



**CT/COMM1/0057**

**BOOKLET 3**

**WORKS CONTRACTORS BRIEF**

**PART 1 – GENERIC PERFORMANCE SPECIFICATION**

**DESIGN AND BUILD – TECHNICAL AND DOMESTIC ACCOMMODATION,**

 **PERMANENT AND SEMI-PERMANENT STAFF**

**AT**

**LAIKIPIA AIR BASE (EAST), KENYA**

170 (Infra Sp) Engr Gp 30 Jun 14

PART 1 – GENERIC PERFORMANCE SPECIFICATION

Introduction

1. This Generic Performance Specification (Gen PSpec), is the initial part of Booklet 3 and is to be read in conjunction with:
	1. Part 2 – Detailed Performance Specification (Det PSpec).
	2. Part 3 – Pre-Construction Information (PCI).
2. Location. The proposed site, known as LAB (E) is located approximately 300 km North of the capital NAIROBI. The nearest town to the site is NANYUKI, approximately 3 km to the Southeast of LAB (E). The locations of the Phase 2B projects within LAB (E) are shown on drawing 20140329\_A\_01\_Town\_Plan.dxf.

**Compliance**

1. The development is to comply with the Kenyan requirements articulated in the Memoranda of Understanding (MoU)[[1]](#footnote-1) and the Kenyan National Environment Management Authority (NEMA)[[2]](#footnote-2).

Contractor’s design responsibilities

1. Unless stated otherwise, any drawings issued by the Authority within Booklet 3 are concept drawings only and are provided as guidance to the Contractor, they are not to be used as construction drawings. As a minimum, floor plans have been provided. Some drawings showing elevations, power distribution and fire plans have been developed to aid requirement and been included. The Contractor is to ensure that the drawings are further developed to meet current design standards and regulations.
2. LAB (E) is being developed over a number of different phases under other contracts. In the interests of commonality across phase elements, design drawings and material specifications for elements currently being delivered. The Contractor is to utilise the provided designs and material specifications as a guide to ensure commonality of appearance and materials. The Contractor shall remain responsible for the design and construction and therefore should ensure compliance with building standards and regulations.
3. The service and road infrastructures for the required buildings are still under construction, with the exception of the Armoury. The drawings provided show the proposed layouts but a request to the Authority should be made for confirmation of locations, specification and levels, prior to detailed design.
4. The Contractor is to advise the Authority within the tender submission of al consultants or sub-Contractors who will be employed on this project and of their areas of responsibility as defined in Booklet 1.
5. It is the Contractor’s responsibility to ensure that all design work is certified for conformity to the specification and to the relevant standards. Only appropriately qualified and experienced engineers are to certify design work.
6. All design calculations and design drawings are to be presented to the Authority (at least 4 weeks before commencement of designed works) and will require design concurrence before the specific work elements to which they refer may commence. All design calculations are to be carried out by professional and certified design engineers and the designed certification submitted to the Authority. Any works undertaken based on designs that have not been granted design concurrence by the Authority will be entirely at the Contractor’s risk. The Authority will examine design documentation and shall be entitled to reject a design as unsatisfactory where it is not in accordance with the specification and/or Statutory Regulations, if it would be unfit for purpose, or all required documentation is not provided.

**Designer’s duties under CDM2007**

1. The Authority regards the active management of H&S as being of prime importance. Although the Construction (Design & Management) Regulations (CDM) 2007 do not apply to works delivered outside of the United Kingdom the Authority requires the Contractor to deliver the specified works as if they do. To this end, the Authority will fulfil the role of CDM Coordinator (CDM Co-ord) and included alongside this Gen PSpec, Pre-Construction Information (PCI) to aid the Contractor in meeting their CDM obligations.
2. The Designer should be fully conversant with his/her duties. The following duties are of particular note[[3]](#footnote-3):
	1. When carrying out design work, avoid foreseeable risks to those involved in the construction and future use of the structure, and in doing so, the Designer should eliminate hazards (so far as is reasonably practicable, taking account of other design considerations) and reduce risk associated with those hazards which remain.
	2. Provide adequate information about any significant risks associated with the design.
	3. Co-ordinate their works with that of others in order to improve the way risks are managed and controlled.
	4. Consider the hazards and risks to those who:
		1. Carry out construction work in and around the site.
		2. Conduct maintenance on the building post construction.

Constraints on methods of works

1. In developing the tender submission and designs the Contractor is to take account of the following constraints:
	1. **Constraints**. The following constraints have been imposed on this project:
		1. Air conditioning is not to be provided[[4]](#footnote-4) unless specifically stated.
		2. Building Regulations is to be applied across all elements of the projects.
		3. The site perimeter and access is controlled by security and all personnel shall be issued an entry pass, available through the Authority. The Contractor shall submit the names, a passport photograph and personal curriculum vitae of all personnel requiring access to LAB (E) on a daily basis, a minimum of 4 weeks prior to the required entry dates.
	2. **Limitations**. The following limitation has been applied to these projects:
		1. The building locations are fixed as per the LAB (E) Town Plan see drawing 20140329\_A\_01\_Town\_Plan.dxf
		2. The electrical power distribution are as per drawing 20140319-BATUK-LAB-E-Electrical-Services.dxf
		3. The water distribution, fire distribution ringmain, sewage and drainage runs are as per drawing 20140319-BATUK-LAB-E-Water-Services.dxf
		4. **Environmental Performance Assessment**
2. The Contractor shall comply with the Design and Construct phases of the Defence Related Environmental Assessment Methodology (DREAM) or equivalent as stated in DIO Policy Instruction 06/11[[5]](#footnote-5). The Contractor shall strive to achieve an excellent rating at completion of each phase. The Survey Stage Assessment for DREAM has been carried out by the MDA. Once the contract has been awarded the nominated Contractor will have to perform the Design and Construction stage assessment. The following steps are to be carried out.
	1. **Contractors personnel are required to register for a DREAM login at** [**http://dream.red-c.co.uk**](http://dream.red-c.co.uk)**.**
	2. Once the login has been acquired the Contractor is to liaise with the MDA to be included onto the authorised list of assessors.
	3. Once the delegated Contractor assessor has been added to the authorised list the Contractor are required to log on to **https://www.dreamassess.com** and conduct the assessment.

**Design references**

1. The Contractor shall ensure that as a minimum, but not exclusively, all construction work it commissions complies with the design standards listed at Annex A and with all other requirements and design documents specified within Booklet 3. It remains the Contractor’s responsibility to ensure that all its designs and subsequent construction work comply with the most current and relevant British and Kenyan design codes, standards (British Standards/ Euro Norms), guides and accepted best practices for the nature of the works being procured and for the specific environment in which they are being procured. The most stringent British or Kenyan design codes or standards shall be applied. If the Contractor wishes to use design references other than those specified within Booklet 3 the Contractor must prove their equivalency, in written form, to the Authority and obtain Authority concurrence in advance of their use.

**Design life**

1. The design life of the works, including all installed equipment, to first major overhaul, repair or replacement is to be at least 25 years. The Contractor is to provide documentary evidence (e.g. warranties) that this design life can be achieved for all major installed components and equipment, or must provide explicit statements detailing where this is not the case and why for the Authority’s approval.

Documents to be provided by the Contractor

1. **Design information**. Particular reference is made to the Conditions of Contract – Booklet 2. The Contractor is to submit all design information to the Authority prior to commencement of the construction phase. The Authority will examine all 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. Amended or updated drawings are to be provided as necessary. The minimum design information to be provided by the Contractor shall include the following, as applicable:
	1. Design calculations for all works.
	2. General layout plans for the site and the structure.
	3. Detailed structural design drawings, along with their supporting calculations.
	4. Detailed electrical and mechanical drawings, along with their supporting calculations.
	5. Any site data gathered for completion of the detailed design.
	6. A foundation plan indicating all footing locations and dimensions, screeds and/or ground slabs or plinths, as applicable.
	7. A detailed layout drawing indicating fire detection and alarm systems, fire escapes, emergency lighting and fire compartmentalisation, as well as all fire system and component fire rating certificates necessary to secure Fire Officer approval for the project.
	8. Utility services layouts and calculations.
	9. Manufacturer’s product details, including safety data sheets.
2. **Construction drawings**. All drawings shall be prepared to best practice and shall include all relevant data required to construct the facilities in question. Design drawings shall be submitted for Authority concurrence as a group, using consistent sheet sizes, in hard copy and on CD in PDF format and AutoCAD DXF format complete with a drawing register. All drawings within the submittal shall have identical title blocks and shall include a consistent numbering schedule, with any amendments clearly indicated.
3. **Drawing concurrence**. No construction of any part of the works shall commence until the Authority has provided written concurrence for the relevant drawings, after which said drawings are to be used as the construction drawings. Where it is necessary to change the design then construction should cease until a revised drawing has been submitted to the Authority and concurrence has been granted in writing.
4. **Project programme**. Prior to the commencement of any works a project programme is to be provided to the Authority in hard copy and as a Microsoft Project file. The programme is to be updated weekly, or upon request by the Authority, and is to include the following information:
	1. Mobilisation date.
	2. Construction start date.
	3. Quality control milestone to be agreed by Authority.
	4. Detailed construction milestones linked to the milestone payment schedule.
	5. Critical path.
	6. Full testing and commissioning programme details, identifying when Authority attendance is required.
	7. Project completion date.
	8. **Works Phasing.** The Authority proposed works phasing for delivery and handover of facilities is as follows:
		1. HQ BATUK (Item 5).
		2. QM Dept (Item 1).
		3. WO Log Dept (Item 2).
		4. DIO SD Trg (Item 3).
		5. Combined Offrs and SNCO Mess (Item 7).
		6. P&RTC (Item 4).
		7. 105mm Gun Shed (Item 6).
5. **Construction Phase Plan**. A Construction Phase Plan (CPP) must be submitted and approved to the CDM Co-ord before work on site may commence. The CPP must be developed as necessary throughout the construction phase to take account of the safety implications of any ongoing design work and of any specification or construction sequence changes. It is the Contractor’s responsibility to gain an understanding of his responsibilities under CDM2007 and its associated Approved Code of Practice (ACOP) prior to proceeding with the planning or implementation of the project.

Management of the works

1. **Proposed start date**. The Contractor is to inform the Authority at least 5 days before the proposed date for commencement of work on site.
2. **Liaison with the Authority**. The Contractor shall designate one English speaking person from within their organisation who will be responsible for liaising with the Authority’s Representative, on a day to day basis and as the need arises. This person is to be known as the Contractor’s Project Liaison Officer (PLO). The person so designated shall be responsible for communicating with the Authority regarding notification of intended work and explaining the effect that the works will or may have on the operation or systems within the project or that may affect the operation of concurrent projects. The PLO will be responsible for responding to the Authority's enquiries and dealing with any issues or complaints. It is a requirement that the Contractor's PLO makes daily contact with the Authority such that an active rather than a responsive attitude to liaison is maintained. The Contractor's PLO is a key person in achieving the successful execution of this contract.
3. **Supervision**. The Contractor shall accept responsibility for design, co-ordination, supervision and administration of the works, including all subcontracts. The Contractor shall arrange and monitor a works programme with each subcontractor, supplier, local employer and any statutory undertaker, and obtain and supply information as necessary to the Authority for co-ordination of the work. In addition to constant management and supervision of the works provided by the PLO, all significant types of work must be under the close control of a competent trade supervisor to ensure the management of satisfactory progress and quality. The Contractor is responsible for confirming that all works offered for inspection has been carried out to the relevant standards before inviting Authority inspection.
4. **English speaking Site Manager**. At all times the Contractor shall have a Site Manager present on site who is able to read, write, speak and receive written technical instructions in the English language, including being able to understand and interpret technical drawings and specifications. This Site Manager must be able to explain the work operations to persons performing the work in a language that is understood by them. The Authority reserves the right to determine whether the proposed representative has sufficient technical and linguistic capabilities.
5. **Project progress monitoring**. The Contractor is to record progress on the works programme, a hard copy of which is to be kept on site and displayed within the Site Office. If any circumstances arise that may affect the progress of the works the Contractor is to put forward proposals, or take other action as appropriate, to minimise any delay and to recover any lost time and report this to the Authority in an agreed written format.
6. **Site Diary**. A Daily Site diary is to be kept by the Contractor and is to be available for viewing by the Authority upon request. The Site Diary is to form the basis of the weekly progress report that is to be submitted to the Authority. The site diary is to be used to record the following information:
	1. Details of personnel.
	2. Plant and equipment on site.
	3. Daily works progress.
	4. Visitors to site.
	5. Any delays incurred, with reasons.
	6. Weather conditions.
	7. Receipt of Change Order requests and Site Instructions (verbal and written) complete with any on-site decisions.
	8. Any H&S incidents or near-misses.
	9. Details of any occurrence that may have a bearing on the project in terms of programme, cost or quality.
7. **Progress reports**. The following meetings and reports shall be carried out by the Contractor:
	1. **Weekly**. A weekly progress meeting is to be held with the Authority, at which a weekly progress report is to be submitted. The report is to include a record of the works carried out containing as a minimum the contents of the Site Diary and also a series of photographs taken at standardised points around the various sites. A proposed format for the report may be obtained from the Authority. The Site Diary and weekly progress report will be used as part of the record of events should any disputes arise between the Contractor and the Authority.
	2. **Monthly**. A monthly report is to be raised consolidating the weekly reports and shall be provided by the Contractor to the Authority. The report shall include but is not limited to completed works of the report period, proposed works for next period, issues and concerns, proposed completion date of key stages, detail that affects the delivery of the project and the Accident Frequency Rates (AFR).
8. **Access**. The Contractor shall provide the Authority access to the works at all reasonable times. The Contractor is to liaise with the Authority to arrange access to commence works.
9. **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 to ensure compatibility between existing engineering services, one with another and each in relation to the project generally.
10. **Approvals**. Where products or work are specified to be approved or the Authority instructs or requires that they are to be approved, the same must be supplied and executed to comply with all requirements. Where products are approved by the Authority these will be retained until completion of the project.

Execution of the works

1. **Work site restrictions**. The following site restrictions are to be adhered:
	1. As far as reasonably practicable the works are to be undertaken without interfering with routine daily business of the location. The demarcation of the site boundary is to be obvious and robust in order to prevent unauthorised or accidental access to the site. Where the Contractor assesses that daily business in or around the site may impact upon his ability to deliver the works he should raise the issue with the Authority at the earliest opportunity.
	2. The Contractor will provide, and agree with, the Authority the hours of work (hours available 0630 – 1830 hrs Monday – Friday) for the duration of the project to meet the required delivery date. Any requirement to deviate from these hours must receive prior agreement at least 5 working days before from the Authority.
	3. The work site is located within a security controlled area, consequently the Contractor must allow for the possibility of experiencing access delays.
	4. The Contractor is responsible for the provision of all services (water, drainage, power) required during the construction, installation, testing and commissioning of the works.
	5. Access to the site on LAB (E) for all Contractor vehicles and personnel shall be via the South entrance only unless agreed by the Authority.
2. **Signage**. The Contractor shall supply and erect appropriate signage for the site in English and any other applicable language/dialect, including as a minimum:
	1. PPE information.
	2. Directions to the site office.
	3. Location of the First Aid and emergency assembly points.
	4. Site Manager’s contact details.
3. **Dust and foreign object damage (FOD) protection**. Where work is carried out in an occupied building/area containing personnel or equipment, or adjacent to sensitive areas/facilities (airfields, hospitals, etc.) the Contractor shall ensure that all necessary dust and FOD control measures are taken to protect the areas. Such measures may include, but not be limited to suppression of dust on roads and physical protection of equipment and material.
4. **Temporary site utilities and facilities**. The Contractor shall be supplied an area within the perimeter of LAB (E) identified by the Authority. The Contractors ‘yard’ shall contain all resource areas, welfare facilities and offices unless otherwise agreed by the Authority. The Contractor is to be self sufficient; no reliance on the Authority is to be made. The Contractor is responsible to provide his own security, power, water, waste water disposal, waste disposal, toilets and welfare area for the site. The Contractor shall reinstate the Contractors yard to its original state on completion of the works including indigenous flora and fauna. The fence surrounding the contractors yard shall be as detailed at Annex C.
5. **Permits to work and authorisations**. It is the Contractor’s responsibility to obtain all necessary authorisations and Permits To Work, including, but not limited to: switching/isolating safety permits, permits to dig, site and camp access permits and hot work permits where applicable. Permits are shall be available from the PCO
6. **Existing services and facilities**. It is the Contractor’s responsibility to conform to the following:
	1. The Contractor is responsible for ensuring all services or facilities on or adjacent to the site including public roads approaching the site, that may be affected by the works are identified and that appropriate action is taken to prevent damage occurring before work commences. Liaison between adjacent sites is essential where any activity on the site or on an adjacent sites are identified which may have an impact on the project or which may be impacted upon by the project the Authority is to be informed in writing at the earliest opportunity (e.g. services requiring redirection). If damage is incurred it will be the sole responsibility of the Contractor to rectify to the Authorities given standard.
	2. All works that could possibly influence existing services may only commence upon receipt of appropriate written documentation (e.g. Statement of known services), a copy of which must be provided to the Authority. The Contractor must discuss in advance with the Authority which specific agencies it will need to obtain approvals and documentation from (e.g. Facilities Manager, Communications, etc). Obtaining any such approvals and documentation is the Contractor’s responsibility.
	3. Upon request, and subject to security caveats, the Contractor may have access to all relevant existing drawings relating to the contracted works on the site, held by the Authority. During the tender stage the Contractor shall fully acquaint himself with the nature and extent of all existing services within the area of the contract works.
	4. The Contractor shall conduct a detailed site investigation and ensure that any existing services which are to be tied in to are of an acceptable standard to ensure the required performance over the life of the new facility. Where it is found that an existing service (including, but not limited to water, sewerage, drainage and electrical power) is not adequate for the project requirements, the Contractor shall inform the Authority and obtain written instruction prior to taking any remedial action.
	5. Where the proposed works interact with any existing facilities and defects are found in said facilities this shall be reported to the Authority without delay. Instructions must be obtained from the Authority before proceeding with work which may cover up, or otherwise hinder access to, the defective construction, or be rendered abortive by the carrying out of subsequent remedial work.
7. **Setting out**. The Contractor is responsible for all setting out and for all ongoing monitoring of line, level and accuracy as works progress.
8. **Workmanship**. Not withstanding any clauses in the conditions of contract or elsewhere in the specifications, the Contractor shall be responsible for ensuring that all work-related activities shall be carried out in a neat and workmanlike manner and fit for purpose undertaken, in accordance with accepted good practice. The Contractor shall pay full attention to quality control, the agreed quality control milestones, adherence to the specifications and particular care shall be taken in respect of Health and Safety matters. All working areas are to be kept clean and tidy on a daily basis, with all redundant and waste materials disposed of in accordance with the extant waste management policy.
9. **Transportation, storage and security**. The Contractor shall be solely responsible for the transportation to site, storage and security of all equipment, material and plant. The Contractor’s security should in no way interfere with, or be reliant upon, that of the Authority. It is expected that the Contractor will not require a forward resources area other than the site, however should one be required a location within an existing base area may be made available by the Authority.
10. **Security at completion**. The Contractor is to leave the works secure with all accesses locked, account for and adequately label all keys and hand them over to the Authority with an itemised schedule, retaining a duplicate schedule signed by the Authority as a receipt.
11. **Spare parts**. The Contractor is to submit with his final design a schedule of spare parts that they recommend should be obtained to cover the first 12 months of the Operation and Maintenance (O&M) of the service installations and provide a 90 day spares pack in accordance with the recommendations. The cost of the spare parts should be included and stated against each item and should be the manufacturer’s current price, including packaging and delivery to site, and the current stock list number. A list of normal consumable items is also to be provided by the Contractor.

**Quality management**

1. **General**. The Contractor is responsible for ensuring that the quality of the works meets the required standards and specification and must submit a written Quality Management Plan to the Authority for review, in advance of works commencing on site. The Contractor must make allowance for the Authority to undertake quality assurance checks as it sees fit. However, such checking in no way absolves the Contractor of their quality assurance responsibilities under the contract. In particular, the Authority must always be given 48 hours notice of any planned concrete pours and of any planned backfilling of service trenches.
2. **Quality control**. The Contractor is to establish and maintain procedures to ensure that the works, including the work of all sub-Contractors, comply with the specified requirements. This is to include all testing of materials that are to be incorporated into the project; concrete as an example. 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 records must include the following:
	1. Identification of the element, item, batch or lot, including location in the works.
	2. The nature and dates of inspections, tests and approvals by the Contractor or Authority.
	3. The nature and extent of any non-conforming work found and details of any associated corrective action taken.

**Quality standards**

1. **General quality of products**. All products shall conform to the following criteria:.
	1. New and unused unless otherwise specified by the Authority.
	2. All products specified to a BS or EN to be provided with certificates of compliance from their manufacturers.
	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 the Authority.
	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 matched to the construction programme and use in an appropriate sequence. Do not use if there are any signs of deterioration, setting or other unsatisfactory conditions.
2. **Proprietary products**. All proprietary products shall conform to the following criteria:
	1. Handle, store, prepare and use or fix each product in accordance with its manufacturer's current written recommendations/instructions. Inform the Authority in advance if these recommendations/instructions conflict with any other specified requirement and submit copies of them to the Authority upon request.
	2. The tender will be deemed to be based on the products specified and recommendations on their use given in their manufacturers’ literature current at the date of tender. Prior to purchase 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 the Authority and do not place orders for, or use, the affected products without further instructions.
3. **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 relevant specifications and project documents. In particular, check that the products comply with the following criteria:
	1. The sources, types, qualities, finishes and colours are correct and match any approved samples.
	2. All accessories and fixings that should 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.
4. **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 not overstressed, are kept clean, are protected from the elements and are kept in their original wrappings until required for the project.
5. **Samples**. The Contractor shall provide the following samples, as a minimum, to the Authority for approval. All samples provided will be retained by the Authority until completion of the project.
	1. Windows including frames, vision panels, sills, fixtures and fittings.
	2. Doors including frames, vision panels, sills, fixtures and fittings.
	3. Roofing tiles, profile sheets or other roof finishes.
	4. All room finishes including tiles and paints.
	5. All sanitary ware including fittings and fixtures.
	6. Push button security locks.
	7. All electrical and mechanical goods including light switches, distribution boards, light fittings, sockets, cables and fans.
	8. Any material or component not specifically specified in the performance specification.
	9. Any material or component that is supplied as an alternative to those specified in the performance specification.
6. **Prohibited products**. The Contractor shall not employ on, or incorporate into, the works any of the following products and shall impose a like obligation upon all sub-Contractors:
	1. Asbestos materials as described in The Control of Asbestos Regulations 2012 and The Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulations 2006.
	2. Lead or any products containing lead for use in connection with drinking water.
	3. 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.
	4. Other products or substances known to be detrimental 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.
	5. Substances that are prohibited under the Montreal Protocol, EC regulation No 2037/2000 and Statutory Instrument 2002 No 528 – The Environmental Protection Regulations 2002, in particular refrigerants R12 and R22. The following list is not exhaustive:
		1. Materials in which chlorofluorocarbons (CFC), hydro chlorofluorocarbons (HCFC) or HFA’s have been used as blowing agents.
		2. Halon or any other substances causing ozone depletion.
		3. Chlorofluorocarbons (CFC) and hydro chlorofluorocarbons (HCFC) based refrigerants. (All refrigerants shall be zero ODP).
		4. Urea formaldehyde or materials which may release formaldehyde.
		5. Lead-based paints or primers.
		6. Polyurethane or polyisocynate foam.
		7. Polychlorinated biphenyls (PCBs) or similar compounds.
		8. Pentachlorophenol, lindane or tributyltin (TBT) oxide.
		9. Extruded polystyrene other than low ozone depletion materials.
		10. Materials manufactured with any form of animal hair.
		11. Materials that support bacteria.
7. **Testing and commissioning**. Detailed inspection, testing and commissioning instructions are provided within the relevant Annexes to this document. All systems and services must have had their final tests and commissioning carried out and be in full working order prior to the date of the Handover Board and all associated commissioning paperwork is to be available at this board. The Contractor shall include a detailed test and commissioning plan in the Project Programme.
	1. The Contractor shall submit, as part of the Contract Programme, a detailed works commissioning plan to the Authority, including within it when they propose to submit the draft H&S File for review. The plan shall include details of those conducting the detailed activities and their qualifications. The Authority reserves the right to determine whether the proposed representative is sufficiently competent and qualified. Advance notice of individual tests shall be given (minimum of ten days) and on the previous working day to each such test or inspection the Contractor is to confirm to the Authority that the work or sample in question will be ready or, if not ready, agree a new test date and time. Test and inspection certificates are to be approved by the Authority and preferred certificate templates are to be extracted from the relevant standards (BS or EN).
	2. 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 manufacturers’ reference number permanently marked in a conspicuous position. All original test and inspection certificates are to be provided to the Authority within the H&S File. It is the Contractor’s responsibility to provide all test instruments, complete with in-date calibration certificates; these shall be available for scrutiny by the Authority on request. The Authority reserves the right to have an independent electrician witness any electrical tests and inspections.
	3. All materials used for construction of permanent works shall have their suppliers’ specifications and/or test certificates included in the H&S File. 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 should be allowed for the parts / items / products (suppliers’ specification) as well as the whole (site testing).

Annexes:

1. Principal Design Standards.

B. Generic [Performance Specification – Groundwork](#Groundwork).

C. Generic [Performance Specification – Construction](#Construction).

D. Generic [Performance Specification – Electrical](#Electrical).

E. Generic [Performance Specification – Mechanical](#Mechanical).

Enclosure:

Defence Estates Operations (North) Construction Support Team: Standard Armoury – Scope of Work, Specification and Drawings.

**Annex A to**

**Booklet 3; Part 1 to**

**CT/COMM1/0057**

PRINCIPAL DESIGN STANDARDS

General

1. Listed below are the principal design and construction standards and regulations applicable to projects commissioned by the Authority. This list is not necessarily exhaustive, nor will all of the listed documents be relevant to the specific task to which this General Performance Specification (Gen PSpec) refers.
2. It remains the Contractor’s responsibility to ascertain in detail which specific design and construction standards and regulations are applicable to the project and to ensure that the Contractor uses the most up to date edition.

Construction and civil works

1. Building Regulations 2010 Approved Documents A-P (Amended 2013).
2. BS 8000-0:2014 –Workmanship on construction sites introduction and general principles.
3. BS EN 752- 2008: Drains & sewer system outside buildings. Code of practice for stability, site investigation, foundations, precast concrete floors and ground floor slabs for housing.
4. BS 8103-1:2011: Structural design of low rise building.
5. BS 8103-2:2013: Structural design of low rise building. Code of practice for masonry walls for housing.
6. BS EN 1997-1:2004: Euro code 7. Geotechnical design general rules.
7. BS 8666:2005: Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete specification.
8. BS EN 1992-1-1:2004: Euro code 2. Design of concrete structure general rules and rules of buildings.
9. BS EN 206-1:2000: Concrete. Specification, performance, production and conformity (2001).
10. BS 8500-1:2006+A1:2012: Concrete complementary British Standard to BS EN 206-1. Method of specifying and guidance for specifier.
11. BS EN 1993-1-5:2006: Euro Code 3. Design of steel structure plated structural elements.
12. BS 5606:1990: Guide to accuracy in buildings.
13. Construction (Design & Management) Regulations 2007 (CDM2007).
14. Manual of contract documents for highway works: Specification for highway works (update due early 2014).
15. BS EN 1176:2008: Playground Equipment and Surfacing.
16. BS EN 1177:2008: Impact Attenuating Playground Surfacing. Determination of critical fall height.
17. BS 6465-1:2006+A1:2009: Sanitary installations. Code of practice.
18. BS 8204-1:2003+A1:2009: Screeds, bases and in situ flooring. Concrete bases and cemetitious levelling screeds to receive floorings. Code of practice.
19. BS 8204-2:2003+A2:2011: Screeds, bases and in situ flooring. Concrete wearing surfaces. Code of practice.
20. Provision and Use of Work Equipment Regulations 1998.
21. Storage Equipment Manufacturer’s Association Codes of Practice

Electrical works

1. BS 7671+A2:2013: Requirements for electrical installations. IET Wiring regulations 17th Edition.
2. Electricity at Work Regulations 1989 as amended.
3. BS EN 61439-3:2012: Low-voltage switchgear and control gear assemblies, distribution boards intended to be operated by ordinary persons.
4. BS 5266-1:2011: Emergency lighting. Code of Practice for the emergency escape lighting of premises.
5. BS EN 60598-1:2008: Luminaries. General requirements and tests.
6. BS 7430: 2011: Code of practice for protective earthing of electrical installations.
7. BS 4678-4:1982: Cable trunking specifications for cable trunking made of insulating material.
8. BS EN 61386-1:2008: Conduit systems for cable management. General requirements.
9. BS EN 61537:2007: Cable management. Cable tray systems and cable ladder systems for.
10. BS EN ISO 1461:2009: Hot dip galvanised coatings on fabricated iron and steel articles. Specifications and test methods.
11. BS EN 50086-1:1994: Specification for conduit systems for cable management. General requirements.
12. BS EN 61537:2007: Cable management. Cable tray systems and cable ladder system.
13. BS EN 61386-1:2008: Conduit systems for cable management.
14. BS EN 50086-2-1:1996 - Specification for conduit systems for cable.
15. BS 4568-1:1970 - Specification for steel conduit and fittings with metric threads of ISO form for electrical installations.
16. BS EN 60947: Low-voltage switch gear and control gear assemblies.
17. BS EN 60529:1992+A2:2013: Degrees of protection provided by enclosures (IP Code).
18. BS EN 60898-1:2003+A13:2012: Circuit-breakers for overcurrent protection for household and similar uses. Circuit breakers for a.c. operation.
19. BS EN 61008-1:2012: Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses.
20. BS EN 61009-1:2004+A14:2012 - Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses.
21. BS EN 62305-1:2011: Protection against lightning. General principles.
22. BS 5839-1:2013: Fire Detection and alarm systems in buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.
23. BS EN 54-5:2001: Fire detection and fire alarm systems. Heat detectors and point detectors.
24. Electricity Safety, Quality and Continuity Regulations 2002 and amended 2006.
25. Society for Light and Lighting, Lighting handbook.
26. BS EN ISO 1460:1995: Metallic coatings. Hot dip galvanised coatings on ferrous materials.
27. BS 4921:1998: Specifications for sherardised coatings on iron or steel.
28. BS EN 50164-5:2009: Lightning protection components, requirements for earth electrode inspection housings and earth electrode seals.
29. BS EN 50164-1:2008: Lightning protection components, requirements for connection components.
30. British Approvals Service for Electric Cables (BASEC).
31. BS 1362:1973 - Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs).
32. BS EN 61243-3:2010: Voltage detectors two pole LV type.
33. BS EN 61557-10:2013: Equipment for testing, measuring or monitoring of protective measures.
34. BS 4662:2006+A1:2009: Boxes for flush mounting of electrical accessories. Requirements, test methods and dimensions.

Mechanical works

1. BS 8558:2011: Guide to design, installation, testing and maintenance of services supplying water for domestic use.
2. Water Supply (Water Fittings) Regulations 1999 (England and Wales).
3. The Pressure Equipment Regulations 1999.
4. BS EN 12056-5: 2000: Gravity drainage systems inside buildings. Installation and testing, instructions for operation, maintenance and use.
5. BS EN 12056-2: Gravity drainage system inside buildings sanitary pipework, layout and circulation.
6. Health and Safety at Work (etc) Act 1974.
7. The Building Regulations 2010 Approved Documents amended 2013.
8. Regulatory Reform (Fire Safety) Order 2005.
9. CIBSE Guides.
10. Approved document H1 (2002): Foul water drainage.
11. Approved Document G (2010): Sanitation, hot water safety and water efficiency
12. BS EN 12056-5:2000: Gravity drainage systems inside buildings. Installation and testing, instructions for operation, maintenance and use.
13. BS 4514: 2001: uPVC soil systems, soil pipes and fittings.
14. BS 6956-5: Jointing materials and compound.
15. BS6920: Suitability of non-metallic products in contact with water.
16. BS EN 1452-2: Plastic piping for water supply.
17. BS EN 1717: Protection against pollution of potable water installations and general requirements of devices to prevent pollution by backflow.
18. BS 6282: Devices with moving parts for the prevention of contaminants of water by backflow
19. National Joint Utilities Group, guidelines.

**Authority Design Documents**

1. Defence Estates – Design and Maintenance Guide 08 – Space requirements for plant access, operation and maintenance.
2. Crown Fire Standards 1997.
3. Joint Service Publication 315. Services accommodation code (2013).
4. Joint Service Publication 317. Joint Service Safety Regulations, 5th Edition, Amendment 2, October 2013, for the Storage and Handling of Fuels and Lubricants.
5. Defence Estates Specification 036. Heating, hot and cold water, steam and gas installations for buildings.
6. Defence Estates Specification 037. Air conditioning, air cooling and mechanical ventilation for buildings (Oct 1997).
7. Defence Estate (DE) Specification 034 – Electrical installation.
8. Defence Estate (DE) Specification 039 – Fuse pillars.
9. Joint Service Publication 480 Defence Coordinating Installation Design Authority Manual of Regulations for Installation of Communications and Information Systems.
10. Joint Service Publication 800 Defence Movement and Transport Regulations.
11. Defence Infrastructure Organisation Practitioner Guide 08/12 Single Living Accommodation.
12. Defence Estates Operations (North) CST– Standard Armoury Scope of Work, Specification & Drawings (Jan 2007).
13. Design and Maintenance Guide 10 Physical and Recreational Training Centres.

**Annex B to**

**Booklet 3; Part 1 to**

**CT/COMM1/0057**

GENERIC PERFORMANCE SPECIFICATION – GROUNDWORK

**Preliminary groundwork**

1. **Survey**. The Contractor is to conduct a thorough topographical survey of the site prior to works commencing.
2. **Setting out**. The Contractor shall regularly keep updated schedules and drawings of all bench marks used in the setting out and shall make these available to the Authority when requested.
3. **Drainage, sanitation and sewerage**. The Contractor is responsible for the design of all necessary waste-water and effluent disposal systems. This includes all connections into and modifications to existing systems.
4. **Ground water level**. The ground water level has not been established. It is the Contractor’s responsibility to take into account the ground water levels when submitting technical and commercial proposals.
5. **Ground level**. The Contractor is to level the existing site to provide a suitable surface to enable construction. All materials arising from works are to be removed from site and deposited in an approved location in accordance with the NEMA Licence and environmental impact assessment.
6. **Sinkholes**. Any sinkholes or soft spots are to be excavated and filled with a suitable engineered fill material. The material is to be sufficiently compacted to refusal. All areas requiring remedial works are to be identified and reported to the Authority for approval prior to work commencing.
7. **Existing ground conditions**. The Contractor is responsible for ascertaining the existing ground conditions, which are to be taken into account whilst designing and compiling the Construction Health and Safety Plan. The Contractor is to satisfy themselves as to the condition of the existing ground, identifying areas for work to achieve the required sub-base specification prior to undertaking any construction works.
8. **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 and located and all appropriate action is taken to prevent damage before work commences. The Contractor shall ensure that any existing services, if required, are reinstated with minimum disruption to the existing facilities and services during construction. All works that could potentially impact upon existing local services may only commence with written approval from the Authority.
9. **Preparatory work**. The Contractor must obtain, from the Authority, a Permit to Dig (Statement of Known Services) and any drawings relating to existing services which may be affected by the proposed works. The certificate is to be forwarded to the Authority for approval prior to any works commencing. The Contractor must identify all local services and take adequate precautions to protect such services from damage for the duration of the works. The Authority must be informed immediately if any unknown services are discovered that will impact the works. The contractor shall clear the site of all debris and break out any existing infrastructure removing all spoil and waste material from site to an approved disposal site in compliance with the NEMA Licence and environmental impact assessment. Any ground disturbed by the removal of waste material is to be made good and the remedial works approved by the Authority.
10. **Excavations**. All excavations must be carried out in a safe manner, cordoned off, safety barriers installed and clearly marked. No excavation is to be left open for any longer than necessary. Prior to carrying out any excavation work the following must be carried out:
	1. Obtain a Permit to Dig (Statement of Known Services) 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.
	2. Identify all local services and take adequate precautions, to include the use of 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.
	3. Inform the Authority immediately if any unknown services are discovered that will impact on the works.
	4. The Contractor is responsible for making good, at his expense, any services damaged by him during excavation services and any additional works required as a result of the damage caused.
11. **Hazardous, aggressive or unstable materials**. The Contractor is not to import or use fill materials which would either in themselves or in combination with other material or ground water, give rise to health hazards, damage buildings or structures, or components[[6]](#footnote-6). These construction materials must not include any additives that may prove to be dangerous to health or limit functionality.
12. **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, avoid damage and subsidence. The plant employed for transporting, laying and compacting must be suited to the type of fill material being used. All compaction works are to be carried out in acordance with the Specification of Highway Works Volumes 1 – 3, with the Contractor informing the Authority of the method to be used.
13. **Placing sub base fill material**. If there is a requirement to make good the existing sub-base, after consultation with the Authority, the sub-base is to be brought up to a sufficient level and compacted to a sufficient Californian Bearing Ratio (CBR) to facilitate the proposed construction. Ensure that areas to be filled are free from loose soil, rubbish and standing water. Place and compact fill against structures, membranes or buried surfaces in a sequence and manner which will ensure the stability and avoid damage. Plant employed for the transporting, laying and compacting must be suited to the type of material.
14. **Compaction**. All compaction operations are to be carried out with suitable compaction methods and equipment, achieving a minimum maximum dry density (MDD) of 95%.
15. **Materials testing**. The Contractor is responsible for carrying out all materials testing and is to present all test results to the Authority on request and place a copy within the H&S file. The Authority will carry out concurrence quality control material tests at regular intervals.
16. **Landscaping**. The whole area will be finished and landscaped. As a minimum the ground will be made good and levelled to a distance of 5 metres from the building perimeter and 2 metres to both sides of the centre line for excavations. The use of shrubs must be carefully considered and is to be approved by the Authority. Indigenous non-evasive species are to be used with consideration as these could harbour rodents and feral animals. Maintenance and grounds keeping must be a priority when considering the landscaping design and its implementation.
17. **Surface water drainage.** The Contractor is to design and install an adequate surface water drainage system for the area within the contract parameters. The system may tie into the existing drainage system but on no account must it exceed the flow capacity of the system which is currently 3 m/s. Drawing 20140319-BATUK-LAB-E-Water-Services.dxf provides the surface water drainage details and will be provided by the Authority.

**Testing and commissioning**

1. **Groundworks.**  Prior to any ground works being excavated the site is to be laid out and a Permit to Dig is to be issued by the Authority. On completion of excavations a hold point is to be enforced to allow the Authority to check all finished levels and CBR readings to ensure compliance with the specification and drawings.
2. **Materials.** All materials should be checked prior to inclusion in the project to ensure that they meet the required quality standards. Particular attention should be paid to locally sourced materials, blocks and timber. All long lead materials that have been transported to site are to be inspected for damage on receipt.
3. **Foundations and concrete works.**  Prior to the start of the foundations and concreting a hold point is to be enforced by the Contractor to allow for the checking of shuttering alignment and ensure that the position and installation of all reinforcement and duct entry points are in accordance with the specification and drawings. The position of expansion and movement joints is to be checked for compliance with the design specification and drawings. In addition slump testing and 7 / 28 day cube testing is to be conducted throughout the process to ensure consistency and strength of materials is in accordance with the specification.
4. **Foul water drainage.** All installed drainage will be tested for water tightness. After installation, including any necessary concrete backfilling, gravity drains should be tested for water tightness using either an air test or a water test.
	1. **Air test.** The pipe should be pressurised up to a pressure of 110 mm water gauge and held for approximately 5 minutes prior to testing. Following this the pipe should be able to hold an initial 100 mm pressure, with a maximum loss of head on a manometer of 25 mm in a period of 7 minutes.
	2. **Water test.** The system should be filled with water up to a depth of 5 m above the lowest invert level and a minimum depth of 1 m measured at the highest invert in the test section. This may then be left for a period (1 hour is generally sufficient) to condition the pipe. The test pressure should then be maintained for a period of 30 minutes, by topping up the water level as necessary so that it is within 100 mm of the required level throughout the test. The losses per square metre of surface area should not exceed 0.15 litres for test lengths, with only pipelines or 0.2 litre for test lengths including pipelines and manholes, or 0.4 litres for tests with only manholes and inspection chambers alone (i.e. no pipelines).

**Annex C to**

**Booklet 3; Part 1 to**

**CT/COMM1/0057**

GENERIC PERFORMANCE SPECIFICATION – CONSTRUCTION

**General**

* + 1. Testing of water excluding structures: As soon as possible after completion of the work and before backfilling, carry out an inspection with the Authority to identify any defects which may lead to water penetration or damp patches. After backfilling, when the ground water table has returned to normal level, carry out a further inspection with the Authority to identify any points of water penetration or damp patches. The exposed faces of the structure must show no signs of leakage and remain apparently dry.

**Materials, batching and mixing**

* + 1. Ready-mixed concrete must be obtained from a recognised batching plant which holds current certification meeting the requirements of the National Accreditation Council for Certification Bodies (NACCB), Category 2 for product conformity. Each mix must be obtained from only one source unless otherwise approved. Confirm name and address of the batching plant to the Authority before any concrete is delivered. Retain all delivery notes for inspection.

**Superstructure**

* + 1. Steel framed structures may be incorporated into buildings but will be a steel portal frame to span the required floor area. Ceiling heights are to be sufficient to allow the required Mechanical Handling Equipment (MHE) to operate unhindered, the maximum available MHE to be used has the dimensions 4.99 x 2.23 x 2.49 m with a maximum lift height of 7 m and an outside turn radius (over tyres) of 3.7 m. The structure should be installed in accordance with the manufacturer’s instructions and specifications.
		2. External walls are to be solid construction and tied into the internal walls. The walls should be constructed in accordance with Building Regulations (England and Wales) Approved Document A – Structures. External walls will be finished flush internally where appropriate and constructed between and tied into the steel columns of the portal framework.
		3. Internal walls will be solid construction tied into the external wall fabric. Walls are to be constructed in accordance with Building Regulations (England and Wales) Approved Document A – Structures. All ground floor corridors are to be a minimum width of 1800 mm and entrances in to all buildings are to comply with Building Regulations (England) Approved Document M – Access to and use of buildings (DDA compliance).
		4. The roof structure must be designed with sufficient redundancy to support its own self-weight, roof coverings and any imposed / dynamic loads arising from Kenyan climatic standards. The roof structure is to be secured to the superstructure in accordance with Building Regulations (England and Wales) Approved Document A – Structures.
		5. Roof covering to be standard 3-Tab asphalt shingles and in keeping with other structures on site. It is to be installed in accordance with the manufacturer's instructions and specifications.
		6. All timber is to be treated / finished in accordance with Kenyan Building Regulations. On completion of the fabrication of the trusses a hold point is to be enforced. All trusses must be inspected prior to installation, the joints and gusset plates must be in the correct locations with the required number of nails, in position as detailed at the specification and drawings. Checks should be carried out to confirm that the trusses are correctly spaced and truss clips are in position. All roofing material must be secured using the correct fittings with the required side and end laps as detailed in the specification and drawings. All insect mesh and draught fillers must be in position to seal the building.
		7. Where ceilings are required they are to be of an exposed grid demountable suspended ceiling system or equivalent and approved, with tiles a minimum of 600 x 600 mm. Ceiling to be suspended approximately 2.7 m above FFL unless otherwise stated.

**Cages**

* + 1. Security cages are to be constructed of expanded metal (XPM) as follows:
	1. A full height mesh partition constructed in expanded metal lathing 2089 or 2073F welded mesh 75 x 12 x 4 mm or welded mesh 4 mm diameter horizontal wires at 12 mm centres with 6 mm diameter vertical wires at 75 mm centres for improved security. The horizontal wire to be on the external face of the wall from the store.
	2. The mesh to be clamped to 50 x 50 x 6 mm mild steel angle frame by 30 x 5 mm mild steel flat or UF 12 XPM trim fixed by 6 mm diameter Cup Square bolts ('coachbolts'), washers and nuts at 250 mm maximum centres. The ends of the bolts to be burred over or, alternatively, 'shearnuts' may be incorporated. Welding each wire to the angle frame by a minimum of 6mm may also be considered.
	3. The maximum size of each panel including a horizontal centre rail to be 1240 x 2460 mm.
	4. The frame to be fixed to the block/brick walls, floor and ceiling by 10 mm diameter approximately 100 mm long expansion bolts at 600 mm maximum centres (i.e. 3 No. at head and cill per panel). NB Expansion bolts may shatter thin panels of brickwork if they are drilled into the plane of the wall.
	5. Panels to be bolted together with 8 mm diameter Cup Square bolts ('coachbolts'), washers and nuts at 450 mm maximum centres. The ends of the bolts to be burred over or, alternatively, 'shearnuts' may be incorporated. Gaps between panels and walls to not exceed 6 mm and panels to ceiling should not exceed 8 mm. Steel washers or slotted shims to be inserted. Holes in framework for bolts to be 2 mm oversized maximum and may be slotted in one direction by 6 mm maximum for tolerance.
	6. Finish to be a matt grey metal paint primer coat and finished with matt black metal paint such as Hammerite or similar metal finishing paint.

**Service entries**

* + 1. Service entries below ground must be adequately protected from the effects of weather, settlement and displacement, ground-borne loads and vermin ingress. For service entries not intended for permanent use (such as vehicle-fit conduits), ducts must be lockable and weather-proof, as well as meeting the aforementioned requirements.

**Doors**

* + 1. All doors are to have solid core. External fire escape steel doors with a solid core (timber or other) are to be steel framed, with self closers, rim panic latch and minimum of 3 No. hinges per door. Appropriate signage is to be fitted as stated in Building Regulations Approved Document B – Volume 2.
		2. External single steel doors at the end of corridors are to be complete with door frame, self closer, intumescent strip, rim panic latch, appropriate vision panel, locking mechanism and door handle fitted. Appropriate signage is to be fitted as stated in Building Regulations Approved Document B – Volume 2.
		3. Plant room doors are to be louvered steel double doors suitably sized to allow access of personnel and any plant/equipment installed, complete with door frame, locking mechanism with door handle fitted. Doors to be fitted with insect mesh on the internal face.
		4. Where dictated by the Crown Fire Standards fire doors are to be solid cored timber FD30 construction single or double doors with 200 x 1000 mm high safety glass, complete with door frame, self closer and intumescent strips. Office doors are to be lockable but fitted with an internal thumb turn device.
		5. Internal doors, not required to be fire rated, are to be timber in keeping with the fire doors complete with door frame, self closer and approved ironmongery.
		6. Ironmongery will be in keeping with the intended use of the building and to include and not limited to the following:
			1. Metal external fire door (per door).
		7. Minimum 1.5 pairs double washed stainless steel butt hinges.
		8. 1 No. rim panic latch.
		9. 1 No. stainless steel pull handle.
			1. Metal internal door (per door).
		10. Minimum 1.5 pairs double washered stainless steel butt hinges.
		11. 1 No. heavy locking door bolt.
		12. 1 pair stainless steel lever handle furniture.
			1. Louver doors (per door).
		13. 1 No. cylinder mortice dead lock.
		14. 1 No. keyed cylinder with escutcheon plate.
		15. 1 No. stainless steel pull handle.
		16. Minimum 1.5 pair double washered stainless steel rising butt hinges.
			1. Timber internal door (per door).
		17. 1 No. mortice cylinder lock.
		18. 1 No. key and turn Mortice cylinder with stainless steel escutcheon plate.
		19. 1 pair stainless steel lever handle furniture.
		20. 1 No. door stops – floor.
		21. 2 No. 700 x 100 mm stainless steel kick plates.
		22. Minimum 1.5 pairs double washered stainless steel butt hinges.
		23. 1 No. door closer type 'Briton'.
		24. 250 x 50 mm aluminium sign engraved in accordance with room name.
		25. 2 No. 300 x 600 mm stainless steel push plates.
			1. Timber internal fire door (per door).
		26. 1 No. door stops – floor.
		27. 2 No. 800 x 100 mm stainless steel kick plates.
		28. Minimum 1.5 pairs double washered stainless steel butt hinges.
		29. 1 No. door closer type 'Briton'.
		30. 2 No. 600 mm stainless steel pull handles.
		31. 2 No. 300 x 600 mm stainless steel push plates.
		32. All rooms/areas to be clearly labelled with the name of store/room/area and details of the Point of Contact (POC) responsible.

Roller Shutter Doors

* + 1. Roller Doors are to be provided in accordance with Defence Infrastructure Organisation Design and Maintenance Guide 13 Mechanical transport facilities. They are to be overhead roller doors constructed from galvanised steel or aluminium to match the building wall or roof cladding, and are to roll into the roof space of the building. The door must be insulated and should incorporate a compressible gasket along the bottom edge which should engage with a constructed threshold when closed to prevent the ingress of rain or wind blown surface water. The operating mechanism should be suitably encased for ingress protection. The roller doors are to be electrically operated individually with controls and means of isolation at a suitable working height above floor surface level and adjacent to the opening. The electric operation should have a manual over-ride in case of power failure, and the manual over-ride mechanism in the case of power failure must be able to be operated at a suitable working height without the need for steps or ladders for both the operation of the roller shutter and change of operation from electric to manual.

**Windows**

* + 1. External windows are to be single glazed and sufficiently sized to allow the required levels of daylight and natural ventilation. The glazing should be appropriate to the activities to be conducted within each room. Frames are to be white with insect mesh and 10 mm diameter mild steel bars for security at 100 mm centres where required.
		2. Ablution area windows are to be high level and sufficiently sized to allow the required levels of daylight. The glass is to be obscured glass with a white frame and insect mesh.
		3. Any internal windows are to be suitably sized to allow the required level of natural light with a white frame and glazing suitable for the activities conducted in adjacent areas.
		4. Any stairs are to be constructed in accordance with Building Regulations (England and Wales) Approved Document K and M.
		5. External fire escape stairs are to be constructed in accordance with Building Regulations (England and Wales) Approved Document’s B – Volume 2, K and M.

**Finishes**

* + 1. External masonry walls are to be finished with a sand:cement render, which is to be painted with hardwearing external magnolia masonry paint in keeping with the other structures on the site.
		2. Internal walls should be of a hardwearing washable finish, with bathrooms and shower rooms tiled using tiles (type 5578).
		3. Internal timber door frames and window frames will be finished with brilliant white gloss paint or as per the manufacturer’s instructions and specifications.
		4. All finishes will be subject to approval by the Authority.
		5. All roof cladding is to be secured to the purlins and using the supplier specified fixings with the required side and end laps. Any translucent panels are to be positioned to achieve the greatest spread of natural lighting. Any flashings and sealants specified by the supplier are to be installed as per their instructions. All ridge ventilation is to be checked for integrity ensuring continuity of the insect mesh.

**Footpaths**

* + 1. Kenblock or similarly approved 60 mm thick (15 kN/m2) laid on a bed of 50mm sand, over 340mm of compacted ‘Type 2’ approved sub-base material to engineers specification. The sub-base is laid, graded, rolled, watered and compacted in 2 layers*.*

**Pavements (roads)**

* + 1. Kenbloc or similarly approved 80 mm thick (35 kN/m2) laid on a bed of 50 mm sand, over 340 mm of compacted ‘Type 2’ approved sub-base material to engineers specification.  The sub-base is laid, graded, rolled, watered and compacted in 2 layers.

**Hardstanding**

32. Unless specified within the Detailed Performance Specification all hardstandings are to be of modular block paving, designed to the road or footpath specifications detailed above. Road junctions are to be of concrete construction as detailed below.

* + - 1. Reinforced concrete slab to be 40 N/mm2.  Transverse and longitudinal joints are required, with the transverse joints at 90 deg to the longitudinal axis of the pavement. Dowel bars and tie bars shall be incorporated.
			2. The reinforcement is to be a minimum of 4.34 kg/m (C503 mesh to BS 4483) and due to the weight of the potential vehicles using this area, the thickness of the pads are to be 200 mm.
			3. A simple brushed finish is appropriate with a minimum surface depression is 3 mm under a 3 m straight edge.  The fall for the pad is to be 1:100.

Beneath the reinforced concrete slabs, a 150 mm layer of Cement Bound Material 2 (CBM2 - a strength of 7 N/mm2 at 7 days) should be laid on a sub base of 200 mm of type 1 aggregate to provide a rigid and load bearing base.

* + 1. Edge protection. All Road kerbs and other heavy duty edge protection should be bedded and haunched in concrete, with a minimum strength of C20. The haunching concrete should be at least the width of the edging it is supporting, or 75mm minimum for residential footpaths, 100mm minimum for driveways, and 100-150mm wide for highways
		2. Surface drainage. The Contractor is to design and install an adequate surface water drainage system for the area within the contract parameters. The system may tie into the existing drainage system but on no account must it exceed the flow capacity of the system which is currently 3 m/s. Drawing 20140319-BATUK-LAB-E-Water-Services.dxf provides the surface water drainage details and will be provided by the Authority.
		3. Fuel/ oil interceptors. Fuel / Oil Interception should be provided if required under Kenyan or UK Environmental Regulations and guidelines, these are to be in accordance with details outlined below:
			1. The design and use of prefabricated oil separators is to be in accordance with BS EN 858-1 and 858-2.
			2. The interceptors are to be capable of dealing with 6.5 mm/hr of rainfall.

They are to be designed to achieve a concentration of 5 mg/l if passing back into surface run off drains or 100 mg/l if passing into foul water drainage.

**Water Closets (WCs)**

* + 1. Toilet cubicles are to be standard cubicles to a height of approximately 2100 mm with doors that open into the cubicle meeting the standards detailed in BS 6465-1:2006+A1:2009. The wall behind the WC’s are to be finished with a 5578 ceramic tile splash back to a minimum height of 1000 mm from floor finish level (FFL) and extend to either side of the appliance a minimum of 300 mm.
		2. Urinals to be mounted 610 mm from FFL to rim. The wall on which the urinals are mounted is to be finished with a ceramic tile (type 5578) splash back to a minimum height of 1000 mm from floor finish and extend to either side of the appliance a minimum of 300 mm.
		3. Wash hand basins (WHBs) are to be placed at a height of 720-750 mm from FFL to the top of the basin, unless specified otherwise for DDA compliance. The walls on which the WHBs are mounted are to be finished with ceramic tile (type 5578) splash backs to a minimum height of 2 tiles. A mirror (450 x 450 mm) should be positioned above the splash back, 600mm above sink level, for the general population.
		4. For X and Y accommodation blocks separate ablutions are to be provided on the basis of 80:20 (male:female) split, based on the building bedspace capacity number. All accommodation WC facilities must be non-gender specific.

**Floors**

* + 1. Surface regularity of concrete structural floors; sudden irregularities not permitted. Variations are to be measured with a slip gauge to BS 8204-1:2003+A1:2009 or BS 8204-2:2003+A2:2011, Figure 3 or equivalent.
		2. Unless otherwise specified or the concrete has another specified finish, in-situ concrete floors are to have a power float finish in order to achieve a smooth, level finish with no excessive undulations or changes in level.
		3. Ablution and toilet floors are to be finished with non-slip floor tiles (type 4512).
		4. Single living accommodation is to be finished with floor tiles (type 4319).
		5. All line-paint to the warehouse floor is to be a heavy-duty epoxy resin or similar approved.

**Sanitary appliances**

* + 1. All sanitary appliances are to comply with Building Regulations (England and Wales) Approved Document G. All sanitary appliances are to be approved by the Authority prior to installation.

**Below ground drainage**

* + 1. All below ground drainage system is to be installed and comply with Building Regulations (England and Wales) Approved Document H. The drainage is to tie in with the overall site drainage plan in co-ordination with the Authority. The drainage system is to be a separate system with surface water running to waste on the surrounding area.

**Rain water goods**

* + 1. Rainwater guttering and downpipes are to be fitted and comply with Building Regulations (England and Wales) Approved Document H. The finish is to be conducive with the environment to ensure minimal maintenance requirement.

**Fixtures and Fittings**

* + 1. Shelving. All shelving shall be supplied and fitted by the contractor, unless specifically specified in Part 2. Shelving is shown on drawings as an indication of size and location to aid design. The minimum specification is as follows:
	1. All shelving shall provide a minimum load capacity of 450 kg/m²,
	2. Be adjustable in a maximum of 300 mm increments to the full height of the stanchions.
	3. In accordance with PUWER Regulations and SEMA Codes of Practice.
	4. Be of an industrial type suitable for use in a warehouse.
	5. Provide an aisle between shelving units a minimum of 900 mm wide.
		1. Counters. All counters are to be a minimum 600 x 2000 mm, hatches are to provide a minimum opening of 600 x 600 mm. Both are to be constructed from timber with working surface finished with formica (or similar) sheet and be capable of supporting a minimum point load of 25 kg for computers/monitors and small stores. Counters within cages are to be located around door opening to allow door to open and service across counter.

**Network Equipment Rooms**

* + 1. Red network equipment room is to be a Class 4 secure room, constructed (as a minimum) to the following standard:

 a. Walls to be 150 mm reinforced concrete.

 b. Floor and roof to be150 mm solid reinforced concrete.

 c. Doors shall be a Bowden Security Door fitted with a Pickersgill-Kaye HS100 Series 3 point locking system incorporating L8709/L8710 Medway Interface kit and Medway locking unit with a Mk8 combination lock. Alternative doors and locks may be supplied but are to be CPNI Class 4, Protection Level High is accordance with Centre for the Protection of National Infrastructure (CPNI) Catalogue of Security Equipment and agreed by the Authority. Authority approved suppliers are as follows:

 (1) **Doors.** ASSA ABLOY Security Doors

 21 Ferguson Drive

 Lisburn

 BT28 2EX

 Telephone: +44 (0) 2892662200

 (2) **Locks.** Pickersgill-Kaye ltd

 Pepper Road

 Hunslet

 Leeds

 LS10 2PP

 Telephone: +44 (0) 1132775531

 d. Air vents and ducts are to be fitted and must be fitted with steel grilles, security louvers or bar sets.

**Permanent security fence**

* + 1. The security fences are to be transparent to allow guards to see outside the protected area. They are to be constructed of weldmesh and have the following design features:
		2. The height of the fence should be 2.9 m security fence to BS 1722-10:1999 (Weldmesh).

a. Access is not to be possible under the fence, or through drains, watercourses and culverts beneath it. Weak points such as drains, watercourses and culverts should be identified and protected.

b. The following factors should be taken into account in regard to the alignment of fences:

(1) Wherever possible, the fence should run in straight lines to ease surveillance and erection.

(2) Junctions where the fence changes direction are usually easier to climb and therefore should be kept to a minimum.

(3) Advantage should be taken of existing or natural features so as to increase the protective value of the fence.

(4) Using natural or existing features may help minimise the use of material in the fence.

c. Where possible, the ground on both sides of the fence should be cleared to remove cover for potential intruders. Therefore, a fence should, if possible, be at least 10 m back from the marked boundary of MOD land.

d. Wherever possible, the whole of the fence area should be visible to resident or patrolling guards.

e. Anti-climbing devices such as barbed wire or barbed tape concertinas should be used at the top of the fence.

f. The following measures apply to gates:

(1) Gates are to be of comparable standard to the fence.

(2) The number of gates should be kept to a minimum.

(3) Locking is to be achieved by padlock and locking bar being welded to the gate and frame, or to both leaves of a double gate.

(4)The bottom of gates are not to have a ground clearance in excess of 50 mm.

**Permanent basic fence**

* + 1. The permanent basic fencing to be utilised on the site at locations and to the heights specified within Booklet 3, Part 2. Permanent basic fencing shall be as follows:
	1. **Holes**. 250 mm dia. x 600 mm hole is to be dug cleaned and free from any foreign materials.
	2. **Gump pole posts**. 200 mm dia. to the full height of the fence detailed in the relevant sections of Booklet 3 Part 2. Gump pole posts are to be **precast concrete** **and** cast in place using concrete C20 tampered and finished at ground level using a trowel. The poles are to be placed at 3m c/c. Concrete is not to be laid if temperatures are above 300C.
	3. **Enhanced Intermediate and corner Posts**. Are to be 200 mm dia to the full height of the fence detailed in the relevant sections of Booklet 3 Part 2. Gump poles is to be fixed diagonally at every tenth post on both sides at an angle no less than 450 and at the corner posts.
	4. **Line Wire**. 12 ½ gauge line wire plastic/galvanised must be fixed to the eyebolt provided and kept taught using stretcher bars at the start and finish of a run, and stretcher bars secured at every third post. Line wire must be equally spaced apart four times over the height of the post with the bottom wire no closer than 100 mm from the ground.
	5. **Chain Link Fence**. The chain link material is to be installed to the full height of the fence detailed in the relevant sections of Booklet 3 Part 2, using 14 gauge chain link plastic/ galvanised secured to the line wires at every post in the holes provided, and also mid span between concrete posts using 12 ½ gauge line wire wind lashed. The bottom 150 mm of the chain link fence is to be secured at underground level to prevent the fence from being lifted by casting the bottom in 0.15 x 0.15 m concrete spanning between the concrete bases using a 1:3:6 mix.
	6. **Barbed wire**. Three strands of galvanised barbed wire must secured and equal spaced in the crank both sides continuous along the full length. Galvanised droppers should be secured to all three strands of barbed wire mid span between every posts using 12 ½ gauge line wire in the hole or utilising ‘U’ nails**.**
	7. **Gates**. All gates are to be procured by the contractor; however the contractor must comply with the following:
		1. The double gates must be 6m long x 3 m high to allow for large vehicles.
		2. The double gates must not be able to be lifted from it hinges.
		3. The double gates must open inwards.
		4. The gates must only be able to be secured from the inside using a Abloy or equivalent padlock.
		5. A shoot bolt should be fixed to both gates on the inside with a housing fixed in to the ground to accommodate the shoot bolt.
		6. Bottom of the Gate must be no closer than 25 mm from ground level.
		7. Front of the gate must have welded mesh on the front.
		8. The fence must also comply with the standard laid down in BS 1722-10:2006.

**Temporary site fence**

* + 1. The temporary fences surrounding the contractors yard and work sites shall be as follows as a minimum:
	1. **Holes**. 250 mm dia. x 600 mm hole is to be dug cleaned and free from any foreign materials.
	2. **Gump pole Posts**. 200 mm dia. x 2400 mm treated timber Gump poles to be cast using concrete C20 tampered and finished at ground level using a trowel. The poles are to be placed at 3m c/c. Concrete is not to be laid if temperatures are above 300C.
	3. **Enhanced Intermediate and corner Posts**. 200 mm dia x 2000mm treated timber Gump poles is to be fixed diagonally at every tenth post on both sides at an angle no less than 450 and at the corner posts.
	4. **Line Wire**. 12 ½ gauge line wire plastic/galvanised must be fixed to the eyebolt provided and kept taught using stretcher bars at the start and finish of a run, and stretcher bars secured at every third post. Line wire must be equally spaced apart four times over the height of the post with the bottom wire no closer than 100 mm from the ground.
	5. **Chain Link Fence.** The fence is 2400 mm high using 14 gauge chain link plastic/ galvanised secured to the line wires at every post in the holes provided, and also mid span between concrete posts using 12 ½ gauge line wire wind lashed. The bottom 150 mm of the chain link fence is to be secured at underground level to prevent the fence from being lifted by casting the bottom in 0.15 x 0.15 m concrete spanning between the concrete bases using a 1:3:6 mix.
	6. **Barbed wire.** Three strands of galvanised barbed wire must be secured and equal spaced in the crank both sides continuous along the full length. Galvanised droppers should be secured to all three strands of barbed wire mid span between every posts using 12 ½ gauge line wire in the hole or utilising ‘U’ nails.
	7. **Gates**. All gates are to be procured by the contractor; however the contractor must comply with the following:
		1. The double gates must be 6m long x 3 m high to allow for large vehicles.
		2. The double gates must not be able to be lifted from it hinges.
		3. The double gates must open inwards.
		4. The gates must only be able to be secured from the inside using a Abloy or equivalent padlock.
		5. A shoot bolt should be fixed to both gates on the inside with a housing fixed in to the ground to accommodate the shoot bolt.
		6. Bottom of the Gate must be no closer than 25 mm from ground level.
		7. Front of the gate must have welded mesh on the front.
	8. The fence must also comply with the standard laid down in BS 1722-10:2006.
	9. The fences are to have sign posted entrances to segregate vehicles and pedestrians.

**Inspection, testing and commissioning**

* + 1. All materials should be checked prior to inclusion in the project to ensure that they meet the required standards of quality and workmanship. Particular attention should be paid to locally sourced materials, blocks and timber. All long lead materials that have been transported to site are to be inspected for damage on receipt.
		2. All steel members are to be inspected to ensure dimensional compliance with the supplier’s engineering drawings. A hold point is to be enforced to check the setting out and alignment of the all cast-in bolts and fixings. All holding-down points are to be checked to ensure they comply with the suppliers engineering drawings and are ready to accept the column base-plates. When in position the level, plumb and alignment of all structural members is to be checked. All structural connection bolts and holding down bolts are to be tensioned as per the supplier’s specification. A hold point is to be enforced once all structural members, sidewall bracing and purlins are in position to ensure compliance with the supplier’s engineering drawings. All column holding-down points are to be grouted around the base plate, using non-shrink grout, to seal any levelling shims in position. All pedestrian and loading doors are to be checked to ensure they are in the correct position in relation to the steel portal frame.
		3. Prior to the commencement of blockwork walls a hold point is to be enforced to allow for checking of the setting out, alignment and ensure that all door locations are to be confirmed in accordance with the specification and drawings. In addition, the 2nd course should be checked for alignment and plumb during construction. An additional hold point is to be enforced to allow checking of window and opening locations once the blockwork reaches the correct course.
		4. Once installed all doors are to be checked for the required number of fixings, correct operation and the function of thumb locking mechanisms. Door cills are to be installed in position and the frame is to be sealed correctly to the blockwork. Windows are to be checked to ensure correct operation and security where required, in addition insect mesh should be checked for integrity. Frames are to have the correct number of fixings and are to be sealed correctly to blockwork.

**Annex D to**

**Booklet 3; Part 1 to**

**CT/COMM1/0057**

GENERIC PERFORMANCE SPECIFICATION – ELECTRICAL

**Introduction**

1. **General**. The power distribution system in LAB (E) currently is by means of standalone generators. Power is expected to be supplied from a proposed Distribution Substation as designated by the Authority. The entire electrical system shall be based on a 400 / 230 V, 3 Phase and neutral, 50 Hz, Terra Neutral - Separate (TN-S) system.
2. **Host Nation Supply**. Provision of Host Nation Supply is proposed for power distribution system within LAB (E) which will be provided by Kenya Power and Lighting Company (KPLC) via HV overhead line. A pole mounted transformer will be installed on each substation.

**Regulations and Standards**

1. The complete installation shall comply with all relevant British Standards and, where indicated, with other standards and specifications, and all amendments thereto. Where practicable, each item of equipment shall be clearly marked to indicate the standard with which it complies. Alternatively a Certificate of Compliance shall be provided for the Authority, to be included in the handover documentation.

**Design parameters**

1. **Division of installations**. Every installation shall be divided into circuits as necessary to:
	1. Avoid danger and minimise inconvenience in the event of a fault.
	2. Facilitate safe inspection, testing and maintenance.
	3. Take account of hazards that may arise from the failure of a single circuit such as a lighting circuit.
	4. Reduce the possibility of unwanted tripping of Residual Current Devices (RCDs) due to excessive protector conductor currents not due to fault.
	5. Mitigate the effect of electromagnetic disturbances.
	6. Prevent the indirect energising of a circuit intended to be isolated.
2. **Prospective fault current (Pfc)**. If a protective device is to operate safely, its rated short-circuit capacity must be not less than the prospective fault current at the point where it is installed. Refer to BS 7671+A2:2013 On-site Guide table 7.2.7(i) for guidance. The distributor needs to be consulted as to the prospective fault current at the origin of the installation.
3. **Earth loop impedance external (Ze)**. The Ze locally is 0.13 ohms from existing generation units, this value is expected to increase when the power generation is switched to Host Nation supply, BS 7671+A3:2013 states that usually the Ze is approximately 0.8 ohms for a TN-S supply. The information for the host nation supply is not available.
4. **Soil thermal resistivity**. An investigation is to be carried out to establish accurate values of soil thermal resistivity appropriate for the load to be carried.
5. **Voltage drop**. The voltage drop between the origin of the installation and a lighting point should not exceed 3 per cent of the nominal voltage and for other current-using equipment or socket-outlets should not exceed 5 per cent.
6. **Power Sockets and CIS Outputs**. The design concept for power sockets and CIS outputs **within office and technical accommodation areas is for each** workstation to be considered as a ‘brick’ for communication and supporting power distribution sockets. The ‘brick’ concept is considered to be 9 m2 floor area, provided with the items detailed below:
	1. 2 x Double Socket Outlets (DSO) switched.
	2. 4 x Comms outlets, RJ45 outputs.
	3. 1 x telephone socket outlet.
7. Office and Technical Buildings. The Authority will install telephone and internet cabling within all office and technical buildings.
8. Accommodation Cabling. All accommodation blocks are to be ‘flood wired’ for telephones, internet and TV (BFBS) connectivity as detailed within Part 1 and Part 2 of Booklet 3.

**Electrical installation**

1. **General**. The Contractor shall design procure, install, inspect, test and commission the entire electrical distribution systems within the proposed building as stated within this Specification and associated drawings.
2. **Main supply**. The main supply should comprise of a TN-S system at 400V, 50 Hz. The incoming supply cable should be run underground, via a service duct system. The supply cable will enter all buildings through a uPVC pipe. The Contractor is to liaise with the Authority at least 7 days prior to planned works, in order to arrange for the Electrical Authorised Person to issue a permit to work for the connection of the main supply cables to feeder pillars.

**Electrical service ducts**

1. **Service duct detail**. The main supply cable is to be laid or drawn through a combined service duct. Drawing 20140319-BATUK-LAB-E-Electrical-Services.dxf provides the proposed electrical distribution details and will be provided by the Authority.
2. **Trenching**. No work shall commence until the Contractor has taken all reasonable steps to ensure that the area is free of all cables, drains and other services. Cable Aviodance Tool (Cat) and Signal Generator (Genny) or any other equivalent cable detector tools shall be used to detect services. Unless otherwise indicated the following is required.
	1. Excavations within 600 mm of existing services shall be by hand digging. Any damage to services shall be reported immediately to the Authority. No repairs or replacement shall be done unless the Authority gives approval. All works will be at the Contractors expense.
	2. Cables shall be buried at a sufficient depth to avoid being damaged by any disturbance of the ground reasonably likely to occur. Trenches shall be excavated to the depth specified in DE Specification 034, Table 6B.
	3. All cable enclosed within trenches are to be installed in accordance with the recognised specification. The Contractor shall ensure an accurate record of the location is made and passed to the Authority.
3. **Warning tapes and covers**. A traceable warning tape shall be placed above each cable that is laid direct in the ground and above each cable duct. The following will be required.
	1. The tape shall be laid at a depth of 300 mm below the finished surface level except where the depth of roadway or paved area base exceeds 300 mm in which case the tape shall be laid immediately below the base.
	2. Warning tapes shall be traceable and be not less than 150 mm wide and 0.1 mm thick. They shall be yellow in colour and bear the continuously repeated legend “CAUTION ELECTRIC CABLE BELOW”, or similar, in black letters not less than 30 mm high.
4. **Service entry**. Cable entry to the building shall be installed in a cable duct. The cable duct is to be sized and located in suitable location. The cable duct is to be flushed to the finished floor level and sealed with appropriate sealing material. The bore shall be smooth and entirely free from rough spots and sharp edges. Correct size of duct shall be sized for the cables to be drawn in. Areas of the external wall below DCP level where pipework penetrates must be supported with an adequate lintel and the pipework sealed against vermin ingress.

**LV electrical equipment**

1. **General**. All intake equipments are to be installed within plant rooms unless otherwise specified. The main supply cable is to be installed via a lockable isolator before entering the main distribution board.
2. **Main intake isolator**. The main intake Isolator will be installed directly below the main distribution board. The isolator is to have the ability to be locked in the off position.
3. **Distribution boards**. All distribution boards shall be type‑tested and comply with BS EN 61439-3:2012. Distribution boards shall be as following:
	1. They shall be suitable for surface mounting, have lockable doors (supplied with two keys) and be controlled by an on-load integral disconnector. Keys shall be labelled and handed to the Authority at practical completion.
	2. Where spare ways are provided they shall be fitted with blanking pieces.
	3. All neutral and earth connections shall be made to bars within the distribution board, each connection having an individual terminal. The neutral shall have a removable link to facilitate testing.
	4. Where specified elsewhere a separate isolated secondary earth bar shall be provided within the enclosure. This earth bar shall be of similar size to the protective earth bar but shall be insulated from the remainder of the assembly.
	5. The connections to the neutral and earth bars shall be made to correspond with the order of the phase connections.
	6. All conductors terminating at distribution boards shall be appropriately marked with cable ring markers indicating the circuit number and where appropriate phase connection.
	7. All covers, doors and access plates into the distribution boards shall be gasketed to achieve a minimum protection as follows:
		1. Internally IP32.
		2. Externally IP65.
	8. Access for cabling shall be from the front only. Shrouding to IP2X shall be fitted to prevent accidental contact with live parts. Warning labels shall be provided.
	9. Each distribution board shall be provided with a circuit schedule identifying each individual circuit giving reference, description, rating of protective device and connected load.
	10. The schedule shall be typed on an A4 sheet, laminated and securely fixed to the inside face of the distribution board door.
	11. An engraved designation label shall be fitted to the front of the board.
4. **Fireman’s switch**. A firefighter’s switch is to be provided for compliance of BS7671+A2:2013 Regulation 537.6.1 to 3 and shall have it’s ON and OFF positions clearly indicated by the lettering to a person standing at the intended site, with the OFF position at the top. Be provided with a device to prevent the switch being inadvertently returned to the ON position. Be arranged to facilitate operation by a firefighter.
5. **Protection**. Protection against electric shock for the electrical installation will be by means of automatic disconnection of supply. Each protective device is to be identified. Identification on the neutral busbar and protective conductor bar shall clearly relate each terminal to its respective device. 25 % spare ways shall be provided unless otherwise indicated. Overload protection will be provided by the use of the following devices:
	1. **Circuit breakers**. All circuit breakers shall comply with BS EN 60898-1:2003+A13:2012.
	2. **Miniature Circuit Breaker (MCBs)**. MCB shall comply with BS EN 61008-1:2012 and have the following characteristics:
		1. Doors shall have locking system or shall require a special tool for opening and have a minimum rated short circuit capacity (Icn) of 10 kA unless otherwise specified.
		2. MCB’s shall be capable of withstanding calculated operational and fault currents as well as calculated power frequency stress voltages and voltages of atmospheric origin, the latter subject to the decision to install surge protection.
		3. Three‑phase MCB shall trip all phases on any fault condition.
		4. Provision shall be made to enable the operating mechanism to be padlocked in the ‘OFF’ position.
	3. **Residual Current Breaker with Overload Protection (RCBO’s) or Residual Current Devices (RCD’s)**. All RCD BS EN 61008-1:2012 shall comply with and RCBO shall comply with BS EN 61009-1:2004+A14:2012 and have the following characteristics:
		1. RCD’s and RCBO’s shall be capable of withstanding calculated operational and fault currents as well as calculated power frequency stress voltages and voltages of atmospheric origin, the latter subject to the decision to install surge protection.
		2. The units shall be double or triple-pole as required and mounted enclosed within the distribution board panels or purpose made enclosure.
		3. RCD’s shall only be used where appropriate overload and short circuit protection is provided by other means and then only with the agreement of the Authority. The contractor shall not rely on overload or short circuit protection provided by others to justify the use of RCD’s.
		4. The RCD or RCBO shall automatically open the protected circuit on an earth leakage fault between phase and earth equal to or greater than the fault current sensitivity rating of the device.
		5. The sensitivity ratings of the RCD or RCBO shall be as indicated on the schematic diagrams and where specified shall be adjustable between the ranges stated.
		6. The operating mechanism shall be independent trip-free and shall not be able to be held closed against an earth fault. The units shall be complete with a test button and trip re-set device.
		7. The RCD or RCBO shall have positive contact indication whereby the opening of the device is clearly indicated by a mechanical indicator. This indicator shall be linked to the device main contacts to show the positive opening of all poles.
6. **Labelling**. The Contractor shall ensure they label the following:
	1. **Emergency lighting**. All emergency test key switches shall be labelled ‘EMERGENCY LIGHT’.
	2. **Switches and outlets**. All switches, socket outlets and fused connection units (FCUs) are to be labelled with their associated circuit numbers i.e. ‘SDB1/1/L1’.
	3. **Distribution boards**. All distribution boards are to be clearly labelled with their respective designation i.e. Main Distribution Board ‘MDB’ and Sub Distribution Board 1 ‘SDB1’.
	4. **Fire alarm control panel**. The FCU for the fire alarm control panel is to be labelled ‘Fire Alarm, Do not turn off’.
	5. **Fireman’s switch**. This is to be coloured red and have fixed on or near it a permanent durable nameplate marked with the words ‘FIREFIGHTER’S SWITCH’, the plate being of a minimum size 150 x 100 mm, and having lettering easily legible from a distance appropriate to the site conditions but not less than 36 point.
7. **Circuit diagram**. On completion of the electrical system installation, as built drawings of the circuit layouts are to be produced and be included in the Health and Safety File and issued to the Authority during the Handover Board. A copy of each Electrical Circuit Diagram is to be situated in the immediate vicinity of the associated distribution board for future reference.

**Final circuits**

1. **General**. All fixtures and fittings shall be securely fixed and checked before and after installation, for defects and damage. All defective fittings shall be replaced.
2. **Sockets**. Socket outlets shall comply with the relevant British Standard for the type of outlet indicated. Socket outlets shall be of the type and rating as indicated. PVC and metalled clad sockets are to be selected dependant on the building function achieving minimum protection ratings stated below. Office areas are to be fitted with PVC where as external and storage areas are to be fitted with metal clad sockets. All socket outlets are to be positioned at a minimum height of 400 mm from FFL in accordance with Approved Document M.
	* 1. Internally IP32.
		2. Externally IP65.
3. **Reefer supply**. A 400 V, 32 A three phase and earth (TP&E) supply is to be provided to a 400 V, 32 A, TP&E interlocked switch socket.
4. **TV outlet**. The outlet shall connect to the distribution splitter board situated in the electrical cupboard or the plant room if no electrical cupboard is available. The outlets in each room should be single outlet IEC, fully screened with UK style front plate, die-cast housing and DAB compatible and of a type similar to:
	1. Part no. 304122
	2. Frequency range (MHz). DC-862
	3. Through losses (dB) TV. 0.3 Type.
	4. Connector type TV. Terminal and clamp IEC female.
	5. Mechanical data. 86 x 86 x 31 mm.
5. **Fused Connection Units (FCUs)**. FCUs shall be double pole switched and fitted with pilot lamps where indicated. Front plates shall incorporate a flex outlet with a clamp for anchoring the flexible cord, where indicated.
6. **Mounting heights**. Mounting heights shall be in accordance with BS 7671+A2:2013 unless otherwise indicated. Where difficulty in locating accessories or equipment occurs, the Authority shall be consulted.
7. **Fixed power circuits**. All fixed power is supplied by radial circuits.
	1. **Air conditioning units**. The split Air Conditioning (AC) units are to be supplied via individual radial circuits dedicated to each AC unit. The split AC units are to have lockable rotary isolator switches for both the internal evaporator and external condenser.
	2. **Water heater and hand dryers**. These are to be supplied via 13 A FCUs and are to be installed 150 mm above the associated hand dryer or water heater.
	3. **DDA toilet assistance alarm**. The DDA toilet shall comply with Approved Document M of the Building Regulations and be fitted with and not limited to a disable person’s assistance alarm. The alarm system will be complete with ceiling mounted pull cord assistance alarm, overdoor warning light with sounder. The pull cord fitting is to be removed for later use and covered with a blanking plate. The system shall include a rechargeable backup battery providing up to 24 hour standby and a 15 min alarm. The control system shall also have remote reset point complete with sounder to provide audible and visual indication of an activated alarm, inside the DDA Toilet, to reassure the users that help is on the way. All control panels shall be mounted at 1200 mm above FFL.
	4. **Fire alarm control panel**. All fire alarm control panels are to be supplied by a dedicated radial circuit via a suitable sized unswitched FCU. The FCU is to be mounted at 1200mm above FFL adjacent to the fire panel. The FCU should be fitted with a BS 1362:1973 fuse rated in accordance with the manufacturers’ recommendation.

**Lighting circuit**

1. **General**. Lux levels are to be achieved as specified or where no specification has been supplied, in accordance with the Society for Light and Lighting Handbook to FFL. The light fittings are to be of a sufficient IP rating to protect against dust and insect ingress.
2. **External lighting**. External lighting to the following levels is required:
	1. External building security (on dusk to dawn PIR), service and amenity areas infrastructure: 30 lux.
	2. Building entry area 30 lux.
	3. Hardstanding infrastructure 20 lux.
	4. Car parking 15 lux.
	5. Primary paths 10 lux.
	6. Vehicular access routes 7.5 lux.
	7. Secondary paths (pedestrian and cycle) 7.5 lux.
3. **Extractor fans**. All rooms with extractor fans will be supplied by non switched FCUs and a three pole fan isolator for independent isolation. The FCU should be fitted with a BS 1362:1973 fuse rated at 3A or in accordance with the manufactures recommendation.
4. **Emergency lighting.** Emergency lighting systems and equipment shall comply with BS 5266-1:2011. The emergency lighting is part of the fire safety plan and should be designed as an integral part of the system.Wiring shall not be drawn into the same conduit, trunking compartment or ducting compartment as cables of other Band I circuits. The emergency lighting shall have the following:
	1. **Emergency escape lighting**. The emergency escape lighting shall provide illumination for the safety of personnel leaving a location or attempting to terminate a potentially dangerous process before doing so. In the event of power failure, minimum of 1 Lux level is to be maintained at floor level for duration of 3 hrs. The emergency escape lighting is to be provided by maintained emergency luminaires that shall have their lamps energised during normal use or in the event of a power failure. The battery backup shall be permanently connected to a circuit supply via a tamper proof test switch, without interruption by local functional lighting switching.
	2. **Emergency escape route lighting**. The emergency escape route lighting shall ensure that the means of escape can be effectively identified and safely used when the premises are occupied. The emergency escape route lighting is to be provided by non-maintained emergency luminaires with pictogram and shall energise their lamps during the event of a power failure. The battery backup shall be permanently connected to a circuit supply, via a tamper proof test switch, without any functional lighting switching. Fluorescent Emergency Exit signs are to be located over each external access doors. The area immediately external of the door is to be illuminated to a distance of 10 m at a level of 1 Lux.
5. **Switches**. Switches shall comply with the relevant British Standard for the type of switch indicated. Switches shall be single pole for single phase circuits and current rating shall be appropriate to circuit. Sensor light switches shall be positioned in an appropriate location so that it operates effectively. PVC and metalled clad switches are to be selected dependant on the building function. Office areas are to be fitted with PVC where as external and storage areas are to be fitted with metal clad switches. All light switches are to be positioned at 1200 mm above finish floor level in order to comply with Approved Document M.

**Cable containment**

1. **General**. The size of the containment shall be calculated in accordance with BS 7671+A2:2013. Conduit, including flexible and pliable conduits, shall be either steel or non-metallic as indicated, and comply with the appropriate British Standards. When circuits are run in containment the following shall apply:
	1. Cable tray shall comply with BS EN 61537:2007.
	2. Steel trunking shall comply with BS 4678-4:1982.
	3. Dado trunking shall comply with BS EN 61386-1:2008.
	4. Conduits shall comply with BS EN 50086-2-1:1996 and BS 4568-1:1970.
2. **Cable tray general**. Perforated cable tray shall be formed from plain steel sheet finished hot dipped galvanised after fabrication to BS EN ISO 1461:2009, unless otherwise specified. Tray shall have a minimum coating weight of 275 g/m².
	1. **Bends and tees**. Bends shall be of the same material, thickness and finish as the cable tray and shall have an inner radius of 50 mm and a straight length of 100 mm at each end. Tees shall be of the same material, thickness and finish as the cable tray. The distance measured between a point of intersection and at the end of the fitting shall be 100 mm.
	2. **Fixing screws**. Mushroom-head steel roofing bolts and nuts or equivalent shall be used to fix together adjacent sections of cable tray and/or accessories. The head of any fixing screw shall be presented to the surface of the tray on which the cables are to be fixed.
	3. **Cable ties**. Cable ties shall be used to secure the cables onto the cable trays. The ties 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. Ties shall be used at intervals as detailed within regulations along each cable. Cable trays support shall be installed within 150 mm on both sides of a joint between two lengths of cable tray.
3. **Trunking general**. Where trunking is required to pass through ceiling fabrics into the roof space, it shall be fitted with suitable and approved flame proof fire barriers.
	1. **Supports and joints**. The trunking shall be installed in the ceiling void and secured to the trusses. Expansion couplings shall be provided where trunking cross an expansion joints within the building fabric.
	2. **Bonding**. The trunking must be bonded to earth and tested for earth continuity but must not be used as a means of providing the protective conductor.
	3. **Access and covers**. Trunking and fittings shall have removable lids along its entire length. The lids shall be of the same material, thickness and finish as that of the trunking.
4. **Dado trunking general**. Dado trunking shall be installed office areas where data communication and socket outlets are to be installed.
	1. **Supports and joints**. Dado trunking is to be mounted at 1000 mm above the FFL.
	2. **Access and covers**. Dado trunking and fittings shall have removable lids along their entire length. The lids shall be of the same material, thickness and finish as that of the dado trunking.
5. **Conduit general**. Dado trunking is to be fitted in offices only, in all other rooms (accommodation, stores, corridors, ablutions etc) conduit is to be buried in the walls. Where conduit can not be buried (i.e. stores cages) then surface mounting will suffice.Conduits shall have screw threads for jointing length to length and for the attachment of accessories. Conduits and fittings shall be screwed classification unless otherwise indicated or approved by the Authority. High impact areas shall have galvanised steel conduit and all other areas shall be PVC. Adequate protection against corrosion shall be provided to steel conduit.
	1. **Supports**. Junction boxes and back boxes installed in conduit runs need be separately fixed to underlying surface and not rely on the efficient saddling of conduits for their support. A spacer bar saddle shall be fixed 150 mm adjacent to any junction or back box. Fixing saddles shall be positioned at a maximum of 1200 mm apart or 300 mm from conduit outlet boxes or changes in direction.
	2. **Bends**. Steel conduit shall be bent on site to the required shape to allow the conduit to run around obstacles and corners. All conduit bends shall be achieved without distorting the diameter of the conduit. Conduit bending shall be by means of good quality conduit bending machine in good condition and poor or damaged conduit bends shall be rejected.
	3. **Couplers, Bushes and Glands**. Bushes and glands used in conjunction with conduits and conduit accessories shall be appropriate to the type used. Conduit connected galvanized steel trunking, back boxes and fluorescent fittings shall utilise a coupler and male brass bush. The male bush is to be fitted from within the fitting, securing the coupler outside the equipment.
	4. **Saddles**. Spacer bar saddles shall be used for fixing conduits to surface walls, ceilings, and roof trusses. In all cases the conduit is to be run parallel to the building lines and shall be fixed in position at intervals of not more than 1200 mm by means of spacer bar saddles and these saddles shall be fixed by the following methods as appropriate:
	5. **Access and covers**. Covers for conduit boxes shall be shall be appropriate to the type used. Gaskets shall be used with conduit box covers within roof space to prevent insects, debris and moisture entering the conduit runs.

**Cables**

1. **General**. All cable types shall be certified and marked in accordance with the British Approvals Service for Electric Cables (BASEC) or equivalent. Cables shall be segregated from other services and shall comply with DE Specification 034, Table 6A. Band 2 cables shall not be installed in the same conduits, trunking compartments or cable ducting compartments as Band 1 cables, unless within parameter detailed within the regulations.
2. **Cable routes**. Cables installed on the surface shall be parallel with the lines of the building construction and properly aligned. Cables buried below ground shall, as far as practicable, follow the features of the site such as roadways and building lines. Ducts at roads shall normally be at right angles to the line of the road.
3. **Cable segregation**. A minimum clearance in accordance with DE Specification 034, Table 6A shall be allowed from any equipment, pipework or ductwork. In the event of difficulty in achieving these requirements the Authority shall be consulted. Adequate space shall be left between cable runs and the building fabric and other services to allow for the future removal or installation of cables.
4. **Cable cleats**. Cable cleats shall be made from materials that are resistant to corrosion without the need for treatment or special finish. Plastic materials shall be non-brittle. Non-metallic cleats used for low smoke fume (LSF) cables shall be of LSF material. Cable cleats shall be of a size such that they can be tightened down to grip the cables without exerting undue pressure. The spacing of cable cleats shall comply with the BS 7671+A2:2013. On each side of the bend, cable cleats shall be used to secure the cable.
5. **WF100 cable**. The cable will be terminated onto an UHF TV socket outlet and 3 m length left to allow the cables to be terminated neatly onto the distribution splitter board situated in the electrical cupboard or the plant room if no electrical cupboard is available.The TV cable cannot be kinked, pinched or twisted as this deforms the cable and changes the cable's propagation characteristics. If the run exceeds 30 m in length then WF 165 cable is to be used. Below are particulars of the cable:
	1. Mechanical specifications.
		1. Inner conductor. 1.00 mm Cu.
		2. Diaelectric. Foam PE
		3. Diameter over diaelectric. 4.8 mm.
		4. First screen. Cu foil.
		5. Braid. Copper.
		6. Second screen. N/A
		7. Sheath. PVC.
		8. Diameter cover sheath. 6.55 mm ±0.3 mm.
		9. Colour. Black, brown and white.
	2. Electrical specifications.
		1. Characteristic impedance. 75 Ω.
		2. DC resistance inner conductor. <26 Ω/Km.
		3. DC resistance outer conductor. <15 Ω/Km.
		4. Capacitance pF/m. 55.
		5. Velocity ratio. 0.81.
		6. Return losses.

* + - 1. 5-470 MHz. >23dB.
			2. 470 – 886 MHz. >20 dB.
			3. 862 – 2150 MHz. >18 dB.
		1. Attenuation (dB/100 m at 20oC).
			1. 5 MHz. <1.6.
			2. 50 MHz. <4.6.
			3. 100 MHz. <6.5.
			4. 200 MHz. <9.5.
			5. 460 MHz. <15.0.
			6. 860 MHz. <19.5.
			7. 1000 MHz. <21.5.
			8. 1750 MHz. <29.0.
			9. 2150 MHz. <32.5.
1. **WF 165 cable**. As stated above if the run of the WF 100 cable exceeds 30 m in length then WF 165 cable is to be used. Below are particulars of this cable:
	1. Mechanical specifications.
		1. Inner conductor. 1.00 mm Cu.
		2. Diaelectric. Foam PE
		3. Diameter over diaelectric. 1.63 mm.
		4. First screen. Plain copper foil tape.
		5. Second screen. Plain copper braid.
		6. Sheath. PVC.
		7. Diameter cover sheath. 10.10 mm.
	2. Electrical specifications.
		1. Characteristic impedance. 75 ±3Ω.
		2. DC resistance inner conductor. <10.5 Ω/Km @ 20°C.
		3. DC resistance outer conductor. <12 Ω/Km @ 20°C.
		4. Capacitance pF/m. 58.
		5. Velocity ratio. 0.81.
		6. Return losses.

* + - 1. 5-470 MHz. >23dB.
			2. 470 – 886 MHz. >20 dB.
			3. 862 – 2150 MHz. >18 dB.
		1. Attenuation (dB/100 m at 20oC).
			1. 10 MHz. <1.2.
			2. 50 MHz. <3.0.
			3. 100 MHz. <4.0.
			4. 200 MHz. <6.0.
			5. 460 MHz. <9.0.
			6. 860 MHz. <12.5.
			7. 1000 MHz. <13.5.

 (h) 1750 MHz. <19.0.

1. Accommodation Data/tele communication cable. All accommodation blocks within 2B build are to be wired to receive data/tele communication, with no external connectivity required. Below are particulars of the cable to be used:
	1. Mechanical specifications.
		1. Conductor. Class 1 solid plain copper.
		2. Insulation. HDPE.
		3. Nominal thickness of insulation. 0.875 mm.
		4. Nominal overall diameter. 4.9 mm.
		5. Drain wire. Tinned copper.
		6. Sheath. PVC.
		7. Sheath colour. Grey.
		8. Temperature rating. 70°C.
		9. Minimum bend ration.
			1. Fixed. 4 x overall diameter.
			2. Flexing. 8 x overall diameter.
		10. Colour. 4 pairs.
			1. Blue + white/blue.
			2. Orange + white/orange.
			3. Green + white/green.
			4. Brown + white/brown.
	2. Electrical specifications.
		1. Characteristic impedance. 100 ±15 Ω.
		2. Max conductor resistance. 93.8 Ω/Km.
		3. Max resistance unbalanced. 2.5 % max.
		4. Return losses.
			1. 1 MHz. 20.0 dB.
			2. 4 MHz. 23.0 dB.
			3. 8 MHz. 24.5 dB.
			4. 10 MHz. 25.0 dB.
			5. 16 MHz. 25.0 dB.
			6. 20 MHz. 25.0 dB.
			7. 25 MHz. 24.3 dB.
			8. 31.25 MHz. 23.6 dB.
			9. 62.50 MHz. 21.5 dB.
			10. 100.00 MHz. 20.1 dB.

* + 1. Attenuation (dB/100 m at 20oC).
			1. 1 MHz. 2.0.
			2. 4 MHz. 4.1.
			3. 8 MHz. 5.8.
			4. 10 MHz. 6.5.
			5. 16 MHz. 8.2.
			6. 20 MHz. 9.3.
			7. 25 MHz. 10.4.
			8. 31.25 MHz. 11.7.
			9. 62.50 MHz. 17.0.
			10. 100.00 MHz. 22.0.
	1. Cable termination. Each data/tele communication cable terminating within each room in each accommodation block is to be terminated using a LSA compatible wall box module positioned minimum 50 mm above workbench height, with the other end terminating neatly onto the distribution splitter board/ patch panel within the electrical cupboard or the plant room if no electrical cupboard is available. Below are particulars of the module and patch panel:
		1. Module.
			1. Description. Cat 5E 568B LJ6C 37 mm x 25 mm x 20 mm.
			2. Colour. White.
			3. Marking. Cat 5e.
			4. Supplied with. Strain relief cable tie for cable protection.
		2. Patch panel.
			1. Description. 1U 24 Port LSA Block Cat 5e Panel 19” UTP.
			2. Colour. Black.
			3. Marking. Cat 5e.
			4. Supplied with. Cage nuts, rear cable management rings, mini cable ties and labelling system.

**Protective conductors and bonding**

1. **General**. Automatic disconnection of the supply is the method of protection utilised for basic and fault protection. Therefore, all protective conductors and all supplementary bonding is to ensure that, in the event of a fault, sufficient current flows to operate the protective devices i.e. circuit breakers or residual current devices.
2. **Earth conductor**. In accordance with Regulation 543.1.4 of the BS 7671+A2:2013, the minimum cross sectional area of the protective conductor shall be half the cross sectional area of the line conductors.
3. **Supplementary bonding**. Supplementary bonding conductors shall be installed to all exposed metal conductive parts. In any part of the installation where the earthed metalwork of the electrical system comes into contact with the metalwork of any other service, structure or equipment, a permanent earth bond shall be formed as close as is practicable to the point of contact.

**Fire alarm**

1. **General**. The fire alarm system shall be an Automatic Fire Detection System (AFDS) incorporating smoke detectors, heat detectors, manual call points and sounders throughout the building with a visual beacon within the DDA toilet. The fire detection system will comply with BS 5839-1:2013 and all fire alarm equipment installed shall comply with BS EN 54-5:2001. Guidance on the categorisation of the fire system is to be sort through the Defence Fire Risk Management Organisation (DFRMO).
2. **Alarm system.** The fire alarm panel is to be located adjacent to the main entrance and will meet the following installation specification:
	1. The system will be wired throughout using red sheathed fire performance cable with harmonised core colours and earth.
	2. The main panel provided will be of the digital addressable type. It shall be supplied complete with an integral charger and battery system to enable the system to be remain operational for 1-hour in the event of a power failure.
	3. The fire alarm system is to be wired, installed and tested in accordance with the manufacturer’s requirement.
	4. The minimum conductor size shall be 1.5 mm², and the number of cores shall be determined in accordance with the manufacturer’s requirements. The complete cabling installation shall comply with BS 7671+A2:2013.
	5. The system should have a repeater capability to the guardroom. The capability is to be hard wired to the guardroom.
3. **Manual call-points**. Break-glass surface mounted addressable call points, or equal and approved is to be installed at the fire exit points of the building. These are to be mounted at a height of 1200 m above the FFL (to be DDA compliant). The installer is to ensure that the call points are so located that a person does not have to travel more than 25 m to operate a call point.
4. **Heat detectors.** All heat detectors shall be surface mounted addressable heat detectors as detailed in paragraph 59 (f) below.
5. **Smoke detectors**. All smoke detectors shall be surface mounted addressable smoke detectors as detailed in paragraph 59 (d) below.
6. All fire alarm systems used are to be compatible with Menvier products. Paragraph 59 – 62 below specifies the model no., the capabilities of the devices and their modes of operation and communication.
7. For the addressable system, 1 loop is capable of connecting a maximum of 200 devices. A maximum of 1500m cable length is recommended to maintain adequate signal strength.
8. The system shall comprise the following devices:
	1. Addressable 1 loop control panel DF6100
	2. Addressable Repeater panel DF6000PR
	3. Addressable Smoke detectors c/w sounder/beacon MASB870
	4. Optical smoke detectors (only to be used in suitable locations) MAP820
	5. Manual call point.
		1. Indoors MBG813
		2. Outdoors MBG817
	6. Addressable Heat detector MAH830
	7. Addressable mounted sounder/beacon MASB860
9. In each building, the system shall consist of one DF6100 Panel. The smoke detectors, heat detectors, flashing beacons, manual call points and sounders, all of these shall be connected to the panel in one loop using 2C x 1.5 mm sq Fire Resistant screened cable.
10. The system shall be programmable to identify faults in terms of location, room no. & name and the area (zone).
11. A DF6000PR Repeater Panel will be installed at the Guard Room. This shall be linked to all other Panels through a network card at each Panel. The Repeater panel shall be programmed such that no signal is filtered. This will allow for monitoring of the Panels in the whole facility.

Public Address System

1. General. A Public Address (PA) system is to be installed in all buildings and linked back to the existing system base station, located in the main guard room, utilising the existing pits and ducts system where applicable
2. Speakers. Ahuja sound solution ASC-320T/ASC-315T/ASC-310T speakers or similarly approved for the PA system is to have the following specification:
	1. Weather resistant — for use under roof eaves. Foam layer to protect speakers from dust.
	2. Array of speakers radiate forward sound beam for wider audience coverage.
	3. Fitted in place with suitable mounting clamps & hardware.
	4. Slim, compact, aesthetically designed column speakers.
	5. Off-white colour to integrate with most interiors.
	6. Aluminium extruded cabinet with moulded plastic covers, metal mesh grille.
	7. 100V line matching transformer with rotary switch for power tap selection.
3. Audio splitter. Ahuja sound solution DA-80 audio splitter or similarly approved, is to be sleek and compact 8-channel line signal splitter suitable for large PA applications and installations. Suitable for use when a single programme source has to feed several amplifiers. Avoids signal loading and related distortion problems. Accepts line level stereo/mono input. Provides four line level stereo outputs or eight line level mono outputs. Individual volume controls for input and eight output channels. Clip LED for setting optimum distortion free input levels. Operates on AC mains. 19” rack mountable in 1U space.
4. Amplifier. Ahuja sound solution TZA-1500 amplifier or similarly approved for the PA system is to have the following specification:
	1. Power output. 100 W + 100 W Max, 80 W + 80 W RMS at 10% THD.
	2. Output regulations. ≤ 2 dB, no load to full load at 1 kHz.
	3. Input channels. 6 Ã— Mic 0.6mV/4.7k, 2 Ã— Aux 100mV/470k.
	4. Frequency response. 65-15,000Hz ±3dB.
	5. Signal to noise ratio. 60 dB.
	6. Tone control. Bass: -10dB at 100Hz, Treble: -10dB at 10kHz.
	7. Outputs. Preamp 200mV/600.
	8. Speaker outputs. 4, 8, 70V & 100V for each zone.
	9. Power supply. AC: 220-240V 50/60Hz DC: 12V (12V Car Battery).
	10. Power consumption. AC: 300VA DC: 6A.
	11. Dimensions. W460 x H155 x D310 mm.

**Lightning protection**

1. **General**. The lightning protection risk assessment is to be carried out to evaluate whether the structure requires a protection system or not. Where lightning protection is required, the designer is to design the lightning protection system in accordance with BS EN 62305-1:2011and BS 7430:2011. The system must be installed and tested by a competent person with certification provided in accordance with the relevant BS. Furse Guide or any other Authority approved equivalent lightning protection and installation is to be used as necessary. If no lightning protection is required then certification of non-requirement along with supporting evidence is to be supplied to the Authority.
2. **Air terminations**. Bare conductors, not less than 25 x 3 mm, are to be used for the air termination. The distances between air termination and vertical air rods are to provide adequate protection which shall be described in BS EN 62305-1:2011.
3. **Down conductors**. Steel structure column may be used as a down conductor. A test joint should be fitted on every down conductor that connects with the earthing termination. The test joint should be capable of being removed, opened for testing and reconnected. It shall meet the requirements of BS EN 50164-1:2008. Any metalwork, sunshades, windows, handrails, pipework, ductwork and cables, adjacent to down conductors shall be bonded to them unless the distance between them provides adequate isolation.
4. **Joints**. Through joints in conductors shall be minimised through out the structure where possible. Except the test point, all the joints between the conductors shall be made by welding process or suitable mechanical clamps. Overlap of conductors in joints shall not be less than 100 mm. A test clamp shall be provided on each down conductor and shall be located in prominent position. Bonding connection to other metal parts shall be oxide inhibiting to prevent galvanic corrosion between dissimilar metal parts. The connection between the conductor and earth electrode rods shall cover all exposed conductive parts. Protective coating shall be of a weather proof, inert, tenacious material. Screws shall be phosphor bronze, naval brass or high tensile manganese brass.
5. **Earth electrodes**. Earth electrodes shall be stainless steel rods of 14 mm minimum nominal diameter. Driving heads shall be high tensile steel. An oxide inhibiting paste shall be applied to the rods, threads and couplers to prevent corrosion. Earth plates shall be installed where difficulty in achieving the depth. The earth plates shall be installed vertically in an excavated hole, with top plate at a minimum of 1 m below finished ground level.
	1. Earth electrode shall be installed in undisturbed ground.
	2. The backfill immediately surrounding the rod shall have a low resistivity and good water retention properties. The backfill shall be well compacted and watered. An approved moisture retaining material shall be used to reduce soil resistivity for earth electrode backfill.
	3. Each earth rod shall be placed with the earth rod head located in a plastic or concrete pit covering to enable access for future testing.
6. **Fixings**. The minimum spacing of fixing shall not exceed 900 mm. Clips and saddles shall be used to secure the conductor, made from gunmetal, phosphor bronze or naval brass. All the clips and saddles shall have rounded edges and countersink screws. For general areas inside buildings, screws and nuts shall be non-corrosive and compatible with the environment; outside buildings, in plant rooms or other locations as indicated, they shall be of stainless steel. No shot firing shall be used and no drilling or welding of structural steelwork shall be done without the approval of the Authority. Drilling and cutting of the outside fabric of the building shall be carried out only after the Authority has given approval.
7. **Inspection pit**. All connections between conductors and earth electrode shall be located in an enclosure. The enclosure shall be either plastic or concrete pit with removable top cover. The enclosure shall be flushed to the finished ground level. The conductor and earth rod connection shall be positioned just below the lid with adequate access for testing purpose. The enclosure shall be made for purpose and clearly labelled with its identification numbers and shall comply with to BS EN 50164-5:2009.

**Inspection, Testing and Commissioning**

1. **General**. During erection, on completion and before being put into service the electrical installation shall be inspected, tested and verified, so far as reasonably practicably, that the requirements of the current edition of BS 7671+A2:2013. The verification shall be made by a competent person and shall include comparison of the results with the relevant criteria and regulations. On completion of the verification all relevant documentation will be prepared.
2. **Inspection**. The inspection shall precede any testing of the installation and shall be carried out with that part of the installation under inspection disconnected from the supply. The inspection shall be carried out in accordance with the current edition of BS 7671+A2:2013.

1. **Live testing**. Live testing of electrical installations is a recognised method of assessing the suitability and safety of the installation. Therefore, suitable precautions must be taken by employment of the correct and calibrated test equipment and suitable personnel protective equipment. Although live testing and fault finding is a recognised method, under no circumstances is any subsequent repair work to be carried out live.
2. **Safety**. It is the test operator’s duty to ensure their own safety and the safety of others, whilst working through the test procedure. Prior to testing the installation the test operator is to ensure the following precautions are taken:
	1. **Equipment**. The Tester must have knowledge and experience of the correct application and use of the test instrumentation, leads, probes and accessories. The tester must carry out the following;
		1. The Tester is to checking that the test instrumentation is made in accordance with the appropriate safety standards such as BS EN 61243-3:2010 for two pole voltage detectors and BS EN 61557-10:2013 for instruments.
		2. The Tester must check before each use all leads, probes, accessories and instruments, including proving units, are clean, undamaged and functioning.
		3. The Tester must also check that isolation can be safety affected and that any locks or other means necessary to securing the isolation are available and functional.
	2. **Standards**. All test equipments must meet the safety measures and procedures set out in Health and Safety Executive Guidance Note GS 38 for all instruments, leads, probes and accessories.
		1. The Tester must ensure that the test instrumentation has some means of fused protection. Various manufacturers advise that their test instruments are to be used in conjunction with fused test leads and probes. Others advise the use of non-fused leads and probes when the instrument has in-built electrical protection[[7]](#footnote-7).
		2. It is imperative that the Tester uses the correct leads and probes with the correct instrumentation.
3. **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 take place;
		1. Visual inspection as laid down within the current edition of BS 7671+A2:2013.
		2. Continuity of protective conductors, including main and supplementary bonding.
		3. Continuity of ring final circuit conductors, including protective conductors.
		4. Insulation resistance.
		5. Polarity (by continuity method).
		6. Earth electrode resistance measurement (clean earth).
	2. **During energising**. With the supply connected and energised he following procedure is take place:
		1. Check polarity of the supply, using an approved voltage indicator.
		2. Earth electrode resistance, using a loop impedance tester.
		3. Earth fault loop impedance.
		4. Prospective fault current measurement[[8]](#footnote-8).
4. **Additional electrical tests**. Insulation resistance tests shall be carried on the new installation of all cables to prove integrity of the cable insulation and continuity after installation.

**Certification and forms of completion**

1. **General**. The Contractor is to prepare all forms of completion. Current editions of forms are to be used from BS 7671+A2:2013.
2. **Instrumentation and calibration**. The Contractor shall provide all instruments, materials and labour to carry out the tests. The Contractor shall give adequate notice to the Authority of the intended final tests on the completed installation. The Authority reserves the right to witness the final tests and to call upon the Contractor to carry out in his presence, tests which he deems necessary. Before any test is carried out the Contractor shall calibrate all instruments and note down the instrument serial numbers providing a copy to the Authority. Only one set of test instruments shall be used throughout the testing procedure.
3. **Commissioning**. The Contractor shall be responsible for carrying out all inspection and testing of the electrical installation and equipment as prescribed by the BS 7671+A2:2013. The Contractor is to complete their required sections of the commissioning forms and present them to the Authority.
4. **Results**. All results obtained during the test procedure are to be recorded on the Schedule of Test Results for the distribution board for future reference and checked for acceptability against the prescribed criteria. All failed measurements are to be highlighted to the Authority at the earliest opportunity, and rectified before project completion. An Electrical Installation Certificate is to be prepared to accompany each Schedule of Test Results. All documents are to be included in the Health and Safety File and issued to the Authority during the Handover Board. A copy of each Electrical Installation Certificate, Schedule of Test Results and a Circuit Diagram are to be situated in the immediate vicinity of the associated distribution board for future reference.
5. **Fire engineering**. During commissioning of the system the correct sound levels are to be achieved throughout the building in accordance with BS 5839-1:2013. These are to be recorded on the specified documentation as detailed in the specification, all tests relating to BS 5839-1:2013 must be witnessed by the DFRMO or a nominated in country DFRMO representative.On handover of the facility, copies of appropriate fire alarm certificates; design, installation, commissioning and verification (if required) with a drawing indicating sound level readings in each area, are to be forwarded to the Authority.The system is to be installed in accordance with BS 7671+A2:2013 and tested by a City and Guilds 2391[[9]](#footnote-9) qualified electrician. The fire alarm system is to have the following certificates completed and presented as part of the H&S File.
	1. **Certificate of design.** BS 5839-1:2013 Annex H, Certificate H1 to be completed by the Designer.
	2. **Certificate of installation.** BS 5839-1:2013 Annex H Certificate H2 to be completed by the Contractor.
	3. **Commissioning certificate.** BS 5839-1:2013 Annex H Certificate H3 to be completed by the DFRMO.
	4. **Acceptance certificate.** BS 5839-1:2013 Annex H Certificate H4 to be completed by the DFRMO.
6. **Emergency lighting.** All emergency lighting is to be tested and certified in accordance with BS 5266-1:2011. All test results are to be presented as part of the H&S File. The emergency lighting system is to have the following certificates completed and presented as part of the H&S File:
	1. **Emergency lighting completion certificate.** BS 5266-1:2011Annex C emergency lighting completion certificate to be completed by the DFRMO.
	2. **Design declaration of conformity.** BS 5266-1:2011Annex C design declaration of conformity to be completed by the Designer.
	3. **Installation - declaration of conformity.** BS 5266-1:2011Annex C installation declaration of conformity to be completed by the DFRMO.
	4. **Verification - declaration of conformity.** BS 5266-1:2011Annex C verification of conformity to be completed by the DFRMO.
	5. **Periodic inspection and test certificate.** BS 5266-1:2011 Annex D periodic inspection and test certificate to be completed by the designer with assistance from the DFRMO.

**Communication Information Services (CIS)**

1. **CIS Design and Installation Reference**. The CIS system is to be designed and installed in accordance with JSP 480. This document is available from:
	* 1. <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/237164/JSP480_Edition_16.pdf>
2. **Network Equipment Rooms**. Network Equipment Rooms (NERs) are to be supplied in accordance with the detailed specification and JSP 480. All data conduit / trunking to be terminated in plantroom. All NERs shall be provided the following:
	1. Temperature controlled to provide an ambient temperature of between 15-20 °C. A cooling load of 2.2 kW shall be used for design purposes.
	2. 2 No. 16 A spurs in Black NERs and 4 No. 16 A spurs in Red NERs. Each spur is to be fitted with a 20 A rotary switch isolator.
	3. The NER is to be fitted with a clean earth. This earth is intended for the CIS equipment and is not to be connected to any part of the electrical system. The earth bar in the NER is to be connected to its own earth electrode and achieve 10 ohms or less. The earth bar is to be located adjacent to the service inlet ducts at 500 mm above FFL.
	4. A power supply formed of a dedicated radial circuit to a dedicated fuse box within the NER from which the spurs are supplied.
	5. 3 No. high level holes through the internal walls into the back of the CIS distribution trunking. The holes are to be a minimum of 100 mm in diameter through the whole of the wall fabric.
3. **TEMPEST power filters**. Suitably sized TEMPEST power filters are to be fitted to the Red NER power supply prior to the fuse box. If a DII red terminal does not have a dedicated power supply, then power filters are to be fitted to the supply cable at a point after the supply becomes dedicated. The power filters are to be purchased from the Authority approved company below:

 MPE Limited

 Hammond Road

 Knowsley Industrial Park

 Liverpool

 L33 7UL

 Telephone: +44 (0) 151 6329100

 Email: sales@mpe.co.uk

1. **Communication pits and ducts**. The Contractor is to connect to the existing pits system and provide a communication pit within 5 m of an NER. Communication pits are to be constructed in accordance with JSP 480:
	1. A minimum of 4 No. 100 mm diameter ducts complete with pull ropes from the communications pit and terminating within the NER. Ducts terminating in NER are to be located between 150-300 mm from the internal face of an external wall.
	2. Pit lids are to be securable in accordance with JSP 480.
	3. Intermediate pits between the new facility and connection to the existing pits and ducts main system are to be spaced at 40 m intervals and at every change in direction.
	4. A drainage system comprising of either a sump or soak away is to be incorporated in the base of each pit.
	5. The ducting has the following requirements:
		1. 110 mm internal diameter ducts are to be installed at all road crossings.
		2. Entries into pits shall be a minimum of 100 mm centres, in both the horizontal and vertical direction. The ducts are to be positioned at least 100 mm from adjoining walls and 250 mm from the base.
		3. Duct entries are to be cut flush with the inside walls and all rough edges removed so that there are no protrusions in the pit.
		4. Ducts are to be fitted with draw ropes for future cable installation. The length of the rope left protruding from the duct will be tied off and be 4 m longer than the length of the duct run.
		5. Once cables are installed, ducts penetrating structures are to be sealed with a fire stopping compound. A suitable duct plug is to be used on all unused duct entries to prevent water ingress.
2. **Trunking**. The Contractor shall provide CIS trunking and back boxes only, as required throughout the buildings. All wiring and connections shall be made by the Authority after construction. All CIS trunking is to be a Cat 5e compliant trunking system to BS 4662:2006+A1:2009 and fitted in accordance with JSP 480:
	1. **General**. Trunking is to start outside the NER and supply all DII terminals as indicated in the Detailed Specification and drawings. The trunking is to run at ceiling height and drop to desk level as required. A double Cat 5e compliant back box is to be fitted to the trunking at the terminal. All trunking shall have a minimum distance of 130 mm from fluorescent lighting.
	2. **Black trunking**. Unless otherwise specified all DII terminals require Black designated communications trunking. Black trunking shall be a 170 x 50 mm 3 compartment system coloured white. The trunking may be concealed behind false ceilings but must be accessible for repair and wiring. The top most compartment may be used for power distribution cabling.
	3. **Red trunking**. Trunking running from a Red NER to a Red DII terminal shall be designated as Red trunking. Red trunking shall be a 50 x 50 mm 1 compartment system coloured red. Red trunking shall not be fitted within 100 mm horizontally of other communication cables or power cables but may cross vertically. Red trunking is to remain separate from the black trunking at all times and may not contain power distribution. The Red trunking may not be concealed behind false ceilings and must remain in view from floor level at all times.
3. **Telephone Socket Outlets**.
	1. **Technical and Domestic Buildings**. Technical and domestic buildings are to have trunking and conduit installed for a telephone network system as specified within this Booklet. Trunking and conduit is to be terminated within the electrical cupboard (or the plant room if no electrical cupboard is available) for each building. Telephone outlet points should be provided as detailed in Booklet 3, Part 2. The telephone network will be cabled by the Authority.
	2. **Z, X and Y Type Accommodation**. Z, X and Y Type accommodation are to have trunking, conduit cable is to be installed for a telephone network system as specified within this Booklet. Trunking, conduit and cabling are ~~is~~ to be terminated within the electrical cupboard (or the plant room if no electrical cupboard is available), for each accommodation building. Telephone outlet points should be provided as detailed in Booklet 3, Part 2.
4. **Accommodation data trunking and conduit.** All data trunking and conduit within accommodation buildings is to be a Cat 5e compliant trunking system to BS 4662:2006+A1:2009 and fitted in accordance with JSP 480. Data trunking from each accommodation room is to be terminated in the electrical cupboard or the plant room if no electrical cupboard is available.

**Contractor to provide**

1. **Projectors and screens**. The Contractor is to supply and fit projectors and projection screens as specified in the detailed specification. The projector screens shall be fitted central to the walls (horizontally and vertically|) indicated on the drawings and projectors suitably fitted in accordance with manufacturers guidance, to the centre of the ceiling to project onto the screens. A switched power socket is to be supplied to the projector. VGA connectivity is to be supplied to a point 1 metre to the right of the screen and held within conduit. The minimum specification for the projectors and screens are as follows:
	1. **Projector**. Resolution Full HD 1920 x 1080p: Viewing Size 27” – 300”: Aspect Ration Native 16:9 Supported 4:3, 5:4, 16:9, 16:10: Video Standard SDTV, NTSC, PAL, SECAM: Brightness 2500 lumens: Focus manual zoom and focus: Projection distance 1-10 m: Speakers x 1: Audio Output 3 W: Inputs VGA, HDMI, USB.A minimum of 1 years manufacturers warranty at the point of handing over each building to the Authority is required.
	2. **Projector screen**. Minimum overall dimensions 2 x 1.5 m. Whiteboard/projection screen combination.
2. **Ceramic hob**. 30 cm high speed frameless ceramic hob with bevelled edge, touch panel control and ultra rapid heat zones. Safety features built in and of a similar features to:
	1. **Specifications**. Front 1200 W, rear 1800 W.
	2. **Dimensions**. 310 x 510 x 41 mm.
	3. **Features**. Low energy consumption and easy to clean.
	4. **Connection**.The hob is to be connected via a push button timer set to turn off at 10 minutes.
	5. **Warranty**. A minimum of 1 years manufacturers warranty at the point of handing over each building to the Authority is required.
3. **Washing machine**. An industrial washing machine with the following or similar specifications:
	1. Cylinder Capacity 1/9 100 kg.
	2. Cylinder Capacity 1/10 90 kg.
	3. Cylinder Volume 900 ltrs.
	4. Cylinder Diameter 1095 mm.
	5. Cylinder Depth 957 mm.
	6. Cylinder Perforations diameter 3.5 mm.
	7. Door opening diameter 622 mm.
	8. Height to door handle 1020 mm.
	9. Speed: High spin (rpm) 500 – 750.
	10. Speed: Low spin (rpm) 250 – 400.
	11. Speed: Intermediate spin (rpm) 80.
	12. Speed: Wash (rpm) 10 – 50.
	13. Kinetic energy of the cylinder 29581 N/m.
	14. Dynamic bottom load 6100 N/13 Hz.
	15. Power motor 15 kW 3 phase.
	16. Water pressure 3 – 5 bar.
	17. Diameter water connection (“) 3/4 (A) / 1 (B/C/D).
	18. Hot water temperature (boiler fed) 80 °C.
	19. Electrical heating 230 V (tri) 27 kW.
	20. Electrical heating 400 V (tri + N) 27 kW.
	21. Electrical heating 400 V (tri + N) 36 kW.
	22. Steam 90 kg/cycle.
	23. Diameter drainage (75/3 mm/”) (2x).
	24. Drain by gravity 200 L/min.
	25. Steam connection ¾ “.
	26. Steam pressure 2.0 – 5.5 bar.
	27. Nett weight 2700 kg.
	28. Gross weight 3000 kg.
	29. Dimensions: 1300 x 1800 2100 mm.
	30. Volume 6.17 m³.
	31. A minimum of 1 years manufacturers warranty at the point of handing over each building to the Authority is required*.*
4. **Dryer**. An industrial dryer with the following or similar specifications:
	1. Capacity 8 kg.
	2. Drum volume 201 ltrs.
	3. Power motor 0.25 kW.
	4. Air outlet diameter 102 mm.
	5. Heating - Electric 5.35 kW.
	6. Dimensions. 1077 x 683 x 711 mm.
	7. Weight. Gross 73 kg, nett 68 kg.
	8. Volume 0.68 m³.
	9. A minimum of 1 years warranty at the point of handing over each building to the Authority is required.
5. **Domestic fridge**. An undercounter fridge with the following specifications or similar:
	1. Fridge capacity 5.3 cu.ft.
	2. Energy rating A++.
	3. Dimensions 850 x 601 x 628 mm.
	4. Auto defrost.
	5. Annual energy consumption 94 kW.
	6. Climate class SN / ST = running at room temperature from 10 ° C to 38 ° C.
	7. Fridge gross capacity 150 ltrs or 5.3 cu.ft.
	8. Fridge storage capacity 147 ltrs or 1.59 cu.ft.
	9. Weight 36.8 kg.
	10. A minimum of 1 years warranty at the point of handing over each building to the Authority is required.

**Annex E to**

**Booklet 3; Part 1 to**

**CT/COMM1/0057**

GENERIC PERFORMANCE SPECIFICATION – MECHANICAL

**Introduction**

1. The purpose of this document is to explain the strategy for the mechanical services that are to be provided within Laikipia Air Base (East) (LAB (E)).
2. The mechanical infrastructure for services such as; sewage and water distribution for the Infrastructure Development Plan (IDP) is to be completed by TRAX. Drawing number 20140319-BATUK-LAB-E-Water\_Services shows the proposed water distribution, fire distribution ringmain, sewage and drainage runs.
3. The contractor shall engage with the Authority to find suitable locations to install services from the buildings to the proposed sewage and mains cold water infrastructure at the earliest opportunity.
4. The clauses in this section of the specification cover all items which will be standard in any installation carried out. The Contractor shall carry out the works specified, using the materials and methods described therein.

**Standard of workmanship**

1. The work shall be carried out using the best current practices in order to produce a first class installation. The work shall at all times be adequately and effectively supervised, and at no time shall the ratio of unskilled / skilled operatives exceed that given by the National Agreement for the Heating and Ventilating Contracting Industry. Where two or more pairs are employed at one time, a responsible person shall be appointed to remain on site at all times to receive instructions and accept responsibility for the progress of the works.

**Regulations and Standards**

1. The complete installation shall comply with all relevant British Standards and, where indicated, with other standards and specifications, and all amendments thereto. Where practicable, each item of equipment shall be clearly marked to indicate the standard with which it complies. Alternatively a Certificate of Compliance shall be provided for the Authority, to be included in the handover documentation.

**Connection to existing installation**

1. The Contractor shall notify the Authority before isolating or connecting into existing services and must obtain approval and co-operation in this matter. All possible preparation (including essential temporary services) shall be carried out before cutting off the existing service. The period of disconnection of the existing service must be kept to an absolute minimum. The Contractor shall visit the site in order to assess the magnitude of work and materials involved and include in his tender for any overtime necessary for this particular operation.
2. The contractor is to provide requirements such as; pressures, flow rates and gradients to the Authority on completion of their design.
3. Under no circumstances shall the Contractor cut off services without first obtaining permission from the Authority unless there is a risk to life or of injury. The permission shall be obtained a minimum of 24 hours before the planned disconnection. Should, however, an emergency arise, then the Contractor shall take what action he deems necessary to safeguard life and plant.

**Interchangeable**

1. The Contractor shall arrange such that all parts of all items of equipment is to be interchangeable with corresponding parts of similar items of equipment, provided that this will not in any way reduce the efficiency of the equipment or in any way make it less safe and reliable in use.

**Buried pipework**

1. All buried pipework shall be in accordance with National Joint Utilities Group (NJUG) guidelines on pipework depths colouring and marking.
2. All pipework to be installed below the surface shall be for use in underground installations.
3. All mains CWS shall be installed in accordance with the mains water Authority for LAB (E). the LAB (E) water Authority shall be consulted prior to laying of the pipe to determine suitable materials and methods.
4. All sewage pipework shall be installed underground in accordance with Approved Document H.

**Cold water service pipework**

1. **CWS**. All pipework, valves (including backflow prevention) and fittings are to be installed in accordance with BS 8558 and the Water Supply (Water fittings) Regulations.
2. **Water meter**. Supply to the buildings will need to be metered to enable the water usage to be monitored. The meter needs to conform to BS 5728 and will be isolated on both sides to facilitate ease of maintenance.
3. **Mains water supply details**. All proposed mains CWS details can be sourced through the Authority.
4. **Supply pipework**. All supply pipework is to be Medium Density Polyurethane (MDPE) pipe with a minimum rating of 8 bar. 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.
5. **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 (PVR)**. A PVR is to be installed to reduce the pressure coming into the building.
	3. **Pressure gauge**. A pressure gauge is to be fitted after the PVR, but prior to the change from MDPE to PPR pipe.
6. **External isolation valves**. All external 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 bar, buried at a minimum depth of 750 mm.
7. **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 to stabilised adequately with concrete. Details of the stabilisation, location, depth and size shall be in accordance with LAB (E) water authorities methods and standards..
8. **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. **Pipework**. All internal pipe work and fittings are to be pressure rated at a minimum of 5 bar, which has been stipulated to account for the design pressure of the future CWS distribution pipe of the South site.
	2. **Supports**. Pipe runs are to be surface mounted and supported at 600 mm centres, with saddle clips secured using eight 50 mm R/H phillips screws in to the walls.
	3. **Joints**. All joints are to be supported 300 mm 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 conections. Pipework shall be installed with a fall towards drain valves, minimising ‘dead leg’ lengths.
9. **Internal pipework fixings**. Distance between fixings to be in accordance with BS EN 1452-2 to allow for stand off distances in order to aid inspection, maintenance, support outlets / terminations and to provide mechanical protection. Pipework is to be fitted horizontally and vertically only.
10. **Elbows & tees**. All internal elbows and tees are to be PPR pipe and pressure rated to 5 bar minimum as stipulated in order to account for the design pressure of the future CWS distribution pipe of the South site, installed to allow for expansion, contraction and to prevent bowing.
11. **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.
12. **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 bar. 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.
13. **Internal drain valves**. All internal drain valves are to be brass bodied with PPR pipe transition inlets. All valves are to be pressure rated to a minimum of 5 bar and fitted at end of pipe runs in order to aid maintenance. There is to be minimum distance of 200 mm from FFL to drain valve outlet in order to aide drain down.
14. **Water heater**. There will be a requirement for a calorifier/water heater to supply hot water. The calorifier is to be an un-vented mains pressure direct water heater. The calorifier is to be electrically powered via a controller in accordance with BS EN 60730 fitted with a suitable connection for a 230 V supply. The calorifier must be capable of feeding the showers simultaneously and have a recovery time of less than 30 minutes. Buildings with high numbers of hot water outlets should use solar panel water heaters. For the remaining buildings the Designer is to carry out a cost comparison based on installation costs and fit the most cost effective solution for that specific building such as unvented instantaneous over sink point of use hot water heaters.
15. Wall mounted water boiler. All wall mounted water boilers are to be of the following specifications or similar:
	1. Capacity. 2.5 litres.
	2. Power. 2.5 kW.
	3. Immediate draw off. 15167 mL.
	4. Output per hour. 140167 mL.
	5. A minimum of 1 years warranty at the point of handing over each building to the Authority is required.
	6. To be mounted a minimum of 1500 mm for finish floor level or minimum 300 mm above workbench height.

**Soil and waste pipework**

1. **General**. The waste water system is to conform to Building Regulations and BS EN 12056-5: 2000 and must be suitable for foul waste from the WCs, urinals, WHBs and sinks. A combined gravity drainage system is to be installed to serve the respective buildings, this is to be separate to surface drainage. The system is to incorporate the installation of all the waste water fittings and pipework from the internal confines of the building to the rodding eye and inspection chambers along the waste distribution network. Falls are to be installed for self cleaning and anti-scour in accordance with Approved Document H and BS EN 752.
2. **Pipework**. The design of a suitable discharge waste pipework manifold system is required within the building incorporating the correct falls from WCs, urinals, WHBs, and sinks for self cleaning properties. Couplings shall be solvent weld joints. All pipework is to be sleeved through the building fabric and sealed.
3. **Sanitary pipework**. All sanitary drainage pipework is to be tested for water tightness[[10]](#footnote-10). The pipes, fittings and joints should be capable of withstanding an air test of positive pressure, of at least 38 mm water gauge for at least 3 minutes. Every trap should maintain a water seal of at least 25 mm.
4. **Vent pipe**. Vent pipes or air admittance valves are to be installed at suitable locations along the pipework to prevent any negative pressures within the system. External fittings are to be UV resistant with a 25 year life span minimum.
5. **Inspection chambers and termination**. Inspection chambers are to be installed at change of direction, change of height, junctions and maximum runs (in accordance with building regulations) along the waste distribution pipework. .
6. **Rodding eyes**. Rodding eyes are to be installed where maintenance is required along the waste distribution pipework in accordance with Approved Document H. These will serve drainage pipework which exits a respective building and are to be fitted at 45˚ maximum from the horizontal in order to allow easy access of the rods.
7. **Buried services**. All drainage pipework shall be buried, where practically possible, to a minimum depth of 600 mm. Where this is not possible bedding materials are to be in accordance with approved document H and authorised by the Authority. All buried pipework must be suitably identified by utilising a buried marker tape. The marker tape is to be buried 300 mm above the pipework. .
8. **Leakage test**. The foul waste pipelines are to be tested in accordance with BS 12056-5 and Building Regulations (England and Wales) Approved Document H.
9. **Installation.** The pipework must be laid to ensure that falls are self cleaning. Once installed, a recording survey of buried services including direction of fall invert levels must be conducted and recorded ensuring that electronic and hard copies are issued in the Health and Safety file. Witnessing of correct falls prior to backfilling excavations needs to be conducted in conjunction with the Authority.

**Ventilation**

1. **Natural ventilation**. LAB (E) is trying to employ an energy efficient camp, therefore trickle vents, air bricks and transfer grilles shall be incorporated into new building designs to reduce power consumptions of the buildings. Where the buildings can not meet the required air changes or heat removal mechanical ventilation shall be implemented.
2. **Extractor fan**. All local extractor fans are to be sized / rated at a minimum Air Change (AC) rate of 10 AC/hr in ablution areas and must be suitable for connection to a 230 V single phase mains power supply, switched fuse spur. All extractor fans are to be suitable for through wall mounting and are to be axial propeller fans. Fan surrounds are to have external angled grilles and a course filter to prevent the ingress of dust or debris. External fittings need to be UV resistant with a 25 year life span minimum.
3. **Localised ventilation**. All localised ventilation systems are to be fitted in accordance with Approved Document F1 Means of Ventilation and CIBSE guide B.
4. **Air conditioning**. Air conditioning shall be implemented into designs as a last resort in areas such as server rooms, where the heat gains are to high to dissipate. CIBSE guide B and ASHRAE refrigeration design guides shall be the over arching documents for all refrigeration designs. Only F-gas certified personnel are to install, inspect and commission the units.

**Electrical bonding**

1. **Passenger Lift**. A passenger carrying lift is to be provided within HQ BATUK, the specification for this is at Appendix 1 to this Annex.
2. **Protective conductors**. Where insulation with a sheet metal surface finish is used for example: aluminium stucco sheeting etc, comply BS 7671+A2:2013 as regards the facility to be electrically bonded to a protective conductor.
3. **Responsibilities**. To be carried out by the Electrical Contractor but the facility for connections to be included for, by the Mechanical Contractor in his tender. Insulation of pipework, ductwork or plant, finished with aluminium sheeting, or any other metal (but not aluminium foil), also to be bonded in accordance with current regulations.

**Inspection, testing and commissioning**

1. All testing and commission shall be conducted in accordance with manufacturer installations guidance, CIBSE commissioning codes and building regulations Approved documentation.
2. All commissioning shall be done with an Authority representative present and their record of attendance shall be stored in the health and safety file.

**Detailed performance specification – PAssenger carrying lift to comply with equalities act 2010**

1. **Aim.** It is the Authorities aim, and therefore the Design and Build contractors aim to deliver a standard of lift installation that shall be robust, reliable and shall meet the building user’s requirements and expectations.
2. **Introduction.** The passenger carrying lift is to be designed and installed in accordance with all specifications detailed within Booklet 3 Parts 1, 2 and 3. In outline references relating to this requirement are detailed below, however the design, and installation of the lift (and all structural and component parts) are to be in accordance with all relevant and current UK legislation, standards and technical guidance relating to passenger carrying lifts (including their operation and maintenance).

a. The Equalities Act 2010 (Supersedes Disability Discrimination Act 1995).

b. The Lift Regulations 1997.

c. Building Regulations part M, Access to and use of buildings 2004.

d. BS EN 81-3 Safety rules for the construction and installation of lifts.

e. British Standard 5655 Lifts and service lifts.

f. British Standard 7255 Safe Use of Lifts

g. Health Technical Memorandum 08-02 Lifts

h. Lifting Operations and Lifting Equipment Regulations (LOLER) 1998.

i. Provision and Use of Work Equipment Regulations (PUWER) 1998.

j. Workplace Regulations 1992.

k. Crown Fire Standards.

1. **Design compliance.** The passenger carrying lift shall meet or exceed all statutory requirements and best practices as detailed within the Equalities Act 2010, all other relevant and related British and European Standards. The installation shall also be carried out to Lift and Escalator Industry Association (LEIA) standards and in accordance with all manufacturers' recommendations and established methods and practices and to the entire satisfaction of the Authority.
2. **Design concurrence.** The proposed lift installation design is to be submitted to the Authority for design concurrence as detailed within the CT/COMM1/0057 Booklets 2, and 3.
3. **Lift system.** The proposed lift installation must include for all requirements including but not limited to lift, lift shaft, switchgear, lift controls, plantrooms, lift fixtures and fittings, safety areas and safety equipment etc.
	1. **Design life.** The design life of the lift is to be a minimum of 10 years before a major overhaul is required, it should be of a robust construction in order to minimise maintenance requirements.
	2. **Lift speed.** Passenger lift shall generally be designed to operate at the approx speed of 1.0 m/s and provide an average waiting time of 30 sec, the designer must confirm that these details complies with regulations and guidelines detail above.
	3. **Drive System.** The main drive system shall provide step-less acceleration/deceleration and stopping cycles, and achieve a floor levelling accuracy of +/- 5mm.
4. **Landings.**  A clear landing area is to be provided at each floor, approx area of 1,500 mm x 1,500 mm as a minimum. Each landing is to be provided with clear visual and textured delineation between the landing and the lift door threshold in order to indicate the potential change in floor height.
5. **Door.** The door must provide a minimum clear opening width of 900 mm, and have a minimum vertical height of 2,100 mm. Doors are to be fitted with a safe edge protection device. An audible door opening and closing indicator is to be installed within the carriage. Door finish is to be robust decorative stainless steel.
6. **Internal dimensions.** The minimum internal dimension of the lift carriage is to be 900 mm wide x 1,250 mm in length. The internal size of the carriage must allow an unaccompanied wheelchair user to access, egress and operate the lift unaided.
7. **Capacity.** The lift is to be capable of transporting a minimum load of 400 kg. The lift is to be fitted with an audio visual alarm to indicate when the maximum safe working limit has been exceeded.
8. **Controls.**  User operated lift controls are to be installed at a suitable height and distance away from the lift doors to comply with the Equalities Act 2010, and to enable use by unaccompanied wheelchair users. The control panels are to incorporate visual and audio level indicators, and audible indication of door operation. Where applicable labelling in Braille is to be provided for the visually impaired.
9. **Safety devices.** The lift installation shall also be designed to produce a safe working environment for Engineers and Auxiliary workers to work on or around, and in accordance with the Lift Regulations 1997 the installation is to be fitted with, but not limited to the following safety devices:
	1. Door locking device.
	2. Fall protection device.
	3. Over speed protection device.
	4. Energy accumulating buffer.
	5. Electric safety devices.
10. **Alarms.** The lift system is to be provided with an interlock from the fire control panel installed within the building. In the event of a fire the lift is to be retained on the ground floor. Any alarms or public address systems which are installed within the building are to be repeated within the lift.
11. **Lift Emergency Call.** The lift carriage is to have an emergency call system installed that is capable of linking in to a standard telephone cable network. The emergency call system from the lift carriage is to be terminated at a suitable point at the base of the lift shaft or lift motor room (if provided), to allow for the MOD to connect this through to the local telephone network to the guardroom.
12. **Lift motor room.** If a lift motor room is required it is to be lockable and is to be fitted with the relevant British Standard warning signs. There is to be sufficient access to the installed equipment to allow for maintenance and repair, in accordance with DMG 08 and CDM requirements. All moving and rotating parts are to be fitted with the required mechanical protection, all moving parts are to be painted yellow.
13. **Lighting.** Within the lift carriage a minimum of 200 Lux at floor level is to be achieved, working lights within the lift shaft shall provide a working light of 100 Lux. Emergency lighting is to be provided within the lift carriage, lift shaft and landing areas.
14. **Testing and commissioning.** The lift and all components are to be tested in accordance with BS EN 81-1, BS 8486-1 and BS 9999. The testing and commissioning should include but is not limited to:
	1. Operational tests reporting on levelling, vibration, jerk and noise.
	2. Safety function.
15. **Health and Safety file.** On completion of the installation a comprehensive Health and safety file is to be produced, including the following as a minimum
	1. A written scheme of testing and inspection in accordance with BS5655 Lifts and service lifts, part 10 Specification for the testing and inspection of electric and hydraulic lifts. The written scheme is to be written by a competent person who has been approved by the Program and Project Delivery Office before the installation.
	2. Log book.
	3. Complete set of as-installed drawings.
	4. Full set of test certificates to include (but not limited to):
		* 1. Hoisting ropes.
			2. Governor ropes.
			3. Over speed governor.
			4. Hoisting motor.
			5. Door gear motor.
			6. Car and counter-weight buffers.
			7. Safety gear.
			8. Fire certificate for landings.
			9. Lifting beam certification where applicable.
			10. Electrical certificates.
			11. Certificate of conformity.
			12. Noise and vibration certification.
	5. Maintenance procedures, risk assessments and method statements.
	6. Details of specialist components and suppliers, including details of warranties.
16. **Lift Ancillary Equipment and Spares.** The contractor is to provide a minimum of 3 x sets of ancillary lift equipment including but not limited to access keys, control keys, safety keys and safety equipment. The contractor is also to provide spares equipment and materials to allow for 12 months of routine operational and maintenance.
17. **Training.** The contractor is to provide training for approx 10 no. MOD personnel, to include routine operation and maintenance tasks, emergency release and any other specific routine operational and maintenance requirements in order for the Authority to comply with relevant UK and Kenyan regulations.

1. MoU with Kenyan Department of Defence is in the process of a re-write and is currently unavailable. The Authority shall promulgate the relevant information once published. [↑](#footnote-ref-1)
2. Licence NEMA/PR/5/2/7693 dated 9 Dec 10, renewed Feb 14. [↑](#footnote-ref-2)
3. Managing Health and Safety in Construction, Construction (Design and Management) Regulations 2007 (CDM2007), Approved Code of Practice L144. [↑](#footnote-ref-3)
4. Joint Service Publication 315, Accommodation Scales, Scale 1, Part 5, dated Jan 13. [↑](#footnote-ref-4)
5. DIO Policy instruction 06/11 Environmental Performance Assessments (Built Environment) in Defence Estates - DREAM [↑](#footnote-ref-5)
6. Components to include Utilities, Communication systems and operation of equipment i.e. the use of heavy iron ore next to an Electro Magnetic sensitive facility. [↑](#footnote-ref-6)
7. It should be noted that such electrical protection does not extend to the probes and leads. [↑](#footnote-ref-7)
8. this is to be measured as it cannot be determined by enquiry of the distributor [↑](#footnote-ref-8)
9. City and Guilds 2391 – Certification in inspection and testing. [↑](#footnote-ref-9)
10. The Building Regulations 2000, Approved Document H, Drainage and Waste Disposal, H1 Foul Water Drainage 2002 Edition. [↑](#footnote-ref-10)