	Ballast	Tonnes	0.6		
3.1.4	Water	Litres	130.0		
3.1.5	6"x1" Timber Formwork	m	9.0		
3.1.6	2"x2" Timber Bracing	m	9.0		
				Sub-total	
3.2	**Piping & Inspection Chamber (0.25x0.25m)**				
3.2.1	Cement	Bags	1.0		
3.2.2	Sand	Tonnes	0.1		
3.2.3	Ballast	Tonnes	0.1		
3.2.4	Water	Litres	32.5		
3.2.4	75mm uPVC Pipe (Class B)	Pcs	1.0		
				Sub-total	
3.3	**Soak Pit (2x2m)**				
3.3.1	Hardcore	Tonnes	10		
				Sub-total	
3.4	**Rainwater Collection**				
3.1.1	1m^3 uPVC Rainwater tank	No.	1.0		
3.1.2	Elevated Platform	No.	1.0		
				Sub-total	
				OTHER TOTAL	

	COLLECTION				
	Sub-structure				
	Super-structure				
	Other				
	Initial Material Estimate				
	Miscelaneaous (5%)				
	Material Sub-total				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

019 2 PF BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**2 Door Water Closet Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/19**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavations**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	52		
1.1.2	**Footing and Walling**				
1.1.2.1	Sand	Tons	2		
1.1.2.2	Ballast	Tons	3		
1.1.2.3	Cement	Bags	18		
1.1.2.4	Waterproof cement	Bags	35		
1.1.2.5	Y12	m	138		
1.1.2.6	R8	m	98		
1.1.2.7	Bonding Strips	m	50		
1.1.2.8	Binding Wire	Kg	20		
1.1.2.9	9 inch local stone	m	28		
1.1.2.10	Water	Litres	571		
				Total for foundations	
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	1		
1.2.3	Cement	Bags	6		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kg	5		
1.2.6	6"x1" Timber Formwork	m	9		
1.2.7	Manhole cover (600x450mm, cast iron)	No.	4.3		
1.2.8	Damp Proof Membrane (gauge 30)	m^2	2		
1.2.9	Water	Litres	210.1		
				Total for Slab	
				Total for Sub-structure	

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	81		
2.1.2	Bonding Strips	m	81		
2.1.3	Sand	Tonnes	2		
2.1.4	Ballast	Tonnes	0.44		
2.1.5	Cement	Bags	12		
2.1.6	Y12	m	36		
2.1.7	R8	m	36		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Ceramic bowl with cistern	No.	2		
2.1.10	Door 1	each	2		
2.1.11	Water	Litre	373.9		
2.1.12	Undercoat	Litre	2		
2.1.13	Gloss	Litre	1		
				Total for Walling	
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	Pcs	7		
2.2.2	4x2 timber	m	11		
2.2.3	2x2 timber	m	6		
2.2.4	3 inch Nails	m	2		
2.2.5	4 inch Nails	Kg	2		
2.2.6	6 inch Nails	Kg	2		
2.2.7	Roofing Nails	Kg	2		
				Total for Roofing	
				Total for Super-structure	
	Materials total cost				
	Miscellaneous (5%)				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

020 PLWD PF BoQ Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**PLWD Water Closet Toilet**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/20**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavations**				
1.1.1.1	Top soil excavation	m^3	0		
1.1.1.2	Pit and wall excavation	m^3	28		
1.1.2	**Footing and Walling**				
1.1.2.1	Sand	Tons	2		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	13		
1.1.2.4	Waterproof cement	Bags	26		
1.1.2.5	Y12	m	106		
1.1.2.6	R8	m	77		
1.1.2.7	Bonding Strips	m	50		
1.1.2.8	Binding Wire	Kg	20		
1.1.2.9	9 inch local stone	m	20		
1.1.2.10	Water	Litres	418		
				Total for foundations	
1.2	**Slab**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	2		
1.2.3	Cement	Bags	12		
1.2.4	Y12	m	87		
1.2.5	Binding Wire	Kg	5		
1.2.6	6”x1” Timber Formwork	m	7		
1.2.7	Damp Proof Membrane (gauge 500)	m^2	10.9		
1.2.8	Manhole cover (600x450mm, cast iron)	No.	1		
1.2.9	Water	Litres	401.1		
				Total for Slab	
				Total for Sub-structure	

2	**Super-structure**				
2.1	**Walling**				
2.1.1	6 inch local stone	m	70		
2.1.2	Bonding Strips	m	70		
2.1.3	Sand	Tonnes	1		
2.1.4	Ballast	Tonnes	0.38		
2.1.5	Cement	Bags	10		
2.1.6	Y12	m	31		
2.1.7	R8	m	31		
2.1.8	Binding Wire	Kgs	25		
2.1.9	Door 1	each	1		
2.1.10	Prefabricated plastic seat	each	1		
2.1.11	1.5 Inch G.I. Pipe	pcs	1		
2.1.12	Hand wash station	each	1		
2.1.13	Water	Litre	323.7		
2.1.14	Undercoat	Litre	2		
2.1.15	Gloss	Litre	1		
				Total for Walling	
2.2	**Roofing**				
2.2.1	GI 2.0m sheets (Gauge 30)	Pcs	5		
2.2.2	4x2 timber	m	13		
2.2.3	2x2 timber	m	7		
2.2.4	3 inch Nails	m	2		
2.2.5	4 inch Nails	Kg	2		
2.2.6	6 inch Nails	Kg	2		
2.2.7	Roofing Nails	Kg	2		
				Total for Roofing	
				Total for Super-structure	
	Materials total cost				
	Miscellaneous (5%)				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

021 Girls Water Closet Block rev. 5 Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Girls Water Closet Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/21**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Footing and Walling**				
1.1.1	Cement	Bags	34.0		
1.1.2	Sand	Tons	3.6		
1.1.3	Ballast	Tons	5.6		
1.1.4	Waterproof cement (2kg)	Bags	8.5		
1.1.5	Water	Litre	1105.0		
1.1.6	Y12	m	79.0		
1.1.7	R8	m	63.0		
1.1.8	Bonding Strips	m	105.0		
1.1.9	6″x1″ Timber Formwork	m	53.0		
1.1.10	2″x2″ Timber Bracing	m	53.0		
1.1.11	Hardcore	Tons	26.5		
1.1.12	Murram	m^3	1.8		
1.1.13	4 inch Nails	Kg	20.0		
1.1.14	9 inch local stone	m	105.0		
1.1.15	Binding Wire	Kg	5.0		
				Sub-total	
1.2	**Floor Slab**				
1.2.1	Cement	Bags	72.0		
1.2.2	Sand	Tons	7.8		
1.2.3	Ballast	Tons	15.6		
1.2.4	Water	Litres	2340.0		
1.2.5	Y10	m	602.0		
1.2.6	Binding Wire	Kg	10.0		
1.2.7	6″x1″ Timber Formwork	m	29.0		
1.2.8	2″x2″ Bracing	m	29.0		
1.2.9	Damp Proof Membrane (gauge 30)	m^2	56.2		
1.2.10	Lockable cast iron Manhole Cover with Frame (600x450mm)	No.	5.0		
1.2.11	75mm uPVC Pipe (Class B)	Pcs	2.0		
				Sub-total	
				SUB-STRUCTURE TOTAL	

2.0	**Super-structure**				
2.1	**Walls**				
2.1.1	6 inch local stone	m	763.0		
2.1.2	Bonding Strips	m	763.0		
2.1.3	Cement	Bags	28.0		
2.1.4	Sand	Tonnes	4.3		
2.1.5	Ballast	Tonnes	2.4		
2.1.6	Water	Litre	910.0		
2.1.7	Y12	m	178.0		
2.1.8	R8	m	108.0		
2.1.9	Binding Wire	Kgs	5.0		
2.1.10	100mm PVC Pipe (Class B)	Pcs	3.0		
2.1.11	Fly Screen	Pcs	5.0		
2.1.12	3 inch G.I. Pipe	Pcs	1.0		
				Sub-total	
2.2	**Fixtures and Fittings**				
2.2.1	Interior Doors	No.	9.0		
2.2.2	PLWD Door	No.	1.0		
2.2.3	Exterior Door (Steel)	No.	1.0		
2.2.4	PLWD Handles (1.5" Gi. Pipe)	No.	1.0		
2.2.5	PLWD Prefabricated Seat	No.	1.0		
2.2.6	Toilet (Squat Type)	No.	5.0		
2.2.7	Cistern	No.	5.0		
				Sub-total	
2.3	**Mass Hand Washing Basin**				
2.3.1	Cement	Bags	0.5		
2.3.2	Sand	Tonnes	0.1		
2.3.3	Ballast	Tonnes	0.1		
2.3.4	Water	Litre	15.0		
2.3.5	R8	m	2.4		
2.3.6	Y12	m	8.1		
2.3.7	6''x1'' Timber Formwork	m	4.2		
2.3.8	2''x2'' Timber Bracing	m	4.2		
2.4.9	Pegglar push taps 1/2"	No.	6.0		
2.4.10	1 inch/25mm Gate Valve	Pcs	1.0		
2.4.11	9 inch Local Stone	m	2.1		
				Sub-total	

2.4	**Roofing**				
2.4.1	GI (2.0x0.7m sheets)	Pcs	46.0		
2.4.2	Timber Rafters (0.1x0.05m)	m	66.0		
2.4.3	Timber Perlins (0.05x0.05m)	m	110.0		
2.4.4	Timber Fascia Board (0.2x0.02m)	m	29.0		
2.4.5	Timber Collar Rafters (0.1x0.05m)	m	66.0		
2.4.6	Timber Ridge Board (0.1x0.03m)	m	10.0		
2.4.7	Timber Wall Plate (0.1x0.05m)	m	19.0		
2.4.8	Timber Wall Plate (0.15x0.05m)	m	37.0		
2.4.9	uPVC Gutters (5m)	Pcs	1.6		
2.4.10	End cap (4” uPVC)	Pcs	2.0		
2.4.11	4’’ uPVC Down Pipe & Spout (4m)	Pcs	1.0		
2.4.12	100mm Downtake	Pcs	1.0		
2.4.13	Fascia Bracket	No.	6.0		
2.4.14	4 inch Nails	Kg	5.0		
2.4.15	6 inch Nails	Kg	5.0		
2.4.16	Roofing Nails	Kg	5.0		
				Sub-total	
2.5	**Finishing**				
2.5.1	Cement	Bags	20.0		
2.5.2	Sand	Tonnes	3.2		
2.5.3	Ballast	Tonnes	0.9		
2.5.4	Water	Litres	650.0		
2.5.5	Undercoat	Litres	5.0		
2.5.6	Bermuda Blue and Cream Gloss Paint	Litres	5.0		
2.5.7	Turpentine	Litres	4.0		
2.5.8	Paint Brushes 6”, 4” & 2”	Pcs	10.0		
2.5.9	3mm Thick Butt Hinges 4”	Pcs	30.0		
2.4.10	Tower Bolts	Pcs	12.0		
2.4.11	Anti-termite Treatment	Litres	8.0		
2.4.12	Sand Paper	Roll	3.0		
				Sub-total	
				SUPER-STRUCTURE TOTAL	
3.0	**Other**				
3.1	**Access Ramp**				
3.1.1	Cement	Bags	4.0		
3.1.2	Sand	Tonnes	0.3		
3.1.3	Ballast	Tonnes	0.6		
3.1.4	Water	Litres	130.0		
3.1.5	6’’x1’’ Timber Formwork	m	9.0		
3.1.6	2’’x2’’ Timber Bracing	m	9.0		
				Sub-total	

3.2	**Piping & Inspection Chamber (0.25x0.25m)**				
3.2.1	Cement	Bags	1.0		
3.2.2	Sand	Tonnes	0.1		
3.2.3	Ballast	Tonnes	0.1		
3.2.4	Water	Litres	32.5		
3.2.4	75mm uPVC Pipe (Class B)	Pcs	1.0		
				Sub-total	
3.3	**Soak Pit (2x2m)**				
3.3.1	Hardcore	Tonnes	10		
				Sub-total	
3.4	**Rainwater Collection**				
3.1.1	1m^3 uPVC Rainwater tank	No.	1.0		
3.1.2	Elevated Platform	No.	1.0		
				Sub-total	
				OTHER TOTAL	
	COLLECTION				
	Sub-structure				
	Super-structure				
	Other				
	Initial Material Estimate				
	Miscelaneaous (5%)				
	Material Sub-total				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

022 Boys Water Closet Block rev. 5 Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Boys Water Closet Block**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/22**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Footing and Walling**				
1.1.1	Cement	Bags	34.0		
1.1.2	Sand	Tons	3.6		
1.1.3	Ballast	Tons	5.6		
1.1.4	Waterproof cement (2kg)	Bags	8.5		
1.1.5	Water	Litre	1105.0		
1.1.6	Y12	m	79.0		
1.1.7	R8	m	63.0		
1.1.8	Bonding Strips	m	105.0		
1.1.9	6”x1” Timber Formwork	m	53.0		
1.1.10	2”x2” Timber Bracing	m	53.0		
1.1.11	Hardcore	Tons	26.5		
1.1.12	Murram	m^3	1.8		
1.1.13	4 inch Nails	Kg	20.0		
1.1.14	9 inch local stone	m	105.0		
1.1.15	Binding Wire	Kg	5.0		
				Sub-total	
1.2	**Floor Slab**				
1.2.1	Cement	Bags	72.0		
1.2.2	Sand	Tons	7.8		
1.2.3	Ballast	Tons	15.6		
1.2.4	Water	Litres	2340.0		
1.2.5	Y10	m	602.0		
1.2.6	Binding Wire	Kg	10.0		
1.2.7	6”x1” Timber Formwork	m	29.0		
1.2.8	2”x2” Bracing	m	29.0		
1.2.9	Damp Proof Membrane (gauge 30)	m^2	56.2		
1.2.10	Lockable cast iron Manhole Cover with Frame (600x450mm)	No.	5.0		
1.2.11	75mm uPVC Pipe (Class B)	Pcs	2.0		
				Sub-total	
				SUB-STRUCTURE TOTAL	

2.0	**Super-structure**				
2.1	**Walls**				
2.1.1	6 inch local stone	m	740.0		
2.1.2	Bonding Strips	m	740.0		
2.1.3	Cement	Bags	28.0		
2.1.4	Sand	Tonnes	4.2		
2.1.5	Ballast	Tonnes	2.4		
2.1.6	Water	Litre	910.0		
2.1.7	Y12	m	178.0		
2.1.8	R8	m	108.0		
2.1.9	Binding Wire	Kgs	5.0		
2.1.10	100mm PVC Pipe (Class B)	Pcs	3.0		
2.1.11	Fly Screen	Pcs	5.0		
2.1.12	3 inch G.I. Pipe	Pcs	1.0		
				Sub-total	
2.2	**Fixtures and Fittings**				
2.2.1	Interior Doors	No.	5.0		
2.2.2	PLWD Door	No.	1.0		
2.2.3	Exterior Door (Steel)	No.	1.0		
2.2.4	PLWD Handles (1.5" Gi. Pipe)	No.	1.0		
2.2.5	PLWD Prefabricated Seat	No.	1.0		
2.2.6	Toilet (Squat Type)	No.	5.0		
2.2.7	Cistern	No.	5.0		
				Sub-total	
2.3	**Mass Hand Washing Basin**				
2.3.1	Cement	Bags	0.5		
2.3.2	Sand	Tonnes	0.1		
2.3.3	Ballast	Tonnes	0.1		
2.3.4	Water	Litre	15.0		
2.3.5	R8	m	2.4		
2.3.6	Y12	m	8.1		
2.3.7	6''x1'' Timber Formwork	m	4.2		
2.3.8	2''x2'' Timber Bracing	m	4.2		
2.4.9	Pegglar push taps 1/2"	No.	6.0		
2.4.10	1 inch/25mm Gate Valve	Pcs	1.0		
2.4.11	9 inch Local Stone	m	2.1		
				Sub-total	

2.4	**Roofing**				
2.4.1	GI (2.0x0.7m sheets)	Pcs	46.0		
2.4.2	Timber Rafters (0.1x0.05m)	m	66.0		
2.4.3	Timber Perlins (0.05x0.05m)	m	110.0		
2.4.4	Timber Fascia Board (0.2x0.02m)	m	29.0		
2.4.5	Timber Collar Rafters (0.1x0.05m)	m	66.0		
2.4.6	Timber Ridge Board (0.1x0.03m)	m	10.0		
2.4.7	Timber Wall Plate (0.1x0.05m)	m	19.0		
2.4.8	Timber Wall Plate (0.15x0.05m)	m	37.0		
2.4.9	uPVC Gutters (5m)	Pcs	1.6		
2.4.10	End cap (4” uPVC)	Pcs	2.0		
2.4.11	4’’ uPVC Down Pipe & Spout (4m)	Pcs	1.0		
2.4.12	100mm Downtake	Pcs	1.0		
2.4.13	Fascia Bracket	No.	6.0		
2.4.14	4 inch Nails	Kg	5.0		
2.4.15	6 inch Nails	Kg	5.0		
2.4.16	Roofing Nails	Kg	5.0		
				Sub-total	
2.5	**Finishing**				
2.5.1	Cement	Bags	19.0		
2.5.2	Sand	Tonnes	3.1		
2.5.3	Ballast	Tonnes	0.9		
2.5.4	Water	Litres	617.5		
2.5.5	Undercoat	Litres	5.0		
2.5.6	Bermuda Blue and Cream Gloss Paint	Litres	5.0		
2.5.7	Turpentine	Litres	4.0		
2.5.8	Paint Brushes 6”, 4” & 2”	Pcs	10.0		
2.5.9	3mm Thick Butt Hinges 4”	Pcs	20.0		
2.4.10	Tower Bolts	Pcs	8.0		
2.4.11	Anti-termite Treatment	Litres	8.0		
2.4.12	Sand Paper	Roll	3.0		
				Sub-total	
				SUPER-STRUCTURE TOTAL	
3.0	**Other**				
3.1	**Access Ramp**				
3.1.1	Cement	Bags	4.0		
3.1.2	Sand	Tonnes	0.3		
3.1.3	Ballast	Tonnes	0.6		
3.1.4	Water	Litres	130.0		
3.1.5	6’’x1’’ Timber Formwork	m	9.0		
3.1.6	2’’x2’’ Timber Bracing	m	9.0		
				Sub-total	

3.2	**Piping & Inspection Chamber (0.25x0.25m)**				
3.2.1	Cement	Bags	1.0		
3.2.2	Sand	Tonnes	0.1		
3.2.3	Ballast	Tonnes	0.1		
3.2.4	Water	Litres	32.5		
3.2.4	75mm uPVC Pipe (Class B)	Pcs	1.0		
				Sub-total	
3.3	**Soak Pit (2x2m)**				
3.3.1	Hardcore	Tonnes	10		
				Sub-total	
3.4	**Rainwater Collection**				
3.1.1	1m^3 uPVC Rainwater tank	No.	1.0		
3.1.2	Elevated Platform	No.	1.0		
				Sub-total	
				OTHER TOTAL	
	COLLECTION				
	Sub-structure				
	Super-structure				
	Other				
	Initial Material Estimate				
	Miscelaneaous (5%)				
	Material Sub-total				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

Project	**UNICEF WASH Schools**
BoQ Title	**Brick Incinerator (De Montfort)**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/23**

Item	**Description**	**Quantity**	**Unit**	**Cost per Unit (Ksh)**	**Total Cost (Ksh)**	**Remarks**
1	Fire bricks (230x116x76mm)	300	m^3			
2	Refractory cement (high alumina) 100kg	2	Bags			
3	Cement	5	Bags			
4	Sand	1	Tons			
5	Ballast	1	Tons			
6	Y10	54	Pcs			
7	R8	9	Pcs			
8	Binding Wire	10	Kgs			
9	Rolled mild steel (40x40x3mm)	42	m			
10	Rectangular section mild steel (75x75x3mm)	8	m			
11	Flat mild steel sheet (2400x1200x3mm)	1	each			
12	Mild steel pipe (150mm diameter x 3mm thick)	2	m			
13	Welding rods	2	Kg			
14	Steel cable (5mm 7 strand)	30	m			
15	6x1 Formwork	14	m			
16	Rolled mild angle steel (50x50x3mm)	1	Pcs			
17	Fuel tank with tank (2 litre)	1	Pcs			
18	Fuel pipe, copper (350mm long x 1/4'')	1	Pcs			
19	Fuel pipe flexible rubber (2000 long x 6mm internal diameter)	2	m			
20	Bolts with nuts and washers (10x75mm)	24	No.			
	Sub Total					
	Labour (20% of material cost)	1	Lump			
	Transport (10% of material cost)	1	Lump			
	Miscellaneous (5% of material, transport and labour)	1	Lump			
	TOTAL TANK COST					

024 5 Cubic Meter Septic Materials Order Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**5 M³ Septic Tank**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/24**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavations**				
1.1.1.1	Main tank excavation	m^3	22		
1.1.1.2	Inlet Manhole excavation	m^3	1		
1.1.1.3	Outlet Manhole excavation	m^3	1		
1.1.1.4	Soakpit excavation	m^3	22		
1.1.2	**Floor Slab**				
1.1.2.1	Sand	Tons	1		
1.1.2.2	Ballast	Tons	2		
1.1.2.3	Cement	Bags	9		
1.1.2.4	Waterproof Cement	Kgs	8		
1.1.2.5	ARC Mesh A142	m^2	7		
1.1.3	**Walling**				
1.1.3.1	Sand	Tons	2		
1.1.3.2	Ballast	Tons	0		
1.1.3.3	Cement	Bags	10		
1.1.3.4	Y12	m	132		
1.1.3.5	9 inch hard stone	m^2	106		
1.1.3.6	Bitumen paint	Litres	5		
				Total for foundations	
				Total for Sub-structure	
2	**Super-structure**				
2.1	**Roof Slab**				
2.1.1	Sand	Tons	1		
2.1.2	Ballast	Tons	1		
2.1.3	Cement	Bags	7		
2.1.4	Binding Wire	Kgs	20		
2.1.5	Bonding Straps	No.	106		
				Total for Slab	

2.2	**Manholes & Ancillary**				
2.2.1	Sand	Tons	1.75		
2.2.2	Ballast	Tons	0.87		
2.2.3	Cement	Bags	12		
2.2.4	9 inch hard stone	m	36		
2.2.5	Manhole cover (18x24, Cast Iron)	No.	5		
2.2.6	6x1 timber	m	26		
2.2.7	2x2 timber	m	26		
2.2.8	3 inch Nails	Kgs	4		
				Total for Manholes & Ancillary	
				Total for Super-structure	
	Materials total cost				
	Miscelaneaous (5%)				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

025 27 Cubic Meter Septic Materials Order Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**27 M^3 Septic Tank**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/25**

Item	Description	Unit	Quantity	Unit price	Total
1.0	**Sub-structure**				
1.1	**Foundation**				
1.1.1	**Excavations**				
1.1.1.1	Main tank excavation	m^3	44		
1.1.1.2	Inlet Manhole excavation	m^3	1		
1.1.1.3	Outlet Manhole excavation	m^3	1		
1.1.1.4	Soakpit excavation	m^3	44		
1.1.2	**Base Slab**				
1.1.2.1	Sand	Tons	6		
1.1.2.2	Ballast	Tons	0		
1.1.2.3	Cement	Bags	27		
1.1.2.4	Waterproof Cement	Kgs	181		
1.1.2.5	Y12	Kgs	278		
1.1.2.6	R8	Kgs	11		
1.1.3	**Walling**				
1.1.3.1	Sand	Tons	6		
1.1.3.2	Ballast	Tons	0		
1.1.3.3	Cement	Bags	27		
1.1.3.4	Y12	m	181		
1.1.3.5	9 inch hard stone	m^2	278		
1.1.3.6	Bitumen paint	Litres	11		
				Total for foundations	
				Total for Sub-structure	

2	**Super-structure**				
2.1	**Roof Slab**				
2.1.1	Sand	Tons	2		
2.1.2	Ballast	Tons	4		
2.1.3	Cement	Bags	18		
2.1.4	Y10 bottom	m	63		
2.1.5	Y10 top	m	63		
2.1.6	R8	m	25		
2.1.7	Rings (R8)	m	194		
2.1.8	Rings (Y12)	m	160		
2.1.9	Binding Wire	Kgs	60		
2.1.10	Bonding Straps	No.	278		
				Total for Slab	
2.2	**Manholes & Ancillary**				
2.2.1	Sand	Tons	0.70		
2.2.2	Ballast	Tons	0.35		
2.2.3	Cement	Bags	5		
2.2.4	9 inch hard stone	m	14		
2.2.5	Manhole cover (18x24, Cast Iron)	No.	2		
2.2.6	6x1 timber	m	77		
2.2.7	2x2 timber	m	77		
2.2.8	3 inch Nails	Kgs	11		
				Total for Manholes & Ancillary	
				Total for Super-structure	
	Materials total cost				
	Miscelaneaous (5%)				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

026 Mass Hand Washing Facility rev. 5 Material Summary - 2017

Project	**UNICEF WASH Schools**
BoQ Title	**Mass Handwashing Facility**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/26**

Item	Description	Quantity	Unit	Cost per Unit (Ksh)	Total Cost (Ksh)	Remarks/Notes
	Mass Hand Washing Basin					
1.1.1	Cement	9.5	Bags			
1.1.2	Sand	0.9	Tons			
1.1.3	Ballast	1.9	Tons			
1.1.4	Water	307.5	Litres			
1.1.5	R8	198.0	m			
1.1.6	Y12	20.0	m			
1.1.7	9 inch Local Stone	9.6	m			
1.1.8	Bonding Strips	9.6	m			
1.1.9	Bonding Strips	22.0	m			
1.1.10	2''x2'' Timber Bracing	22.0	m			
1.1.11	Pegglar Push Taps 1/2"	20.0	No.			
1.1.12	1inch/25mm GI Pipe	1.0	Pcs			
1.1.13	25mm uPvC	1.0	Pcs			
1.1.14	1inch/25mm Gate Valve	1.0	Pcs			
	Initial Material Estimate					
	Miscelaneaous (5%)					
	Material Subtotal					
	Transport (10%)					
	Labour (20%)					
	TOTAL TANK COST					

Project	**UNICEF WASH Schools**
BoQ Title	**G. I. Stand pipe**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/27**

Item	Description	Quantity	Unit	Cost per Unit (Ksh)	Total Cost (Ksh)	Remarks
1	Cement	5	Bags			
2	Sand	1	Tons			
3	Ballast	1	Tons			
4	R8	9	Pcs			
5	Binding Wire	5	Pcs			
6	Hardcore	2	Tons			
7	1 inch GI Pipe	1	Pcs			
8	1 inch GI Elbow (90degree)	1	Each			
9	1 inch GI Tee	1	Each			
10	1 inch GI Hex Nipples	3	Each			
11	1 inch GI Coupling	2	Each			
12	1 inch Peglar Gate valve	1	Each			
13	6x1 Formwork	8	m			
14	2x2 Formwork	4	m			
15	1 inch Union	1	Each			
16	1 inch Peglar Tap	2	Each			
17	3 inch nails	21	Kgs			
	Sub Total					
	Labour (20% of material cost)	1	Lump			
	Miscellaneous (15% of material, transport)	1	Lump			
	TOTAL TANK COST					

Project	**UNICEF WASH Schools**
BoQ Title	**10m deep Shallow well fitted with a handpump**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/28**

Item	Description	Unit	Quantity	Unit price	Total
1	**Excavations**				
1.1	Top soil excavation	m^3	4		
1.2	Well Excavation	m^3	14		
1.3	Soak pit Excavation	m^3	7		
2	**Well Lining**				
2.1	Sand	Tons	2		
2.2	Ballast	Tons	9		
2.3	Cement	Bags	17		
2.4	Water	Litres	553		
2.5	Waterproof cement	Kgs	34		
2.6	A142 BRC Mesh Reinforcement	m^2	44		
2.7	Solid precast concrete rings	No.	4		
2.8	Porous precast concrete rings	No.	7		
3	**Headworks**				
3.1	Sand	Tons	3		
3.2	Ballast	Tons	3		
3.3	Cement	Bags	17		
3.4	Water	Litres	553		
3.5	Y12	m	182		
3.6	Y10	m	22		
3.7	R8	m	50		
3.8	Binding Wire	Kgs	15		
3.9	6x1 Form Work	m	20		
3.10	2x2 Form Work	m	20		
3.11	Damp Proof Membrane (gauge 500)	m^2	4		
3.12	6 Inch stone	m	20		
3.13	Hardcore	Tons	3		
3.14	Murram	m^3	1		
				Total for Headworks	
4	**Soak Pit**				
4.1	Hardcore	Tons	10		
				Total for Soak pit	
5	**Others**				
5.1	Handpump and rising mains	L/Sum	1		
				Total for Others	

	Materials total cost				
	Miscelaneaous (5%)				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

Project	**UNICEF WASH Schools**
BoQ Title	**25m³ Masonry Tank**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/29**

Item	Description	Quantity	Unit	Cost per Unit (Ksh)	Total Cost (Ksh)	Remarks
1	Top soil excavation	5	m^3			
2	Foundation excavation	8	m^3			
3	Cement	87	Bags			
4	Sand	11	Tons			
5	Ballast	14	Tons			
6	Waterproof Cement	13	Kgs			
7	Y12	6	Pcs			
8	Y10	62	Pcs			
9	R8	7	Pcs			
10	Binding Wire	60	Kgs			
11	Hard stone 9x9	136	m			
12	Bondex	8	Litres			
13	0.6m x 0.6m Cast Iron Air Tight Manhole Covers with Frame	5	each			
14	4 inch Heavy Waste Pipe	30	m			
15	4 inch Tee	2	Pcs			
16	6x1 Formwork	141	m			Can be used in other tank sites
17	2x2 Formwork	141	m			Can be used in other tank sites
18	3 inch nails	20	Kgs			
	Sub Total					
	Labour (20% of material cost)	1	Lump			estimated
	Miscellaneous (15% of material, transport)	0	Lump			estimated
	TOTAL TANK COST					

Project	**UNICEF WASH Schools**
BoQ Title	**50m³ Masonry Tank**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/30**

Item	Description	Quantity	Unit	Cost per Unit (Ksh)	Total Cost (Ksh)	Remarks
1	Top soil excavation	10	m^3			
2	Foundation excavation	15	m^3			
3	Cement	202	Bags			
4	Sand	22	Tons			
5	Ballast	24	Tons			
6	Waterproof Cement	110	Kgs			
7	Y12	59	Pcs			
8	Y10	54	Pcs			
9	R8	46	Pcs			
10	R8	21	Pcs			
11	Binding Wire	20	Kgs			
12	Hard stone 9x9	173	m			
13	Hardcore	21	Tons			
14	Bondex	8	Litres			
15	0.6m x 0.6m Cast Iron Air Tight Manhole Covers with Frame	1	each			
16	2 inch GI	15	m			
17	Flanges	2	No.			
18	Float Valve 2”	1	No.			
19	Gate Valve 2”	4	No.			
20	6x1 Formwork	113	m			Can be used in other tank sites
21	2x2 Formwork	205	m			
22	Struts (2.85m long)	124	Pcs			
23	3/4 inch plywood for formwork	4	Pcs			4 x 8 cut as needed on site
24	3/8 inch plywood for formwork	11	Pcs			
25	2 inch nails	31	Kgs			
26	3 inch nails	21	Kgs			
27	4 inch nails	33	Kgs			
28	Other fittings (sockets, 90 deg bend)	1	Lump			estimated
	Sub Total					
	Labour (20% of material cost)	1	Lump			estimated
	Miscellaneous (15% of material, transport)	1	Lump			estimated
	TOTAL TANK COST					

Project	**UNICEF WASH Schools**
BoQ Title	**4m Tall Reinforced concrete water tank tower**
BoQ by:	**Rural Focus LTD**
BoQ No.	**B/31**

Item	Description	Unit	Quantity	Unit price	Total
1	**Foundation**				
1.1	**Excavations**				
1.1.1	Top soil excavation	m^3	2		
1.1.2	Pit and wall excavation	m^3	4		
1.2	**Footing (Column pads)**				
1.2.1	Sand	Tons	1		
1.2.2	Ballast	Tons	1		
1.2.3	Cement	Bags	6		
1.2.4	Y12	m	80		
1.2.5	Binding Wire	Kgs	5		
1.2.6	Murram	m^3	4		
				Total for foundations	
2	**Columns**				
2.1	Sand	Tons	2		
2.2	Ballast	Tons	3		
2.3	Cement	Bags	16		
2.4	Y16	m	106		
2.5	R8	m	56		
2.6	Binding Wire	Kgs	8		
2.7	6x1 Form Work	m	36		
2.8	2x2 Form Work	m	36		
2.9	4 Inch nails	Kgs	4		
				Total for Columns	

3	**Beams**				
3.1	Sand	Tons	2		
3.2	Ballast	Tons	3		
3.3	Cement	Bags	17		
3.4	Y16	m	112		
3.5	R8	m	59		
3.6	Binding Wire	Kgs	8		
3.7	6x1 Form Work	m	77		
3.8	2x2 Form Work	m	77		
3.9	4 Inch nails	Kgs	8		
				Total for Beams	
4	**Slab**				
4.1	Sand	Tons	2		
4.2	Ballast	Tons	3		
4.3	Cement	Bags	15		
4.4	Y12	m	288		
4.5	Binding Wire	Kgs	8		
4.6	6x1 Form Work	m	86		
4.7	2x2 Form Work	m	86		
4.8	4 Inch nails	Kgs	9		
4.9	Handrails (50x4mm welded GI Pipe)	m	41		
				Total for Slab	
5	**Accessories**				
5.1	10CM plastic water tank	No.	1		
5.2	5m extension ladder	No.	1		
				Total for Accessories	
	Materials total cost				
	Miscelaneaous (5%)				
	Transport (10%)				
	Labour (20%)				
	GRAND TOTAL				

Project						**UNICEF WASH Schools**
BoQ Title						**Steel Platform for Plastic Tank**
BoQ by:						**Rural Focus LTD**
BoQ No.						**B/32**
Item	**Description**	**Quantity**	**Unit**	**Cost per Unit (Ksh)**	**Total Cost (Ksh)**	**Remarks**
1	Top soil excavation	1	m^3			
2	Foundation excavation	5	m^3			
3	Cement	5	Bags			
4	Sand	2	Tons			
5	Ballast	1	Tons			
6	Y12	4	Pcs			
7	R8	3	Pcs			
8	Installation of 4 pcs 16mm anchor bolts and metal plate (350x350x10mm thick)	40	Kgs			
9	Mounting and fabricating of steel members to manufacturer's instructions	1	Lump			
10	10 cubic plastic tank	1	Tank			
11	Provision of platform / walkway	1	Lump			Can be used in other tank sites
12	Ladder for tank access	1	Lump			
13	Level indicator in tank	1	Pcs			
14	1.3'' inch fittings (inflow, outflow, washout & overflow)	1	Lump			
15	Flanged gate valves for transmission, washout and overflow pipes	1	Lump			
	Sub Total					
	Labour (20% of material cost)	1	Lump			estimated
	Miscellaneous (15% of material, transport)	1	Lump			estimated
	TOTAL TANK COST					

APPENDIX F

SPECIFICATIONS

(Reproduced from the Minimum Infrastructure Standards for LCPBS in ASAL, MOEST, 2016)

Table of Contents

SECTION 1: EXCAVATIONS

101 Excavation Generally

Excavations shall be made in open cutting unless tunnelling or heading is specified or approved by the Project Manager and shall be taken out as nearly as possible to exact dimensions and levels so that minimum of infilling will afterwards be necessary. The Contractor shall ensure the stability and safety of excavations and shall take all measures necessary to ensure that no collapse or subsidence occurs.

Except where described in the Contract or permitted under the Contract, excavation shall not be battered. The sides of all excavations shall be kept true and shall where necessary be adequately supported by means of timber, steel or other type struts, walling, poling boards, sheeting, bracing and the like.

Excavations shall be kept free from water and it shall be the Contractors responsibility to construct and maintain temporary diversion and drainage works and to carry out pumping and to take all measures necessary to comply with this requirement.

In the event of soft or otherwise unsuitable ground being encountered at formation level or if the formation is damaged or allowed to deteriorate, the Contractor shall forthwith inform the Project Manager, shall excavate to such extra depth and refill with compacted granular or other approved fill or C15 concrete (minimum compressor strength 15N/mm2) as the Project Manager may require. With respect to the side face of any excavation against which concrete or other work will be in contact the Project Manager may require that the net dimensions of the work be increased.

102 Excavation for Foundations of Structures

The Contractor shall give sufficient notice to the Project Manager to enable him to inspect and approve foundations in advance of placement of the permanent works. The Project Manager may withdraw his approval if work is not commenced within 48 hours or the formation is subsequently allowed to deteriorate.

If the Project Manager directs, a bottom layer of excavation of not less than 75mm thickness shall be left undisturbed and subsequently taken out by hand immediately before concrete or other work is placed.

Formations which are to receive concrete blinding or a drainage layer shall be covered with such blinding or layer immediately the excavation has been completed, inspected and approved by the Project Manager.

103 Excavation for Pipe laying

The width of trench excavation shall be the minimum required for efficient working after allowance has been made for any timbering and strutting, and shall not exceed the widths described in the Contract. At any one spread the maximum length of open trench shall not, without the prior approval of the Project Manager, exceed 100 metres.

Trenches in rock for pipes up to 100mm bore shall be excavated to provide a minimum clearance of 100 mm around the outside of the pipe and joints. For pipes exceeding 100mm bore the minimum clearance shall be increased to 150mm.

Where the trench is in rock or rocky ground the Contractor shall excavate the pipe trench to a depth of 150mm below the invert of the pipe and refill with compacted granular fill.

The materials for re-use excavated from trenches shall be stockpiled at the sides of the trench except where this would obstruct any road or footpath and prevent the passage of traffic or pedestrians. In such cases the Contractor shall excavate the trench in such lengths and stockpile the excavated materials at such places as the Project Manager may require.

Where excavation for pipe laying is carried out behind thrust blocks on existing pipelines the Contractor shall provide adequate support arrangements to transfer thrusts to the surrounding ground.

104 Excavated Materials Suitable for Re-use

In so far as they are suitable and comply with the Specification, materials arising from excavations shall be re-used in the Works.

During excavation, the Contractor shall ensure that all material suitable for re-use are kept separate and set aside and protected as necessary to prevent loss or deterioration.

105 Backfilling of Excavations

Backfilling shall be thoroughly compacted in layers not exceeding 150mm compacted thickness and by means which will not damage the Works.

Backfilling of reinforced concrete structures shall be with suitable material approved by the Project Manager.

"Granular material" as backfill is defined as unconsolidated quarry dust, gravel, sand or similar in which the clay or silt content is not predominant. The use of angular crushed stone shall not be permitted.

SECTION 2: CONCRETE WORKS – GENERAL

201 Scope

This Specification applies to structural concrete in small structures such as manholes, chambers and superstructure

elements of small building works. This specification also applies to concrete in thrust blocks, blinding, supports, fill etc.

202 Concrete

202.1 Classes

This Specification includes 4 grades of concrete: Grade C15 Grade C20 Grade C25 Grade C30. The grade refers to the 28 day characteristic strength in N/mm^2.

202.2 Composition

The concrete composition shall generally conform to the requirements of the prescribed mix design, as set out in BS 5328 Tables I and 2.

Small quantities of concrete may with the approval of the Project Manager be batched in accordance with the Table 2.1 of Nominal Mixes

Table 2.1 Nominal Mixes

Grade of concrete	Approx. volume of Aggregate m^3 per m^3 concrete		Approx. cement per m^3 finished concrete in bags each 50kg	Remarks
	Fine	Coarse		
C15	0.450	0.900		Aggregate max size to be 20mm. Fine Aggregate to zone M of BS 882. Water not to exceed 28 litres per 50kg of Cement
C20	0.400	0.875		
C25	0.375	0.825		
C30	0.350	0.725	1	

202.3 Structural Concrete

Structural concrete shall be Grade C20, C25 or C30, as shown on the drawings. The cement content shall not be less than 320 kg per cubic metre and the water/cement ratio shall not exceed 0.55 (27.5 litres per 50 kg of cement). The slump shall be 50 mm +1- 15mm when tested to BS 1881

202.4 Cement

Cement for normal concrete shall be Ordinary Portland or Rapid Hardening cement to BS 12 or shall be CEMI-32.5, CEMII-32.5 or CEMIV 32.5 or higher strength grade. Cement for sulphate resisting concrete shall be sulphate resisting cement to BS 4027. Cement which is not fresh and dry before mixing shall not be used in the Works.

202.5 Water

Water shall be potable.

202.6 Aggregates

Fine aggregate shall be clean natural sand. Coarse aggregate shall be crushed stone, washed gravel or other inert granular material as approved by the Project Manager.

All aggregates shall comply with the requirements of BS 882 and grading curves shall be provided for all aggregates used.

203 Reinforcement

Reinforcement shall comply with BS 4449 and shall be bent in accordance with BS 4466. Fabric reinforcement shall be made from cold-drawn high tensile steel and shall comply with BS 4483. Reinforcement which is rusted shall be wire brushed before use to remove mill scale.

204 Formwork

204.1 Requirements

Formwork shall be accurately formed and shall be of sufficient strength and rigidity as to carry the weights and pressures of the concrete without deformation. It shall be tight so as to avoid the loss of grout and shall be clean and free from damage.

"Rough Finish Formwork' shall consist of sawn boards or sheet metal panels and shall only be used where specified in the Bill of Quantities to produce a rough finish.

"Fair Finish Formwork' shall produce a high standard of finish. Where not otherwise specified in the Bill of Quantities this formwork shall be used throughout the Works. It shall consist of wrought timber boarding 40 mm thick tongued and grooved, or framed plywood, and arranged in a uniform pattern.

204.2 Striking and Removal of Formwork

Striking of formwork shall be carried out having regard for the climatic conditions prevailing, and shall be undertaken at the sole risk of the Contractor. Where premature removal of formwork takes place and deformation is apparent, with or without distress in the concrete, the work shall be made good as described in this Specification.

The following striking' times are included as a guide for normal conditions and shall be treated as a minimum requirement:

Suspended Slabs	(props left under)	5 days
Ditto	(props removed)	10 days
Beams soffits	(props left under)	9 days
Ditto	(props removed)	19 days
Sides of beams, walls and columns		1 day

All exposed concrete arrises are to have 20mm x 20mm chamfer unless otherwise shown on the drawings.

205 Concreting

205.1 Requirements

The finished concrete shall be dense durable and free from cracks and honeycombing.

205.2 Mixing, Transporting and Placing

All concrete shall be made in a mechanical mixer. Concrete shall be placed within 30 minutes of completing the mixing or agitation. Mixing may be continued in the mixer or agitator up to a maximum period of 90 minutes and for not less than the period required to achieve an even consistency of the mix. All concrete shall be compacted by a mechanical vibrator and a slump test shall be carried out on each batch mixed, unless otherwise approved by the Project Managers Representative.

205.3 Concreting in difficult weather conditions

Concreting during hot or cold weather conditions shall comply with the established requirements of good practice. During wet weather adequate covering shall be provided to both materials and concrete.

205.4 Curing

All concrete shall be properly cured for 7 days by wetting or by use of an approved curing membrane.

205.5 Finishes to Concrete

All exposed faces of concrete shall be hard, smooth and free from honeycombing and other blemishes. All projections shall be rubbed down with carborundum stone. The normal finish to slabs and screeds, unless otherwise specified, shall be formed by wood floating the accurately levelled or screeded surface.

205.6 Making Good

Any section of the work which, in the opinion of the Project Manager, does not conform to the requirements or clear intent of this Specification, or to the requirements of established good practice, shall be made good or removed and replaced as directed by the Project Manager at the expense of the Contractor.

206 Ready Mixed Concrete

Ready mixed concrete shall comply with the requirements of this Specification and to those other requirements of BS 5328 which do not conflict with the Specification.

207 Granolithic Concrete

Granolithic concrete shall conform to the recommendations laid down in the "Specification for Granolithic floor toppings laid on in-situ concrete' as published by the Cement and Concrete Association with special reference to monolithic construction.

208 Concrete Benching

Concrete benching shall consist of structural concrete, as herein specified, placed to a low workability and finished while still green with 50mm Grade C25 fine concrete using a maximum aggregate size of 10 mm and steel troweled to a smooth dense finish to the concrete contours.

209 Precast Concrete Units

209.1 Requirements

Precast concrete units, unless otherwise stated, shall be obtained from an approved manufacturer and shall be true to dimension and shape with true arrisses and with perfectly smooth exposed faces free from surface blemishes, air holes, crazing and other defects, whether developed before or after building-in. They shall comply with the appropriate BS. In addition, the following requirements particular to the various units shall be complied with:

209.2 Kerbs

Precast concrete kerb shall conform to BS 340, except that coarse aggregate shall conform to BS 882. Fine aggregate shall consist of sand resulting from the natural disintegration of rock. Approved air- entraining agents may be permitted to be used provided that approved adjustments are made to the mix with regard to water and fine aggregate proportions. In such cases the moisture absorption limits set out in BS 340 may be neglected subject to the concrete satisfying an approved freeze-thaw test based on thirty cycles of exposure.

209.3 Other Blocks

Blocks used for building work shall conform to BS 6073/2028.

SECTION 3: BUILDING AND STRUCTURES

301 Concrete Building Blocks

Concrete building blocks shall be of approved manufacture and shall be formed in a press. The blocks manufactured in Class C30 concrete shall be cured for at least 10 days before use. Blocks shall be well and evenly formed with true corners and unbroken arises, and shall be carefully handled and stacked.

302 Laying Building Blocks

Joints between blocks shall be filled solid with mortar and shall be of regular thickness of 5 to 10mm. The blocks shall be laid in level courses and bonded so that each vertical joint is midway above the face of the block below, except at junctions and piers where a bond of not less than 100mm shall be provided. The walls shall be raised in lifts not exceeding three metres in height in any one day, and truly vertical. All blocks shall be wetted before being laid.

Joints of exposed work shall be raked out and neatly flush-pointed in the same mortar. The whole of the visible faces of the walls shall be left perfectly clean and all surface mortar and droppings shall be removed before they have set.

Joints in work to be rendered shall be raked out to a depth of 8mm to provide a key for the rendering.

Blockwork shall be tied into adjoining structural members at the same level as blockwork reinforcement using 150mm long butterfly tangs or equivalent fixed and mortared into proprietary vertical strips.

303 Precast Concrete Units Generally

All precast concrete units shall include all fixing plugs and strips to enable screw ties or other fixing devices to be firmly attached. For all precast units to be set in block of masonry walls the plugs and strips shall be so positioned as to provide fixing at course and in no case exceeding 450mm centres.

304 Masonry Using Natural Stones

Stones shall come from selected quarry layers to the approval of the Project Manager. They shall be homogeneous, frost resistant, flawless, free of any cracks or bousins, solid, and of equal grain and shall have all the required quantities to give a regular facing. They shall give out a clear sound when hit by a hammer. Stones shall be machine dressed.

Mortar shall be removed from the external surface of the wall. The Contractor shall prepare a wall sample approved by the Project Manager which shall be kept at the construction site until all the masonry is completed.

305 Screen Walling

Screen walling shall consist of perorated precast concrete blocks 100mm thick of approved shape, design and manufacture laid to an approved pattern in cement mortar with perfectly even joints which shall be neatly flush or recess pointed as directed.

306 Damp-Proof Course

All external walls of buildings are to be provided with damp-proof course (DPC) of textured PVC strip of width equal to the total thickness of the wall and any external rendering. The DPC is to be lapped with the damp-proof membrane and bedded in mortar specified for the type of block used. The greatest lengths possible are to be used for the DPC's but any end laps required are to be at least 200mm long made dry without intervening mortar. Piers are to have complete DPC's lapped with the wall DPC.

307 Damp-Proof Membrane

Damp-proof membranes shall be laid, as directed by the Project Manager, beneath all floor slabs resting on the ground.

They shall be composed of single sheets of minimum thickness 0.300mm black polyethylene film of an approved manufacturer specially made for use as damp-proof membrane.

The film shall be laid on sand and turned up around all edges of the slab and with 150 mm margin above the top of the slab to be tucked into the perimeter walls of the building. Where the building is so large as to exceed the maximum sheet size available, several sheets shall be used and the joints shall be lapped 150mm and fused together using a welding tool designed for that purpose. Every care should be taken by the following trades to prevent perforation of the membrane but in the event of the puncture the perforation shall be covered by a patch of similar material of dimensions exceeding the area of the puncture by 300mm and the two sheets welded together as described above.

308 Composition of Mortars

Cement mortar for bonding concrete shall be composed of cement and sand mixed in the proportion of the jointed concrete.

Cement mortar for setting precast concrete or pitching shall be composed of cement and sand mixed in the proportion of 50 kg of cement to 0.14m^3 of sand, with the addition of an approved plasticizer.

Cement mortar for blockwork in concrete blocks shall be composed of cement and sand mixed in the proportion of 50kg of cement to 0.14m^3 of sand.

Sand and Cement for mortars shall be as described in the specification for concrete.

309 Mixing of Mortars

The materials of mortars shall be measured out in their correct proportions and shall first be thoroughly mixed together in a dry state by turning them over upon a clean wooden stage until they are of a homogeneous appearance in consistency and colour. Clean water shall then be added while the mixture is being turned over until it attains a suitable consistency.

Plasticizer shall be added in accordance with the manufacturer's recommendations as approved by the Project Manager.

The mortar shall be used immediately after it has been mixed. No mortar which has commenced its first set shall be used, or mixed up again. Mortar shall, where possible in hot weather, be protected from too rapid action by covering with impervious material such as polyethylene film.

Mixing by hand will be allowed only if the Project Manager gives specific approval. Mixing by machine using the same sequence of operations described above shall be carried out whenever possible.

310 Cement Rendering

Rendering shall be in a 50 kg: 017-2-.20m^3 cement: sand mix but where approval had been given to the use of a plasticizer or other additives these proportions may be modified to the approval of the Project Manager.

All surfaces to receive a finishing coat of cement rendering or fine concrete shall be thoroughly prepared and cleaned and the rendering or screeding shall be placed immediately after such surfaces have been thoroughly wetted.

All rendering shall be put to a minimum of two coats, the first being left rough to a minimum of 10 mm thickness, but the second coat shall be troweled up to a fair face as soon as possible after it is applied.

All internal rendering shall be finished to an even and polished surface with a float, trowel or other suitable tool, special care being taken to obtain perfectly smooth and glazed faces. It shall not be less than 15mm thickness when finished unless instructed otherwise.

All external rendering shall be brought to an even surface with a wood float following which a tyrolean finish of approved colour shall be applied unless otherwise stated.

All rendering shall be protected from sun and rain by adequate and suitable coverings which shall be supplied and fixed in advance of these conditions arising. The renderings shall be kept damp while setting and protected from drying winds.

311 Tanking to Buried Concrete Surfaces

External concrete surfaces to be tanked shall be coated with a bituminous waterproofing membrane 3mm minimum thick. The tanking shall be dressed into structure as shown in the Drawings and be protected by non-rotting boarding prior to backfilling.

312 Waterproof Rendering

Waterproof rendering slurry shall comprise a 50kg to 125kg cement sand mix with an approved waterproofing admixture such as styrene arcrylate copolymer. The material shall block capillaries and minor shrinkage cracks to prevent water ingress while allowing the passage of water vapour through the structure. The render shall be applied to a total thickness of not less than 20mm, the first coat shall be applied levelled scratched and left to dry for not less than 3 days.

313 Grouting in Ironwork

All brackets, rag-bolts and other ironwork for which holes have been boxed out or left in the concrete of a structure shall be carefully grouted in to their correct positions in all particulars. The grouting in shall be carried out with cement and sand grout in such a manner that there shall be no apparent difference in the texture or colour throughout the face of the finished structure and that there shall be no seepage of water either between the ironwork and the set grout or between the set grout and the surrounding structure.

The above instructions shall apply also to the building-in of pipes except that Class C25/1 O concrete shall be used in lieu of cement grout. All holes left for building-in shall be free from any sign of infiltration of water before the building-in is carried out. No reliance shall be placed upon the building-in process for the sealing of such leakage.

314 Checker Plate Covers

Checker plate covers shall be hot dipped galvanized mild steel fitted flush with the floor surface and fully supported.

315 Fences and Gates

Fences generally shall be in accordance with the relevant parts of SS 1722 Part 1: 1986. Chain link fencing shall be Type PL.213 Grade A with 1.8 m high plastic covered chain link mesh. The mesh and line wires shall be galvanized prior to being plastic covered. The posts shall be reinforced concrete.

The straining posts, intermediate posts and struts shall be manufactured and erected complete as specified in BS 1722. The fencing shall be true to line and vertical, following profile of the ground, previously graded so as to prevent access beneath the bottom wire. Gates shall be hung on adequate post, and shall be truly vertical.

Ornamental fabricated metalwork fences and gates shall be constructed of mild steel bar, strip or tube in accordance with the Drawings. All welded joints and drillings for bolts shall be made before painting, and all bolts, nuts and washers shall be galvanized or plated in an approved manner. Any metalwork sunk into the ground shall be treated with two coats of bituminous paint.

316 Structural Steelwork

Material for structural steel work shall comply with BS EN 10137 and workmanship with BS 5950. The steelwork shall be securely fixed to the foundations or building and designed to have such strength and stiffness that its deflection and movement under the loads to be applied shall be within tolerable limits.

All bolts and nuts shall comply with the requirements of BS 3693 except for High Strength Friction Grip Bolts which shall comply with BS 4395.

Mild steel electrode shall comply with the requirements of BS EN 499 and High Yield Steel with BS 2540.

All structural steel fabrication shall conform to the requirements of BS EN 5400. The use of High Strength Friction Grip Bolts shall be in accordance with BS withdrawn.

All structural steel work shall be fabricated using welded joints where possible for shop joints and bolted joints for field assemble.

317 Open Mesh Walkways and Covers

Open mesh type walkways, platforms and covers shall be of aluminium or galvanized steel, suitable for a superimposed

load of not less than 6kN/m^2. The walkways, platforms and covers shall include all necessary supports not detailed on the Drawings.

Open mesh panels shall be trimmed with full depth nosing bar along all edges and bolted to each other when in place to help ensure a firm walkway. Panels shall be cut in such a way and fixing so as to provide a continuity of pattern.

Covers shall incorporate a hinged lockable open mesh access panel with a 750 x 750mm clear opening, strong durable hinges and heavy duty non-corrodible padlock. Openings for valve keys shall be just sufficient in size for the valve key and shall incorporate a cover hinged only.

All panels shall be securely bolted to the supporting structure. Where the supporting structure is concrete, galvanized mild steel angle curbs shall be provided and securely grouted into rebates left in the concrete such that the tops of the panels are flush with the top of the concrete.

318 Fixings to Structure

Where fixings to structures previously constructed are to be made by setting a bolt system into performed holes, such fixings shall be made either by Rawlbolt Projecting Bolt Type or by using an approved proprietary resin anchor system.

Where performed holes have not been provided a self- drilling expanding bolt system shall be used.

Where thin sections are involved or where stresses are likely to be set up which might cause damage to the structure the use of the resin anchor system only will be permitted. Only in special circumstances will the Project Manager or the Project Managers Representative permit rawlbolts to be uses. Performed holes shall be accurately set to template prior to placing the surrounding concrete and shall be kept rigidly in place until the concrete has properly set.

Where resin anchorage is used the Contactor shall ensure that the setting time of the resin is appropriate to the requirements for setting up, plumbing and aligning the work before is sets. Bolts shall be set to template and hole diameters shall conform to the recommendation of the suppliers. Whatever system is used, all bolts shall be plated to resist corrosion.

SECTION 4: PIPELINES, PIPEWORK - MATERIALS

401 Samples and Storage of Materials

Where required by the Project Manager the Contractor shall submit to the Project Manager for approval samples of pipes, fittings and materials prior to procurement. The Contractor shall only store pipe, fittings and other material at places approved by the Project Manager and shall at all times provide adequate supervision and watchmen to prevent theft or damage. Any loss or damage incurred will be the Contractors responsibility.

Pipes shall not be stacked higher than recommended by the manufacturer. The area on which the pipes are to be stacked shall be free draining, the grass or other vegetation shall be kept cut and suitable timber cradles shall be provided on which the pipes shall be laid. End stops to all stacks shall be provided.

Fittings and valves shall not be stacked more than one tier high and they shall be supported off the ground by suitable timbers.

Air valves, rubber joint rings, gaskets, bolts and similar fittings and materials shall be kept in approved locked premises and such fittings and materials shall not be distributed to the trench side until immediately prior to laying, fitting, jointing or assemble thereof. All rubber joint rings and gaskets must be stored in a cool damp location and all fittings and materials shall at all times be stored in the shade under cover and protected from the weather to the satisfaction of the Project Manager.

402 Flanges

Flanges shall be faced and drilled to conform to the dimensions specified in BS 4504. Flanges shall be compatible with the pressure rating of the adjacent pipework or as stated on the drawings. Bolts, nuts and washers (two washers per bolt) shall be to SS EN 1092-3; 2003. No bolt shall project less than two full threads beyond its nut after tightening. In no circumstances shall the shortening of excessively long bolts by cutting be allowed.

Gaskets shall comply with BS EN 1514 (1997) and replaced by BS EN 681-2 (200) and BS 681-1 (1996) Type W.

Flanges shall be painted with two coats of epoxy resin paint. Puddle flanges shall be fitted to all pipework passing through water-retaining structures and manholes greater than 25m deep.

403 Mechanical Couplings

Unless otherwise specified or shown in the Drawings, pipes and fittings shall be supplied with flexible joints. Mechanical couplings shall be of the Dresser, Viking Johnson type without a centre register. Joints rings used shall be of the ethylene propylene rubber (EPDM) or other material approved by the Project Manager. All mechanical couplings and flange adapters including nuts, bolts and washers shall be supplied with 'Rilsan' nylon thermoplastic polyamide applied by fluidized bed dipping or similar approved.

404 Materials for the Assembly of Flexible Joints

Lubricant shall be of a kind not conducive to the growth of bacteria and shall have no deleterious effects on either the joint rings or pipes.

Lubricants for water supply shall not impart to water, taste, colour, or any effect known to be injurious to health.

405 Ductile Iron Pipes

405.1 General

Ductile iron pipes and fittings for water supply shall comply with BS EN 545 (1995). Pipes and fittings shall have spigot and socket joints unless otherwise specified. Pipes shall be class K9. Spigot and socket flexible joints shall be of the push-fit type with gaskets of ethylene propylene rubber (EPDM). The Contractor shall supply 5% of the straight pipes suitable for cutting on site and these shall be clearly marked.

405.2 Corrosion Protection

Pipes and fittings shall be protected externally with an extruded polyethylene or polyurethane coating complying with DIN 30674 Part I.

Pipes and fittings shall be lined internally with centrifugally applied cement mortar and complying with DIN 30674. Joint areas shall be coated with epoxy or polyurethane to DIN 30674. All lining and coating materials shall be approved for contact with potable water by an internationally recognized body like the Drinking Water Inspectorate of UK.

406 Galvanized Steel Pipes

Galvanized steel pipes shall be medium duty manufactured to BS 1387.

406.1 General

Steel pipes shall be manufactured to BS EN 10224 or AWWA C200 and shall be suitable for the pressure ratings required by the Contract.

Fittings shall conform dimensionally to BS EN I0224, AWWA 208-59 or AWWA M11. Unless otherwise specified or necessary to meet the requirements of the Contract steel pipes shall be manufactured as follows:

a) DN300mm and below shall be manufactured to minimum of Grade L235 or API 5L Grade B
b) DN35Omm and above shall be manufactured to a minimum of Grade L275 or API 5L Grade X42.

The pipes and fittings of diameter 600mm or less shall be supplied with push-fit spigot and socket type joints with integral gasket of EPDM rubber or similar to BS EN 10224 or BS CP 2010. Pipes greater than 600mm shall be supplied with ends cut square suitable for use with flexible couplings and the external weld ground back sufficiently.

The Contractor shall supply 5% of the straight pipes as half-length pipes (not exceeding 6m). Each pipe shall be supplied complete with a coupling for jointing.

406.2 Corrosion Protection

Steel pipes and fittings shall be protected externally at the manufacturer's works with fusion bonded epoxy resin in accordance with AWWA C213. Pipes greater than 600mm and all fittings shall also be lined internally with fusion bonded epoxy to AWWA C213. Pipes 600mm or less shall be lined with cement mortar to AWWA C205 or BS EN 10298. All lining and coating materials shall be approved for contact with potable water by an internationally recognized body like the Dunking Water Inspectorate of UK.

Where required by the Bills of Quantities, the Supplier shall also price for the provision of an alternative 3LPE coating to DIN 30670 or AWWA C215 of a triple wrap system of fusion bonded or sprayed epoxy primer, an intermediate polymer adhesive layer and an extruded high density polyethylene coating in general conformance with ISO/DIS 21809-1 Class B as appropriate.

407 Glass Reinforced Plastic (GRP) Pipes and Fittings

Glass reinforced plastic (GRP) pipes and fittings for sewers shall be high stiffness and shall comply with the relevant provision of BS 5480. The minimum pipe stiffness shall be 5,000 N/m^2.

Pipes and fittings shall be marked in accordance with Clause II g. BS 5480.

Pipes shall only be cut by techniques which can be shown not to impair the pipes pressure regression performance.

Where any pipe is cut, the exposed fibres at the cut pipe end shall be resealed to prevent potential long term degradation. Methods of cutting and resealing exposed fibres shall be submitted to the Project Manager for Approval.

Elastomeric sealing rings and foils shall comply with BS EN 681.

On delivery to site and immediately prior to installation each pipe shall be visually inspected both externally, and where possible, internally for damage such as star cracking of the gel coat layer. Where any damage extends through the pipe wall the pipe shall be rejected or the damaged section cut out and replaced in accordance with repair methods approved by the Project Manager. If in the Project Managers opinion the pipe is not suitable of repair it shall be rejected and removed fromsite.

408 uPVC Sewers and Pressure Pipes and Fittings

Unplasticised PVC pipes and fittings for water supply pressure pipes shall comply with British Standards 3505 current but also superseded by BS EN 1452 and 4346. They shall be obtained from an approved manufacturer and shall be minimum pressure rated (14 bar) unless otherwise stated.

Unplasticised PVC pipes and fittings for gravity sewers and drains shall comply with British Standards 4660 or 5481 and shall be obtained from an approved manufacturer. Restrained rubber ring type push fit flexible joints shall be used unless otherwise stated. Solvent weld joints will not normally be permitted. Pipes and fittings shall be protected from the direct rays of the sun at all times by means of reflective cover sheets.

409 Concrete Pipes, Bends and Junctions

Concrete pipes, bends and junctions for use in sewers shall be made with sulphate-resisting cement. Pipes, bends and junctions shall conform to the requirements of BS 5911 for the particular class of pipe required to be used. The internal dimensions shall be true and regular and the internal surface smooth and free from surface blemish. The actual diameter of the pipe shall be not less than the nominal diameter.

All joints shall be of the gasket type with flexible spigot and socket approved by the Project Manager. Gaskets shall be elastromeric complying with BS EN 681.

The main pipe and branches of all junctions shall be of the same strength classification and shall have the same internal dimensions as the pipes with which they are to be used.

The pipes, bends and junctions delivered to the Site shall be certified by the pipe manufacturer to have complied with BS 5911 , or other approved standard and one copy of the certificate shall be delivered to the Project Manager before the goods are unloaded.

Unless otherwise specified pipes are required to be of Extra Strength; they may, unless otherwise specifically called for, be reinforced either with cast-in steel or by an external wrapping of fibre glass and resin, applied by an approved manufacturer.

The Contractor shall provide all facilities for and shall carry out jointly with the Project Manager (if so required) a full visual inspection of all pipes, bends and junctions for manufacturers defects and other faults or damage. Before any pipe, bend or junction is laid it shall again be carefully examined and sounded with a wooden mallet. Any pipe found to be cracked or otherwise defective shall not be used on the Works.

Concrete pipes shall be internally coated with a 100 percent solids coal tar epoxy lining 70 percent minimum epoxy content. Coat thickness 300 micron minimum.

410 Polyethylene Pipes and Fittings

410.1 General

Polyethylene pipes up to nominal size 63mm for below ground use shall be coloured blue and comply with the relevant provisions of BS 6572. Polyethylene pipes for use in nominal diameters greater than 63mm shall be coloured blue High Density Polyethelene (HDPE) suitable for a working pressure of 14 bar.

The pipes shall be clearly and indelibly marked to show the name of the manufacturer, diameter, pressure class and date of manufacture.

House connection pipework downstream of the manifold shall be PE80, all other HDPE pipework shall be PE100.

410.2 Joints

Unless otherwise specified or approved by the Project Manager polyethylene pipes shall be electrofusion welded. Joints between polyethylene pipes supplied from different manufactures or not manufactured from the same grade of polymer shall only be jointed by electrofusion or by push fit mechanical couplings. Mechanical couplers and compression type fittings shall incorporate a serrated internal liner to support the pipe against compression loads exerted by the fitting and to prevent pullout under axial load.

Butt or socket fusion joint techniques shall only be applied between pipes supplied from single source and manufactured from the same grade of base polymer. Fusion welding of polyethelyne pipes shall only be undertaken by skilled operatives using appropriate specialized tooling. Pipes to be jointed shall be free from contamination and care shall be used to protect fusion jointing operations from wind and against the effects of inclement weather. Mechanical jigs or other approved methods shall be used to ensure correct alignment of the pipe when making butt fusion joints. Details of fusion welding procedures including details of tools, operatives, materials and method statements shall be submitted to the Project Manager for approval prior to any jointing.

Steel and iron pipe fittings shall comply with the relevant provision of BS EN 545 (1995) replaced by BS EN 10224 but also current.

411 Gate Valves

411.1 General

Valves for normal duty on water pipelines with pressure ratings up to PN25 shall be key operated cast iron flanged gate valves for waterworks purposes generally complying with the requirements of BS 5163 (Type B). All Gate Valves shall be supplied with a 10 year manufacturer's warranty.

Cast iroñgate valves for pressure ratings to PN14 shall be cast iron flanged valves complying with BS 5150 replaced by BS EN 1 171 (both BS 5150 and BS 5151) or cast iron parallel slide valves complying with BS 5151.

Butterfly valves for pressure ratings of up to PNI4 shall be double flanged wafer type butterfly valves complying with BS 5155. Unless otherwise specified valves for use on steel pipes shall be flanged, where butt-weld ends are specified valves shall comply with BS EN 1984, or BS EN 13709.

411.2 Wedge Gate Valves for Manual Operation

Valves up to and including DN 300 shall be of the resilient seal type and valves larger than DN 300 shall have metal seals.

Spindles shall be of the non-rising type and screwed so as to close the valves when rotated in the clockwise direction.

The direction of closing shall be clearly cast on the valve cap or hand wheel as appropriate. The valves shall be constructed of the following materials;

body - cast iron;
spindle - forged bronze or stainless steel;
metal faces and seal - gunmetal.

The valves shall be suitable for the unbalanced head as specified or indicated in the schedules.

Suitable gearing and anti-friction devices such as ball bearing thrust collars shall be provided as necessary to enable opening and closing by manual operation at the pressure stated, using an effort no greater than 26kg on the tee key or hand wheel supplied. Handwheels shall not exceed 500mm diameter. A bypass with gate valve forming an integral part of the valve shall be provided where recommended by the valve manufacturer for the pressures specified.

Gearing on valves of DN 300 and less shall be enclosed in a sealed gearbox suitable for buried installation and operated with a tee key.

Except where shown in the Drawings, all valves exceeding DN 300 shall be provided with bevel gearing and handwheels.

Valves to be used for washouts and isolating air valves shall have screwed seats. Extension spindles shall be galvanized or stainless steel adequately supported with cast iron brackets, and of sufficient diameter to prevent any whiplash effect through twisting when being used to operate the valves. The spindles shall be capped for key operation. Valve caps shall be fitted with hexagonal set screws.

Valves shall be coated with an approved epoxy complying with DIN 30674. Keys for valve operation shall be of sufficient length so that the valves can be operated by a man standing, but shall not exceed 1 .2m in length, and shall have a detachable cross bar.

412 Butterfly Valves

412.1 General

Butterfly valves shall conform to BS EN 593. All Butterfly Valves shall be supplied with a 10 year manufacturer's warranty.

412.2 Construction

Butterfly valves shall have a high grade cast iron body to BS EN 1561 designed to the specified working and test pressures. The pressure rating valve shall be cast in the valve body. The disc shall be of high grade cast iron to BS EN 1561 or nodular cast iron to BS 2789 to the defined working and test pressures. It shall have a convex shape designed to achieve low head loss characteristics. The valve shafts shall be of stainless steel operating in self-lubricating bushes in the body.

The valve seat shall be of gunmetal to BS 1400. The sealing ring shall be a renewable Ethylene Propylene Diene

Monomer (EPDM) rubber attached to the disc edge by a sectional bronze retaining ring to form a resilient and durable seal.

The valves shall be fitted with hand wheel actuators not exceeding 500mm diameter incorporating gearing to allow opening and closing by manual operation at the pressure stated using an effort no greater than 36kg on the hand wheel supplied.

In all cases the gearing shall be designed to close the valve, from fully open to fully closed in a period of not less than ten minutes with this effort. Actuators shall be designed so as to close the valves when the hand wheel is turned in a clockwise direction; the direction of closing shall be clearly cast on the hand wheel. Position indicators shall be fitted to all actuators.

Where required valves shall be electrically actuated with a manual override. Remote actuation shall be provided with a visual indication of valve open, valve closed and percentage opening together with fault indication.

412.3 Valve Performance

A performance curve, relating percentage valve travel, open area and discharge coefficient shall be submitted to the Project Manager. The head loss coefficient with valve fully open shall be defined.

412.4 Testing

All valves shall be tested in accordance with BS EN 593 and pressure and material test certificates shall be submitted to the Project Manager for approval.

413 Air Valves

Air valves shall be either:

a) Single (small) orifice valves (SAV), for the discharge of air during the normal operation of the pipeline.
b) Double orifice valves (DAV), consisting of a large orifice and a small orifice. These shall permit the bulk discharge of air from the main during filling and air inflow when emptying in addition to the discharge of small quantities of air during normal operating conditions.

Air valves shall be supplied with an independent isolating butterfly valve (DAV) or cock (SAV) which permits the complete removal of the air valve from the main, without affecting the flow of water in the main. Each air valve assembly shall be suitable for connection to a flange on the pipeline.

At the connection between the air valve and its isolating valve a BSP tapping shall be made suitable for fitting of a pressure gauge. All tapping shall be sealed by a brass plug and copper compression ring gasket.

Air valves shall operate automatically and be constructed so that the operating mechanism will not jam in either the open or closed positions.

414 Non-Return Valves

414.1 Swing Check Valves

Non-return valves shall be suitable for waterworks purposes and shall be manufactured to comply with the general requirements of BS EN12334. They shall be double flanged type, non-slamming and recoilless on flow reversal.

Valves of DN 700 and larger shall be of the multi-disc type or tilting disc type. The valves shall have a high grade cast iron body and cover to BS EN 1561 Grade 220/260 with gun metal nickel bronze alloy door seating. The hinge pin shall be of stainless steel carried on non-corrodible bearings.

414.2 Nozzle Check Valves

Nozzle check valves shall be slam free closing with a streamlined cross section as manufactured by Mannesmann Demag or similar.

415 Flow Control Valves

Flow controls unless otherwise specified shall be butterfly valves. They shall be installed complete with a headstock and position indicator showing the degree of opening.

416 Pressure Reducing Valves

Pressure reducing valves shall automatically reduce a higher inlet pressure to a steady lower downstream pressure regardless of changing flow rate or varying inlet pressure. The valve shall be a hydraulically operated pilot controlled diaphragm type, globe or angle valve. The main valve shall have a single removable seat and a resilient disc.

417 Ball Float Valves

Ball float valves which are to be installed within reservoirs shall be the delayed action type to eliminate inflow at small valve openings. They shall be fitted with a stilling chamber, auxiliary float valve and inlet bellmouth with regulating valve.

The main valve shall be fitted with a long actuating lever to provide a long float travel for slow valve closure.

Valves shall be of the right angle pattern type with flanged inlet and have a resilient synthetic rubber disc which forms a drop tight seal against a removable seat insert. Valves shall be free of cavitation and vibration under the specified working conditions. Flanged tapers shall be provided on the inlets as necessary to suit the size of valves proposed.

Valves shall be capable of withstanding the maximum static pressure and of passing the maximum flow rate shown.

Orifice plates shall be provided as necessary to absorb excess working pressure at the initial flow rates indicated. The pressure rating of the valve shall be cast into the body of the valve.

418 Constant Flow Valves

Constant flow valves shall maintain a constant rate of flow regardless of fluctuations in upstream pressure.

Valves shall be hydraulically operated, diaphragm actuated globe pattern. They shall have a resilient synthetic rubber disc which forms a drop tight seal against a removable seat insert. The diaphragm assembly and valve stem shall be fully guided at both ends by bearings in the valve cover and valve seat. The diaphragm shall consist of nylon fabric bonded with synthetic rubber. Packing glands and stuffing boxes are not permitted and there shall be no pistons operating the valve or pilot controls.

The pilot control shall be direct acting diaphragm valve designed to close when the actuating differential increases beyond the spring setting.

The actuating differential pressure shall be produced by a thin edged orifice plate installed in an orifices flange downstream of the valve.

Any necessary repairs to the valve shall be accomplished without removing the valve from the main.

Valves shall be sized to pass the maximum continuous flow stated on the drawings at the working pressure given. The pressure rating of the valve shall be cast into the body of the valve.

419 Surface Boxes and Chamber Covers

Surface boxes and chamber covers shall be either cast iron or ductile iron and coated with black bituminous solution.

Surface boxes over gate valves shall be hinged and chained and shall generally comply with BS 5834. In roads, tracks, verges: Heavy duty with 150 X 150mm nominal clear opening. In fields and areas subjected to light wheeled or pedestrian traffic: Medium duty with 150 x 150 mm nominal clear opening.

Surface boxes for hydrant chambers shall have a 150 x 150mm clear opening and shall comply with BS 750 and shall be suitable for heavy traffic loading.

Covers to air valve and other chambers shall be to the dimensions and loading requirements shown on the Drawings or as stated in the Bill of Quantities.

Covers shall be suitable for the following maximum safe centre static loads:

Light duty - 250kg
Medium duty - 1500kg
Heavy duty - 5000kg

Where applicable, covers shall comply with BS EN 124 or other appropriate Standard.

Lifting keys shall be provided for each type surface box or cover supplies. One set of keys shall be provided for every ten surface boxes or covers subject to a minimum of ten sets of keys or the actual number of covers if less than ten.

420 Gully Gratings and Frames

Road gully gratings and frames shall be of approved type and manufacture in cast Grey Ductile Iron and shall be of Heavy Duty Non-rocking Pattern designed for wheel load of 11.5 tonne and generally in accordance with BS EN 124. Single gullies of nominal size 1050mm x 750mm. Inlet gratings of other plan dimensions shall have a minimum water way area of 49% of the total inlet grating area.

Gully frames shall be set in cement mortar and haunched with Class C25 concrete. It shall be the Contractors responsibility to establish the finished road levels from the appropriate authority and fix the gratings accordingly.

421 Manhole Safety Chains

Mild steel chain shall be 8 mm nominal size Grade M (4) non-calibrated chain, Type 1, complying with BS withdrawn. After manufacture, mild steel safety chains shall be hot dip galvanized in accordance with BS EN 124.

422 Manhole and Chamber Access Covers

The manhole and chamber access covers shall comply with BS 497 Part 1 and be obtained from an approved manufacturer and shall be to the internal minimum clear opening as detailed in the Contract.

All manhole and chamber access covers in road shall be to an approved Heavy Duty pattern and in footpaths shall be medium/heavy duty unless otherwise specified. The frame and lid shall have key holes formed with sealed pockets underneath to prevent ingress of sand, grit and surface water and shall be of an approved non-rocking pattern. The covers and frames shall have accurate seating faces to prevent rocking and the ingress of sand or water, and it shall be tight fitting to resist overflow conditions or unauthorized removal. The seating faces shall be coated with graphite grease before installation of the cover.

A supply of keys for use with every type of manhole cover and surface box shall be handed over by the Contractor at the completion of the Contract on the basis of one set of keys for each 50 covers or part thereof.

Manhole and chamber cover frames shall be set in cement mortar and haunched with Class C30/10 concrete and shall be set to the camber or fall of the finished road surface. It shall be the Contractor's responsibility to establish the finished road surface levels from the appropriate authority and to fix the covers accordingly.

423 Manhole Step Irons

Manhole step irons shall be of galvanized malleable iron and shall conform in all particulars to BS EN 13101.

SECTION 5: PIPELINES, PIPEWORK - CONSTRUCTION

501 General

The requirement of this section shall apply to the construction of potable and raw water pipelines and pipework. Within this section 'Plant' refers to pipe fittings, valves, surface boxes and chamber covers, and other such materials required for pipelines, mains and pipework at reservoirs and elevated tanks.

All Plant shall be suitable for waterworks purposes for the conveyance of potable water in the climatic conditions prevailing in the region and in particular at the location of the Works.

The Project Manager shall provide details of each pipeline diameter, pressure rating, hydraulic characteristics and the approximate alignment. The Contractor shall, in consultation with the Project Manager set out the proposed pipeline alignments, making any changes that the Project Manager may deem necessary, confirming also the exact locations of all manholes, valves, air valves, washouts, hydrants, and the like.

When pipes are being loaded into vehicles care shall be taken to avoid their coming into contact with any sharp corners such as cope irons, loose nail heads, etc. Whilst in transit, pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry.

Pipes may not be offloaded from lorries by rolling them, suitable carnage shall be used. Pipes shall not be rolled or dragged along the ground.

502 Stringing and Examination of Pipes Prior to Laying

All DI and Steel Pipes and their coatings and linings shall be carefully inspected on Site prior to laying. Inspection of the pipe will be made by the Project Manager after delivery and again immediately prior to laying. Any pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the site.

All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the pipe linings or coatings shall be repaired as directed by the Project Manager. Handling and laying of pipe and fittings shall be in accordance with the Manufacturer's written instructions and as specified herein.

Before lowering into the trench or placing in position each ductile iron pipe or casting shall be slung and sounded with a mallet to test for hair cracks. Pipes that do not ring true will be discarded.

All cement mortar linings shall be visually inspected for defects such as cracking or spalling and crack widths shall be measured to confirm that width is such that natural re-sealing will occur once put into service; otherwise cracks as well as any spalling shall be made good before laying in accordance with the manufacturers written instructions.

All epoxy linings and all coatings shall be subjected to holiday detection tests, in accordance with NACE RP 0490, the voltage of the holiday detector being selected appropriate for the material and its thickness. No pipe shall be laid having failed the holiday tests until the defective area is made good in accordance with the manufacturer's written instructions and retested satisfactorily before use.

All pipe and fittings shall be thoroughly cleaned before laying, and shall be kept clean until they are used in the work, and when laid, shall conform to the lines and grades required. Pipe shall not be laid unless the trench is free of water and in a satisfactory condition. Ductile iron pipe and fittings shall be installed in accordance with the requirements of AWWA C600 except as otherwise provided herein. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his own expense.

When laying is not in progress, including any work break exceeding 30 minutes, the open ends of the pipe shall be closed by watertight plugs or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the Manufacturer. End caps shall not be removed until such time as the pipe is to be inspected and laid.

Where the pipeline crosses roads, tracks or any other access or where directed by the Project Manager, the Contractor shall place the pipes so that access to the public is not in any wayprohibited.

Shortly before laying or fixing any valve, pipe or fitting, the Contractor shall examine each valve, pipe and fitting to ascertain that there is no damage or defect. The Contractor shall give the Project Manager not less than 48 hours' notice of his intention to undertake such examination. The Contractor shall not lay such pipes and fittings until he has received approval from the Project Manager. Linings shall be inspected prior to laying and any defect made good.

503 Laying Pipes

Immediately before any pipe is lowered into the trench the plug shall be removed from the end of the last pipe laid and the new pipe shall be carefully lowered into the trench.

Each pipe and fitting shall be laid true to alignment curve and gradient in accordance with the Drawings or as directed by the Project Manager. The minimum gradient shall not be flatter than 1 in 500.

Pipes shall be boned to gradient and sight rails shall be provided for this purpose at intervals not exceeding 50m and at all changes in grade.

No dips or summits shall be permitted other than as shown on the Drawings.

503.1 Embedment and Compaction

All ductile iron and steel pipes shall be embedded using a sand or coarse grained soil with less than 12% fines, which if necessary shall be imported if excavated material is found to be unsuitable:

In areas prone to water logging or where specifically called for on the Drawings or in the Bills of Quantities a single size or graded gravel shall be used as a special lower bedding, with grading as indicated below:

Nominal Pipe Diameter (mm)	Grading for Special Lower Bedding [to ASTM Sieve Sizes]	
	Single size Gravel	Graded gravels
<200	10 or 14 single-size gravel	14 to gravel
200 to 500	10,14 or 20 single size gravel	14 to 5 graded or 20 to 5 graded
>500	10, 14, 20 single-size crushed rock, or gravel	14 to 5 graded or 20 to 5 graded

The suitability of as-dug trench material as an embedment material and where imported, the source shall be approved by the Project Manager. Any delays as a result of not seeking this approval in good time shall be entirely to the Contractors account.

All layers of the embedment shall be thoroughly compacted, and shall not exceed 150 mm and be raised evenly on both sides of the pipe as it is placed. A minimum compaction of 90% MPD shall be achieved at all times, this being confirmed by sampling and testing at intervals on different levels of embedment at intervals of not more than 50 m with testing in accordance with BS 1377 or ISO 22476 using the 'sand replacement' method.

Should any results fail to achieve this absolute minimum level, then the pipes, embedment material and layer shall be removed for an equal distance on either side of the failed test, the total distance being equal to the length between adjacent sampling locations, and re-laid appropriately but with compacted layer thickness halved. In addition the distance between sampling and testing shall also be halved until in the opinion of the Project Managers Representative a sufficient number of consecutive passes allows both individual layer thickness and the distance between sampling and testing to be returned to the previous thickness and spacing.

All backfill soil above the embedment shall be free from clay lumps, boulders and rock fragments greater than 50 mm and as far as practicable, given the nature of the soil, 90 % MPD shall be attained. However, this requirement may be relaxed to 85% MPD by the Project Managers Representative if he considers the circumstance warrant it.

503.2 Pipes Laid in Trench

Pipes and fittings laid in trench shall have at least the minimum cover stated in the Drawings.

Long radius curves in buried pipelines shall be negotiated by deflections taken up in the joints of one or more pipes. The deflection at joints shall not exceed 75% of the manufacturer's maximum specified limits. Designs have been based upon the use of 6m long pipes. If the Contractor provides longer pipes sufficient short lengths shall be provided to enable the proposed pipe curvature without additional bends or deep excavation.

Pipes shall not be dragged along the trench bottom. Pipes laid in trenches shall be laid and firmly bedded on an even and uniform bed. Where pipes are not laid on a granular bed, the bottom of the trench shall be smooth and free from stones or other projections.

Joint holes shall be excavated below the trench bottom and shall be as small as possible and shall be filled in and compacted after the pipes are laid and before the refilling of the trench is commenced.

503.3 Pipe Bedding and Surround

For polyethylene, uPVC and GRP pipelines, Class S bedding shall be used where the cover is equal to or greater than 1.0m. Where there is less than 0.6m cover, Class A concrete surround shall be used. In between the Project Manager shall decide upon the bedding type dependent upon the assessed risk of damage to the pipe.

503.4 Pipes Laid Above Ground

Pipelines to be laid above ground shall be constructed of flanged ductile iron pipes with mechanical type expansion joints. Supports shall be provided at a maximum spacing of one pipe length and adjacent to the flanged joints.

The expansion joints shall compensate for a variation of ambient temperature between zero and 400 C on the adjoining pipeline. Anchorages shall be provided immediately uphill of each expansion joint and at each change in vertical and horizontal alignment. The ground/rock surface under the pipeline shall be re-graded as necessary to allow a satisfactory vertical alignment of the pipeline.

The Contractor may propose, as an alternative to the use of mechanical expansion joints, either of the following methods for accommodating thermal expansion:

a) A zigzag pipeline alignment whereby the thermal movement is accommodated by deflection of the bends.
b) A rigid form of construction with the thermal movement being constrained within the pipe walls by the use of substantial anchor blocks.

Joints shall be made in compliance with the manufacturer's instructions as approved by the Project Manager. Care shall be taken to ensure the absolute cleanliness of the pipe ends and joint components. Only the recommended approved lubricants shall be used. Jointing shall only be carried out by experienced personnel under close supervision by the Contractor.

The Contractor shall ensure that no dirty water or other extraneous matter is allowed to enter the pipes during or after laying. In the event of dirty water or extraneous matter entering the pipes the Contractor shall immediately carry out cleaning and disinfection as directed by the Project Manager.

Except when necessary for jointing, the end of the last pipe laid shall be kept plugged to the satisfaction of the Project Manager to prevent the ingress of dust, dirt, rocks and other debris.

The Contractor shall be liable for any damage caused to the Employees Plant and apparatus or other equipment as a result of foreign matter of any kind not having been cleared out of pipelines before Taking-Over.

Pipe trenches shall not be backfilled until approved by the Project Manager. Once approved trenches shall be backfilled without delay to at least the minimum extent required for pressure testing.

504 Cutting Pipes

The edges of the cut pipes shall be clean, true and square. Ductile iron pipes shall only be cut with an approved mechanical pipe cutter in conformity with the pipe manufacturer's recommendations. The use of oxyacetylene flame cutter will not be permitted. The edges of the cut together with those parts of the pipes from which the coating has been removed shall be given two coats of bituminous paint and the internal lining repaired. When the cut pipe is to be inserted in a 'Tyton' type joint it shall be bevelled for 10mm at 300 to pipe the axis.

Asbestos Cement, HDPE, uPVC and GRP pipes shall be cut with an approved mechanical pipe cutter and in conformity with the pipe manufacturer's recommendations. Where the cut end of the pipe is to be incorporated in a joint the pipe shall be turned down to the correct diameter required for forming the joint by and approved mechanical turning machine. The length of turning shall be accurately bevelled by mechanical means to the dimensions specified in the manufacturer's recommendations.

Steel pipes shall be cut by using a mechanical pipe cutter approved by the Project Manager. The use of an oxyacetylene flame cutter will not be permitted. The edges of the cut shall be given two coatings of liquid epoxy compatible with the original coating. The external coating and the internal lining shall be repaired to the approval of the Project Manager. The cut end shall be bevelled as required to suit the form of joint used.

505 Proprietary Joints and Couplings

Proprietary joints and couplings shall be assembled in accordance with the manufacturer's instruction as approved by the Project Manager. Where pipes are laid above ground and jointed with bolted couplings the joint shall be protected against vandalism by sheathing with an approved heat-shrink moulding as manufactured by Raychem of Swindon UK or similar approved.

506 Flanged Joints

Flanged joints shall be made with two washers per bolt, one under the bolt head and the other under the nut. The tightening of the bolts shall be carried out in the sequence and to the torque recommended by the manufacturer. A torque wrench shall be used.

Buried flange joints shall be protected by painting with an approved bitumen paint and by wrapping using 'Denso' paste, mastic tape and outer wrap, or similar approved materials all in accordance with the manufacturer's instructions as approved by the Project Manager, unless supplied with epoxy coating and galvanized bolts.

Flanged adaptors and mechanical couplings shall have a RILSAN nylon coating applied by the manufacturer.

507 Steel Pipelines Welded Joints

If specifically required under the contract pipes shall not be welded. If permitted by the Project Manager for particular conditions the Contractor shall submit to the Project Manager a detailed method statement for constructing the pipeline using welded joints which shall include, but not be limited, to: details of the Contractor's skilled labour and supervision staff who have direct experience in the construction of welded steel pipe; details of the Contractor's plant to be deployed; details of temporary staging, access and craneage; procedure for construction of supports and anchorages, and welding joints quality assurance proposals for testing the integrity of the welds.

These details shall be submitted to the Project Manager for his approval not later than 21 days before the Contractor wishes to commence pipe laying.

All field welds shall be inspected visually with special attention given to the line up and down the root run or stringer beads. Non-destructive testing of the completed weld shall be carried out using radiographic methods with procedures in accordance with BS 2910.

On completion and inspection of joint welding, remedial works shall be carried out on the internal lining and external coating. No more than five pipe joints shall be welded without completion of remedial works to joints.

508 Fixing Valves and Penstocks

Valves, penstocks and other fittings shall be securely fixed. Extension spindles and headstocks shall be properly aligned and fixed in a vertical position and valve caps shall be fixed securely using the locking nut.

509 Thrust and Anchor Blocks

Concrete thrust and anchor blocks shall be formed at bends, tees and valves in accordance with the details shown on the Drawings or as directed by the Project Manager. Excavation shall be made after pipelaying and the blocks concreted immediately after excavation. The back supports and blocks shall abut in to solid undisturbed ground with all loose material being removed before concreting.

No pressure shall be applied in any section of main until the concrete has achieved adequate strength and at least three day's curing. Flexible joints shall not normally be cast in. Where the size of the block does not make this possible, additional flexible joints shall be provided no greater than half a pipe diameter beyond each face of the block.

510 Concrete Surround to Pipes

Where pipelines pass under streams and rivers or where directed by the Project Manager, the pipeline shall be surrounded with concrete as shown on the Drawings. Concrete surround shall be "broken" at all pipe joints to retain flexibility in the pipeline. No joints shall be concreted in without the prior approval of the Project Manager.

511 Flotation of Pipelines

The Contractor shall ensure that flotation of the pipeline does not occur during construction. Sufficient backfill shall be placed over each pipe after laying and before testing to prevent flotation.

512 Pressure Rating

The pressure rating of pipes shall be as indicated on the drawing or Bill of Quantities or if not indicated then selected such that the maximum pressure in the pipeline inclusive of surge pressures shall not exceed the maximum allowable sustained working pressure rating of the pipe.

The surge pressure amplitude (the difference between maximum and minimum surge pressures) shall not exceed one half of the maximum allowable sustained working pressure rating of the pipe.

513 Testing of Water Supply Pipelines

All pressure pipelines shall be hydrostatically tested. Site test pressures shall be 1.5 times the maximum working pressure or allowance pressure plus 5 bar whichever is the smaller measured at the lowest part of the pipeline, unless otherwise specified on the drawings.

The Contractor shall give the Project Manager not less than 48 hours notice of his intention to carry out a pressure test. Testing shall not commence without the Project Managers approval. Before a length of pipe is tested, each pipe shall be securely anchored. All thrust and anchor blocks shall have been constructed and, the barrel of each pipe shall be backfilled to the extent necessary to prevent flotation or movement of the pipeline and shall be not less than 600mm.

Normally joints shall be left exposed until pressure testing has been satisfactorily completed. Any need to backfill a pipeline before pressure testing shall not relieve the Contractor of his responsibility to excavate to locate and repair any leaks.

Pressure testing shall be carried out as the work proceeds in such lengths as are convenient but not exceeding 500m. The ends of the length of pipeline under test shall be closed by means of securely anchored caps or blank flanges. Pipeline valves shall not be used for this purpose. All washout valves shall be fitted with blank flanges and the valves opened before the commencement of any pressure test. At each air valve location, a special air release arrangement shall be provided to allow manual release of air during filling operations. Pressure testing shall not be carried out with permanent air valves in place.

The pipeline to be tested shall be filled slowly with water in such a manner that all air is expelled. Air vents shall be checked to ensure that no air is trapped at high points.

The pressure in the pipeline shall slowly be raised to the working pressure, the test pump disconnected and the pipeline left charged under pressure with air valves opened for a period of not less than 24 hours to allow air in the pipeline to be expelled and pipe linings and pipe walls of absorbent materials to become saturated. At the end of this period of time air valves shalt be closed and the test pump shall be reconnected and the pressure in the pipeline raised to the test pressure and this pressure maintained for a period of 24 hours or such other period as directed by the Project Manager.

Throughout this period the pressure in the pipeline shall not be allowed to fall or rise more than 6m head of water above the test pressure and this shall be accomplished by pumping water into or releasing water from the pipeline as required. The volume of water pumped into or released from the pipelines shall be carefully measured. At the end of the test period the pressure in the pipeline shall be adjusted to the test pressure by pumping water into or releasing water from the pipeline as required.

The apparent leakage from the pipeline shall be ascertained from the net volume of water that has been pumped into the pipeline during the test period. The permissible loss shall not exceed 2 litres per metre nominal bore per kilometre length per m head per 24 hours.

During the pressure test exposed joints shall be inspected and any leakage or seeping joints shall be remedied. All signs of leakage shall be remedied whether total apparent leakage from the pipeline under test is less than the apparent allowable leakage or not. Should any length of pipeline fail to pass the pressure test the Contractor shall at his own expense carry out all work necessary to locate and remedy the faults and to retest the pipeline until it satisfactorily passes the test.

A low pressure air test (not exceeding 0.3 bar) may be used as a preliminary joint tightness test prior to backfilling and hydrostatic testing.

The water used for pressure testing shall be provided by the contractor and shall be free from impurities and of such a quality which will not pollute or injure the pipeline. The Contractor shall be responsible for obtaining the water, transporting it and for its safe disposal on completion.

514 Cleansing and Sterilizing of Pipelines

After the pipelines have been completed and pressure tested satisfactorily as herein specified the Contractor shall flush out and cleanse the pipelines. Where water is provided by the Employer, the cost of this will be reimbursable under a provisional sum.

Diameters 300 mm and greater:

Pipelines shall be cleansed in sections and this shall be carried out by means of passing through polyurethane foam swabs. The swabs shall be to the approval of the Project Manager.

Diameters less than 300 mm:
Pipelines shall be cleansed in sections by flushing with potable water, for a period of time to be decided by the Project Manager's Representative.

Cleansing of any section shall be repeated as required by the Project Managers Representative in the event of the initial or subsequent operation not being to his satisfaction. The cost of such water shall be charged to the Contractor.

The Contractor shall supply all necessary equipment for the cleansing and sterilizing operations, including all swabs and swab detectors which shall be handed over to the Employer on completion of the Works.

Swabs shall be passed through pipelines at speeds of between 0.2 and 0.4 metres per second to obtain. the best

cleaning results with the minimum number of passes. Should it be apparent from the debris collected by the swab that damage to the lining has occurred; the Contractor shall be wholly responsible for repairing the lining to the satisfaction of the Project Managers Representative.

The swabbing operation shall be controlled by an experienced Project Manager to ensure that no undue surges in the pipeline, heavy docking of the pig or pressurising of the pipeline occur causing damage to any of the permanent works. Any damage caused shall be made good by the Contractor to the satisfaction of the Project Managers Representative.

The Contractor shall make all necessary arrangements for the transportation of water from the point of supply from the Employer to the required location, and make all arrangements for the disposal of the water. All disposal methods and locations shall be to the approval of the Project Manager's Representative.

When the pipelines have been cleansed to the satisfaction of the Project Managers Representative the Contractor shall introduce at a stow rate of water flow by a portable chlorinator or other approved means of a solution of sterilizing agent in such quantity and of such strengths than 30 parts per million. This sterilizing charge shall be allowed to remain in the pipelines for 24 hours after which time the pipelines shall be thoroughly flushed using the supply water to remove chlorine in excess of that in the supply water.

When this flushing has been satisfactorily completed samples of water will be taken by the Project Managers Representative for bacteriological analysis by the Employer. If any of the results of the analyses are unsatisfactory when compared with those of the control sample of the supply water the sterilizing process shall be repeated until satisfactory results are obtained. On completion of sterilizing and flushing the pipelines shall be left full of supply water.

The Contractor shall be solely responsible for the provision of all labour, materials and chemicals necessary for carrying out the foregoing operations.

The cost of water used for repeated cleansing, sterilizing and flushing pipelines in accordance with this clause of the Specification will be charged to the Contractor and the Contractor shall be responsible for all temporary works and other arrangements in connection with cleansing, sterilizing and flushing the pipelines.

The costs of the initial sampling analyses and preparing reports on the bacteriological quality of the water shall be borne by the Employer but the costs of any subsequent sampling analyses and preparing reports should the initial reports be unsatisfactory shall be borne by the Contractor.

515 Painting
All steel or ductile iron pipes and fittings exposed to view including above ground pipelines shall be painted after making good the external protection with two coats of Bitumastic Aluminium solution or similar approved.

Pipes and fittings in chambers shall be painted with two coats of approved paint. Valves and Surface Boxes shall be similarly painted.

516 Connections to and Diversions to Existing Pipework

516.1 General

The Contractor shall be responsible for connecting new pipework and service connections laid under the Contract to existing pipework, and for blanking-off existing pipework and service connections. The connection shall be made in a manner to minimize any disruption to supply.

Before blanking-off or making a connection to existing pipework the Contractor shall notify the Project Manager in writing no less than 14 days in advance of the date on which he proposes to carry out the work. After giving such notice the Contractor shall obtain from the responsible Authority agreement on the precise date, times and method that the connection will be made. The connection or blanking-off shall be made at such times of the day or night as stipulated by the Project Manager.

The Contractor shall prepare a detailed method statement, programme of the work and a schedule of all plant and materials to be used and shall obtain the approval of the Project Manager not less than 72 hours before commencement of the work. The programme shall allow for the immediate re- commissioning on completion of the work.

The Contactor shall be responsible for locating the exact line and level of the existing pipework and service connections and shall agree with the Project Manager and the responsible Authority the precise location of the connection or blanking-off.

516.2 Materials

Before commencing the connection the Contractor shall excavate trial pits as necessary and shall check the outside diameter of the existing pipework and ensure that the couplings to be used for making connections to the existing pipework and the materials used for blanking-off existing pipework are dimensionally suitable. .

The Contractor shall ensure that all the materials are on site not less than 24 hours before the commencement of the work.

516.3 Personnel

The Contractor shall ensure that at least one senior member of his field supervisory staff, who is experienced in such operations and fluent in both English and the language of his labourers is on site throughout the duration of the work.

The Contractor shall also ensure that all necessary skilled artisans and an adequate number of labourers for the operation are on site throughout the work.

516.4 Preliminary Work

The Contractor shall execute all works possible before disconnection of the supply including:

a) Excavation and supports to the excavation.
b) Blinding with concrete the immediate working areas, but not less than the whole of the bottom of the excavation.
c) Putting in all drains, or where this is not possible a sump of adequate size from which a pump may operate.
d) Casting the floor of any chamber which is later to be constructed around any of theworks.
e) Casting the thrust blocks or any other works which may be required.
f) Exposing and cleaning pipes in readiness for the work.

516.5 Carrying out the Work

The Contractor shall be responsible for emptying the section of existing pipework on which the work is to be carried out, by a method agreed with the Authority and approved by the Project Manager.

The Contractor shall take all precautions necessary to prevent dirt and other foreign matter entering the pipelines.

The Contractor shall provide at the Site a sufficient quantity of clean water containing approximately 10 parts per million (10mg/l) of chlorine before proceeding with the cutting of the existing pipeline. Each item of pipework including the joints shall be submerged in the solution for a minimum period of 15 minutes immediately prior to installation.

516.6 Water Pipes and Chambers to be abandoned

Where existing water pipes are to be replaced with new pipework the existing pipework is to be abandoned. Where new works conflict with existing pipework to be abandoned, abandonment of pipework shall consist of removal and disposal to a site approved by the Project Manager. Water supply pipework shall not be abandoned until suitable alternative means of supply are in place and ready for connection.

Where chambers are to be abandoned these shall be broken down and disposed of and the void filled and compacted with suitable material approved by the Project Manager. Chambers deeper than 1 metre will be broken down to 1 metre below finished ground level and the remaining void filled and compacted with suitable material approved by the Project Manager.

APPENDIX G

STAKEHOLDER CONSULTATIONS

The following list presents the participants that took part in the Consultative Workshop (19th May 2017), 3-day Critical Review Sessions (28th – 30th June 2017) and the Validation Workshop (2nd August 2017) held in order to review and compile the 2nd Edition of the School WASH Standards and Guidelines. This list does not include the numerous stakeholders from County Governments, Schools and civil society groups that were consulted during the county field visits but whose contribution was important to the development of the document.

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