Defence Infrastructure Organisation

Civil & Mechanical Works Contract

DIO RD OS Trg (Kenya)

BATUK

Required Works: KEN/GE/1902

Booklet 3 Performance Specification Design pack

Reference: KEN/GE/1902 (version 1.0)
Dated: 3 Oct 19

PERFORMANCE SPECIFICATION - CIVIL & MECHANICAL WORKS KEN/GE/1902

Project Considerations

1. **Introduction**. There is a requirement to upgrade 30No existing direct unvented solar hot water system to indirect unvented (sealed primary) solar hot water system for 6No ablution blocks at the Forward Mounting Base (FMB) on Nyati barracks. The replacement of an existing underground double skinned diesel tank Glass Reinforced Plastic (GRP) fibrelite sump

2. **Location**. The proposed sites are located at Nyati barracks, in the vicinity of the FMB as per Drawing (Dwg) No. DIO/LABE/FMB/C/01 and at Kifaru barracks in the vicinity of the Petroleum Oil and Lubes (POL) point which can be seen on Drawing (Dwg) No. DIO/KEN/KIF/1902/001.

3. **General.** This Performance Specification (PSpec) outlines the required works at Nyati and Kifaru barracks. Information on the Scope of Works, Specifications, 'Inspection, Supervision, Testing and Commissioning' regime, Construction Materiel List and also Pre-Construction Information (PCI) are at Annexes A – I of this document. This PSpec is to be read in conjunction with the following project documents, and is to be utilised by the contractor in order to produce a cost and time quotation for the required works:

(a) Project drawings.

(b) Invitation to Tender (ITT).

4. **Constraints**. The Contractor must adhere to the following constraints:

a. **Occupation**. The existing site may be partially occupied by permanent and Battle group personnel during the construction phase. All works should be deconflicted with the end user through the Superintending Officer (SO) prior to any works been carried out.

b. **Power and Utilities**. The Contractor is to ensure that minimum disruption is caused to all services during the construction phase.

c. **Security**. The Contractor will receive a security brief in English from the Authority[1] prior to commencement of works. The Contractor is to ensure a linguist is available to relay the brief to local workers. Actions on emergency events will be briefed, the Contractor is to ensure that all workers abide by the stipulated directions. All Contractor workers will be issued with security passes by the Authority. These passes are to be held on the person at all times when on site. Contractors will be subject to security searches by the Authority.

d. **Battle-group**. It is highly likely that the Battle-group (Exercising) troops will be on site at the same time as the Contractor, de-confliction of works is to be co-ordinated via the Authority.

e. **Food**. The contractor will provide food, drinking water and PPE to his work force, since no items such as food, clothings or equipments considered as "Gifts" shall be accepted by the contractor or his team from any member onsite as it is seen as theft by the Authority.

Project tasks description

5. **Task No.1.** Nyati barracks: upgrade 30No existing direct unvented solar hot water system to indirect unvented (sealed primary) solar hot water system for 6No ablution blocks at the FMB.

[1] The Authority is designated as 'Maj Plackett DIO Garrison Engineer. A delegated Superintending Officer will be on site daily, this individual will make decisions and advise the contractor on behalf of the Authority accordingly.

6. **Task No.2.** Kifaru barracks: The replacement of an existing underground double skinned diesel tank GRP fibrelite sump.

Background Information for this project

Task No.1

7. Nyati Barracks FMB is occupied by battle groups when they are in transit to the training area. The FMB consists of the followings buildings:

a. 28 No. Accommodations 26m x 6m floor area with gable ends at the short sides.

b. 1 No. VIP accommodation 29m x 8m floor area with gable ends at the short sides.

c. 6 No. Ablutions 26x6m floor area with gable ends at the short sides.

d. 1 No. Kitchen 15x10m floor area with gable ends at the short sides.

e. 2 No. Dining rooms 42x9m floor area with gable ends at the short sides.

f. 2 No. Welfare buildings 28x8m floor area with gable ends at the short sides.

g. 4 No. Storage rooms 7x3m with single slope roof.

8. Currently the FMB ablution blocks shown on Drawing (Dwg) No. DIO/LABE/FMB/C/01 are installed with direct unvented solar hot water system incorporated with electric immersion heaters. Each ablution has 5 sets of solar water heating system connected in parallel as shown in figure 1 below, each set of the solar water heating system consist of:

a. 1No. 320 litres dayliff water storage vessel.

b. 2No. Solar water heating glass panels.

c. Connection pipework, safety devices, drain and isolation valves.

Figure 1. Shows the existing direct unvented solar hot water system that installed in each Ablution

9. Each ablution block is divided into three sections, with the following requirements:

a. Male east side consisting of:

(1) 12No. shower heads.

(2) 17No. Wash Hand Basins (WHB).

b. Female middle consisting of:

(1) 3No. shower heads.

(2) 3No. wash hand basins (WHB).

c. Male west side consisting of:

(1) 12No. shower heads.

(2) 15No. Wash Hand Basins (WHB).

10. Currently the solar water heating system number 1 and 3, of each ablution water storage vessel Is supplied by a single phase 3 Kilowatt (KW) electric immersion heater that is set to operate to 60^{o}c.

11. The solar water heating system is fenced off with a chain-link fence and a double access gate 2.0 meters wide.

Task No.2

12. Kifaru barracks POL point has an underground double skinned diesel tank which has a fibrelite sump which consists of pipework connections (filling point, breather and outlet points) and inter tissue skin alarm device. The exsiting fibrelite sump leaks, hence lowing ingress of water to the sump, This increases the risk of damaging the alarm device, contaminating the stored diesel and corroding the pipework fittings.

13. The sump as shown in figure 2 below consists of the following devices:

a. Outlet pipe of diameter 50mm black mild steel (BMS).

b. Inlet pipe of diameter 100mm BMS.

c. Vent pipe of diameter 50mm BMS.

d. Content gauge pipe of diameter 75mm BMS.

e. Return pipe of diameter 50mm BMS.

f. Euro gauge make Inter tissue skin alarm device.

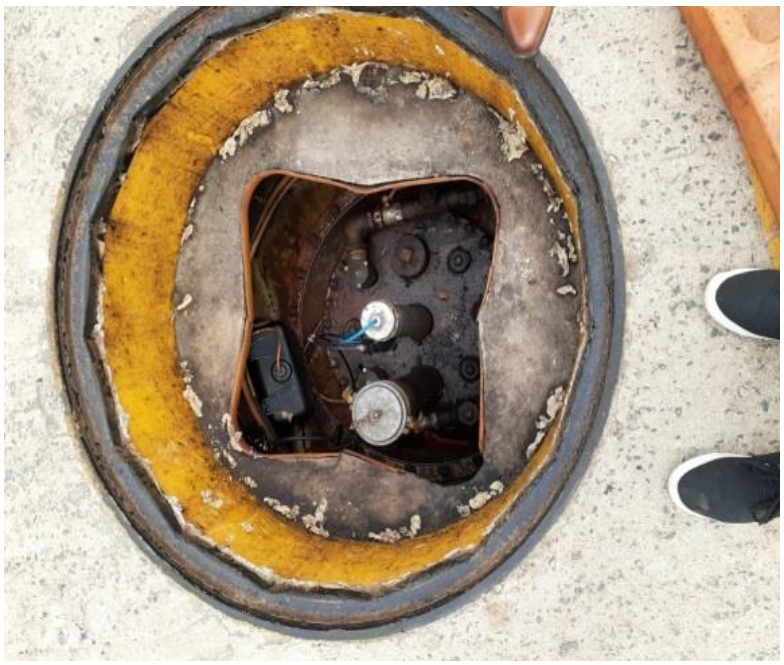

Figure 2. Showing the existing sump.

Outline requirement for this project

Task No.1

14. **Works**. The following provides an overview of the required works. The works are to be phased as follows:

a. **Enabling Works**. The following enabling works are to be carried out by the contractor prior to carrying out the project tasks:

(1) Identification of unknown services that may affect the task site.

(2) Getting approvals from authority and construction of own site office and material storage area.

(3) Task site should be complete with fence and appropriate safety signs prior to start of construction off and installation of the safety signs in accordance with HASAWA[2].

b. **Decommissioning of the existing installation.** The decommission of the existing solar hot water system should be carried out after each block has been installed, tested and commissioned. Decommissioning should be done in accordance with NEMA[3]

c. **Design, Installation, test and Commissioned.** The contractor should design, install, test and commission an indirect unvented (sealed primary) solar hot water system integrated with an electric water heater with a closed loop supply (circulation loop) in accordance with BS7671[4], BS8558:2011[5], JSP 375[6] and the concept drawing No. KEN/NYA/M/001 at FMB. 6No ablution blocks should comprise of the minimum components listed below:

[2] UK Health and Safety at Work Act 1974 (HASAWA).
[3] National Environment Management Authority (NEMA) regulation
[4] Requirement for electrical installations. IET wiring regulations 18th Edition.
[5] Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – Complementary guidance to BS EN 806

(1) Solar collector tank (Heat exchanger)
Model: 300 l/g 2K XL
Capacity: 300 Litres
Maximum operating pressures: 10 bars
Anode protection:
Closed-circuit: With natural circulation

(2) Solar collector
Model: Apollo E XL
Number: 2pcs
Collector type:
Closed system maximum operating pressure: 3 bar
Anode protection:

(3) Electrical Water Heater
Model: ATA 203
Capacity: 200 litres
Water Inlet: ¾"
Hot water outlet: ¾"
Circulation water inlet: ¾"
Maximum operating pressure: 10 bar

d. The contractor should provide the required labour, materials, equipments and service to complete the task.

e. Contractor shall supply all solar collectors, mounting equipment, piping, pumps, controls, metering, related wiring, monitoring equipment and all ancillary equipment necessary to install the solar system and commissioned to the authority hot water supply for the ablution blocks.

Task No.2

15. **Works.** The following provides an overview of the required works. The works are to be phased as follows:

a. **Enabling Works**. The following enabling works are to be carried out by the contractor prior to the installation of an underground double skinned diesel tank which has a fibrelite sump:

(1) Identification of unknown services that may affect the site.

(2) Excavation and disposal of the existing concrete area, this is to include making safe all utility services in close vincity to the site.

(3) Getting approvals from authority and construction of own site office and material storage area.

(4) Task site should be complete with fence and appropriate safety signs prior to start of construction off and installation of the safety signs in accordance with HASAWA[7].

[6] MOD Health and Safety Handbook.
[7] UK Health and Safety at Work Act 1974 (HASAWA).

b. **Kifaru camp installation of fuel tank..** Replacement of the existing underground double skineed diesel tank firelite sump.

(1) Decommissioning, demolition and disposal of the existing fuel tank sump and concrete surround.

(2) Purchase and installation of like to like fuel tank sump to the existing underground GRP tank with the accompanying ground works.

Documents to be provided by the Contractor

16. **Requirement**. On acceptance of contract award, and no later than 7 days prior to commencement of works, the Contractor is required to submit the following documents to the Authority:

a **Supporting drawings**. The drawings attached to this document, are to be read in conjunction with this PSpec. It should be noted that these drawings are **'**Concept Only' and the Contractor is to produce a full set of design documentation. It is the Contractor's responsibility to confirm quantities and distances.

b **Construction design**. The Contractor is to advise the Project Manager (PM) of all design consultants / Sub-Contractors who will be employed on this contract and the areas of their design responsibility. Any works undertaken without prior issue of full information for the necessary approvals will be entirely at the Contractor's risk. The Contractor shall not commence any work in accordance with any design document until the Authority has agreed the relevant design document. The Contractor shall keep one copy of each design document on Site, to which the Work Contracts Officer (WCO) or his representatives may have access.

c **Construction Phase Plan (CPP)**. The CPP is to be developed from the Pre-Construction Information (PCI) provided at Annex G. The Contractor shall submit a CPP to the Authority for approval, including but not limited to all risk assessments, method statements and hazardous material procedures.

d **Works plan (Programme)**. To identify the following:

(a) Mobilisation date.

(b) Construction start date.

(c) Anticipated project completion date.

e **Health & Safety File (H&SF)**. The Contractor is provide the Authority with a copy of the Health & Safety File (including As Built drawings) which must be submitted no later than 2 weeks before completion of the works. The H&SF is to be submitted on Compact Disc (CD) in Portable Document Format (PDF) format and hardcopy.

Design responsibilities

17. **Contractor design responsibilities**. The Contractor is responsible for the design of all elements contained within the schedule of works. Where required, all designs are to be submitted to the Authority for concurrence and authorisation prior to implementation of Works. Where the nature of works does not warrant full design, a descriptive proposal complete with proposal sketch must be submitted for concurrence. The Contractor shall ensure all designs are in accordance with, and include the applicable requirements as per British Standards and all other design documents specified within this PSpec. It shall be noted that these references are provided as guidance and minimum requirement only; the responsibility remains with the Contractor to ensure that all design and construction works comply with the latest methods, requirements and guides,

and generally accepted practice as relates to the works, geography, climate, environment and theatre of operations. Where there are conflicts between the Contractor's design drawings and the PSpec (Booklet 3), the PSpec will take precedence in all cases. Any queries shall always be addressed to the Authority in the first instance. The references and specified British Standards (BS) / Euro Norms (EN), within this PSpec are to be used (or similar Authority approved standards) as a minimum standard, throughout the Works.

18. **UK Building Regulations**. All works shall comply with the latest UK Building Regulations. Shall any variation be required, approval from the Authority shall be obtained in writing prior to the commencement of any Works.

19. **Health and Safety (H&S)**. All works shall be carried out in accordance with the Health and Safety at Work Act 1974 (HASAWA). The Contractor shall submit a Construction Health and Safety Plan (CH&SP) to the Authority for approval, including but not limited to all risk assessments, method statements, and procedures for transport, storage, handling and disposal of hazardous materials.

19. **Construction drawings**. All works shall be constructed in accordance with the final approved Contractor finished construction drawings (or written proposal in this case). Where a conflict in design is found, authorisation shall be obtained in writing to the Authority prior to any changes in design. No construction shall commence prior to obtaining written approval of the final construction drawings / proposal by the Authority. All project changes will be conducted in accordance with Booklet 2 para 61, change control procedures.

20. **Design life**. The design life of all new electrical and structural components and assemblies to first major overhaul or replacement shall be 10 years or otherwise stated in the manufacturer literature or specification. The Contractor shall supply and install all components, elements and systems / structures to satisfy this requirement, and any additional contractual requirements that may apply.

21. **Existing services**. The Contractor is responsible for ensuring all services on or adjacent to the site that will be affected by the works are identified, located and appropriate action taken to prevent damage before work commences. The Contractor shall ensure that any existing services and concrete slabs are reinstated to the standard of the existing, with the minimum of disruption to existing facilities and services during construction. All works that could possibly influence existing services may only commence with written approval. The Authority must be informed immediately if any unknown services are discovered that will have an impact on the works.

22. **Approval and instruction**. The Contractor shall ensure that any existing services and affecting works including all connections and services tied into are of an acceptable standard to ensure the required performance over the life of the facility. Should it be found that one or more of the services (including but not limited to existing water, sewerage, drainage and electrical reticulation) is not considered acceptable to the requirements, the Contractor shall inform the Authority and obtain written approval and instruction prior to taking any actions to rectify or make good the pertinent unacceptable situation.

Construction preliminaries

23. **Health and Safety (H&S)**. The Authority regards the provision of adequate H&S measures as being of prime importance. A guidance document to assist in the development of H&S practices is included in this PSpec at Annex G.

24. **Construction pre-start meeting**. The Authority will arrange for a construction pre-start meeting after award of contract. All Stakeholders will be engaged and invited to attend. Items detailed in this document and associated tendering documentation will be discussed. An agenda will be issued by the Authority no less than 5 days prior to the meeting.

25. **Existing ground condition**. The Contractor is responsible for confirming the existing ground conditions, which are to be taken into account whilst designing and compiling the CPP.

26. **Obstructions**. As the proposed works are to be carried out around existing infrastructure and surrounding areas, the Contractor is to review the site before commencing works.

27. **H&S restrictions, precautions and monitoring**. The Contractor shall implement the requirements described in the HASAWA 74 to protect members of the public and persons visiting the site from risks arising from the use of equipment, materials or substances defined therein.

28. **Control of noise and vibration**. The Contractor shall comply with the recommendations for practical measures to reduce noise set out in BS 5228[8] Parts 1, 2 and 4.

29. **Equipment movement and storage**. It is expected that the Contractor will not require a forward resources area other than the site. Should one be required, a location shall be made available, as agreed by the WCO. Packaging shall be to a good standard capable of withstanding transportation and handling loads. The Contractor shall be solely responsible for storage and movement of all equipment to site. The Contractor shall remain at all times responsible for the security of equipment including prevention of theft.

General conditions

30. **Site diary**. The Contractor shall keep an in date, daily site diary in English language. This document is to be used to record all decisions made on the site both verbal and written. The document is also to be used to record visits to site and note anything, which has a direct effect on the project in terms of cost and extensions to time, or any other occurrence that affects the project programme. The Contractor shall on request make the site diary available for the Authority to inspect. This document will be used as the audit trail in light of any disputes, concerning the project.

31. **Design standards**. The Contractor should produce designs in accordance to BS and is to ensure all designs and take-offs are correct.

32. **Change protocol**. All changes must be agreed and authorised by the Authority in writing. The site diary shall list all issued variation orders and site instructions, including amended drawings, and verbal decisions made on site. All verbal decisions must be recorded in writing no less than 24hrs after they have been made and entered in the site diary.

33. **Access**. The Contractor shall provide at all times, access to the works. The Contractor shall supply the Authority with copies of any documentation and drawings, which may reasonably be required for the purposes of monitoring the work performed under this or any Sub-Contractor.

34. **Signage**. The Contractor shall supply and erect all applicable and appropriate signage to the site. This shall include as a minimum all H&S signage, directions and location of site office and emergency contact details of the Contractor's representative on site. Temporary warning signs and careful demarcation of works areas must be undertaken with care to ensure compliance with any and all requirements; all signs must be written both in English and the local language of the Contractors workforce.

35. **Workmanship**. Notwithstanding any clauses in the contract or elsewhere in the specifications or scope of works, the Contractor shall be responsible for ensuring that all work-related activities be carried out in a neat and workmanlike manner, in accordance with accepted good practice. The Contractor shall pay full attention to Quality Control (QC) and adherence to the specifications. Particular care shall be taken in respect to H&S matters. All working areas are to be kept clean and tidy on a daily basis.

[8] Code of practice for noise and vibration control on construction.

36. **Communications**. The Contractor shall provide his workforce with adequate means of communications throughout the life of the contract in order to carry out the work specified.

37. **Temporary services**. The Contractor shall provide temporary service for any required mechanical and electrical systems.

38. **Security at completion of daily work**. The Contractor is to leave the works secure with all accesses locked and keys to be handed to the main guardroom.

39. **Contractor welfare**. The Contractor is to provide and maintain the following temporary worker welfare facilities under CDM 2015 at an Authority approved location[9].

a. Rest area.

b. Changing area.

40. **Accidents**. The Contractor is to inform the Authority of all on site accidents & near misses. These occurrences are to be recorded in the accident log book. The Contractor is to ensure adequate first aid and emergency evacuation measures to medical facilities are in place prior to commencement of works. The Contractor is also required to provide the Authority with planned actions to be taken in the event of an accident. This information is to be provided during return of tender.

ORIGINAL SIGNED

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[9] The contractor is to liaise with the Authority to determine which areas within the site is suitable for locating welfare facilities.

Annexes:

A. Scope of Works.
B. Civil Specification.
C. Mechanical Specification.
D. Electrical Specification.
E. Supervision, Inspection, Testing and Commissioning regime.
F. Generic Points Pre-Contract.
G. Generic Points Pre-Construction Information.
H. Generic Points During Construction.
I. Generic Points Post Construction.

Drawings

DIO/KEN/KIF/1902/001:	Kifaru barracks site plan showing the petroleum, Oil and Lubrication Point (POL).
KEN/NYA/M/001:	Showing the concept schematic for the indirect unvented solar hot water system to be installed in each Ablution.
DIO/LABE/FMB/C/01:	Showing Nyati Barracks FMB compound layout.

Annex A to
KEN/GE/1902
Dated 3 Oct 19

Scope of works

Task No.1

1. The following is the scope of works which will be carried out on each ablution block to include full commissioning and testing:

a. Carry out the site survey on how the chain-link fence, access gate, water pipework, ablution plant room walls and ceiling conditions looks like before conducting the works.

b. Demolition of existing solar water heating system and accessories.

c. Installation of the solar water system (collectors, heat exchangers, pipeworks, safety devices and all other components as per the design.)

d. Installation of the electrical water system (electric heater, elements, thermostats, control panel, electrical wiring, pipeworks, safety devices and all other components as per the design.)

e. Installation of the circulation pump and circulation loop inside the ablution as per the design.

f. Disinfection of the system and connection to the existing pipework to the ablution block.

g. Reinstating of the chain-link fence, access gate, ablution plant room walls and ceiling should there is any during your construction period. This shall be of a high standard inline with its orginal state.

h. Testing and commissioning as per BS 7671 2018[10] & BS EN 858-2[11].

i. Handover and production of Health and Safety file.

Task No.2

2. Task requires the demolition of existing underground fuel tank sump and installation of new fuel tank sump in the same location. Based on following phases.

a. Enabling works.

b. Site clearance and security fencing.

a. Decommissioning of fuel tank sump will include;

(1) Obtain required permits to decommission fuel tank sump from authority.

(2) Disconnection of all pipe connected to the tank sump to allow safe removal of the sump.

(3) Disposal of tank sump contents.

[10] Requirement for electrical installations, IET wiring regulations 18th Edition.
[11] Separators systems for light liquids part 2: selection of nominal size, installation, operation and maintenance.

(4) Cleaning and making good all affected areas.

b. Demolition and disposal of concrete surround.

(1) Demolition and disposal of the reinforced concrete surround.

(2) Removal and disposal of gravel fill around tank sump.

(3) Levelling and making good to excavated surface.

(4) Removal of fuel tank sump

c. Installation of new fuel tank sump.

(1) Assembling and fixing of new fuel tank

(2) Fixing and reinstating of all the existing pipe works and services to the new fuel tank sump

(3) Testing and commissioning

d. Filling and concreting surround of sump

(1) Fill with grave up to the manufacture required level and compact well.

(2) Place reinforced concrete as per manufactures required level.

e. Painting of the hazardous Area zone.

(1) Demarcating the hazardous area with yellow 100mm thick paint

(2) Labelling the zones demarcated as hazardous with black paint

f. Handover and production of Health and Safety file.

Performance specifications

Task No.1

3. The following performance specifications are to be considered into the contractor's design.

a. **Trenching.** All trenches for the ducting shall be 450mm deep. A warning tape shall be place above duct works. Warning tape shall be laid at a depth of 300mm below the finished surface level. Warning tapes shall be traceable and be not less than 150mm wide and 0.1mm thick. They shall be blue in colour and bear the continuously repeated legend "CAUTION WATER PIPE WORK BELOW", or similar, in black letters not less than 30mm high.

b. **Pipe sizing.** The pipe sizing should be done as per BS EN 806-3[12], in consideration of simultaneous use of appliances (Shower heads and WHBs) which can reduce flow rates. It is important that the whole system should be designed so that flow rates are not reduced to such an extent as to adversely affect the satisfactory functioning of the system. Thus the minimum design flow rates to shower head outlet and wash hand basin should be 0.10 litres per seconds.

c. **Piping system.** Generally type L copper, black steel and stainless steel are appropriate materials for the piping system. When using copper tubing, hard soldering is recommended for the collector loop. No use of Teflon tape to seal threaded pipe joints when heat transfer fluid used is water/glycol. Piping should be designed for low pressure drop and the shortest routes used. Contractor shall provide a piping system complete with pipe, pipe fittings, valves, strainers; expansion loops pipe hangers, inserts, supports, anchors, guides, sleeves, and accessories. Pipe shall be designed to observe limits on flow velocity, pressure drop, and gauge pressure with the pipe type and characteristics. The pipe work should be design in accordance with BS 8558:2011[13].

d. **Pipes passing through walls and floors.** Where fire regulations and other considerations require the ends of sleeves to be sealed, such sealing should be of a permanently flexible form to allow movement of the pipe.

e. **Valves installed Underground.** Valves installed on an underground pipe should be enclosed within a pipe guard or chamber under a surface box of the appropriate grade for the traffic loading according to the location.

f. **Above ground pipework.** Adaptor couplings are available for jointing different materials covering a range of different jointing methods and including both direct and union type couplings; these should be used whenever possible. Where suitable adaptors are not available for the particular joint required, both materials should be adapted to BS P threaded ends, which should be screwed together if male and female or connected by a nipple, socket or union of a material compatible with the pipe material that does not lead to corrosion.

g. **Below ground pipework.** Joints in buried pipework should be kept to the absolute minimum and joints between pipes of different materials should be restricted.

[12] Pipe Sizing
[13] Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – Complementary guidance to BS EN 806

h. **Location of pipes and valves.** Location and position of underground pipes and valves should be recorded. Surface boxes should be marked to indicate what service is below them. Durable markers with stamped or set in indexes should be set up to indicate pipe service, size, position and depth below the surface.

i. **Thermal insulation.** All pipes/fixtures shall be insulated with the specified insulation thickness in accordance with BS 5422[14] and installed as per BS 5970[15].

j. **Support brackets.** The pipe supports shall have polyethylene insulation rings (Armafix). There shall be no part besides the water heater, the pump and the solar panels that shall not be insulated.

k. **Safety devices.** Pressure relief valves, temperature relief valves, combined temperature and pressure relief valves, check valves, pressure reducing valves, anti-vacuum valves and pipe interrupters should be fitted in accordance with BS 6280, BS 6283-2, BS 6283-4[16].

l. The safety valves should be designed for flow conditions that should occur under stagnation. All safety accessories are required to meet category IV of the pressure equipment directive and carry a “CE” mark.

m. **Pressure gauges.** The gauges should be installed within view of the filling/draining point as well as accessible to the user of the system.

n. **Stagnation protections.** The contractor is responsible for designing and installing a solar system that meets stagnation and overheat protection requirements by providing the appropriate safety devices and control system.

o. **Heat Transfer fluid.** The fluid used should meet a number of requirements to ensure good performance:

(1) A high heat capacity and conductivity allowing efficient heat transportation from the collector.

(2) Anti-corrosive protection, if mixed or corrosion prone materials are present in the collector.

(3) Non-toxicity and environmental friendliness.

(4) Low viscosity for easy pumping of the fluid

(5) Low cost and availability.

(6) Withstand the high stagnation temperatures, which occur when the heat transfer fluid stays in the collector too long and high temperature is reached greater than the normal due to the heat from radiation.

p. **Heat Loses.** The collector looping piping system between collectors and storage tanks must be insulated to avoid energy loses. Any pipes and insulation materials that are exposed (to weather and animals) should be resistant to damage (UV degradation and removal by birds) as not to fail.

[14] Thermal insulation material
[15] Thermal insulation materials installation guide.
[16] Safety devices guide

q. **Valves.** Valves are used for balancing flow, flow adjustments, component isolation, and for temperature and pressure control. Valves should be of same materials as the pipe.

r. **Circulation pump.** The contractor shall provide an electrically-driven, single stage, centrifugal type circulating pump. The pump shall be supported on a concrete foundation or mounting intended for the purpose, or by the piping on which installed if appropriate to the size. The pump construction, the pump shaft of corrosion resistant alloy steel with a mechanical seal. Stainless steel impellers and casing of bronze. The pump motor start stop shall be controlled by the solar thermal temperature control system and complete with manual override (hand-off-automatic). Pump shall be installed with an isolation valve so the pump can be serviced without draining the system.

s. **Heat exchanger.** The design requires a heat exchanger constructed of 316 stainless steel, titanium, cooper-nickel, or brass. Furnish heat exchanger with a capability of withstanding high temperatures. Tube-in-tubes copper side-arm heat exchangers are acceptable for appropriate system types. Should be able to withstand the temperatures and pressures that will be experienced in the system. The material of construction needs to be compatible with the heat transfer fluid and with other materials in the piping system.

t. **Legionella considerations.** Caution should be exercised to avoid the risk of the growth of legionella Pneumophia bacterium. They can multiply quickly when the water temperature is between 30 and 45^{o}c and should be avoided. Thus to avoid legionella bacteria hot water should be stored at 60^{o}c and the furthest hot water outlet within the ablution should attain 50^{o}c within 1 minute. Other design options are to limit the quantity of usable hot water by means of a heat exchanger or tank-in-tank construction.

u. **Solar collectors.** The collectors shall be oriented to face on the same direction. Collectors arranged in multiple rows should be spaced to avoid shading from other collectors. The solar collector proposed by the contractor shall comply with at least, but not limited to, the following:

(1) All equipment shall be new, undamaged, fully warranted without defect.

(2) All equipment and installation shall qualify for available solar hot water incentives.

(3) Acceptable mounting methods for panels shall be provided either by manufacture of approved design. Bolted and similar connections shall be non-corrosive and include locking devices designed to prevent twisting.

(4) Should be glazed closed loop flat plate collector. Providing minimum 65% optical efficiency, rugged high quality construction using impact-resistant, anti-reflective solar glass, copper meander/serpentine absorber tube, selective-surface absorber plate, non-degrading thermal insulation and rapid connections kits to interconnect collectors, ports for collector temperature sensors, air vents and electronic differential controls.

(5) The collector shall have no less than 95% transmission, eta conversion factor of no less than 0.75 by gross area.

(6) Resistant to large variations in temperature.

(7) Resistance to environmental conditions.

(8) Casing should be resistant to corrosion.

v. **Electrical components.** Contractor shall provide electrical equipment and wiring in accordance with BS 7671[17].

w. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.

x. **Electrical water heater.** The electric water heater shall comply with at least, but not limited to, the following:

(1) To have minimum of two immersion heater elements.

(2) Element power to be between 3.0 to 6.0 kW.

(3) The insulation should be of minimum 50mm thickness.

(4) It should have the special blue enamel coating

(5) Should have stronger anode rod for perfect protection of the inner tank of the water heater against corrosion and ensure the even longer life of water heater.

(6) Use Emerson thermostat which has a temperature setting range 49 to 82^{o}c

(7) Have a nylon drain valve, using composite (glass filled polymer) material for a drain valve which doesn't deplete the system anode.

y. **Mounting system.** The mounting system shall be designed and installed such that the panels may be fixed with reliable components proven in similar projects, and shall be designed to resist dead load, live load, corrosion, UV degradation, wind loads and seismic loads appropriate to the geographic area over the expected 10 years lifetime.

z. **Accessibility.** The installation of collectors and other equipment's shall provide adequate room for access and maintenance of existing equipment in the ablution plant rooms.

aa. **Corrosion control.** Contractor must comply with at least, but not limited to following requirements.

(1) Fasteners and hardware throughout system shall be type L copper, stainless steel or material of equivalent corrosion resistance.

(2) Racking components shall be anodized aluminium, hot-dipped galvanised steel, or material of equivalent corrosion resistance.

(3) Unprotected steel not to be used in any of components.

(4) Each system and associated components must be designed and selected to withstand the environmental conditions of Nyati barracks (Laikipia County) i.e. temperatures, winds, rain, flooding etc. to which they will be exposed.

bb. **Decommissioning existing hot water system.** Disposal of the existing hot water system components shall be in accordance with NEMA. The Contractor shall arrange for removal from site by a registered waste disposal contractor in accordance with NEMA[18]. The Waste Transfer Note shall be handed to the Authority. Additionally, hazardous waste is to be placed in suitable sealed containers.

[17] Requirement for electrical installations. IET wiring regulations 18th Edition.
[18] National Environment Management Authority (NEMA) regulation

cc. **Training.** The contractor shall provide on-site training to the authority tradesmen in all aspects of operation and maintenance. The training shall be scheduled to take place at time agreeable to both parties. At a minimum, training topics shall include the following:

(1) System safety, including shut-down procedures.

(2) Solar thermal collector maintenance and troubleshooting.

(3) Calibration and adjustment procedure for temperature sensors, pressure gauges and safety valves.

(4) Heat transfer fluid changing guide and schedule.

(5) Monitoring solution, including standards and custom reporting.

dd. **Cleaning.** The contractor will ensure purge new piping and parts of existing water piping that have been altered, extended, or repaired have been cleaned and disinfected before use. Clean the non-portable solar thermal side of the system including the solar thermal collectors and heat exchangers according to the manufacturer's recommendations.

ee. **Removal and remediation.** Contractor shall remove all construction spoils, abandoned footings, utilities, construction equipments and other by-products of construction. All disturbed areas including plant room walls, floor landscaping, aggregate, access gates, chain-link fence and concrete shall be remediated to be in equal or better condition than found. The site shall be left clean and free of debris or dirt that has accumulated as a results of the construction operations.

ff. **Consideration.** Below are general good points to factor during the design and installation stage.

(1) System will be well grouted/clamped with collectors installed so as to enable it to sustain the highest wind pressure of that area.

(2) All the collectors will be south facing inclined at a suitable angle to give best performance.

(3) There will not be any shadow falling on the collectors from nearby structures or of other collectors in front or back.

(4) Hot water pipe lines of any kind in colder regions shall be fully insulated from the point of drawl of water from tank to delivery points. In other regions also care will be taken to avoid heat losses from pipelines.

(5) System will be installed nearest to the point of hot water usage to avoid longer pipeline & higher heat losses.

(6) The workmanship & aesthetics of the system will be good and it should be visible to anybody

(7) Air vent pipe, make up water and cold water tanks will be installed as required for smooth functioning of the system

(8) There won't be any leakage observed in the system from tanks/ collectors/ pipelines

gg. **Close-out documentation requirements.** Close-out documents must include at minimum, but not limited to, the following items.

(1) Final As-built drawing of the installation.

(2) Owner's manual and component warranties.

(3) Signed inspection cards.

(4) Testing and commissioning certificates related to start-up and performance testing of the system. (Acceptance testing; System start-up and Proving period)

Task No.2

4. In conjunction with drawing No. DIO/KEN/KIF/1902/001. The following data will need to be considered into the contractors design.

a. **Groundwork.** The contractor is to inspect the ground, check level and soil condition where necessary before starting of the work and report to the authority any fault within the system. A statement of known services should be acquired from the authority on request before any excavation starts. Breaking of concrete should be done carefully not to break adjacent concrete with the debris kept aside for disposal. Excavations are to be done carefully and excavated materials set aside for disposal. All open excavations must be kept free of water and fallen materials as far as reasonably practicable. Where the excavated sides are not firm, extra strutting should be used to retain the soil. All the time the open excavation should be protected and proper signage erected. Ground works should be done in accordance with (PUWER) regulations 1998.[19] And BS 5228.[20] The existing ground is as below

(1) 4**.**5m(L) x 4.5m(W) x 0.6m (D) overall size of reinforced concrete separated with expansion joint from the adjacent concrete all inclusive of 1.2m dia x 1.2M(D) sump at the centre of the concrete.

(2) 0.6m deep gravel below the concrete surround.

(3) Fibrelite sump 1,200mm dia x 1,200mm deep bolted to the existing GRP fuel tank and connected with fuel pipes.

b. **Filling and concrete works.** The contractor is to fill around the sump with approved gravel to the bottom of the frame as required by the manufacture guideline. Gravel used should be clean free from dust or foreign material, Using reinforced concrete the underside of the frame should be adequately supported. The concrete should be minimum 300mm ramped away from the sump. All filling and concrete works should be designed to take up heavy truck load without applying pressure to the sump and the tank. All concrete works should be carried out in accordance with (PUWER) Regulations 1998, CDM2015[21], BS EN 1992-1-1:2004: Euro code 2[22]. BS 5228 and BS EN 206:2013 [23]:

c. **Reconnection of existing services.** Existing pipes should be disconnected and made safe for reuse before any works start. The pipes should be inspected and reported for any faulty before disconnecting. The following pipes are existing:

[19] Provision and Use of Work Equipment Regulations (PUWER) 1998.
[20] Code of practise for noise and vibration control on construction and open sites
[21] Construction (Design & Management) Regulations 2015
[22] Design of concrete structures general rules and rules of the buildings
[23] 2013 Concrete - specification, performance, production and conformity

(1) Outlet pipe of diameter 50mm black mild steel (BMS).

(2) Inlet pipe of diameter 100mm BMS.

(3) Vent pipe of diameter 50mm BMS.

(4) Content gauge pipe of diameter 75mm BMS.

(5) Return pipe of diameter 50mm BMS.

(6) Euro gauge make Inter tissue skin alarm device.

d. **Finishes to concrete.** All concrete surfaces must be finished and ramped away from the sump; concrete joints should be sealed with petroleum resistant mastic sealant. This to be in accordance with ACOP L138 & L135[24].

e. **Installation of new fuel tank sump.** The contractor is to source fuel Tank Sump Suitable for GRP Tank. 1.2m diameter chamber with collar ring base connection, a sealed corbel, watertight platform, adjustable skirt and round 900mm flat sealed cover and composite frame. Installation of new fuel tank sump in position with all elements fixed as per manufactures requirement. A sample Installation guideline of the new fuel tank sump is as per the installation manual and in accordance with OFS T-200 standards (OFTEC)

f. **Connection of pipes and services.** The existing pipes and services should be reconnected back to their original positions. All joints should be made tight and tested for leakage.

g. **Painting and labelling.** The hazardous area zones should be painted with yellow line and labelled with the applicable ZONE (the paint should be none slippery and not reactive with petroleum products). Zoning should be done in accordance to OFS T-200 standards (OFTEC), And to consider that the existing tank is for one product, diesel only.

Contractor Assurance

5. The Specification for this project is a concept only and the Contractor is to provide detailed designs and detailed specifications supported with any applicable design calculations for the Authority. Request for isolation of any existing services which may interfere with the task will need to be factored into the Contractor timelines.

[24] Approved code of practice

Annex B to
KEN/GE/1902
Dated 3 Oct 19

Civils Specification

Groundworks

1. **General**. Site investigation is to be conducted by the Contractor. A Statement of Known Hazards (SoKH)[25] is to be obtained prior to any groundworks being undertaken. The area is to be clear from rubbish, rubble or debris prior to any works being carried out. All local services are to be identified and adequate precautions taken to protect such services from damage for the duration of the works. Before starting work the Authority will verify which existing fences, gates, roads, paved areas and other site features are to be removed, and which assets are to be relocated. Open excavation shall be protected, suitable signage erected, and a banks man employed when vehicles are manoeuvring. Backfilling shall be completed utilising suitable materials and compacted in 75mm layers to achieve the bearing strength enough to safely carry the imposed loads without settling.

2. **Permits**. Obtain a statement of know hazards and all drawings relating to existing services that may be affected by the proposed works. A copy of the Permit to Dig must be given to the Authority prior to any works commencing.

a. **Identification**. All local services are to be identified using a Cable avoidance tool and signal generator (Cat and Genny) or otherwise approved cable detector tool and hand digging as required, in order to protect such services from damage during and after the construction.

b. **Notification**. Inform the Authority immediately if any unknown services are discovered that will impact on the works.

c. **Accidental damage**. The Contractor is responsible for making good, at his expense, any services damaged by excavation and any additional works required as a result of the damage caused.

3. **Unrecorded features**. If any unrecorded legacy construction is unearthed, it is to be left undisturbed while further Authority instruction is obtained.

4. **Unstable ground**. The Contractor is to inform the Authority without delay if any newly excavated face will not remain unsupported sufficiently long enough to allow the necessary earthwork support to be inserted.

5. **Hazardous, aggressive or unstable materials**. The Contractor shall not import or use fill materials which would, either by themselves or in combination with other materials or ground water, give rise to a health hazard, damage to the facility structures or instability in the filling. Construction materials should not include any finishes that may lead to shedding of particles.

6. **Groundwater level**. The groundwater level has not been established but it is not expected to impact on the works. It is the Contractor's responsibility to take into account the groundwater levels when submitting technical and commercial proposals.

7. **Ground level**. The Contractor is to prepare the ground to enable construction. All materials arising from the works that are not suitable for general filling, are to be removed from site and disposed in an approved location.

[25] The application for Statement of Known Hazards and Permit to Dig from the Authority requires seven (7) days for the approval process and remains valid for thirty (30) days from the date of approval. The Contractor is expected to apply for Permit to Dig in advance of any intended ground works.

8. **Sinkholes**. Any sinkholes or soft spots are to be excavated and filled with a suitable fill material. The imported fill material is to be thoroughly compacted in layers not exceeding the capability of the compaction equipment. Any areas requiring extra or unforeseen works are to be reported to the Authority for approval on the remedial works prior to any rectification action.

9. **Placing fill**. The Contractor shall ensure that excavations and areas to be filled are free from loose soil, organics, rubbish and standing water. All fill is to be placed and compacted against structures, membranes or buried services in a sequence and manner which will ensure stability and avoid damage. The plant employed for transporting, laying and compacting must be suited to the type of fill material being used and the size of the site. All compaction works are to be carried out correctly; any imported fill is to be wetted and compacted a total of three times using suitable mechanical vibration means to provide a minimum Californian Bearing Ratio (CBR) of 10%.

10. **Compacted fill**. The following is to be adhered to:

a. **General**. Compacted general fill includes any materials that have been excavated or imported. Suitable and unsuitable excavated materials that have been excavated, are to be kept separate to prevent cross contamination. If there is insufficient suitable excavated material, the Contractor is to provide the Authority with details (and quantities) of proposed imported material. The Contractor is to spread and level all materials in layers and as soon as possible thereafter compact each layer using plant and methods suitable for the type of material.

11. **Disposal of materials**. All materials requiring disposal are to be kept to a minimum on site and the following rules are to be applied:

a. Spoil heaps are not to be more than 2.5m high as this may present a potential FOD risk.

b. Do not place any other material on top of spoil heaps.

c. Do not allow construction plant to pass over spoil heaps.

d. Prevent compaction and contamination.

e. Surplus subsoil is to be removed from site.

f. Separate different materials so as not to cross contaminate.

12. **Grading**. Crushed aggregate is to be used as Type 1 and is to conform to the grading requirement illustrated in Table 1. The optimum Moisture content of the Type 1 aggregate is to be maintained within a range of 8 - 12%, to aid the compaction process:

BS EN Sieve Size	**Percentage by Mass Passing**	
	Minimum	**Maximum**
63 mm	100	100
31.5 mm	75	100
16 mm	43	81
8 mm	23	66
4 mm	12	53
2 mm	6	42
1 mm	3	32
63 micron	0	9
The particle size shall be determined by washing and sieving method as stated in BS 933.		

Table 1: Type 1 Aggregate grading requirements.

Formwork

13. **Design and construction**. Formwork is the responsibility of the Contractor but must comply with the following:

a. Formwork is to be rigid and durable, suitable for re-use during construction and of sufficient strength to support the loads and lateral pressures of the wet concrete and the placing and finishing operations.

b. Formwork is to be constructed to produce finished concrete to the required dimensions. Formed surfaces must be free from twist and bow, all intersections, lines and angles being square and straight. Formwork is to be adequately braced during placing operations to withstand, without springing or settlement, the impact and vibration of the spreading, compacting and finishing operations.

c. Formwork is to be constructed, including joints between forms and completed work, to prevent loss of grout, using seals when necessary. The formworks are to be secured tight against adjacent concrete to prevent formation of steps.

d. The depth of forms shall be adequate to fully support the nominal thickness of the slab. The thickness of packing below the forms shall not exceed the irregularity of the surface permitted by this specification, specifically +/- 3 mm over a 3m straight edge.

e. Forms are to be coated in mould release agent to aid in striking and the interior of all forms shall be completely free of debris to enable the formwork to be readily removable without impact, shock or damage to the concrete surfaces. The release agent shall not bind with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds.

f. Formwork materials shall be protected before, during and after erection to insure acceptably finished concrete work. In the event of damage to erected forms, the necessary repairs or replacement prior to concrete pours shall be performed at no expense to the Authority.

Concrete

14. The concrete surround will be a C30 reinforced concrete foundation that is to accommodate weight of up to 40tonne vehicle. The overall concrete surround to be demolished and replaced dimensions are 4.5m(L) X 4.5Mm(w) existing concrete thickness is of minium 450mm. The sub-base is to be compacted in accordance to the specifications within this document.

15. **Concrete materials and mix designs**. The Contractor shall submit to the Authority the proposed concrete mix designs for all concrete works, including in-situ and pre-cast concrete. The size of the aggregate used is not to exceed the nominal 20mm and will comply with BS EN 13139:2013[26]. The Contractor is to notify the Authority 48 hours prior to pouring of concrete. Cubes are to be taken from structural concrete with 7 & 28 day crushing results passed to the Authority by the Contractor QC representative. PQC is to be used for all concrete works and the required strength of the PQC will be a minimum of 30N/mm^2 (C30 concrete).

16. **Reinforcement**. Mild steel reinforcing mesh are to be A252 8mm, reinforcement must be free from oil, dirt, loose rust and scale when placed. Reinforcement fabric mesh shall be placed and fixed on supports or preformed spacers not exceeding 500 mm centres. Water shall be sprinkled on steel and forms prior to placing concrete. There must always be a minimum of 50 mm

[26] Specification for aggregates for mortar / concrete.

cover over steel reinforcement in all directions. Concrete works in accordance with BS 4482:2005[27].

17. **Concrete workability**. Workability shall be constant and if necessary plasticizing or retarding admixtures may be used to suit local or weather conditions. The slump of concrete will be tested prior to pouring in accordance with BS EN 12350-2:2009[28] to ensure that the mix is not too stiff. Workability is not to be increased by adding water.

18. **Water**. Any water used in the mixing of the concrete shall be clean and non-saline. The Contractor is required to check any water sources used for salinity. The Authority reserves the right to check water salinity on site. Concrete made using saline water will be rejected and replaced by the Contractor.

19. **Concrete practice**. The Contractor shall ensure that suitable consideration is given to the placing of concrete in inclement weather and that appropriate precautionary / avoidance measures are taken to minimise shrinkage and cracking. Due to the potentially low temperatures during the winter months, an accelerator may be required as an additive to the concrete in order to speed up the curing process.

20. **Placing and compacting concrete**. At the time of placing concrete, the Contractor shall ensure that all surfaces on which concrete is to be placed are clean and free from debris, organic material and free water. The concrete shall be placed in 150 mm layers; to avoid trapping air, their thickness should be regulated. Do not add water or re-temper mixes. Fully compact to full depth (until bubbles cease to appear on the top surface) especially around cast-in accessories, into corners of formwork and at joints. Vibration of the concrete shall be by means of mechanical vibration only, with care taken in the mix design and compaction to minimise segregation. A spare mechanical vibration unit should be at hand in the event of break down during the concrete pour.

21. **Curing of concrete**. The Contractor shall prevent surface evaporation during the curing process. It is the Contractor's responsibility to ensure the concrete is cured correctly. The fresh concrete shall not be subjected to the weight of any traffic or equipment for a period of 14 days after the pour[29]. Where further pours are required on to the concrete, a period of 2 days curing is to pass before further formwork and pouring is introduced.

22. **Concrete finish**. The contractor is to carry out all finishing operations at optimum times in relation to the setting and hardening of the concrete. Wetting of surfaces of concrete to assist surface working or sprinkling cement on to the surface is to be avoided. The surface of the concrete shall receive no special treatment other than finishing operations required to produce the specified degree of accuracy of the surface level. Any exposed concrete edges are to have a 25 x 25 mm chamfered finish applied to prevent damage when striking formwork. The surface of the slab after final regulation shall be brush textured in a direction away from the tank sump. The surface texture must be applied evenly across the slab with a stiff brush with the minimum texture depth of the less than 1mm.

23. **Joints**. Expansion joints allow expansion and contraction of a concrete slab without generating potentially damaging forces within the slab itself or the surrounding structures. There shall be a definite break in the concrete and any reinforcing steel that may be present. Where adjacent bays are 'tied' together by means of dowel bars, these dowels shall be sleeved in one of the bays to allow expansion to take place without generating stresses within the slab. Joints are to be constructed after every individual slab to allow for expansion and extraction. The dowels shall be 600mm long and manufactured from mild steel (Grade 250). In expansion joints, the dowels are 25mm diameter at 300mm centres. Expansion joints shall consist of a flexible piece of compressible board, topped with a waterproof sealant. The sealant is to be petroleum resistant and sandwiched between adjacent bays or between the concrete slab and another fixed object.

[27] Steel wire for the reinforcements of concrete products.
[28] Testing fresh concrete, slump test.
[29] The minimum period of fourteen (14) days for curing concrete must be factored into the Contractor's Works Programme.

Drainage

24. **Surface drainage**. The Contractor is to design and install an adequate surface water drainage system for the area within the contract parameters. The existing drainage is adequate for the contrite surround and the contractor is to make sure that concrete surround slopes towards the existing drain. The slope should be gentle maximum of 1:200 towards the existing open drain.

25. **Service entries**. Service entries below ground must be adequately protected from the effects of weather, settlement and displacement, ground-borne loads and vermin ingress.

Annex C to
KEN/GE/1902
Dated 3 Oct 19

Mechanical Specification

1. **Hot and cold water Supply.** The main water supply to each ablution block to be Medium Density Polyethylene (MDPE) pipe and couplings to BS EN 1519 rated at a minimum of 12.5 Bar is to be used throughout the installation, sized in accordance to BS 6700**:** 2007. The supply pipe is to be sleeved and sealed using uPVC pipe for protection upon entry into the building through the floor slab and wall.

a. **Transition fittings**. A transition fitting is to be installed where the internal Polypropylene Random (PPR) pipe connects to the MDPE pipe. The following components shall be installed prior to the transition:

(1) **Check valve**. MDPE compression fitting double check valve is to be installed, preventing siphoning of the system.

(2) **Pressure Reducing Valve (PRV)**. A PRV is to be installed to reduce the pressure coming into the building.

(3) **Pressure gauge**. A pressure gauge is to be fitted after the PRV, but prior to the change from MDPE to PPR pipe.

(4) **External isolation valves**. All external Cold Water System (CWS) and Hot Water System (HWS) isolation valves are to be MDPE ball valves with male connections to a female coupler compression fitting. All external service isolation valves are to be pressure rated to a minimum of 8 bars, buried at a minimum depth of 750mm.

(5) **Valve pit**. The service isolation valve pit will be (GRP) with a sealed push fit cover. An extension bar for operation is to be provided, terminating in the valve pit. The valve pit is too stabilised adequately with concrete. Details of the stabilisation, location, depth and size shall be in accordance with the Authority's methods and standards.

b. **Internal pipework**. All internal pipework and fittings are to be PPR pipe, with butt fusion welded fittings. PPR pipe should have the following characteristics.

(1) **Pressure**. All internal pipe work and fittings are to be pressure rated at a minimum of 5 bars, which has been stipulated to account for the design pressure of the CWS distribution pipe.

(2) **Support**. Pipe runs are to be surface mounted and supported at 600 mm centres; with saddle clips secured using eight 50mm R/H Philips screws in to the walls.

(3) **Joints**. All joints are to be supported 300mm from the centre of the joint, to reduce deformation of the pipe**.**

(4) **Outlets**. Outlets should be fed from below and joined using flexible couplings with ½ BSP connections. Pipework shall be installed with a fall towards drain valves, minimising 'dead leg' lengths.

(5) **Internal pipework fixings**. Distance between fixings to be in accordance with BS EN 1452-2 to allow for standoff distances in order to aid inspection,

maintenance, support outlets / terminations and to provide mechanical protection. Pipework is to be fitted horizontally and vertically only.

(6) **Elbows & tees**. All internal elbows and tees are to be PPR pipe and pressure rated to 5 bars minimum, as stipulated to account for the design pressure of the future CWS & HWS distribution pipe of the South site, installed to allow for expansion, contraction and to prevent bowing.

(7) **Internal stop cock**. To be located as soon as is practicable within the confines of the building to aid in isolation in the event of catastrophic failure.

(8) **Internal service valves**. All internal service valves are to be brass bodied ball type isolation valves with PPR pipe outlet and inlet. All valves are to be pressure rated to a minimum of 5 bars. These are to be fitted prior to every outlet in order to aid in maintenance. All toilet and urinal cisterns are to be fitted with double check valves and isolation valves.

2. **Water distribution.** Medium Density Polyethylene (MDPE) pipe and couplings to BS EN 1519 rated at a minimum of 12.5 Bar is to be used throughout the installation, sized in accordance to BS 6700**:** 2007[30]. Pressure reducing valve are to be used to reduce the pipe and fittings pressures to acceptable levels. All outflows (faucets etc.) are to conform to the relevant BS or approved local equivalent. Pipework connections are to be made using electro-fusion jointing, preference is for coils to be utilised where space allows minimising the amount of couplings. Where screwed joints are used for final connections, the male component shall be taper threaded and the jointing between them shall be sealed with PTFE tape. All fittings and materials used throughout the water system are to be WRAS[31] approved. External and internal pipework are to be insulated against freezing.

3. **Legionnaires' Disease Prevention.** The cold and hot water storage and distribution systems within the male and female ablutions is to be designed and installed so as to prevent Legionella bacteria from proliferating within the system in accordance with the HSE ACOP L8[32].

4. **Labels and safety signs**. The whole cold and hot water system should have the flow direction signs, names of the main components, valves numbering and all other related safety signs as per the as built drawings.

[30] Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages Specification
[31] Water Regulatory Advisory Service (WRAS).
[32] The Legionnaires' disease Approved Code of Practice (ACOP) (L8)

Annex D to
KEN/GE/1902
Dated 3 Oct 19

Electrical Specification

1. **Distribution cables.** All armoured cables shall comply with BS 5467:1997 or BS 6346:1997[33] and all other cables shall comply with BS 6004:2000. Cables shall have copper conductors and the colour identification of cores shall comply with BS 7671[34] or BS EN 60446:2000. For live conductors, the identification shall extend throughout the length of the cable. Identification is to be consistent with the relevant wiring diagrams. Cable locations shall be positioned in accordance with the following:

    a. Cables will be supported and run within 300 x 300mm heavy duty cable tray or be laid direct on the floor. Where positioned on the floor they are to be as far as reasonably possible, positioned so as not to cause a hazard.

    b. Where armoured cables are used they are to be terminated using a correctly sized proprietary cable glands. Where cables enter a metal enclosure they shall be protected by grommets and secured by cable clamps.

2. All cable types shall be BSEN compliant or similar and complies with new colour coding.

    a. L1 – Brown

    b. L2 – Black

    c. L3 – Grey

    d. Neutral – Blue

    e. Earth - Yellow/green

3. **Buried services.** All buried cable services are to be run in armoured cable to BS 5467 or BS 6346. Excavation of trenches, back filling and reinstatement of the ground (including pavements where appropriate) will be carried out to ensure no cable damage occurs. Cables laid in trenches shall be laid on a 75mm bed of sieved earth or sand and covered by a similar 75mm dressing of sieved earth or sand. Suitable marking tape shall be placed 300mm below ground level, along the entire length of all cable runs. A SoKH is to be obtained prior to any trench excavation. The following minimum separation distances from other services and burial depths are to be observed:

    a. LV cable to LV cable: 50mm unless they are run in ducts.

    b. LV cable below ground level (un-trafficked): 500mm.

4. **Cable handling.** Cables shall be handled with care and every effort made to avoid damage to the cables, other services and building fabric. Cable drums shall be unloaded carefully by means of either a crane or ramp and impact with the ground shall be avoided. They shall be supported on axles and axle stands while the cable is being pulled. The cables are not to be dragged over ground or twisted.

33

34 Requirement for electrical installations. IET wiring regulations 18th Edition.

5. **Cable containment.** All containment routes are to be straight, run vertically or horizontally and shall be parallel with the adjacent components. The following shall apply:

a. **Cable tray.** Cable trays shall be installed and mechanically connected to the associated building fabric at a height above finished ground level suitable for pedestrians traversing underneath. Cable tray shall be metal perforated, hot dipped galvanised and brackets shall be installed to provide adequate support without sagging. Metallic cable trays shall be electrically and mechanically continuous throughout and bonded to the earth system. The tray should afford such space as to allow for circuits to be separated by at least 25mm. Where cables are laid on the cable tray they shall be secured by ties complying with the following:

(a) They shall be of a proprietary type low in halogen, self-extinguishing and ultra-violet resistant. The use of wire or similar material is not permitted.

(b) They shall be installed at 600mm (maximum) intervals for vertical runs and 450mm (maximum) for horizontal runs and within 100mm of any bend or offset.

b. **PVC Trunking**. 50 x 50mm surface mounted, white PVC high impact trunking shall be installed along the walls of the offices at a height of 2200mm above finished floor level in order to accommodate respective final circuits within the technical accommodation areas. PVC trunking shall be adequately supported along its full length via proprietary methods.

c. **PVC Conduit**. Surface mounted 20mm nominal diameter heavy gauge white PVC conduit shall be installed as required between the PVC trunking to point of use appliances and fittings. PVC conduit shall be adequately supported along its full length via proprietary methods.

6. **Enclosures.** Enclosures for exterior applications shall be rated to IP65 (minimum). All enclosures shall be suitable for the environment that they are located in.

7. **Electrical Fittings.** All the electrical fittings (termination boxes; immersion heaters control panel) should be of appropriate ingress protection rating in accorandance with BS EN 60529:1992+A2:2013[35] to the zone installed with the facility.

[35] Degrees of protection provided by enclosures (IP Code)

Annex E to
KEN/GE/1902
Dated 3 Oct 19

Supervision, Inspection, Testing and Commissioning Regime

General

1. **Requirement**. In order to establish whether the requirement has been fully met by the Contractor, the Authority will require proof of testing of the materials used, equipments installed and the practices employed. The Authority is to be invited to all testing and commissioning. Additionally, the Authority has the right to conduct its own inspection and tests on materials used and equipment installed for this task. Any discrepancy will require additional testing at the expense of the Contractor.

2. **Documentation**. On completion of the project, the following information is to be provided to the Authority for approval and inclusion to the project H&SF:

a. The manufacturers' operating and maintenance manuals and instructions for all equipment and controls, including all available information relating to installed electrical equipment and switchgear.

b. All inspection, test and commissioning results.

c. All associated calibration certificates as it relates to the testing instruments used during the testing procedure.

d. As built / installed drawings and schematic drawings.

Management of the works

3. **Survey and setting out**. The Contractor will be responsible for all setting out and leveling during construction

4. **Supervision**. The Contractor shall accept responsibility for relevant design amendments, co-ordination, supervision and administration of the works, including all subcontracts. They shall arrange and monitor a programme with each sub-Contractor, supplier, local employer and any worker, and obtain and supply information as necessary for co-ordination of the work. In addition to constant management and supervision of the works, all significant types of work must be under the close control of competent trade supervisors to ensure maintenance of satisfactory progress and quality.

4. **Liaison with the Authority**. The Contractor shall designate one person from within his organisation who will be responsible for liaising with the Authority on a day to day basis and as the need arises. The person so designated shall be responsible for communicating with the Authority in English both written and verbally. This is to include notification of intended work and explaining the effect that the works will or may have on the operation or systems within the site. The liaison will be responsible for responding to the Authority's enquiries and dealing with any issues or complaints. It is a requirement that the Contractor liaison makes daily contact with the Authority such that an active rather than a responsive attitude to liaison is maintained. The Contractor’s liaison is a key person in achieving the successful execution of this contract.

5. **Co-ordination of engineering services**. The site organisation staff must include one or more persons with appropriate knowledge and experience of mechanical and electrical engineering services, as required to ensure compatibility between mechanical and electrical engineering

services. The Contractor is to provide CVs on tender return of suitably qualified, competent and experienced personnel. The Authority retains the right to request further evidence of competency.

6. **Site clearance**. On completion of project works ALL Contractor related equipment, material, ancillaries and temporary works are to be removed from site. Where applicable all waste is to be disposed of outside of BAF and at an approved disposal site.

Quality Control

7. **Procedures**. The Contractor is to produce a QC Schedule for approval by the Authority. The Contractor is responsible for ensuring that the works, including the work of all sub-Contractors, comply with specified requirements. This is to include all testing of materials that are to be incorporated into the project (e.g. concrete). The Contractor is to maintain full records, keep copies on site for inspection by the Authority, and submit copies of particular parts of the records on request. The Contractor is to take daily progress photos and these are to be sent to the Authority on request. The records must include the following:

a. Identification of the element, item, batch or lot including location in the works.

b. The nature and dates of inspections by the Contractor, tests and approvals.

c. The nature and extent of any non-conforming work found.

d. Details of any approved corrective action.

8. **General quality of products**. All products shall conform to the following:

a. Products to be new unless otherwise specified by the Authority.

b. Where a choice of manufacturer or source is allowed for any particular product, the whole quantity required must be of the same type, manufacture and / or source unless otherwise approved. Produce written evidence of sources of supply when requested by Authority.

c. Ensure that the whole quantity of each product required to complete the work is of consistent kind, size, quality and overall appearance.

d. Where consistency of appearance is desirable ensure consistency of supply from the same source. Do not use different colour batches where they can be seen together.

e. If products are prone to deterioration or have a limited shelf life, order in suitable quantities to a programme and use in appropriate sequence. Do not use if there are any signs of deterioration, setting or other unsatisfactory condition.

9. **Checking compliance of products**. The Contractor shall check all delivery tickets, labels, identification marks and where appropriate the products themselves to ensure that all products comply with the project documents. In particular, check that the products comply with the following:

a. The sources, types, qualities, finishes and colours are correct, and match any approved samples.

b. All accessories and fixings that should be supplied with the products have been supplied.

c. Sizes are correct. Where tolerances are critical, measure a sufficient quantity to ensure compliance.

d. The delivered quantities are correct, to ensure that shortages do not cause delays in the work.

e. The products are clean, undamaged and otherwise in good condition.

f. Any products with a limited shelf life are not out of date.

10. **Protection of products**. All products shall be protected to ensure that they remain in the condition they are required to be in. In particular the Contractor is to ensure that products are prevented from overstressing, kept clean, protected from the elements and kept in original wrappings until required for the project.

11. **Prohibited products**. The Contractor shall not employ on or incorporate in the works any of the following products and shall impose a like obligation upon all sub-Contractors:

a. Asbestos materials as described in the Control of Asbestos Regulations 2012.

b. Materials which are generally composed of mineral fibres either manmade or naturally occurring which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not scaled or otherwise stabilised to ensure that fibre migration is prevented.

c. Other products or substances generally known to be deleterious to H&S at the time of use or to the durability of the property in the particular circumstances in which they are being used.

d. Galvanized iron (GI) pipes and hem materials should not be used because of legionella control in accordance with ACOP L8 4th edition.

e. Only blue triangle and Bamburi cement are to be used.

f. River dredged aggregates are not to be used.

12. **Authority Quality Assurance (QA) checks**. The Authority may conduct QA checks at any stage throughout the construction phase. These in no way absolve the Contractor from his responsibilities under the contract for QC.

Civils

13. **Levels**. All levels will be checked by the Authority. Any areas which are not as specified will be rectified by the Contractor before the works are allowed to continue.

14. **Compaction**. The compaction of aggregates will be conducted using the correct equipment and are not to exceed the recommended depths of material for each layer. The Authority has the right to check all layers of the construction to determine the density of compacted material. Potable water will be added to aggregates during compaction to aid the process and to lubricate the material. Any areas of concern (loose material or voids) will be rectified by the Contractor at no extra cost.

15. **Aggregates**. The aggregates used for construction layers must conform to the performance specification for grading and in accordance with BS EN 13285, BS EN 13242 and BS EN 933-1. Testing for particle distribution and flakiness will be tested by the Contractor and the results passed to the Authority. Aggregate for concrete will conform to BS EN 12620 and be no greater in size than 20mm.

16. **Formwork**. The formwork will be checked for rigidity and shape by the Contractor prior to any concrete being placed. Levels will be checked and any adjustment made to ensure that the finished concrete is as per the design.

17. **Concrete**. The Contractor shall submit to the Authority the proposed concrete mix designs for the concrete works, including in-situ and pre-cast concrete. The size of the aggregate used is not to exceed the nominal 20mm and will comply with BS EN 12620[36]. The Contractor is to notify the Authority 48 hours prior to pouring of concrete. The Contractor is to adhere to the following:

a. **Concrete test**. The concrete will be subjected to the following tests on arrival at site and every batch will be tested by the Contractor. The Authority may test alongside for QA.

(1) **Slump**. The slump of concrete[37] will be tested prior to pouring to ensure that the mix is not too stiff. Workability is not to be increased by adding water.

(2) **Compressive strength**. This will be carried out by crushing 0.1m cubes at the 7 and 28 day point[38]. Samples will be taken at the point of laying the concrete and each batch will be tested. Any concrete not forecasted to meet the requirement of the 28 days strength at the 7 day cube test will be replaced at expense to the Contractor.

Mechanical

19. **Pipework**. All pipework and fittings are to be hydrostatically pressure tested to 1.5 times the working pressure for 1 hr. This is to be conducted under a controlled Safe System of Work. The Authority is to be given written notice at least 24 hours before pressure testing is to be undertaken. All diesel fuel lines are to be thoroughly flushed to remove all residual matter.

Electrical

20. The Contractor[39] will provide electrical inspection, testing and commissioning certificates for the new works. The Contractor installed power supply, distribution and all final circuits in accordance with BS 7671:2018.

21. Electrical Installation Inspection and test procedure. The inspection and testing of the new installation shall include the following:

(1) Prior to energising**.** Before the supply is connected the following procedure is to take place:

(a) Visual inspection as laid down within the BS7671:2018.

(b) Continuity of protective conductors, including main and supplementary bonding.

(c) Continuity of ring final circuit conductors, including protective conductors.

(d) Insulation resistance.

(e) Polarity (by continuity method).

[36] BS EN 12620 - Specification for aggregates from natural sources for concrete.
[37] Slump test to conform to BS EN 12350-2:2009.
[38] BS EN 12390-3:2009 Testing hardened concrete.
[39] The Authority may supervise aspects of this process to ensure all electrical installations are T&I to BS 7671 2018 Requirement for electrical installations, IET wiring regulations 18th Edition.

(f) Earth electrode resistance measurement (clean earth).

(2) During energising. With the supply connected and energised the following procedure is to take place:

(a) Check polarity of the supply, using an approved voltage indicator.

(b) Earth electrode resistance, using a loop impedance tester.

(c) Earth fault loop impedance.

(d) Prospective fault current measurement

22. **Tradesmen**. Electrical tradesmen responsible for conducting technical assurance of installed electrical works, making final connections to fittings and enclosures and for the electrical installation inspection, testing and commissioning of the installation in its entirety are to be suitably trained, qualified and competent to the following standards or similar standards:

a. BS 7671: 2018 - Requirements for Electrical Installations.

b. City & Guilds 2391: Electrical Installations or City & Guilds 2394 initial verification and certification of installation and City & Guilds 2395 or equivalent qualifications: Principles, practices and legislation for the periodic inspection, testing and condition reporting of electrical installations.

Annex F to
KEN/GE/1902
Dated 3 Oct 19

Generic Points Pre-Contract

Designers

1. **General**. This project is a Design and Build contract, meaning the Contractor must fulfil the role of both the designer, and the Principle Contractor. The design work must be carried out by a qualified and competent person. The Contractor shall ensure that all designs are in accordance with, and all applicable requirements contained within references and all other design documents specified within this Performance Specification. If the Contractor is not competent to carry out some aspects of the design work, a qualified person or consultancy firm shall be sub-contracted to carry out that portion of the work. The Contractor is to inform the PM of all design consultants/sub-Contractors who will be employed in this project and the areas of their responsibility.

2. **Competency**. Where design work is required to be carried out by a professionally qualified person, details of their qualifications and experience, registration with the Engineers Board of Kenya and copy of their professional liability insurance needs to be submitted to the Authority.

3. **Pre-Construction Information Pack (PCIP)**. All pre-construction information is contained within this Booklet 3. If any additional information is required, the Contractor is to request a copy in sufficient time to allow any changes prior to tender submission.

Contractors design

4. **Design parameters**. The Contractor is to ensure that their design meets the parameters outlined within this PSpec.

5. **Site visit**. The Contractor shall acquaint himself completely with the exact conditions relating to access and site environment, along with the layout, conditions and positions of the existing services, the full extent of the works required, and the supply and conditions affecting labour, carriage, carting, unloading, storage, tools, scaffolding etc. as well as any security and access constraints.

6. **Existing ground levels**. The Contractor shall confirm or identify all existing site levels required prior to any construction works.

7. **Ground water level**. The ground water level has not been established but it is not expected to impact on any of the works. However, it remains the Contractor's responsibility to consider the ground water levels when submitting technical and commercial proposals.

8. **Existing record drawings**. The Contractor will upon request, be supplied with copies of all available and relevant as built Drawings. The Contractor during tender stages shall fully acquaint himself with the nature and extent of all existing services within the area of the contract works.

9. **Compliance**. The responsibility remains with the Contractor to ensure that all design and construction works comply with the latest methods, requirements and guides, and generally accepted practice as related to the works, geography, climate, and environment. Where there are conflicts between the design Drawings and detailed specification the detailed specification will take precedence in all cases. Any queries shall always be addressed to the Authority in the first instance.

Use of design codes and specifications

10. **Conformity**. All designs must conform to the most current editions of British Standards (BS) or Euro Norms (EN). Other design codes may, on occasion, be used provided that they meet the minimum requirements and the Contractor shall submit proof of equivalency to the Authority for approval of use. The Authority can be approached for clarification of the relevant BS if required. On no account is the Contractor to use any design information other than that stated or approved by the Authority. All Contractors will be required to certify their designs for conformity to the specification and to the relevant BS/EN. Only appropriately qualified and experienced engineers are to certify the designs.

a. **Letter of conformation**. The design engineer is to produce a letter to state that the design conforms to all applicable legislation, most current editions of BS or EN, and best practices. The letter is to have the company header (of the design agency if sub-contracted) and to be signed by the lead designer with his name, contact details and qualifications detailed in the signature block.

b. **Construction Inspections**. Prior to the start of construction, the Contractor, designer and Authority shall agree key stages at which the works are to be inspected by the designer for compliance with the design.

c. **Build Conformity**. At the end of the project, the lead designer is to confirm in writing that the works have been built correctly, in accordance with his design.

11. **Design Life**. The design life of all new works and structural components and assemblies to first major overhaul, repair or replacement will be 10 years. The Contractor shall supply and install all components, elements and systems and structures to satisfy this requirement and provide documentary evidence.

Annex G to
KEN/GE/1902
Dated 3 Oct 19

Generic Points Pre-Construction Information

Detailed design and planning

1. **Additional design information**. The Contractor is to submit any additional design information to the Authority prior to commencement of the construction phase. The PM will examine design documentation and shall be entitled to reject a design as unsatisfactory where it is not in accordance with the specification, statutory regulations or if it would be unfit for purpose.

2. A copy of all construction Drawings are to be provided by the Contractor to the PM prior to commencing Works. Amended or updated Drawings are to be provided as necessary. The minimum design information to be provided by the Contractor shall include the following:

a. Any additional design calculations for the works.

b. Any additional general layout plans for the site and the structures.

c. Any additional detailed structural design, calculations and drawings.

d. Any additional foundation plans shall (as a minimum) indicate: all footing locations and dimensions, screeds and / or ground slabs or plinths, as applicable.

e. Any additional services layouts and calculations.

f. Any additional detailed Electrical, Mechanical Drawings and calculations.

g. Manufacturer's product details including safety data sheets.

h. Designer's risk register.

i. Project programme is to be regularly updated and, upon request by the Authority, provided electronically on Microsoft Project or equivalent.

Design Responsibilities under CDM 2015

3. The designer has the following responsibilities under CDM (2015).

a. **Eliminate hazards and risks during design**. Designers are to analyse the risks posed during the construction, daily use, maintenance and ultimate demolition of the facility. Once identified, these risks shall, where practicable, be designed out however the Contractor shall be aware of the following site specific hazards:

(1) Working with moving vehicles and plant equipment.

(2) Working in and around excavations.

(3) Manual handling general to all task activities.

(4) Traffic control around the site.

(5) Working with and around existing electrical sources and services.

(6) Working with concrete.

(7) Working at height.

b. **Provide information on remaining risks**. Remaining risks after the design process are to be compiled onto a designer's risk register and submitted with the final design.

Provision of information

4. Unless otherwise specified the following is to be provided:

a. **Documentation**. Three copies of all information, including valid certification, in respect to work, goods and materials proposed by the Contractor, shall be supplied to the Authority. Where the original document is written in a language other than English, it shall be accompanied by an English translation.

b. **Time**. Information and certificates shall be provided at least 2 days prior to the work commencing or supply of goods or materials.

c. **Drawing and Calculations**. Three copies of detailed working and fabrication drawings and calculations shall be submitted to the Authority for reference purposes. Such submittal shall in no way relieve the Contractor of his responsibilities for the work under the contract.

5. The Authority reserves the right to request copies of all calculations and drawings for analysis prior to the commencement of any construction on site. The Contractor will provide copies of all calculations and 'As Built Drawings' for the Health and Safety File.

6. The signed and approved drawings shall be used as the construction drawings on site for all work purposes and to satisfy the requirements as specified by the CDM (2015) and appropriate Approved Code of Practice (ACoP).

Construction phase plan

7. Under the requirements of HASAWA, the Contractor is to prepare a construction phase plan detailing how they will safely conduct the works. Risk assessments are to be included for all elements of work and method statements are required for any works that are out of the ordinary or high risk. The Construction Phase Plan must cover the following areas (where applicable):

a. **Safety Risks**

(1) **Protecting the public**. The public is any persons not involved in the works. Particular attention shall be paid to areas where children are likely to have access to the site outside of working hours.

(2) **Traffic routes**. Traffic routes for delivery of stores and equipment shall be clearly highlighted and controlled. Movement of plant and machinery on site shall be organised in a way that minimises risks to the workforce and any visitors to site. Care must also be taken to minimise risk from existing traffic routes.

(3) **Existing buried and overhead services**. Some of these may be identified in the permit to dig process, however care must be taken to identify and avoid any damages on existing services.

(4) **Adjacent land use**. The use of adjacent land and properties will affect the level of protection for noise and dust suppression etc.

(5) **Stability of nearby structures**. Care must be taken that works do not affect the stability of nearby structures.

(6) **Demolition works**. Demolition work is a particularly dangerous task and careful planning must be conducted. Method statements for all aspects of demolition will be required by the Authority.

(7) **Work equipment**. Work equipment must be inspected and in a suitable condition not to cause a hazard on site.

(8) **Electrical safety**. Electrical works will be conducted in accordance with the JSP and CDM recommendations.

(9) **Preventing falls**. Falling from height is one of the biggest causes of accidents in the construction industry. Even when not working under a permit, it is expected that the correct equipment and management methods are utilised to prevent falls.

(10) **Working with or near fragile materials**. Fragile materials shall be identified prior to work commencing and appropriate action must be taken.

(11) **Control of lifting operations**. Lifting operations are to be carefully planned and controlled on site.

(12) **Excavations / confined spaces**. All excavations inside buildings where work is to be conducted are to have the appropriate level of shoring / protection. Where an area is deemed a confined space, a permit may need to be issued to control the works. If permit is not issued, the Contractor is to have a suitable system in place with appropriate document i.e. risk assessment and method statements associated to the work being carried out.

(13) **Working on or near water**. If working on or near water the Contractor is to plan the works to minimise the risk drowning.

b. **Health risks**

(1) **Temperature and weather**. Protection from the weather conditions for the workforce.

(2) **Substance misuse**. Assurance mechanism to prevent the workforce from working under influence of drugs or alcohol.

(3) **Manual handling**. Assurance mechanism for correct lifting techniques, lifting equipment etc.

(4) **Dust**. Provision of dust suppression and removal.

(5) **Noise**. Reduction and suppression of noise. Management of timings for noisy activities etc.

(6) **Control of Substances Hazardous to Health (COSHH) Regulations 2002**. The correct storage and use of hazardous substances. Appropriate protective equipment must be worn when handling COSHH materials. Safety data sheets must be available on site at all time.

(7) **Asbestos**. Identification and appropriate management of Asbestos in accordance with Asbestos Prohibitions Regulations1985 and Asbestos products (Safety) Regulations.

c. **Provision of**

(1) **Welfare facilities**. Water, food, shade, toilet facilities etc.

(2) **First aid**. There shall be at least one qualified first aider with appropriate medical equipment on site at all times.

(3) **Emergency procedures**. Procedures for response to incidents such as fire, major and minor injuries, security incident etc.

(4) **Reporting of accidents, incidents or near misses**. Procedure for reporting and follow-on actions to prevent re-occurrence.

(5) **Waste management**. Management, storage and disposal of waste and arising from the site.

(6) **Fire prevention, detection and fire fighting**. Methods to prevent the start and spread of fire, and to identify any fire that does start. There must also be appropriate fire fighting equipment available and access to the site for fire fighting services.

Pre-start meeting

8. Prior to the commencement of any works, a Pre-Start meeting is to be held with the Contractor, lead designer and chaired by a representative from the Authority. The following topics are to be discussed as a minimum:

a. Mobilisation plan.

b. Site setup.

c. Health and safety.

d. Required permits.

e. Access and security.

f. Programme.

Annex H to
KEN/GE/1902
Dated 3 Oct 19

Generic Points During Construction

Facilities / temporary works / services

1. **Locations**. The Contractor is to agree with the PM of the intended siting of all spoil heaps, temporary works and services in advance. The Authority shall verify with the Contractor which site features are to be removed and protected during construction works.

2. **Survey and setting out**. The Contractor will be responsible for all setting out and levelling during construction. The Contractor shall keep updated schedules and Drawings of all bench marks used in setting out of the site; these must be made available to the Authority when required. A minimum of 2 survey control stations are to be constructed, one visible from the site at a distance of 50 m and the other 200 m away from the first but in line of site.

3. **Record drawings**. The Contractor shall record details of all grid lines, setting out stations, bench-marks and profiles on the site setting out Drawing. Retain on site throughout the contract and hand to PM on Completion.

4. **Signage**. The Contractor shall supply and erect all applicable and appropriate signage to the site. This shall include as a minimum all H&S signage, directions and location of site office and emergency contact details of the Contractor's representative on site. Temporary warning signs and careful demarcation of works areas must be undertaken with care to ensure compliance with any and all requirements.

5. **Lighting and power**. The Contractor shall provide all lighting and power for this work. No facility will exist on site from the general base infrastructure.

6. **Communications**. The Contractor shall provide his workforce with adequate means of communications throughout the duration of the Contract period in order to carry out the work specified.

7. **Temporary services**. The Contractor shall provide temporary service connections to both mechanical and electrical systems. All temporary service connections are to be in accordance with current UK regulations.

8. **Use of the site**. The Site shall not be used for any purpose other than undertaking the specified works. The Contractor may erect the site office and storage compound in a location agreed with the Authority. No storage of materials, parking of vehicles, temporary accommodation or any other use of areas beyond the boundaries shall be permitted. Under no circumstances shall it be permissible for the Contractor to cause an obstruction to normal pedestrian or vehicular movements within the vicinity of the site.

9. **Restrictions to the works**. The Works are to be undertaken without interfering with every day running of the Authority's operations within the area. The demarcation of the Site boundary is to be obvious and clearly marked to restrict access to the Site whilst the Works are being undertaken.

Project management

10. **The Authority**. The Project Support Officer (PSO) has overall Authority on this project. For the purpose of this specification, the PM is the only person from within the Authority acting on behalf of the PSO, or Superintending Officer (SO) in most cases. The Contractor shall not

commence any work in accordance with any Design Document until the PM has agreed the relevant Design Document.

11. **Buried Services**. Prior to carrying out any excavation work, the Contractor must:

a. Obtain a Permit to Dig (Statement of Known Services) and all Drawings relating to existing services that may interfere with the proposed works. A copy of the Permit to Dig must be given to the Authority prior to any works commencing.

b. Identify all local services and take adequate precautions to protect such services from damage for the duration of the works.

c. Inform the Authority immediately if any unknown services are discovered that will impact on the works.

12. **Supervision**. The Contractor shall accept responsibility for delivery, co-ordination, supervision and administration of the works, including all subcontracts. They shall arrange and monitor a programme with each Sub-Contractor, supplier, local Employer and any statutory undertaker, and obtain and supply information as necessary for co-ordination of the work.

13. **Site diary**. The Contractor shall keep an up to date daily site diary. This document is to be used to record all decisions made on site both verbally and written. The document is also to be used to record visits to site and note anything, which has a direct effect on the project in terms of cost and extensions to time, or any other occurrence that affects the project programme. This document will be used as the audit trail in light of any disputes, concerning the project.

14. **Contractor's site meetings**. The Contractor is to hold meetings with appropriate sub-Contractors and suppliers shortly before site meetings with the Authority to facilitate accurate reporting of progress.

15. **Site meetings**. The PM, or his representative will hold regular site meetings to review progress and other matters arising from the administration of the Contract. It will be the Contractor's responsibility to ensure the availability of accommodation and attend all such meetings.

16. **Liaison with the Authority**. The Contractor shall designate a site manager from within his organisation who will be responsible for liaising with the PM, PSO or his representative (SO) on a day to day basis and as the need arises. At all times the Contractor shall ensure that the Site Manager present on site has the capability of reading, writing, speaking and receiving instructions in the English Language, including being able to understand and interpret technical Drawings and specifications. The Site Manager must be able to explain the work operations to the person performing the work in a language that those performing the work are capable of understanding. The PM shall have the right to determine, whether the proposed representative has sufficient technical and linguistic capabilities.

17. **Approvals**. Where products or works are specified to be approved or the PM instructs or requires that they are to be approved, the same must be supplied and executed to comply with all requirements.

18. **Access**. The Contractor shall provide, at all reasonable times, access to the Works. The Contractor shall supply the PM or his representative with copies of any documentation and drawings, which may reasonably be required for the purposes of monitoring the work performed under this or any sub-contract.

19. **Regulations**. It is the Contractor's responsibility to be fully conversant with all local/MOD regulations and requirements in respect of fire, safety, security and occupational health, etc. These are to be fully complied with throughout the contract period.

Health and Safety

20. **Health and Safety (H&S)**. All works shall be carried out in accordance with UK, Health and safety at Work Act 1974 (HASAWA).

21. **JSP 375**. The Contractor shall comply with the Client's permit to work system and the JSP 375, Volume 3, (details of which are obtainable from the Authority SO), including the provision of method statements, risk assessments, switching/isolating safety programmes, permit to dig, etc.

Permit to work

22. **Permit to dig**. If any excavation or breaking of ground is to be carried out, the Contractor must request a permit to dig at the Pre-Start meeting. Should any excavation be conducted without a permit; the Contractor may be removed from site.

23. **Hot works permit**. The Contractor is to establish at the Pre-Start meeting if hot work permits will be required for this location of work.

24. **Authorised Persons (AP)**. The following table shows details of APs in their respective discipline.

Discipline	CAP	Contact No
Electrical	Mr Ezekiel / SSgt Ringjali	0719197643/0704405046
Mechanical	WO2 Hattingh/ Mr Patrick	0702659971/0720922564
Petroleum	Mr Ezekiel/Mr Patrick	0719197643/0720922564
Confined Spaces	Mr Mbilo/Mr Julius	0720015852/0719197599
Working at Height	Mr Mbilo	0720015852

25. **Skilled persons & Persons in Charge (PIC)**. Any works required to be completed under a JSP 375 permit must have a dedicated PIC and the work carried out by registered skilled persons. At the Pre-Start meeting the Contractor must establish if any of his works require a permit, and if so arrange for currently registered personnel to conduct the works, or registration of the Contractor's personnel.

26. **CDM 2015**. The Contractor shall submit a pre-construction H&S file to the Authority for approval, including all risk assessments, method statements, hazardous material procedures etc to comply fully with CDM (2015) & appropriate ACOP.

Quality of work

27. **Quality standards and control**. The Contractor will provide evidence to the PM of his quality standards and controls and will produce a plan detailing Quality Control (QC) activities in order for the PM to plan for witnessing of critical activities.

a. **General quality of products**. All products shall conform to the following subparagraphs:

(1) Products to be new unless otherwise specified by the Authority.

(2) For products specified to a BS or EN obtain certificates of compliance from manufacturers when requested.

(3) Where a choice of manufacturer or source is allowed for any particular product, the whole quantity required must be of the same type, manufacture and/or source unless otherwise approved. Produce written evidence of sources of supply when requested by PM.

(4) Ensure that the whole quantity of each product required to complete the work is of consistent kind, size, quality and overall appearance.

(5) Where consistency of appearance is desirable ensure consistency of supply from the same source. Do not use different colour batches where they can be seen together.

(6) If products are prone to deterioration or have a limited shelf life, order in suitable quantities to a programme and use in appropriate sequence. Do not use if there are any signs of deterioration, setting or other unsatisfactory condition.

b. **Proprietary products**. All products shall conform to the followings:

(1) Handle, store, prepare and use or fix each product in accordance with its manufacturer's current printed or written recommendations/instructions. Inform PM if these recommendations/instructions conflict with any other specified requirement. Submit copies to PM when requested.

(2) The tender will be deemed to be based on the products specified and recommendations on their use given in the manufacturer's literature current at the date of tender.

c. **Product Quality**. Obtain confirmation from manufacturers that the products specified and recommendations on their use have not been changed since that time. Where such change has occurred inform PM and do not place orders for or use the affected products without further instructions.

d. **Checking compliance of products**. The Contractor shall check all delivery tickets, labels, identification marks and where appropriate the products themselves to ensure that all products comply with the project documents. In particular, check that the products comply with the following sub-paragraphs.

(1) The sources, types, qualities, finishes and colours are correct, and match any approved samples.

(2) All accessories and fixings that shall be supplied with the products have been supplied.

(3) Sizes are correct. Where tolerances are critical, measure a sufficient quantity to ensure compliance.

(4) The delivered quantities are correct, to ensure that shortages do not cause delays in the work.

(5) The products are clean, undamaged and otherwise in good condition.

(6) Any products with a limited shelf life are not out of date.

e. **Protection of products**. All products shall be protected to ensure that they remain in the condition they are required. In particular the Contractor is to ensure that products are to be prevented from overstressing, kept clean, protected from the elements and kept in original wrappings until required for the project.

28. **Prohibited products**. The Contractor shall not employ on or incorporate in the Works any of the following products and shall impose a like obligation upon all Sub-Contractors.

a. Asbestos materials as described in the Asbestos Prohibitions Regulations 1985 and the Asbestos Products (Safety) Regulations 1985.

b. Lead or any products containing lead for use in connection with drinking water.

c. Materials that are generally composed of mineral fibres either manmade or naturally occurring which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not scaled or otherwise stabilised to ensure that fibre migration is prevented.

d. Other products or substances generally known to be deleterious to health and safety at the time of use or to the durability of the property in the particular circumstances in which they are being used.

29. **Hazardous, aggressive or unstable materials**. The Contractor is not to import or use fill materials that either would in themselves or in combination with other material or ground water, give rise to health hazards, damage buildings or structures. The construction materials shall not include any finishes that may lead to shedding of particles.

30. **Defects in existing construction/services**. This shall be reported to the PM without delay. Obtain instructions before proceeding with work which may be covered up or otherwise hinder access to the defective construction or be rendered abortive by the carrying out of remedial work. This is particularly relevant in relation to the expansion of the existing service runs.

31. **Proposals for rectification of defective work/products**. As soon as possible after any part(s) of the work or any products are known to be not in accordance with the Contract, or appear that they may not be in accordance, the Contractor is to submit proposals to the PM for opening up, inspection, testing, making good, or removal and re-execution. Such proposals may be unacceptable to the PM and he may issue contrary instructions.

32. **Quality control**. The Contractor is to establish and maintain procedures to ensure that the works, including the work of all Sub-Contractors, comply with specified requirements. This is to include all testing of materials that are to be incorporated into the project (e.g. concrete). The Contractor is to maintain full records, keep copies on site for inspection by the PM, and submit copies of particular parts of the records on request. The records must include the following:

a. Identification of the element, item, batch or lot including location in the works.

b. The nature and dates of inspections by the Contractor or PM, tests and approvals.

c. The nature and extent of any non-conforming work found.

d. Details of any corrective action.

33. **Materials testing**. It is the Contractor's responsibility to carry out all materials testing and present all test results to the Authority on request and within the H&S file. The Authority will carry out concurrence quality control material tests at regular intervals.

34. **Notification**. The Authority requires to be informed in writing at least 10 days in advance of any tests and commissioning being carried out. Access must be available to the Authority to carry out testing as deemed necessary by the Authority.

Annex I to
KEN/GE/1902
Dated 3 Oct 19

Generic Points Post Construction

Completion / handover

1. **Commissioning period**. The Contractor shall submit a Works Commissioning Plan, setting out his commissioning proposals including the preparation of handover documentation.

2. **Notice of completion**. The Contractor is to provide the PM at least five days' notice of the anticipated date of Practical Completion of the whole or parts of the works.

3. **Mechanical and electrical services**. Mechanical and Electrical Services must have final tests and commissioning carried out by the Contractor so that they are in full working order at Practical Completion. This includes buried but not connected cables and pipelines.

4. **Timing of tests and inspections**. The Contractor is to agree dates and times of tests and inspections with PM 10 days in advance, to enable the PM and other affected parties to be present. On the previous working day to each such test or inspection the Contractor is to confirm to the PM that the work or sample in question will be ready or, if not ready, agree a new date and time.

5. **Test certificates**. The Contractor is to submit a copy of each certificate to PM as soon as practicable and keep copies of all certificates on site. Copies shall be included in the Health and Safety File on handover of the works.

6. **Work at or after completion**. The Contractor is required to undertake the following works prior to handover.

    a. Make good all damage consequent upon the work.

    b. Remove all temporary markings, coverings and protective wrappings unless otherwise instructed.

    c. Clean the works thoroughly inside and out including all accessible ducts and voids; remove all splashes, deposits, efflorescence, rubbish and surplus materials consequent upon the execution of the work.

    d. Cleaning materials and methods to be as recommended by manufacturers of products being cleaned, and to be such that there is no damage or disfigurement to other materials.

7. **Security at completion**. The Contractor is to leave the Works secure with all accesses locked. Account for and adequately label all keys and hand over to PM with itemised schedule, retaining duplicate schedule signed by PM as a receipt.

8. **Making good defects**. The Contractor is to make arrangements with the PM and give reasonable notice of the precise dates for access to the various parts of the Works for purposes of making good defects. The PM is to be informed by the Contractor when remedial works to the various parts of the Works are completed and ready for approval.

9. **Inspection, testing and commissioning**. The installations shall be tested and inspected in accordance with but not limited to the current CIBSE Codes, BS 7671: Requirements for Electrical Installations. IET wiring regulations 18th Edition where appropriate, etc. Advance notice of tests shall be given (minimum of 10 days prior to notification).

10. **Test and inspection certificates**. Test and inspection certificates are to be approved by the Authority, preferred document templates will be provided by the Authority on request. Test certificates shall serve as a record that the item referred to has been shown under test to meet the requirements of the specifications and of British Standards as applicable and shall be dated, numbered and clearly referenced to the item tested by means of serial, chassis or other manufactures reference number permanently marked in a conspicuous position.

11. **Equipment calibration**. The calibration certificates for the testing of the equipment are to be available on request to be shown to the Authority for scrutiny. The Contractor shall ensure all calibrations are in date. The Authority reserves the right to have an independent electrician available during the test and inspection phase.

12. **Defects**. Any defects of workmanship, materials or non-compliance with the specifications or other irregularities that become apparent during the tests shall be rectified by the Contractor, at his own expense, until the whole work is free from defects and in full working order to the complete satisfaction of the Supervising Officer.

13. **Material data sheets**. All materials used for construction of permanent works shall have suppliers' specifications and/or testing certificates available. Where materials are used as part of a whole or in conjunction with other materials, and in any case where site testing is required by best practice, verification of quality and specifications shall be allowed for the parts / items / products (suppliers' specification) as well as the whole (site testing).

14. **Defects Liability Period (DLP)**. A defects liability period shall apply for the works as detailed above. The Contractor will be responsible for making good at his own expense any defects in the works arising within that period. The Contractor is to ensure that a defects inspection is conducted 2-4 weeks prior to the end of the liability period in order to release the contract retention.

15. **Operations and maintenance documentation**. Upon completion of the works the Contractor shall forward all manufacturers' details relating to equipment/materials used to the Authority for inclusion into the O&M Manual/H&S File. Refer also to Construction, (Design and Management) Regulations 2015 (CDM 2015) & appropriate ACOP, this documentation less 'As Built Drawings' is to be made available at the Pre-Board of Officers not less than 10 days before the due project handover date. A full list of snagging items shall be produced and presented to the Authority with a rectification programme at this very same board.

Health and Safety File

16. **Presentation of health and safety file**. Upon project completion the H&S file shall be presented to the Authority before the Board of Officers is convened and in compliance with CDM (2015) & appropriate ACOP. The Contractor is to provide the PM with an electronic and hard copy of the H&S File. The Manual is to be contained in a series of A4 size, plastic covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover titled. Selected Drawings needed to illustrate or locate items mentioned in the Manual, where larger than A4, are to be folded and accommodated in the binders so that they may be unfolded without being detached from the rings. The main set(s) of as-built Drawings will form Annex (es) to the Manual.

17. **Health and safety file**. The Contractor is required to complete the Project Health and Safety File on completion of the works, a copy will be provided to the Authority at handover. Advice can be sought from the Authority if required. The H&S File provides information required for future construction work, which includes cleaning, maintenance, alterations, refurbishment and demolition. The Manual is to consist of the following parts, sub-sectioned as appropriate.

a. **Section 1: H&S**. The Contractor is to provide a description of the site and the buildings thereon. This is to include details of construction methods and materials, which may present significant residual hazards in the future.

b. **Section 2: Certificates**. The Contractor is to provide a copy of all Test Certificates (including but not limited to electrical circuit tests, start and commissioning tests) for the installations and plant, equipment, valves, etc, used in the installations. Warranty Certificates and guarantees are also to be included in this section.

c. **Section 3: As-built Drawings**. The Contractor is to provide as-built Drawings recording details of all construction, electrical and mechanical work. A fire strategy for the site shall also be included with Drawings showing emergency escape routes, location of emergency and fire fighting systems, services shut-off valves, switches, etc.

d. **Section 4: Operation & Maintenance (O&M) schedules**. The Contractor is to provide recommendations as to the preventative maintenance, frequency and procedures to be adopted to ensure the most efficient operation of the systems. Manufacturers' O&M schedules are to be included. Diagrammatic Drawings of each system indicating principal items of plant, equipment, and valves are also to be included.

e. **Section 5: O&M manuals**. The Contractor is to provide copies of manufacturers' current literature for all products for which the particular proprietary brand has been chosen by the Contractor, including COSHH data sheets, catalogue list numbers and manufacturers' ecommendations for cleaning and maintenance. The mechanical and electrical systems section shall contain a full description of each of the systems installed, written to ensure that the client fully understands the scope and facilities provided. All manufacturers' technical literature for items of plant and equipment, assembled specifically for the project, including detailed Drawings, electrical circuit details and operating and maintenance instructions are to be included.

18. **Draft health and safety file**. A complete draft of the Manual must be submitted by the Contractor, not less than 2 weeks before the date for submission of the final copy of the Manual. This is to be amended in the light of any comments and resubmitted to the Authority. Do not proceed with production of the final copy of the Manual until authorised to do so by the Authority.