Project Brief

Critical Infrastructure, Seismic Upgrades & Space Optimization

High Commission of Canada
Nairobi, Kenya

Limuru Road, Gigiri

Project Number: B-NROBI-102

Sept 2016

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General Requirements

Section 1

Critical Infrastructure, Seismic Upgrades & Space Optimization

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SECTION 1 – GENERAL REQUIREMENTS

1.1 GENERAL INFORMATION

1.1.1 PROJECT SUMMARY

1.1.1.1 The project brief describes the requirements for the development of schematic design, design development, working drawings and specifications for the Upgrades to the Chancery and Grounds. The program is to increase physical security, upgrade the Chancery Building / Envelope and upgrade the Grounds at the High Commission of Canada in Nairobi, Kenya. The project works shall be phased in a series of stages over a projected 24 month construction period. The development of an onsite phasing strategy is necessary to maintain chancery operations.

1.1.1.2 Any work required on the security and communication systems must be completed by DFATD specialists and will not be included in the scope of work of the proponent.

1.1.1.3 The Consultant will be obligated to design the project in accordance with this Design Brief, Design Review Requirements, Description of Project and the Statement of Work.

1.1.2 A&E CONSULTANT SERVICES

Scope

Without limiting the scope of the requirements of the T-405 RFP and the Sample Architectural and Engineering Contract T 409, the Consultant shall be required to furnish all design services including, but not limited to architectural, landscape architectural, civil, structural, and mechanical and electrical engineering and physical security expertise in delivery of the project.

The Project is to be implemented on a traditional design-bid-build model based on a fixed price construction contract that will be delivered in Phases. The consultant documentation needs to be developed to allow this Phasing Strategy.

The Consultant is to provide all services generally outlined in the Project Brief and as required by a full service contract in order to successfully complete the Project. These services shall be comprised of Project Analysis, Concept Design, Design Development, Construction Documentation, Tender, Contract Administration, Commissioning, Deficiency Correction and Warranty. Such services shall be hereinafter referred to as the “Service” The performance of the Service must meet the approval of Department of Foreign Affairs, Trade and Development hereinafter referred to as “DFATD”, as represented by the “Departmental Representative”.

In this Project Brief “Consultant” refers to the A&E Consultant responsible for the Service, and “Contractor” refers to the construction contractor. Refer also to the requirements of the Consultant Contract which are to be read in concert with this Project Brief.

Initial Phase

Without restriction and in addition to the services described in the sample contract the following specific points apply to the initial design development phase of the project:

- Analysis of all existing documentation
- Review and analysis Architectural, Structural, Mechanical, Electrical documentation
- Complete survey of existing façade
- Evaluation of the Preliminary Design Concept outlined in the RDH Building Condition Report

- Report on feasibility of the RDH Building Condition Report
- Design alternatives for façade recladding
- Design alternatives for the Seismic upgrades
- Design alternatives for the Curtain wall and window upgrade
- Calculation on new heat loads and ventilation requirements
- Evaluation and design of any mechanical electrical upgrades or modifications

Construction Phasing:

Operations at the existing facility are to be maintained throughout the project with minimal disruption by means of a coordinated construction phasing approach outlined in the Project Brief. Work will need to be executed with the least possible disturbance to the site, operation of the existing facility, and site personnel.

Consultation and coordination with DFATD and the Contractor will be required and the Consultant has the responsibility to obtain all required permits and licenses.

Communication: As mission operations throughout this project are an important aspect of its successful delivery, a dynamic communication plan will be required. The intent is to keep the Mission informed of developments and impacts of the various phases of project delivery. To this end, the Consultant will be required to participate in presentations to stakeholders from time to time.

1.1.3 GENERAL SCOPE OF THE CONSTRUCTION PROJECT

- Seismic upgrades of the building to meet the requirements of the National Building Code 2015
- general structural upgrades to the building,
- architectural upgrades to the building exterior, walls, windows and roofs
- electrical and mechanical systems upgrades and
- office space upgrades to the Government of Canada Work Place 2.0 Standard.

1.1.4 GENERAL PROJECT PHILOSOPHY

General

The Project Brief describes the minimum acceptable quality standards required for the architectural, structural, electrical, mechanical elements as well as interior design fit up including special construction of security and communication systems. It may be necessary from time to time to amend or supplement the information provided.

The design of the Project shall be based on the use of established construction procedures, methods and equipment of proven dependability for the stated performance and purpose. At the same time, it should be compatible with the sophistication and methods of the local construction industry in Kenya.

1.1.5 MATERIALS

The, materials external works shall satisfy the provisions of the contractual scope of work, space program, drawings and specifications as outlined in this project brief.

All building elements and engineering systems such as building structure, mechanical, electrical, security and life safety system shall become an integral part of the architectural and interior design, well incorporated into building functional design and shall be aesthetically pleasing.

1.1.6 TECHNICAL PERFORMANCE REQUIREMENTS

Element performance

Facility elements shall withstand, within acceptable tolerance, all environmental loads such as wind, sand, rain, sea spray, earthquake, etc. Proponents are required to provide the most efficient and cost effective solutions.

Life Cycle

In keeping with a life cycle cost approach, systems and equipment shall be designed and selected for their proven reliability in order to minimize capital and life cycle costs. Life cycle costs include equipment life, projected maintenance and energy consumption.

Systems efficiency and maintenance

Systems and equipment shall ensure easy, efficient and cost effective operation, as well as straightforward and cost effective maintenance and repair during the facility's useful life. All system designs and equipment shall default to a fail-safe condition under emergency situations.

Code & Quality

All design and installation shall meet the latest issues of the applicable codes, standards and regulations. The quality of the design, construction, construction material, equipment, and installation of equipment shall be monitored by a quality assurance team of specialists assigned by DFATD.

1.1.7 SECURITY AND SAFETY

General Considerations

DFATD is committed to ensuring the protection, conservation and consequent minimization of risks to life, health, property and financial investment.

The design, since it’s earliest stage shall provide for protecting employees and property, ensuring privacy and protecting from threats of natural disasters, fire, explosion, intrusion, theft, violence, espionage penetration and terrorist attacks.

Chancery Security

Security is a priority program requirement and shall be prominent in the designer’s thinking throughout the development of the project.

Integrated security encompasses general and specific safety measures applied to facility components and facility systems.

1.1.8 NATIONAL SECURITY

1.1.8.1 This project involves National Security issues. The Consultant is obliged to:

a) Keep all project documentation secure;
b) Ensure that project staff do not communicate project related information to any third parties, unless required for completion of the work;
c) Return all materials and documentation at the end of the project;
d) Direct all media enquiries to the Department Representative.

1.1.2 PERSONNEL AND PROPERTY SAFETY

Personnel and property

Personnel and property safety is a complex of measures taken to:

a) eliminate or minimize conditions threatening the health and life of persons;
b) eliminate or minimize accidents and accident-related injuries and casualties;
c) eliminate or minimize damage and loss of property.

Integrated safety

Integrated safety encompasses general and specific safety measures applied to facility components and facility systems. This subject is developed in detail in Parts 2 through 6 of the Project Brief.

1.1.3 FIRE SAFETY

General

Fire safety encompasses fire prevention, fire detection and fire alarm systems, fire suppression systems, emergency lighting systems, exit signs and directional exit signs, emergency electric power systems, fire resistance for structures and assemblies and emergency procedures.

Fire detection and fire alarm

For fire detection and fire alarm systems, emergency electric power systems, emergency lighting systems, illuminated exit signs and directional exit signs refer to *Part 6 Electrical Engineering*.

1.1.4 ENVIRONMENTAL POLICIES AND PRACTICES

General

DFATD is committed to and fully endorses environmental policies and practices in compliance with environmental laws and regulations, in using environmentally beneficial products and services, and in using resources in a sustainable manner.

1.1.9 CODES, REGULATIONS, BY-LAWS

Through their responsibility, DFATD is required to ensure buildings and properties meet or exceed Canadian codes and standards for their properties abroad. Specifically, these standards must be met to ensure life safety, quality building environments and working conditions for occupants of chancery buildings.

At minimum, the design and construction shall conform to all current and applicable laws, codes, regulations and ordinances of local authorities and the most recent edition of Canadian Codes and Standards including but not limited to,

a) Canada Labour Code, Occupational Safety & Health Regulations;
b) National Fire Code of Canada (NFC);
c) National Building Code of Canada, (NBC);
d) Barrier-Free Design Standard CAN/CSA-B651;
e) National Fire protection Association Standards (NFPA).

All facility systems shall be designed utilizing a conservative interpretation of relevant codes, particularly where considering the potential of forces such as blast and earthquakes.

Any other relevant codes, regulations by-laws and standards as stipulated in the Project Brief.

Contact with authorities is to be coordinated with the Departmental Representative.

In the event of a conflict between Canadian and local codes, the Consultant shall fully inform the Departmental Representative of such conflict. The more stringent code shall take precedence as determined by the Departmental Representative.

This project must be delivered using the International System (SI) and must conform to CAN/CSA Z-234.1 Canadian Metric Practice Guide.

1.1.10 DFATD SUPPLIED SERVICES AND ITEMS

Special purpose materials may need to be provided by DFATD and integrated into the work should the suppliers not be able to provide products meeting operational requirements

Security and Information Technology Systems as described in *Guidelines for Security and Information Technology Systems*;

Door security hardware by DFATD: hinges, kick plates, door stops, etc. are supplied by the Contractor.

1.1.11 COMPARATIVE CODE ANALYSIS

DFATD recognizes Canadian building codes.

Where local codes and standards are being applied, the Prime Consultant shall ensure that initial designs incorporate key elements of the Canadian standards and codes, particularly as they relate to:

a) fire egress routes;
b) fire suppression systems;
c) fire alert/alarm systems;
d) key life safety design elements; and
e) environmental considerations.

The successful proponent and their consultants shall carry the final liability regarding the implementation of the applicable codes, standards and regulations.

1.1.12 COMPLIANCE REVIEW

The designated DFATD representative will be reviewing the code compliance on this project. The successful proponent shall be responsible for providing the necessary documentation and coordinating the requirements with the designated Foreign Affairs Canada representative

1.1.13 SUPPLIED EQUIPMENT

The following items will be supplied by DFATD:
a) Bullet Resistant (**BR**) doors, windows and Frames;
b) Steel doors and frames;
c) Door security hardware (when existing not being re-used).

All items supplied by DFATD shall be incorporated into the design and installed by the Contractor.
Note that DFATD will procure the following materials and engage Canadian Contractors and others for the installation of: Voice Data Cables and Security Cables; IT Equipment; furnishings; fine art, and final door lock cylinders.

1.1.14 DFATD PROJECT MANAGEMENT

1.1.14.1 A designated Project Manager will manage the project. The Project Manager is the official point of contact between the Consultant and DFATD.

1.1.14.2 To facilitate communication the Consultant shall provide a dedicated work station at their office location for the use of the DFATD representative

End of General Requirements

Site Work

Section 2

Critical Infrastructure, Seismic Upgrades & Space Optimization

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SECTION 2 – SITE WORK

2.1 GENERAL INFORMATION

2.1.1 CODES AND STANDARDS

2.1.1.1 See **Section ONE** - General Requirements / Codes, Regulations, By-laws.

2.1.2 EXTERNAL SPACES

2.1.2.1 The design of exterior spaces and related elements should achieve a functional and aesthetic relationship with the overall design of the project as a direct extension to, and integration of the building.

2.2 SITE IMPROVEMENT / CIRCULATION

2.2.1 LEVELLING, GRADE AND SLOPES, DRAINAGE

2.2.1.1 Slopes for walkways (used to access facilities) should not exceed 5% and have a maximum cross slope of 2%. Slopes greater than 5 percent must comply with accessibility requirements. Preferably walkways should not have steps but where steps are necessary, alternate accessible routes need be provided.
2.2.1.2 Parking areas or large paved areas should have slopes of 1% minimum and 5% maximum.
2.2.1.3 Paved and other hard areas adjacent to buildings should have a minimum 2% slope drainage of surface water.
2.2.1.4 Site grading, particularly those aspects such as retaining walls, terraces and earth shaping, shall define and enhance the exterior spaces as well as maintain architectural continuity.
2.2.1.5 Design resolution of surface run-off and drainage shall not impede pedestrian circulation and functional use of exterior spaces and shall eliminate the potential for standing water on the site.

2.2.2 PAVING AND SURFACING

2.2.2.1 Pedestrian walkways shall retain continuity through the selection of surfacing materials.
2.2.2.2 Material selected for vehicular paving shall as much as possible complement that used for the pedestrian walkways.
2.2.2.3 New exterior ramps and walkways shall be designed for safety and ease of maintenance.
2.2.2.4 Pedestrian paths and ramps shall be surfaced with non-slip materials and embody visual / tactile demarcations as required by CAN/CSA-B651-M90 Barrier-Free Design.
2.2.2.5 Upgrades to existing immigration area ramp and existing ramp to the swimming pool shall be designed to meet barrier free requirements of CSA B651-04 and/or the National Building Code of Canada.
2.2.2.6 Extensive cracking of the concrete walls of the immigration and swimming pool ramps is evident and must be addressed.
2.2.2.7 The exterior slabs have in some areas settled differentially from the upstand walls and retaining walls and must be addressed.

End of Site Work Requirements

Architectural/ Interior Design Requirements

Section 3

Critical Infrastructure, Seismic Upgrades & Space Optimization

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SECTION 3 - ARCHITECTURAL REQUIREMENTS

3.1 GENERAL INFORMATION

3.1.1 CODES & STANDARDS

3.1.1.1 See **Section ONE** - General Requirements / Codes, Regulations, By-laws.

3.1.1.2 Negotiations required by municipal, regional, federal or other authorities involving such matters as Kenya jurisdiction on zoning, planning or legal matters governing the design and construction of the project will be carried out by the Consultant, with the assistance of the Departmental Representative, when appropriate. The Consultant shall fully inform the Departmental Representative of such negotiations from the initial contact and throughout the project.

3.1.1.3 Standards and materials stipulated indicate the minimum acceptable.

3.1.1.4 Existing building systems / components intended for re-use shall be identified, quantified, stored and protected during construction.

3.2 PLANNING

3.2.1 SWING SPACE

3.2.1.1 The existing Multi-Purpose space on the ground floor is available to be fit up as swing space. Additionally a portion of the basement parking garage is proposed as conversion to temporary swing space.

3.2.2 EXTERIOR

3.2.2.1 Building materials together with massing and detailing are to provide a coherent entity. The objective being to improve aesthetics through recladding, enhance energy performance through insulation and glazing upgrades, and manage rainwater infiltration through re-roofing. The details for much of this work are outlined in "*Preliminary Building Envelope, Structural and Space Optimization Study*" (included as part of the RFP package).

3.2.3 INTERIOR

3.2.3.1 The appearance and character of the embassy interior spaces shall be similar to that found in Class A office buildings.

3.2.3.2 The appearance and quality of finished space shall reflect 3 categories: Enhanced, Office Standard and Service areas.

A) Enhanced are Public and Representational areas. Specifically waiting rooms, meeting rooms, multipurpose room, Head of Mission office and circulation route to same. These areas should be finished in the highest quality and durable material similar to what one would expect to find in a luxury hotel. These areas are intended to showcase Canada.
B) Office Standard would be employed for the general office functions of the embassy. This comprises the majority of the chancery space. These areas would be finished in a manner consistent with class A office space.
C) Service areas are devoted to the operations and technical rooms of the embassy. These areas would be finished in a durable and utilitarian manner.

3.2.3.3 Phased demolition drawings are required and to be fully coordinated with all disciplines.

3.3 BUILDING ENVELOPE

3.3.1 BUILDING CLADDING

3.3.1.1 Exterior cladding materials shall be: low maintenance; vandal resistant; readily available; easily repaired and/or replaced. All assemblies and projections shall meet the NBC standards for fire resistance. Where no adequate local fire protection services exist all assemblies shall also be non-combustible. Propose and develop a lightweight exterior cladding system for all exposed facade surfaces.

3.3.1.2 The exterior wall planes shall maintain simple alignments necessary for effective air, vapour, thermal and weather membranes. Conditions conducive to weather staining, moisture migration and deterioration shall be avoided. Install insulation and vapour retarder to the exterior side of existing uninsulated exterior walls.

3.3.1.3 The new envelope cladding shall accommodate an optimal amount of thermal protection, while minimizing penetrations. The envelope assembly shall have a thermal performance rating of at least RSI 3.5.

3.3.1.4 The assemblies shall accommodate the movement of component materials potentially caused by ambient temperature ranges without buckling, failure of joint seals, excessive stress on fasteners or other detrimental effects. Assemblies shall limit deflections normal to the principal plane.

3.3.2 WALLS AND WINDOW

3.3.2.1 Ventilation and drainage shall be sufficient to ensure that moisture, condensation or water vapour is not trapped. Water drainage shall be designed such that moisture flow will not damage or stain finished materials.

3.3.2.2 The method of accommodating water run-off shall prevent defects associated with vertical surface irregularities and joints, staining or discoloration and local stresses caused by moisture or temperature changes.

3.3.2.3 Air leakage of wall assemblies shall be limited to a maximum of 0.10 $l/s \cdot m^2$ measured at an air pressure difference of 75 Pa. The air barrier system shall be continuous and able to resist 100% of wind load.

3.3.2.4 The design should be based on ASHRAE Handbook data for exterior conditions at the locale and the following interior conditions:

a) interior: 22 ^{0}C 30% RH still air
b) exterior: 24 ^{0}C 45% RH still air

3.3.2.5 Air and vapour barriers shall provide the following performances:

a) air barrier: 0.02 $L/(s \cdot m^2)$
b) vapour barrier:15 $ng/Pa \cdot s \cdot m^2$

3.3.2.6 All existing single glazed units shall be replaced with hermetically sealed, double glazed units. These units shall be optimized for U value, solar heat gain coefficient, and glass visible transmittance.

3.3.2.7 Existing skylights shall be reconsidered in terms of options as to appropriateness of function and climate.

3.3.3 ROOFS

3.3.3.1 The Consultant shall specify a written guarantee stating that the roof materials and installation shall be free from water penetration for a period of at least 15 years.

3.3.3.2 Air, vapour and thermal requirements noted for walls and windows shall also be observed for roofs.

3.3.3.3 Provide adequate protection to roofing surfaces to resist and accommodate:

a) ultra-violet radiation for the protection of insulation;
b) potential for up-lift due to wind, flotation;
c) foot traffic, vehicular, maintenance (as applicable);

3.3.3.4 Preference shall be given to roof assemblies using materials and techniques having a proven track record of long term and maintenance free performance life in the local area.

3.3.3.5 The roof system shall be designed using industry accepted specifications and details.

3.3.3.6 Consider the redesign of exterior plaster soffits at overhangs with a ventilated grillage.

3.3.3.7 Consider redesign of the existing inverted roof assemblies for a conventional roofing system incorporating

greater insulation values and having positive drainage slopes.

3.3.3.8 Existing flashings and copings at roof curbs and parapets to be redesigned to suit new roof assembly. Roof curbs will likely require to be raised to accommodate increased insulation depth and buildup necessary for drainage slopes.

3.4 SPACE OPTIMIZATION

3.4.1 GENERAL REDESIGN OF INTERIOR

3.4.1.1 The interior scheme shall align with the three categories of spaces listed in 4.2.2.2. Redesign of the interior layout to be based on DFATD Interior Design Layout Concept (provided to the successful bidder) and Specialty Room Data Sheets (examples at end of this document).

3.4.1.2 All layouts to conform to *Government of Canada Workplace 2.0 Fit-up Standards* (included as part of the RFP package) using current staff numbers per the *Space Inventory* that will be provided to the winning proponent.

3.4.1.3 Enclosed spaces shall be kept to the interior of floor areas to allow maximum natural light penetration from perimeter windows. Interior offices shall include glazing to allow transmission of natural daylight.

3.4.1.4 A DFATD Interior Designer will be responsible for the selection, procurement and installation of all movable furniture and furnishings.

3.4.1.5 A finish and colour scheme shall be developed by the consultant and subject to DFATD approval. The finish and colour selection will encompass all interior surfaces including the ceiling system, walls, floors, baseboards, millwork, doors, hardware, and lighting. The DFATD Interior Designer will work closely with the Consultant on the coordination of all materials and colours.

3.4.1.6 Allow for a tunable acoustic sound masking system.

3.4.2 INTERIOR DOORS

3.4.2.1 Doors for enclosed offices and other common areas (meeting rooms, quiet rooms, etc.) may be wood veneer, glass or steel and shall be co-ordinated with the overall interior scheme. Wherever possible it is desirable to re-use existing doors.

3.4.2.2 Characteristics (fire ratings and finishes) of DFATD supplied doors and Contractor supplied doors require coordination with local codes, existing building, fit-up standards and interior layouts.

3.4.3 FLOORS

3.4.3.1 Enhanced and Office area floors shall be finished in high quality locally sourced stone.

3.4.3.2 Service areas could be polished, sealed concrete, vinyl or static-dissipating vinyl.

3.4.3.3 All floor areas shall be finished in an appropriate high traffic, non-slip, hard surface, moisture resistant material. All existing highly polished stone floor areas should be removed and replaced with selected non-slip material.

3.4.4 WALLS

3.4.4.1 Interior partitions required to be security barriers, assembly and construction details shall be consistent with the wall types indicated in Security Guidelines (to be provided to the winning proponent).

3.4.4.2 Interior partitions not required to be security walls may be glazed or gypsum Board / metal stud partitions/refurbished existing wall system.

3.4.4.3 Demountable systems partitions shall be redeployed wherever possible.

3.4.4.4 The location of voice / data / power boxes shall be coordinated with furniture systems. Ensure that they will not be obstructed by furniture, panels, chairs etc.

3.4.4.5 Various sound transmission coefficient ratings will be required ranging from STC 38 to STC 45 depending on the function of the space.

3.4.4.6 Wall surfaces shall permit cleaning and provide resistance to service use damage.

3.4.5 CEILINGS

3.4.5.1 Areas forming part of the Enhanced Areas may be a mix of fixed hard surface ceiling finishes and coordinated accessible panels or ceiling tiles.
3.4.5.2 The general office space should have a uniform drop ceiling height. Enclosed spaces should have the same drop ceiling height as adjacent open office spaces.
3.4.5.3 Service Standard areas shall be exposed ceiling or accessible drop ceiling.
3.4.5.4 An integrated drop ceiling incorporating luminaries, ceiling tiles, secondary suspended ceiling suspension, sprinkler heads and smoke detection devices shall be installed. It is desirable to re-use existing ceiling systems and bulkheads where appropriate.

3.4.6 WINDOW COVERINGS

3.4.6.1 Roller shades to be specified and procured by DFATD Interior Design. Installation by local installers. Consideration will be given to possible reuse of existing window coverings where possible.
3.4.6.2 For general office areas, 3-5% light transmittance factor will be required. For Enhanced areas, additionally a combination of black-out, sheers and/or lined curtains could be required.

3.4.7 SIGNAGE

3.4.7.1 All required statutory illuminated exit signs and others to meet code requirements.
3.4.7.2 All non-statutory signage consisting of exterior and interior signs shall be designed following the DFATD *Mission Signage Standard* that will be provided to the winning proponent.

End of Architectural/ Interior Design Requirements

Structural Engineering

Section 4

Critical Infrastructure, Seismic Upgrades & Space Optimization

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SECTION 4- STRUCTURAL ENGINEERING

4.1 GUIDING PRINCIPLES

4.1.1 ANALYSIS/DESIGN PRINCIPLES

4.1.1.1 All new construction must meet both the National Building Code of Canada (NBCC) most recent edition and Local Building Code requirements for Structural Design and Analysis. The DFATD Structural Technical Advisor will review the design criteria and provide any additional guidance for the project.

4.1.1.2 Proponent is to review the following reporting and assessment documents as part of the Project Analysis phase:

a) Preliminary Building Envelope, Structural and Space Optimization Study by Rounthwaite Dick & Hadley Architects Inc. dated June 25, 2013 (included as part of the RFP package);

b) Site Geotechnical Investigation (to be provided to the successful proponent);

c) Golder Associates – Evaluation of Surface Fault Displacement and Earthquake Ground Shaking Hazards, Canadian Chancery, Nairobi, Kenya – December 2001 (to be provided to the successful proponent);

d) Complete set of original structural tender drawings dated February 2000 (to be provided to the successful proponent);

e) Appendix A - Seismic Hazard Desktop Study by ARUP, dated May 2, 2012 (to be provided to the successful proponent);

4.1.1.3 Modifications to the structural framing shall not reduce the design loading as specified on the original Structural Drawings unless directed by the DFATD Technical Advisor. Higher loading shall be used if specified by the current NBCC or current local codes. This includes, but not limited to minimum live loads and climatic loads: wind, seismic, rain, etc. All design loads must be clearly identified on the drawings.

4.1.1.4 All Seismic Upgrades are to include all the different aspects necessary to bring the Chancery to a Post-Disaster performance level as defined by the NBCC. This includes primary and secondary structural elements and non-structural building components.

4.2 STRUCTURAL DESIGN LOADS

4.2.1 GRAVITY LIVE LOADS

4.2.1.1 The slab design live loads should not be less than the design loads noted in the original structural drawings.

4.2.1.2 Based on the proposed new floor layout and occupancy, the design slab live load shall meet the minimum requirements as noted below:

a) Ground floor and basement: live load 4.8 kPa;

b) General office area above ground floor: 2.4 kPa;

c) Parking garage: 2.4 kPa;

d) Storage Areas and Server Rooms: live load 4.8 kPa;

e) Mobile shelving units: live load 4.8 kPa

f) High Security Zone (HSZ): live load 4.8 kPa

4.2.1.3 In addition to the superimposed live load, include a minimum 1.0 kPa partition allowance

4.2.1.4 The slab shall meet the requirement of article 4.1.5.9 of NBCC 2015 to carry a point load of 9.0 kN applied over an area of 750 x 750mm at any point throughout the building, except for the parking area. For the parking area, the slab must carry a point load of 18.0 kN applied over an area of 120 x 120mm.

4.2.1.5 Allow for higher linear partition loading for all security walls Type 1 (4.0 kPa x height of wall), Type 2 (0.92 kPa x height of wall) and Type 3 (0.42 kPa x height of wall);

4.2.1.6 Higher superimposed loads might be required in mechanical and electrical rooms to carry proposed equipment.

4.2.1.7 No reduction of the superimposed live load based on the tributary area shall be applied;

4.2.1.8 All design loads shall be clearly identified on the structural drawings. Provide design loading maps for floors designed for different live loads.

4.2.2 SEISMIC LOADS

4.2.2.1 Seismic loads will be calculated considering the building as a post-disaster facility

4.2.2.2 The seismic spectral response acceleration will be based on 5% damping, and a 2% probability of exceedance in 50 years.

4.2.2.3 The seismic site classification shall be determined based on the site measurement of average shear wave velocity measured for the 30mm of soil located below the foundations.

4.2.3 CLIMATIC LOADS

4.2.3.1 Wind loads:

a) The specified external wind pressure shall be calculated based on local code requirements, considering a 50 years return period.

b) The Consultant shall use the post-disaster importance factor for wind loads.

c) The calculation of wind loads shall include the building and the terrain geometry.

4.2.3.2 Rain loads: rain load shall be considered in accordance with the NBCC 2015, based on climatic data specific to the site.

4.3 PRIMARY STRUCTURAL DESIGN ASPECTS

4.3.1 SEISMIC REINFORCING

4.3.1.1 PRE-DESIGN ANALYSIS

a) The Consultant shall complete an update to the Probabilistic Seismic Hazard Assessment by undertaking a Site Specific Seismic Hazard Assessment.

b) The consultant shall undertake a geotechnical investigation to confirm soil bearing capacity, slope-stability, earthquake induced lateral soil loads, stability of the underlying fault, and the Vertical Seismic Profile (VSP) of the soil.

c) Prior to undertaking any design for the seismic structural upgrades, the consultant shall undertake an options analysis study to provide three (3) options for the seismic upgrade of the Chancery. The analysis shall include for each option:

- General description of the concept, supported by relevant sketches;
- Requirements for foundation reinforcing, including description of proposed foundation work.
- A discussion regarding the local availability of materials, proposed systems and construction skills required by each option;
- A discussion regarding impact on the construction phasing and schedule;
- Class D cost estimates;

4.3.1.2 STRUCTURAL SEISMIC UPGRADE DESIGN

a) The seismic analysis shall be completed following the non-linear time-history analysis method;

b) The analysis shall account for the unbalanced soil pressure, including earthquake induced lateral soil pressures;

c) The Seismic Upgrade design shall include the floor diaphragm design, including diaphragm connections to the primary SFRS;

d) Structural upgrades shall include seismic bracing / anchorage of non-Structural components including but not limited to Mechanical, Electrical, Architectural, Physical Security elements.

4.3.2 SLAB REINFORCING

4.3.2.1 All slabs shall be reviewed, and if required reinforced to carry the loads as specified in article 4.2. Slab deflection shall be limited to the values indicated in the NBCC 2015 and any other applicable codes.

4.3.2.2 Cracks in various parts of the slabs of the building have been noted. The locations of these cracks are outlined in detail in the “Preliminary Building Envelope, Structural and Space Optimization Study”. Areas requiring repairs include, but are not limited to, the underside of the second floor at the northwest corner, third floor edge beam at the front façade, and the parking level floor slab. Identify and address the cause of the cracking, and provide construction details for any required remedial work.

4.3.3 STRUCTURAL ASPECTS RELATED TO PHYSICAL SECURITY

4.3.3.1 The Consultant shall complete the structural design for the anchorage and support of new physical security elements, including but not limited to blast and ballistic windows and doors and reinforcing of exterior walls as specified in the Physical Security Project Brief.

4.3.3.2 The Consultant shall complete the structural design for the anchorage and support of internal security walls, including transaction windows and vault doors based on requirements specified in the Physical Security Project Brief.

4.3.4 STRUCTURAL REMEDIATION OF BUILDING DAMAGES

4.3.4.1 The Consultant shall review all damages (cracks, spalls, etc.) affecting structural elements, and identify the cause. Evaluate any impact on the structural performance of the affected element, and provide a written technical note including proposed remedial work.

4.3.4.2 The Consultant shall develop remedial details to address the cause of the deterioration, and to reinstate the original condition of the affected structural element.

4.3.4.3 The locations of these cracks are outlined in detail in the “Preliminary Building Envelope, Structural and Space Optimization Study”. Areas requiring repairs include, but are not limited to, the basement retaining walls and the sub-basement shear walls. Additional damages might be recording during the site review, and they shall be addressed as outlined above.

End of Structural Engineering

Mechanical Engineering

Section 5

Critical Infrastructure, Seismic Upgrades & Space Optimization

Nairobi, Kenya

SECTION 5 - MECHANICAL ENGINEERING

5.1 GENERAL

5.1.1 INTRODUCTION

5.1.1.1 The building envelope will be upgraded to improve the appearance and thermal performance of the exterior by recladding the façade with an insulated assembly including the addition of double glazed windows. The upgrades to the building envelope will inherently increase the spare capacity of the existing HVAC systems. However, the future occupant load in the building could increase with more employees.

5.1.1.2 This chapter identifies criteria for the design of Heating, Ventilation and Air-Conditioning (HVAC) systems, Plumbing Systems, Fire Suppression and the Building Management System (BMS). Existing equipment shall be evaluated and verified to meet the design criteria. All new mechanical systems should have a minimum life expectancy of 25 years.

5.1.2 SCOPE OF WORK

5.1.2.1 Provide mechanical design services and construction supervision for the Chancery space optimization and new swing space projects. Implement the recommendations and upgrades in the Building Condition Report (prepared by RDH Architects) and supervise the mechanical commissioning process to ensure the mechanical infrastructure meets or exceeds the specified operational requirements:

e) Heating, Ventilation and Air-Conditioning (HVAC) Systems;
f) Building Management Systems;
g) Plumbing – Domestic Water Supply and Drain, Waste and Vent System;;
h) Fire Suppression System;
i) System Start-up,
j) Testing, Adjusting and Balancing, and Commissioning;
k) Administration (construction drawings, shop drawings, record drawings, samples, codes, attendance at meetings, permit fees, etc);
l) Certificates of Completion and performance verification;
m) Operating and Maintenance (O&M) manuals.
n) Training; and
o) Spare Parts

5.1.2.2 **Drawings**

5.1.2.2.1 Layout drawings and calculations shall be certified by the Engineer (Consultant) and be responsible for all other disciplines, such as, HVAC, plumbing, electrical and other contractors.

5.1.2.3 **Specifications**

a) Engineering specifications for construction of all mechanical systems are to include written descriptions of materials, performance, characteristics, installation and quality of work requirements.

5.1.2.4 **Training Manuals and Materials**

a) Provide training, training materials and manuals in English.

5.1.3 BUILDING SYSTEMS ANALYSIS

5.1.3.1 **Validation of Mechanical Systems**

5.1.3.1.1 Provide a validation report resulting from a building systems analysis of the mechanical systems installed. The report shall provide details about the mechanical systems which will be needed to meet the requirements of DFATD.

5.1.3.1.2 Prior to implementing any of the recommendations in the Building Condition Report (prepared by RDH Architects) through a validation mandate, each of the building's mechanical components such as but not limited to the components mentioned below shall undergo an assessment of its existing condition, resulting in the identification of deficiencies and establishment of each component's remaining life, while considering the following factors:

a) Age of component;
b) Normal expected life considering its quality and durability;
c) Duty cycle;
d) Weather conditions;
e) Hours of operation and maintenance practices;
f) Obsolescence of the component; and
g) Current condition.

5.1.3.1.3 Validation report shall at a minimum provide the following :

a) Provide specific details as to the survey, inspection and operational tests;
b) Identify any major, urgent (relating to health and safety) deficiencies;
c) Deficiencies along with recommendation and cost shall be described in a paragraph form;
d) Photograph(s) shall be provided for each deficiency; and
e) A priority list complete with sequence of work for all major components required to be modernized within the next 10 years.

5.1.3.1.4 Survey (validate) the existing mechanical systems, except those that may need to be replaced, and verify the condition and age of the existing systems and corresponding components to confirm replacement. Provide an evaluation report describing all mechanical systems including but not limited to fire suppression (fire pumps, control valves, tanks, etc.), air handlers, fans, fan coil units, sump pumps, chillers, pumps and ancillary system. Determine the condition of all existing air handling systems for thermal cooling and confirm the life expectancy of these systems and if they should be replaced or require upgrades. Engineer (Consultant) to provide their recommendations based on inspection and any operational testing recommended;

5.1.3.1.5 The Chancery in Nairobi houses the following plant rooms / systems: 1) chiller and pump plant room; 2) air handlers; 3) fire suppression plant; 4) solar hot water heating; 5) generator and fuel distribution; 6) Plumbing (domestic water supply); and 7) Pool Plant Room.

5.1.3.1.6 The validation report, as mentioned above, shall include details about the mechanical systems which will be needed to meet the requirements of the DFATD program for the building envelope improvement and space optimization project. For the purpose of this report mechanical systems are considered to comprise of: heating, ventilation and air-conditioning (HVAC) systems; building control systems; fire suppression; plumbing, including water supply, sanitary, drain, waste and vent systems; and any associated pumps. Inspect existing mechanical installations (as much as possible) and review as-built drawings (provided by DFATD) of mechanical systems, such as, but not limited to the HVAC, plumbing, building management system (BMS) and fire suppression systems;

5.1.3.1.7 The HVAC system shall be altered, as required, to suit the new layout for the DFATD fit-out /space optimization project on floors using the existing HVAC systems; provided they

meet the demand for any new zones developed. The HVAC system installed serves multiple air handlers (4) and fan coil units with chilled water as the cooling medium.

5.1.3.1.8 Chilled water is provided by two Trane (model RTAB 212) air-cooled chillers with rotary compressors (2) and evaporators in the sub-basement. Each chiller has a nominal capacity of 237 kW. The chilled water is circulated to fan coils and air handlers complete with chilled water pumps located in the chillier plant room. All chilled water is circulated to the air handlers located in the sub-basement. Pressure is maintained in the system by an expansion tank. Ensure that the refrigerating systems (pressure vessels) are protected by pressure-relief devices designed to relieve pressure due to fire or other abnormal conditions. The pressure relief device must be discharged to the outside of the building and shall not be less than 15 ft. above ground level and not less than 25 ft. from any window, ventilation opening or exit in any building. Confirm if the minimum ventilation requirements are satisfied and if the airflow required to maintain a maximum temperature rise above ambient of 10°C is available. The temperature in the plant room shall not exceed 40°C. Confirm if exhaust fan for the ventilation of the chiller room is installed. Tight construction and tight fitting doors are required for the chillier plant room. Confirm that there are no openings in the chillier plant room that will permit passage of escaping refrigerant to other parts of the building. Confirm if Code requires leak detection that may be connected to the BMS. Control of chilled water system is through BMS. Observe installation for best practices and report any deficiencies in the installation;

5.1.3.1.9 Before any works at the Chancery commence, all closed looped water recirculating systems shall be tested for microbiological and chemical parameters (content). The Contractor shall employ a water treatment specialist to ensure the existing water treatment systems for cooling systems (distribution network) is designed, installed and operating satisfactory to control corrosion and bacterial growth. The contactor shall ensure that chemical treatment for closed loop systems comply with Local and Health & Safety Regulations. The Contractor shall ensure that an eye station is adjacent to every dosing point, if required by local codes.

5.1.3.1.10 The Consultant shall ensure, through heat load calculations, that the cooling plant capacity is adequate for the building, taking into consideration the new building envelope installed, new space optimization plan, occupants (current and future) and inherent equipment (computers, task lighting, equipment, etc.). In addition, confirm that the air handlers (4) have the capacity to match the demand for the zone which they serve in the new configuration and space optimization plan.

5.1.3.1.11 All HVAC systems are controlled and monitored by the Building Management System (BMS). The Chancery has an existing BMS installed that controls, monitors, alarm, trends and includes a graphic user interface. The BMS displays parameters such as humidity, temperatures (supply air, room, set point, return air, outside air, etc.) and status (on-off) of equipment (chillers, pumps, sump pumps, exhaust fans, fan coils, air handlers, etc.). Comment on the following mechanical systems:

a) Based on the condition, capacity and operation of existing chillers (manufactured by Trane), determine whether the existing systems can meet the design requirements for the new DFATD program and more importantly, the building load; this includes capacity for outdoor ventilation air requirements, solar heat gain through windows, heat transmission through walls, and internal heat gain from lighting, occupants and equipment.
b) Assess and comment on controls of the existing BMS system installed. A BMS representative may be required to provide a full analysis of the BMS installed;
c) Confirm if the existing chillers at Chancery uses an environmental friendly refrigerant or an ozone depleting type such as R-22;
d) Confirm if the existing HVAC design at the Chancery incorporates a return air plenum. Drawings indicate that AHU-2, AHU-3 and AHU-4 have no dedicated return

risers (duct work) that are hard connected to the air handlers located in the sub-basement. The return air from the plenums on each floor is returned to the shaft / riser that shares the same supply air ducts. The return air is rejected in the sub-basement

e) All air handlers serving multiple floors (or more than one suite in a storey) are to be designed to prevent circulation of smoke, and upon signal from a duct-type smoke detector, must shut down. Confirm that this provision is provided.
f) Confirm if any combustible material at the Chancery is installed above the ceiling. Combustible material in the plenum should be removed and/or remedied.
g) Note that PVC material (i.e. piping) installed above the ceiling, and incorporating a return air plenum, should have flame spread rating of not more than 25.
h) Confirm the flame spread rating if any PVC material is installed above ceiling.
i) Confirm if cast iron and copper piping is used for sanitary waste, drain and vent piping at the Chancery and if the installation is satisfactory;
j) Inspect plant rooms in the sub-basement for proper drainage and any ingress of water around perimeter. Provide solution to remedy any apparent issues with infiltration;
k) Assess and comment on installation and location of fire dampers, that is, are the fire dampers activated by fusible link or are they smoke dampers activated by smoke detector via fire alarm panel;
l) Assess and comment on the condition and operation of the domestic solar hot water supply system;
m) Provide water treatment (for kitchenette sinks, if required) according to water quality test results; see parameters in the brief to be tested. Note that if chlorine is used as a disinfection treatment by the municipality, residual chlorine must be measured in the field (on site) with a kit test;
n) At the Chancery, one large water storage tank (72 m^3) is buried below ground for domestic water supply and the fire suppression system. It is understood that there is no water treatment at the Chancery. If water treatment is non-existent, design a water treatment plant as describe in the brief, herein after. The treatment could be as simple as providing UV disinfection ahead of the discharge of the domestic water booster pumps;
o) There are several ventilations systems in the building, they are as follows: 1) fresh air supply; 2) exhaust systems; 3) generator supply / exhaust; 4) toilet extract; 5) stairwell pressurization; 6) car park ventilation; and 7) storage room supply fans. All fans shall be tested for their operation, condition and flow. Confirm which fans are approaching their end of useful life or need replacement.
p) Confirm if mechanical exhaust system for the parking garage is activated by carbon monoxide detectors. Comment on condition and operation of the mechanical exhaust system for the indoor parking garage;
q) Confirm if the fire pumps in the fire pump room is installed within a 1 hour fire resistant rating complete with fire rated doors;
r) The operating and maintenance (O&M) manual indicates that fire pump 1 will start when the pressure drops below 109 psi and will stop 10 minutes after the system pressure reaches 109 psi. If the system pressure drops to 100 psi then the second pump will start will start automatically and will stop 10 minutes after the system pressure reaches 109 psi. For clarity we want to ensure that the sequence of operation does not allow both fire pumps to operate simultaneously. Although fire pumps are designed to stop automatically (after a specified time) if the system pressure is achieved, two pumps (duty and standby) should not be allowed to operate simultaneously; if this is the case it shall be rectified. The above-mentioned should be clearly evaluated further for clarity. The tank for firefighting and domestic water is a shared tank with a total capacity of 72 m^3; of which 48 m^3 is reserved for firefighting. The fire pumps have a flow rate of 750 GPM so the water designated for firefighting would be depleted in approximately 15 minutes. The water from the swimming pool is considered a backup to the firefighting water. However, it is not

clear, and should be tested, how the water from the swimming pool is seemingly transferred (diverted) from the firefighting tank to the swimming pool;

s) Confirm the condition and operation of the sump pumps in the sub-basement. Confirm if sump pump(s) need replacement;

t) The exhaust system from the generator has been modified from the original installation and it is not clear that rework is satisfactory; the back pressure should also be calculated for adequacy.

5.1.3.1.12 Identify challenges and issues that may arise with the proposed layout considering our requirements. Review any available drawings for mechanical systems, such as, but not limited to: reflected ceiling, HVAC, plumbing systems, water supply / distribution and fire suppression. Comment on the following mechanical systems:

a) Based on the capacity of the air handlers for the floors at the Chancery, determine whether they can meet the design requirements for DFATD's space optimization program. This includes outdoor air requirements, solar heat gain through the windows, heat transmission through walls, and internal heat gain from lighting, occupants and equipment;

b) The air handlers (AHU-1, AHU-2 and AHU-3) are not enclosed in dedicated mechanical rooms and there is no return air duct hard connected to the air handlers (with the exception of AHU-1). The return air is not indicative of the space being served since all the return air is mixed (dumped) in the sub-basement. All air handlers shall be provided with dedicated return duct work and installed in the risers (shafts) leading to the corresponding floors;

c) Ensure the sequence of operation of all HVAC systems, i.e. set points, alarms, supply air temperature, return air temperature, etc. and design parameters for all the systems and equipment provided are controlled by the BMS and identify any concerns that could have an impact on the operation of the mission;

d) Verify the condition and operation of all existing VAV terminals before removal and/or relocation;

e) Due to the space optimization work (fit-up) it is anticipated that HVAC work including removal and replacement of duct runs, VAV terminals and new VAV terminals, and relocation of supply /return diffusers, new supply /return diffusers and removal, relocation and replacement of thermostats will be relocated to suit new layouts. All hydronic and air distributions systems shall be rebalanced and all sensors, switches, etc. recalibrated (or replaced as required).

5.1.3.1.13 Plumbing

a) There is no water treatment at the existing Chancery. Since the municipal water (and water from bore hole) is stored, water treatment is required for the showers, sinks in washrooms and sinks in kitchenettes. The Canada Occupational Health and Safety (COHS) Regulations does not differentiate between water for drinking, personal washing and food preparation. The COHS Regulations (Section 9.24) states that every employer (including the Canadian Federal Government) shall provide potable water for drinking, personal washing and food preparation that meets the standards set out in the *Guidelines for Canadian Drinking Water Quality*. Please provide water treatment for stored water. In addition, potable water should be separated from firefighting water, if feasible.

b) The water tanks for firefighting and domestic consumption and currently shared and buried. Having the water tank buried below ground limits the possibility of any maintenance. Typically, the tank should be accessible for maintenance; to be

drained and cleaned. A new tank for domestic consumption should be considered and be aboveground.

c) The potable water tank must be certified to NSF 61. Plastic products designed for potable water applications are usually designated with "NSF-61" to indicate that the product complies with the health effects requirements of NSF/ANSI Standard 61 for materials designed for contact with potable water. This standard also establishes similar guidelines for other plumbing materials, including copper tubing. If the tank does not have NSF-61 designation it is probably not meant for potable water applications and should not be used for such purposes. Please use a tank with the NSF designation.
d) Domestic hot water is available through a solar hot heating system complete with hot water recirculating loop. Confirm if this system is operating correctly. Repair or replace any components deemed to be defective or inoperable;
e) Galvanized piping is installed throughout the building in several locations. Remove galvanized piping and replace with copper piping; and
f) The existing septic tank needs to be inspected to confirm the level of treatment being achieved. In short, sludge is building up at the bottom and sewage is flowing into the secondary chamber. At the moment the septic tank is not accessible by vacuum truck in order that it can be emptied. A review and redesign of the existing septic tank and field is required for right sizing based on the expected increased future capacity. Currently, the existing septic tank is overflowing and contaminating the ravine nearby. Consider replacing the existing septic tank with a small waste water treatment plant, if feasible. The existing septic tank may have seen its useful life as it is no longer performing as expected; and is difficult to maintain and pump out due to its current location. If a small waste water treatment plant is not feasible, consider replacing the vertical soak away pit with a horizontal septic bed. The primary chamber in the septic tank is not performing as expected and as a result raw sewage is ending up in the secondary chamber, the vertical soak away pit and subsequently, the ravine located nearby.

5.1.3.1.14 Fire Suppression

a) Where the incoming water branches into fire water supply and municipal water, protect the potable water supply from sprinkler and standpipe supply using double black flow preventer to isolate potable water;
b) It is not apparent that water for firefighting is returned to the tank during water flow test. A yearly water flow test is required with the fire pump. The duration of the water flow test with the fire pumps is 10 minutes. At 750 GPM, this is approximately 30,000 L for each pump. Confirm through records if the yearly water flow test is being performed on each pump in addition to churn. Ideally, firefighting water should be separated from domestic water. Confirm if this change is feasible;
c) Ensure the sprinkler system in the building is operable including the fire pump control valves, tamper and flow switches throughout the facility;
d) Sprinkler design drawings must include the following information as a minimum in the legend and/or notes on each sheet: 1) Occupancy classification; 2) Sprinkler density; 3) Area of application; 4) Coverage per sprinkler; and 5) sprinkler k-factor.
e) Ensure isolation valves are required at both the suction and discharge of the pumps to isolate them for maintenance;
f) Ensure check valves are required on the discharge piping for both pumps;
g) It is understood that a FM200 fire suppression system is installed on the second floor in an IT room. This system shall be replaced with a wet pipe system.

h) Two (2) electric fire pumps are connected to a water reservoir and swimming pool; electrically interconnected with the fire alarm and sprinkler systems. The fire pumps start automatically when the jockey pump pressure falls below a pre-defined level. The fire pumps are designed for manual or automatic shutdown. Controls for the fire pumps shall ensure that the pumps do not shut down prematurely before controlling the fire.

i) It is apparent from the design that water is not returned to the reservoir for testing fire pumps. Confirm if this is feasible to remedy.

5.1.3.1.15 Building Management System (BMS)

a) A BMS is already installed at the Chancery. However, the graphic user interface (GUI) will have to be redesigned to suit the new layout; primarily for the HVAC systems installed and any other new systems added;

b) Although a new BMS is not required, components such as software and hardware may need to up-graded to adapt or integrate new components such as VAV terminals or independent air handlers;

c) All HVAC systems shall be fully integrated with the BMS;

d) The BMS should be direct digital control (DDC) technology, with networked distributed processing, and be user programmable in the field for all required automated functions of all energy consuming systems;

e) All HVAC control strategies shall be programmed to optimize energy savings while maintaining indoor air quality;

f) The BMS consultant is to do a point by point check of all hardware and software items including graphics and displayed data;

g) On completion of the installation, demonstrate that all hardware and software meet the full intent of the building systems as installed. Ensure all controller application software required for the BMS is installed on applicable workstation(s);

h) Provide training, training materials and manuals in English;

i) Provide testing and verification of all systems of the BMS;

j) Confirm if the BMS system hardware requires any upgrades for any new equipment such as VAV terminals.

k) The BMS manufacturer shall be a recognized global leader in the control system industry. The BMS supplier shall be capable of providing maintenance service locally and shall have a single point of contact for servicing worldwide.

l) The BMS system shall be capable of calculating, reporting, archiving, and maintaining optimum energy utilization. Include a preventative maintenance programming capability so as to minimize preventive maintenance requirements, minimize and optimize operations and maintenance costs. Provide efficient operation of systems based on optimization calculations and compare total building energy performance against partial energy load profiles.

m) The system shall use an intelligent alarm processing routine so that only critical alarms requiring operator interaction shall be reported. Install an alarm printer with visual alarm, if not already provided.

n) Ensure the BMS includes room or zone intelligent terminal controllers networked to control cooling, meet space requirements and satisfy energy optimization needs. These controllers shall provide feedback to system controllers to optimize temperature/volume/humidity of supply air from main air handlers.

o) The BMS shall be able to provide the following (but not be limited) to the operator:

- Indicate / acknowledge alarms;
- Modify operating parameters (set points, time, schedules, etc.;
- Perform dynamic analysis to verify efficient equipment operation;
- Make changes to system databases to allow changes to field hardware;
- Generate reports: alarm summary, alarm limits, run time logs, schedules, current readings or status, history log and trends;
- Allow for manual control of outputs and set points;
- Enable / disable control of equipment;
- Selectively turn on or off all mechanical and electrical equipment;
- Reset temperature for occupied or unoccupied conditions;
- Allow for automatic ramping of temperature set point so that space temperatures can be gradually raised or lowered;
- Maximize the use of free cooling.

p) Ensure full graphics are provided for monitoring as a minimum the following points:

- Condenser / compressor - oil pressure, oil temperature, refrigerant discharge and suction pressures, condensing temperatures, evaporator temperatures, refrigerant leak detection (if required) and monitoring;
- Air handling units, VAV terminals, fan coils, fans, pumps, etc.;
- All energy readings;
- Oil tank level reading and leak detection;
- System pressures, all pumps status, all pumps on/off control, etc.
- Plumbing: all pumps status, on/off; all sump pumps status, on/off; water meter reading;

5.1.4 GENERAL REQUIREMENTS

5.1.4.1 The mechanical systems should consist of simple, proven components selected for reliability, durability, flexibility, accessibility and ease and economy of operation.

5.1.4.2 Mechanical engineering should consolidate layouts using the minimum space consistent with maintenance and service requirements. Systems should be designed considering the potential impact of power outages.

5.1.4.3 Selection, sizing, specification, and location of motors, starters, indicating lamps and all other similar electrical devices should be co-ordinated with Electrical Engineering.

5.1.4.4 Mechanical systems and equipment shall be compatible and coordinated with electrical, architectural, structural and other building systems including interior design, controls, fire protection, security, communications, etc. All mechanical systems shall become an integral part of the architectural design.

5.1.4.5 Evaluate the existing building systems for code deficiencies. Code deficiencies that relate to life safety, particularly the most stringent requirements (Canadian and Kenyan Standards) for fire protection are to be remedied.

5.1.4.6 New work and alterations shall meet current codes, unless combining new and old systems creates a special hazard. Such conflicts should be resolved with Departmental Representative as well as with the Kenyan Authority Having Jurisdiction (AHJ).

5.1.4.7 During the life span of a typical Chancery building, many minor and major alterations may be necessary. Mechanical systems shall be designed to provide some leeway for increase in load concentrations in the future. They shall also be designed to facilitate future alterations, i.e. new elements, such as piping, conduit and ductwork. To the maximum extent possible, system solutions shall also accommodate planned future occupancies and modes of operation.

5.1.4.8 Provide all required documentation to authorities as required. Provide all permits, licenses and certificates and arrange for inspection of all work by the appropriate authorities and pay all associated fees.

5.1.4.9 All welding, if required, shall be done by qualified and licensed welders.

5.1.4.10 Identify all equipment, piping and ducts.

5.1.5 PERFORMANCE REQUIREMENTS

5.1.5.1 The mechanical systems must be responsive to each functional requirement of each area. They shall be designed, constructed, and commissioned to ensure the following:

a) Occupant safety;

b) Occupant comfort;

c) Indoor air quality;

d) Reliability;

e) Maintenance and operation simplicity;

f) Energy conservation;

g) Cost effectiveness; and
h) Economy of installation.

5.1.5.2 New mechanical systems (materials and equipment) installed by DFATD shall be fail-safe and meet design requirements of a quality consistent with top tier equipment. Installation of equipment is to have a design life consistent with anticipated minimum building life expectancy. This includes service life of individual elements as follows:

a) Split units: 15 - 20 years;

b) Fan coil units: 15 - 20 years;

c) Galvanized duct work: 25 - 30 years;

d) Closed pipe work systems (steel): 25 - 30 years;

e) Pumps (based mounted and in-line): 15 - 20 years;

f) Control valves/dampers: 15 - 20 years;

g) General controls (electrical) 15 - 20 years;
h) Sanitary fittings (except moving parts): 35 - 40 years; and
i) Chillers: 20 - 25 years

The above economic factors are dependent on good and regular maintenance being undertaken throughout the life of systems together with correct water treatment.

5.1.5.3 System selection and design shall be based on a life cycle costing analysis, for the lowest total cost of ownership and the lowest operating and maintenance cost.

5.2 APPLICABLE CODES, STANDARDS AND GUIDELINES

5.2.1 CODE COMPLIANCE REQUIREMENTS

5.2.1.1 The latest editions of publications and standards listed here are intended as guidelines for design. They are mandatory where referenced as such in the text of this chapter or in applicable codes. The list is not meant to restrict the use of additional guides or standards. When publications and standards are referenced as mandatory, any recommended practices or features should be considered “required”. The requirements of all other authorities having jurisdiction shall apply.

5.2.1.2 All mechanical systems designed and installed shall meet all applicable codes, standards and regulations of the authority having jurisdiction. The most stringent codes and standards shall be applied.

5.2.2 CANADIAN PUBLICATIONS

a) CAN/CSA B52-05: Mechanical Refrigeration Code
b) “Handbook of Occupational Safety and Health”. Treasury Board of Canada
c) National Fire Code of Canada of Canada (NFCC), 2015
d) National Plumbing Code of Canada (NPCC), 2015
e) National Building Code of Canada (NBCC), 2015
f) All applicable Treasury Board Standards and Guidelines.

5.2.3 UNITED STATES PUBLICATIONS

a) ASHRAE: Handbook of Fundamentals, Handbook of HVAC Applications, Handbook of HVAC Systems and Equipment, and Handbook of Refrigeration.
b) ASHRAE: Standard 55: Thermal Environmental Conditions for Human Occupancy.
c) ASHRAE: Standard 62-2010: Ventilation for Acceptable Indoor Air Quality.
d) ASHRAE: Standard 90.1-2010: Energy Standard for Buildings Except Low-Rise Residential Buildings.
e) ASHRAE: Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC Systems.
f) SMACNA (Sheet Metal and Air-Conditioning Contractors' National Association) for HVAC Duct Construction Standards
g) NFPA 13: Installation of Sprinkler Systems, 2010
h) NFPA 14, Installation of Standpipe and Hose Systems, 2010
i) NFPA 20, Installation of Stationary Pumps for Fire Protection, 2007

5.3 MECHANICAL SPACES AND SPECIAL SPACES

5.3.1 MECHANICAL SPACES

5.3.1.1 All mechanical systems and equipment shall be located and arranged so that they are readily and safely accessible for routine maintenance and repair, as well as for removal and replacement of major equipment as well as sub-components.

5.3.1.2 Access doors shall be provided on all air handling equipment, plenums and ductwork, as required, for purposes of inspecting, maintaining and servicing and for access to coils and filters for inspecting for evidence of growth of micro-organism.

5.3.1.3 Mechanical equipment should be located such that sound will not be readily transmitted to other parts of the building. The transmission of noise and vibration from mechanical equipment to the floor below should be minimized.

5.3.2 SPECIAL SPACES

5.3.2.1 **High Occupancy Areas**

5.3.2.1.1 High occupancy areas, such as, Immigration Waiting and the Multi-Purpose Room, which may have large variable occupancies, should be served by dedicated air handling systems, and should consider CO_2 demand controlled ventilation (DCV) system to minimize energy consumption, while maintaining appropriate levels of ventilation and pressure relationships between spaces and the outdoors. Heat recovery system should be utilized if this is justified by a life cycle costing analysis.

5.4 NOISE, VIBRATION and THERMAL LOSS CONTROL

5.4.1 GENERAL

5.4.1.1 Isolate all mechanical equipment, piping and ductwork to eliminate objectionable noise and vibration transmission.

5.4.2 NOISE AND VIBRATION ISOLATION

5.4.2.1 Provide noise control equipment to prevent mechanical equipment from exceeding the noise criteria. Provide silencers where required to achieve the noise criteria.

5.4.2.2 If objectionable noise or vibration should be transmitted to occupied portions of the building by any part of the mechanical work, make necessary changes and/or additions, to the owner's approval.

5.4.2.3 Vibration isolation shall be 99% efficient for all rotating mechanical equipment to prevent transmission of vibration to the building structure, floors and walls.

5.4.2.4 Control of noise generated by air in air plenums and ducts shall be achieved by controlling air velocity, and by using sound attenuators.

5.4.3 THERMAL INSULATION FOR DUCKWORK

5.4.3.1 All supply ductwork shall be insulated. Insulation shall be applied to the outside of the ductwork only.

5.4.3.2 Insulation thickness and type to be in accordance with *ASHRAE 90.1 Energy Standard for Buildings, Except Low-Rise Residential Buildings*.

5.4.4 THERMAL INSULATION FOR PIPING

5.4.4.1 All piping transporting fluids at temperatures other than room temperature shall be thermally insulated. If fluid temperatures are below the ambient dew point, insulate the piping and cover with a vapour barrier to prevent condensation on the pipe surface.

5.4.4.2 Insulation thickness and type to be in accordance with *ASHRAE 90.1 Energy Standard for Buildings, Except Low-Rise Residential Buildings.*

5.4.4.3 Insulate domestic hot and cold water piping.

5.4.4.4 Insulation which is exposed to outdoor elements shall be covered in an embossed aluminum jacket for protection against UV rays.

5.5 SEISMIC PROTECTION

5.5.1 CODES AND STANDARDS

5.5.1.1 All mechanical equipment is to be laterally and vertically restrained for seismic load requirement.

5.5.2 GENERAL REQUIREMENTS

5.5.2.1 All primary equipment, such as, air handlers, storage tanks, pumps, etc. shall remain fully operational during and after earthquakes.

5.5.2.2 Nairobi is considered a moderate seismic zone area. All primary equipment is to be restrained for seismic load requirements accordingly. This shall include shock mounts for all pad mounted equipment or equipment suspended from the floor slab. Provide seismic restraints on, main ventilation ducts, water mains, standpipe and drain lines, etc., as necessary, to protect personnel and the facility from falling objects during an earthquake.

5.6 PLUMBING SYSTEMS

5.6.1 GENERAL REQUIREMENTS

5.6.1.1 **Scope**

5.6.1.1.1 Provide complete plumbing and drainage systems, as required, including:

a) Any revisions to domestic hot and cold water supply;

b) All piping and plumbing fixtures, including all drains, waste and vent piping and traps with their devices and connections within the structure;

5.6.1.1.2 Plumbing fixtures shall comply with the latest applicable standards of the Canadian Standards Association (CSA) and with applicable codes, standards and regulations.

5.6.1.1.3 Provide sleeves and escutcheon plates on all piping passing through floors and walls. Fill voids around pipe with fire and waterproof material.

5.6.1.1.4 All washroom and kitchen fixtures shall be water efficient (low flow), and shall comply with accessibility requirements. Fixtures in washrooms shall come complete with infra-red sensor operated faucet to support proper hand washing hygiene. Models should enable pre-mixed (hot / cold) water supply connection and integral spout temperature mixer.

5.6.1.1.5 All piping shall be properly identified.

5.6.2 DRINKING WATER QUALITY ANALYSIS

5.6.2.1 Water Treatment

A water quality test is required to determine if water treatment is required. Appropriate water treatment will be installed based on the water quality results and site specific conditions. The water sample should be taken as close to the municipal main as possible and the analysis must be conducted by a lab accredited to ISO 17025 and/or having local accreditation. You can find a list of accredited laboratories at the website of the International Laboratory Accreditation Cooperation.

The water treatment system shall be capable of producing sufficient treated water to serve all staff members and visitors on a continuous basis. The municipal water to the building shall be analyzed for the parameters referred to in the most recent version of Health Canada's *Guidelines for Canadian Drinking Water Quality.* A summary table of the GCDWQ is available on Health Canada's website:http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php

5.6.2.1.1 The GCDWQ has over 80 parameters with either health based maximum acceptable concentrations or aesthetic objectives. Depending on the quality of the local water supply additional parameters may need to be tested and/or some parameters may not need to be tested if they are consistently absent from the water supply.

5.6.2.1.2 The following is an abbreviated list of microbiological and chemical parameters that are to be tested as a **minimum**: aluminum, antimony, arsenic, barium, boron, cadmium, chromium, copper, cyanide, fluoride, hardness, iron, lead, mercury, nitrates and nitrites, uranium, total and free residual chlorine (field measurement), total dissolved solids (TDS), turbidity, UVT, pH, total coli forms, e-coli, faecal coli forms, faecal streptococci and heterotrophic plate count.

5.6.3 DOMESTIC WATER SUPPLY

5.6.3.1 Domestic Water Distribution

5.6.3.1.1 Provide potable water by means of a distribution system separated from other plumbing systems, as required. Copper piping is to be used for potable water distribution, as required.

5.6.3.1.2 Domestic water piping inside the building shall be type "L" hard copper to ASTM B 88 with wrought copper fittings and lead-free solder joints. Galvanized and polyvinyl chloride (PVC) pipes for domestic water shall not be permitted.

5.6.3.1.3 Maintain adequate water supply, pressure and flow in all parts of the system, fixtures and equipment. Size piping as required for purposes of ensuring adequate water supply at proper pressure to all fixtures and equipment at all times.

5.6.3.1.4 Evaluate the existing the water distribution system and ensure the system is designed to prevent water hammer and contamination. Use water hammer arrestors to protect piping, fixtures and equipment from the adverse effects of water hammer.

5.6.3.1.5 Water quality sample test results shall be submitted to Departmental Representative before finalizing the design of this system.

5.6.3.1.6 Ensure the water treatment system complies with the more stringent of Canadian and local potable water standards. Provide water treatment system specifications to Departmental Representative for approval before purchase of equipment.

5.6.3.1.7 The water treatment system must be easy to maintain by trained personnel. Specify the provisions for the training of the water treatment system. The operating manual for all water treatment equipment requiring maintenance, include schedules for maintenance tasks. Manuals are to be provided in English.

5.6.3.2 **Domestic Cold Water Distribution**

5.6.3.2.1 The following already exist at the Chancery: the system should only be verified for deficiencies or refurbishment: cold-water service consists of municipal and ground water from the bore hole.

5.6.3.2.2 Internal distribution shall consist of a piping system that should supply domestic cold water to all necessary plumbing fixtures.

5.6.3.2.3 Size any new piping, as and if required, to ensure adequate water supply and pressure to all fixtures and equipment at all times.

5.6.3.3 **Domestic Hot Water Distribution**

5.6.3.3.1 The temperature in hot water tanks shall not be less than 60°C. Thermostatic mixing valves shall be designed such that the hot water outlet temperature does not exceed 49°C. Control hot water temperature through point of use thermostatic mixing valves for hot water distribution.

5.6.3.4 **Water Back flow Preventers**

5.6.3.4.1 Protect entire water distribution system against contamination due to back flow from non-potable sources, as required.

5.6.4 SANITARY WASTE

5.6.4.1 **Scope**

5.6.4.1.1 Provide a complete sanitary drain, waste and vent system for all new plumbing fixtures for safe sanitary disposal of sewage from fixtures in the building.

5.6.4.1.2 Sanitary piping above ground inside the building shall be copper or cast iron.

5.6.4.1.3 Sanitary vent piping shall be copper or cast iron.

5.6.4.1.4 Note that PVC piping is only permitted to be installed in a building required to be of non-combustible construction provided that, except when concealed in a wall or concrete floor slab, they have a flame-spread rating not more than 25.

5.6.4.1.5 Locate and assess adequacy of existing sanitary main for estimated peak sanitary load as per National Building Code requirements and include any future building loads. A backwater valve shall be installed on the main where it leaves the building.

5.6.5 PLUMBING SPECIALTIES, FIXTURES AND TRIM

5.6.5.1 **General Requirements**

5.6.5.1.1 Plumbing fixtures shall comply with the applicable codes, standards and regulations.

5.6.5.1.2 Provide products of top tier high commercial standards.

5.6.5.1.3 Materials and equipment shall be manufactured by internationally recognized companies. Plumbing fixtures and fittings shall be the products of one manufacturer.

5.6.5.2 **Plumbing Specialties**

5.6.5.2.1 Cleanouts: Provide clean-outs where sanitary piping changes direction by more than 45 degrees and every 15 m on horizontal branches and main drains, at every riser, at the ends of horizontal lines and where required by code. Provide access from walls or under slab.

5.6.5.2.2 Floor Drains: In general, floor drains should be cast iron body type with nickel-bronze strainers for public washrooms, kitchen areas, etc. The floor drains shall be designed with adequate cleanouts.

5.6.5.2.3 Trap all fixtures and floor drains in accordance with applicable codes, standards and regulations.

5.7 FIRE SUPPRESSION SYSTEMS

5.7.1 SCOPE

5.7.1.1 The building is provided with a sprinkler and stand pipe system. However, relocation of sprinkler heads to suit new layout will be required. The sprinkler drawings shall clearly indicate original and relocations of sprinkler heads.

5.7.1.2 All fire protection systems and components are subject to approval by DFATD, at design, construction and commissioning phase. The fire sprinkler system shall be recommissioned to ensure compliance with NFPA standards.

5.7.1.3 If the existing sprinkler installation is altered such that it includes new branch lines and/or changes in main piping, then a hydraulic load calculation must be provided.

5.7.1.4 All material and products shall be listed and bear the approval markings of the Underwriters' Laboratories (UL) listed, Factory Mutual (FM) or approved equivalent testing and certification agency.

5.7.1.5 Comply with the following codes and standards as a minimum:

a) National Fire Code of Canada, 2015

b) National Building Code of Canada, 2015

c) NFPA 13: Installation of Sprinkler Systems, 2010

d) NFPA 14: Installation of Standpipe and Hose Systems, 2010

e) NFPA 20, Installation of Stationary Pumps for Fire Protection, 2007

5.7.2 SPRINKLERS, AND FIRE FIGHTING SPECIALTIES

5.7.2.1 Automatic sprinklers shall be installed in new construction and renovation projects. This includes elevator machine rooms, mechanical equipment rooms, essential electronic facilities, electrical closets, telephone closets, emergency generator room, uninterruptible power service and battery rooms, electrical switchgear rooms, transformer vaults, telephone

exchange rooms, etc. All electrical equipment should be provided with a sprinkler proof enclosure; as required.

5.7.2.2 Ensure red wire guards for sprinklers heads are installed in mechanical rooms, electrical rooms, transformer rooms, generator room and other areas subject to damage.

5.7.2.3 Ensure all system zoning and shut-off valves (OS&Y) are electrically supervised. Zone control valve (ZCV) should include an OS&Y isolation valve, that is supervised, a flow switch, pressure gauge and check valve.

5.7.2.4 Provide multi-purpose, dry chemical, hand held portable fire extinguishers in, hazardous rooms, i.e. electrical, mechanical and elevator machine rooms with rating as required by the authority having jurisdiction. Fire extinguishers, type to suit hazard, should be positioned throughout the building in accordance with NFPA 10 and local building code requirements.

5.7.2.5 Test sprinkler and fire pump system in accordance with NFPA 13 and NFPA 20, respectively. Arrange for the testing and certification of the fire protection system by the authority having jurisdiction.

5.7.3 MATERIALS FOR SPRINKLER

5.7.3.1 All materials and products shall be listed and bear the approval markings of the Underwriters' Laboratories (UL), Factory Mutual (FM) or equivalent testing and certification agency.

5.7.3.2 Black steel piping shall be used for all wet-pipe sprinkler piping.

5.7.3.3 Mobile Shelving – smoke detectors connected to the fire alarm system shall be provided above the mobile shelving system.

5.7.3.4 Mobile Shelving - Where the records storage utilizing a mobile shelving system is subsidiary to a floor area protected by a Light Hazard Occupancy sprinkler system, the sprinkler system may be deemed acceptable where the aggregate area of the mobile shelving system is not more than 70 m^2: (1) on one floor, or (2) in a 1 h fire compartment.

5.7.3.5 Mobile Shelving - a minimum of 460 mm clearance shall be maintained between the sprinkler deflectors and the top of the mobile shelving, and between the smoke detectors and the top of the mobile shelving.

5.7.4 ENERGY EFFICIENCY AND BUILDING LOAD AND ENERGY ANALYSIS

5.7.4.1 Design of mechanical systems shall comply with energy-efficiency requirements of ASHRAE 90.1 Energy Standard for Buildings, Except Low-Rise Residential Buildings.

5.7.4.2 Building cooling loads shall be established and supported by engineering calculations and submitted to the departmental representative for review and record purposes. Building load calculations and energy analysis shall be performed with a computer-based load and energy simulation program using the latest ASHRAE Handbook of Fundamentals developed for the hourly analysis of heating and cooling loads in commercial buildings.

5.7.4.3 The program shall be capable of calculating each zone's peak load cooling load as well as the whole building "*block"* loads. The program shall at a minimum calculate: solar heat gains through fenestration, internal heat gains from lighting and equipment, outside air loads (sensible and latent) from ventilation and infiltration, and heat gains or losses through fenestration, walls, floors and roofs.

5.7.4.4 The HVAC load calculations report shall include all input and output used in the cooling calculation program, and shall include zone peak cooling load results, and the whole building block loads, air handling unit coil selection and psychometric charts.

5.7.4.5 The program shall be based on an actual hourly data. Submit reports as a minimum at the concept design stage. The reports shall include an executive summary, spaces and zone information, all input sheets, schedules, building construction materials, output sheets and any other relevant data.

5.7.4.6 <u>Internal Heat Gain From Occupancy Levels</u>

a) The minimum occupancy should be determined as per the functional program. Sensible and latent loads per person should be based on the latest edition of the ASHRAE "Handbook of Fundamentals".

5.7.4.7 <u>Internal Heat Gain From Lighting and Other Equipment</u>

a) Lighting and other Equipment Loads: Lighting loads should be based on the actual design loads. For estimation purposes, the electrical load required for heat load calculations shall be based on the following:

- 20 W/m^2 for receptacle load; and
- 15 W/m^2 for lighting load.

5.7.5 OUTDOOR DESIGN CRITERIA

5.7.5.1 Consult the outdoor dry and wet bulb conditions from the Carrier Hourly Analysis Program (HAP). Alternatively, use data as published in ASHRAE Handbook for outdoor design wet bulb and dry bulb temperatures. Outdoor design criteria shall be based on weather data tabulated in the latest edition of the *ASHRAE Handbook of Fundamentals*. Summer design conditions for sensible heat load calculations shall be based on the 0.4% dry bulb temperature with its mean coincident wet bulb temperature.

5.7.6 INDOOR DESIGN CRITERIA

5.7.6.1 Provisions shall be made for measurement during commissioning of all factors making up the indoor environment as listed in Tables 5.1, 5.2 and 5.3.

Table 5.1: Indoor Temperature

Parameter	Occupied	Unoccupied	Measurement Location
Cooling mode (summer)	24˚C	No cooling required	Waist height

Table 5.2: Indoor Humidity

Parameter	Relative Humidity
Summer	50% ± 5% maximum.
Winter	Not controlled

Table 5.3: Other Requirements

Parameter	Value
Ventilation rate (100% fresh air)	Refer to ASHRAE 62.1- 2010
Air velocity	Minimum 0.10 m/s. Maximum 0.25 m/s
Supply Air Filtration	Pre-filters to have MERV 8 (30 – 35% efficiency) Maximum allowable particle size of 10 microns
	Final filters to have MERV 13 (80 – 90% efficiency) Maximum allowable particle size of 1 micron
Carbon Dioxide	Less than 800 ppm

5.7.7 THERMAL COMFORT – TEMPERATURE AND HUMIDITY

5.7.7.1 General

5.7.7.1.1 Systems shall be capable of automatically maintaining space comfort conditions for all building load variations during the cooling mode. Areas with unique load variations shall have individual temperature controls. To increase thermal comfort, consider implementing the following suggestions:

5.7.7.2 Offices, General Spaces

5.7.7.2.1 Office Areas

The following HVAC system shall be considered to meet Performance Brief requirements:

a) The incoming fresh air from the base building system should be treated through an air handler unit before reaching the office space.
b) Office space shall be served by variable air volume (VAV) systems as required to meet load conditions and minimum air circulation rates specified herein.
c) Provide pressure independent VAV boxes capable of resetting air flow between 30 to 100% of air flow rate.
d) The minimum supply air shall not be less than 4 air changes per hour.
e) The above mentioned ventilation rates are applicable for normal office occupancy. The building ventilation systems shall have the capacity to provide make-up air for additional exhaust systems for areas, such as, washrooms, janitor closets, kitchenettes, lunch rooms, etc.
f) The operation of the heating, ventilation and air conditioning (HVAC) systems shall be extended beyond the business hours by a lead time sufficient to meet the defined ventilation and thermal comfort standards by the start of the business hours or building operating hours.
g) Thermostats shall be monitored and controlled through BMS. Thermostats to include liquid crystal display (LCD).

5.7.8 ZONING CRITERIA

5.7.8.1 Separate systems should be provided for interior and perimeter zones.

5.7.8.2 Interior thermostatic control zones should not exceed 139 m^2 per zone for open office areas.

5.7.8.3 Perimeter thermostatic control zones shall not exceed 28 m^2 and shall be no more than 4.6 m from an outdoor wall along a common exposure. Corner offices shall be dedicated zones.

5.7.8.4 The HVAC system should be carefully zoned such that unoccupied areas can be set back for energy conservation without total shutdown.

5.7.8.5 Independent zones should be provided for spaces, such as, Immigration Waiting Rooms, Reception Area, photocopying rooms, meeting rooms, entrance lobbies and atriums, and kitchen areas.

5.7.8.6 The Immigration Waiting Room will require a dedicated air handler or fan coil unit(s). Supply minimum fresh air required when the room is occupied. The ventilation shall be controlled / monitored with thermostat.

5.7.9 INDOOR AIR QUALITY

5.7.9.1 **Indoor Air Quality Criteria**

5.7.9.1.1 Ventilation is defined as the supply of clean, odour-free and contaminant-free air to a space in sufficient quantities to dilute and remove space generated air contaminants and odours and to maintain the occupant oxygen requirements. Provide adequate ventilation to maintain proper indoor air quality. The ventilation rates of *ASHRAE Standard 62* are the minimum acceptable for this project.

5.7.9.1.2 Supply air should be evenly distributed to fully cover the entire occupied space. The minimum air supply shall be maintained during occupancy under all operating conditions.

5.7.9.1.3 Storage Areas: Provide a minimum ventilation rate of 0.6 $l/s \cdot m^2$

5.7.9.2 **Exhaust Ventilation Criteria**

5.7.9.2.1 Provide mechanical exhaust and make-up air systems to provide the following minimum requirements:

a) Washrooms: the minimum exhaust rate shall be 25 l/s per water closet or urinal or a minimum 10 air changes per hour (ACH). Washroom areas should have dedicated exhausts and should be negative in pressure relative to surrounding spaces.
b) Telecommunications Closets (TC): all telecommunications closets shall have mechanical ventilation through the provision of an exhaust fan and door grille. Telecommunications Rooms shall be ventilated and cooled, as required.
c) Photocopiers: Provide an exhaust rate of 2.5 l/s·m^2. As per ASHRAE Standard 62.1-2010.
d) Kitchenette / Lunchroom: Provide an exhaust at a rate of 1.5 l/s·m^2. As per ASHRAE Standard 62.1-2010.
e) Waiting Area and Immigration Booths: Supply air shall not be served by the same supply (AHU) air as building areas occupied by Mission staff (Canada Based Staff / Locally Engaged Staff). Supply air to Immigration waiting area and public booths can be a mixture of fresh air and return air. However, this space must be kept under a slightly negative pressure relative to Mission staff to reduce cross contamination of air.
f) Electrical rooms: ventilation for electrical rooms shall meet the requirements of the Canadian Electrical Code CEC 2-318. shall have mechanical ventilation through the provision of an exhaust fan and door grille
g) Demarcation Point: shall have mechanical ventilation through the provision of an exhaust fan and door grille.

5.8 HEATING, VENTILATION AND AIR CONDITIONING – SYSYTEMS, EQUIPMENT AND SYSTEMS DESIGN

5.8.1 GENERAL REQUIREMENTS FOR HVAC SYSTEMS

5.8.1.1 Provide systems to meet indoor air quality (IAQ) standards as described here.

5.8.1.2 Outdoor air should be used for free cooling whenever economically feasible. Use outside air economizer cycles where economically feasible; if applicable.

5.8.1.3 Heating, Ventilating and Air Conditioning (HVAC) systems shall be designed in accordance with the National Building Code of Canada and the National Fire Code of Canada for basic design requirements and with the Technical Design Standards included in the Handbooks published by ASHRAE. The HVAC system should allow individual operation of particular areas while operating the remainder of the building using the unoccupied control strategies. HVAC systems to be energy efficient at all part load conditions.

5.8.1.4 All work regarding HVAC systems should be co-ordinated with other divisions including architectural, structural and electrical. A Building Management System (BMS) should be provided to control the HVAC systems.

5.8.1.5 Provide sleeves for all ductwork crossing through walls and floors.

5.8.1.6 Provide dielectric coupling where dissimilar metals are joined.

5.8.1.7 Provide pipe hangers and supports for piping, duct work and equipment. Provide pipe and duct work identification and flow direction indicators.

5.8.1.8 All exterior openings shall be equipped with heavy duty steel security bars, wire-mesh screens and louvers.

5.8.1.9 Structural openings for HVAC services shall be sealed with fire stop compound and waterproofed.

5.8.1.10 No mechanical equipment except for air handlers units, condensers and exhaust fans shall be permitted on the roof of the building.

5.8.1.11 Mechanical rooms with air handlers shall not be used as mixing plenums for return air and outdoor air.

5.8.2 AIR HANDLING SYSTEMS – AIR HANDLERS AND COMPONENTS

5.8.2.1 General

5.8.2.1.1 Units shall be modular with all components contained within plenum sections of insulated double wall construction, 50 mm thick with metal liners and shall be complete with access doors.

5.8.2.1.2 If incorporated to design, air handling units shall be complete with supply and return fans, mixing section, pre-filter, final filter, hinged access doors, and cooling coil(s) section.

5.8.2.1.3 All permanently joined panel and module flanges shall be sealed with neoprene tape during assembly to provide an air tight unit.

5.8.2.2 Air Filters

5.8.2.2.1 Air filtration should be provided in every air handling system. Air-handling units should have a disposable pre-filter and a final filter. The filter media should be rated in accordance with ASHRAE Standard 52.2 Pre- filters should be MERV 8 or better. Final filters should be MERV 13 or better.

5.8.3 DUCTWORK

5.8.3.1 Design and Constructions Standards

5.8.3.1.1 Ductwork, reinforcing and sealing techniques are to be designed in accordance with ASHRAE: Handbook of Fundamentals, and constructed in accordance with the ASHRAE: HVAC Systems and Equipment Handbook, and the SMACNA Design Manuals.

5.8.3.1.2 The contractor shall supply and install all ducting, flexible connections, supply diffusers, exhaust registers, return grilles, dampers and louvers. Energy consumption, security and sound attenuation should be major considerations in the routing, sizing and material selection for the air distribution ductwork.

5.8.3.1.3 All ductwork shall be of galvanised steel, lock forming quality, G90 to ASTM A653.

5.8.3.1.4 Duct work shall be sealed. Insulation shall be applied to the outside of the duct work only. All joints shall be a proprietary system.

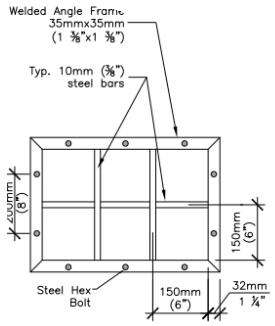
5.8.3.1.5 All ductwork joints and all connections to air handling and air distribution devices should be sealed with mastic— including all supply and return ducts and all exhaust ducts.

5.8.3.1.6 All services (i.e. ducts, pipes, etc.) running between different rooms shall be acoustically insulated so that the resulting sound levels and acoustic criteria are not compromised (i.e., minimize "cross-talk" between various rooms).

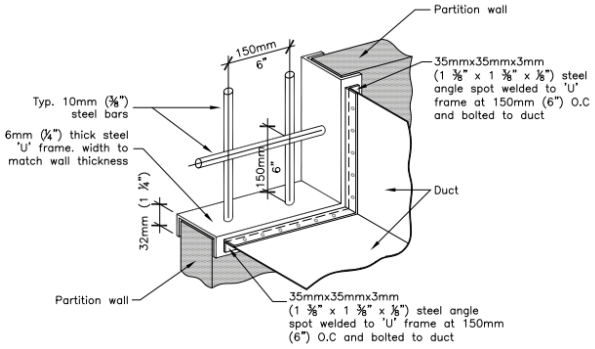
5.8.3.1.7 All ductwork connections to equipment having motors or rotating components should be made with 150 mm length of flexible connectors.

5.8.3.1.8 Provide sleeves for all ductwork crossing through walls or floors.

5.8.3.1.9 For type 2 and 3 physical resistant walls, ducts penetrating physical resistant walls require security bars when ducts penetrating these walls exceeds a surface area of 0.06 m^2 (93 sq. in.).



FRONT ELEVATION AT TYP. DUCT GRILLE



ISOMETRIC VIEW DETAIL AT TYPICAL DUCT GRILLE

5.8.4 AIR HANDLING SYSTEMS DISTRIBUTION COMPONENTS

5.8.4.1 Diffusers, Registers and Grilles

5.8.4.1.1 All grilles and diffusers shall reflect high class standards. Equipment should be selected considering required flow rate, terminal velocity, throw, discharge air pattern, acceptable pressure loss, uniform air distribution, and, acceptable sound level.

5.8.4.2 Balancing and Fire Dampers

5.8.4.2.1 Balancing Damper

a) Provide a branch take-off at each diffuser.
b) All dampers shall be capable of tight shut-off with low leakage.
c) Install all dampers in accordance with SMACNA and manufacturer instructions. Balancing dampers shall be fitted to all branch ducts as required to achieve correct balancing of the HVAC system.

5.8.4.2.2 Fire Dampers

a) Provide fire dampers in ducts entering and leaving mechanical rooms, ducts through floors not encased in a fire shaft, ducts entering and leaving fire shafts and ducts penetrating fire walls and fire barriers.
b) All fire dampers shall withstand fire for at least 90 minutes.

5.8.4.3 Connections

5.8.4.3.1 Flexible Connections: Provide flexible connections at all fan inlets and outlets. Maximum flexible duct: 1.5 m at the diffusers.

5.9 SCOPE OF WORK FOR SWING SPACE

5.9.1 SCOPE

5.9.1.1 Design mechanical systems for the swing space that will be located in the parking garage based on the requirements within the mechanical brief. The fit-out of the swing space in the parking garage will be further detailed on the architectural drawings.

5.9.1.2 Provide mechanical design services and construction oversight for the swing space in the parking garage. Supervise the mechanical commissioning process to ensure the mechanical equipment and infrastructure meets or exceeds the temporary operational requirements of the mission.

5.9.1.3 The following services are required as a minimum but not limited to: Air-Conditioning and Ventilation; Drain Waste and Vent Systems; Fire Suppression; Testing, Adjusting, Balancing, and Commissioning; Construction Drawings, Shop Drawings; and Operating and Maintenance (O&M) Manuals.

5.9.1.4 The incoming fresh air should be treated through an independent air handler unit before reaching the swing space. Cooling should be done through an independent spilt unit or a VRV system depending on space constraints. The minimum supply air shall not be less than 4 air changes per hour and building ventilation systems shall have the capacity to provide make-up air for additional exhaust systems for areas, such as, washrooms, janitor closets, kitchenettes, lunch rooms, etc.

5.9.1.5 Air-cooled split units can be provided for thermal comfort complete with direct expansion (DX) cooling coil, filter section, supply grille, and thermostat control to maintain temperature and humidity requirements. Unit should come complete with disconnect switch. Provide air-cooled split units with high efficiency compressors and coils with copper tube and aluminum fins. Provide split units with coefficient of performance (COP) of at least 3.5 or EER of 16 or better. Only environmentally friendly refrigerants are to be used in accordance with environmental regulations. The condenser coils for split units shall have aluminum fins mechanically bonded to seamless copper tubes. Unit shall automatically restart after a power failure.

5.9.1.6 The placement and location of outside air intakes is critical to the safety of the occupants inside a building. Avoid contamination from external sources such as road traffic, foul or hazardous exhaust discharges

5.9.1.7 Relocate sprinkler heads to suit new layout in the swing space. The sprinkler drawings shall clearly indicate original and relocation of sprinkler heads.

5.10 START-UP, TESTING ADJUSTING AND BALANCING (TAB)

5.10.1 START-UP

5.10.1.1 The specifications shall indicate that factory representatives will be present for start-up of all major equipment, such as, the installation of new chillers or a VRV system.

5.10.1.2 Control functions shall be proven fully operational and read out design flow rates before testing and balancing starts.

5.10.1.3 Provide start-up and verification reports.

5.10.2 TESTING, ADJUSTING AND BALANCING

5.10.2.1 Provide during the design development stage of the project the proposed methodology and procedures for performing TAB.

5.10.2.2 Provide in the construction specifications the procedures for TAB and copies of verification sheets to be used for TAB.

5.10.2.3 TAB is to be carried out for air moving system, hydraulic, and plumbing systems.

5.10.2.4 Perform TAB to standards of SMACNA and ASHRAE.

5.10.2.5 Test low pressure ductwork at static pressure of 500 Pa. Leakage shall not exceed 5% of the design air flow.

5.10.2.6 Provide testing and verification of controller/programmable thermostats. This shall include pre-installation, completion of operational and acceptance tests.

5.10.2.7 Provide TAB report. The report shall include schematic of as-built system. Submit preliminary TAB report and obtain Departmental Representative approval for all procedures before finalizing the TAB report.

5.10.2.8 The Consultant shall verify at least 30% of the measurements of TAB. Departmental Representatives can also review the test results or have the results verified by an independent commissioning agent. If found deficient, perform the TAB again.

End of Mechanical Engineering

Electrical Engineering

Section 6

Critical Infrastructure, Seismic Upgrades & Space Optimization

Nairobi, Kenya

SECTION 6 - ELECTRICAL ENGINEERING

6.1 GENERAL REQUIREMENTS

6.1.1 SCOPE

6.1.1.1 Provide design for complete electrical systems as well as for telecommunications and security raceway systems as specified herein to meet the general and specific needs for the Space Optimization (fit-up) and the temporary swing space to the Chancery at the High Commission of Canada in Nairobi, Kenya.

6.1.1.2 The work shall include, but shall be not limited to the following:

a) Fit-up to a temporary swing space within the parking garage area as outlined in **Section 6.9**;
b) Removing branch circuit wiring (power and lighting) in the space optimization area to the nearest junction box in the ceiling excluding circuits that are code compliant and in correct position that will remain;
c) Rectify code deficiencies including replacing PVC conduit and any other components of the electrical systems in the return air plenums (ceilings) not compliant to the National Building Code of Canada (NBCC) 2015 article 3.1.5.18 and 3.1.5.20.;
d) Providing power and lighting circuits for new layout with new and existing circuits;
e) New Chancery lighting Design to meet new layout;
f) Redesign fire alarm system to meet new layout;
g) Review and redesign illumination in the transformer room;
h) Reposition and/or install new exit and emergency lighting in renovated area;
i) Waterproof guards to protect switch gear in main electrical room from discharge of sprinkler system;
j) Rewire battery pack emergency lights in the main electrical room;
k) Reconfigure the transformer temperature alarm to extend to a remote monitored location;
l) Replace breakers (RCD 10mA) for receptacles over wash basins;
m) Rotate wall wash down lights to wash the walls in downstairs meeting room;
n) Repair or replace the dimming system in meeting room 118;
o) Review the central lighting control system for functionality problems and make appropriate adjustments to mitigate issues;
p) Test and document the results of the lightning protection and grounding system and set up a scheduled yearly maintenance contract for future testing/ documentation;
q) Provide a load bank or load bank connection (for portable load bank) for the generator to permit running at full load intervals.
r) Provide a central on-line double conversion UPS to replace the Harmonic mitigation transformer;
s) Review and improve the design of the lighting in the main transformer room;
t) Review and repair the alarm in the main transformer room;
u) Update the Single Line and Mimic diagrams in the Switch gear room;
v) Check the proper connections of the emergency lights in the Switch gear room; and
w) Other services as outlined throughout the project brief.

6.2 VALIDATION OF ELECTRICAL SYSTEMS AND SERVICE

6.2.1 Inspect existing electrical installations and review as-built drawings (provided by DFATD). Through the assessment/validation mandate, provide a report of each of the building's components such as but not limited to the components mentioned below. Each component shall undergo an assessment of its existing condition, identification of deficiencies and establish remaining life, while considering the following factors:

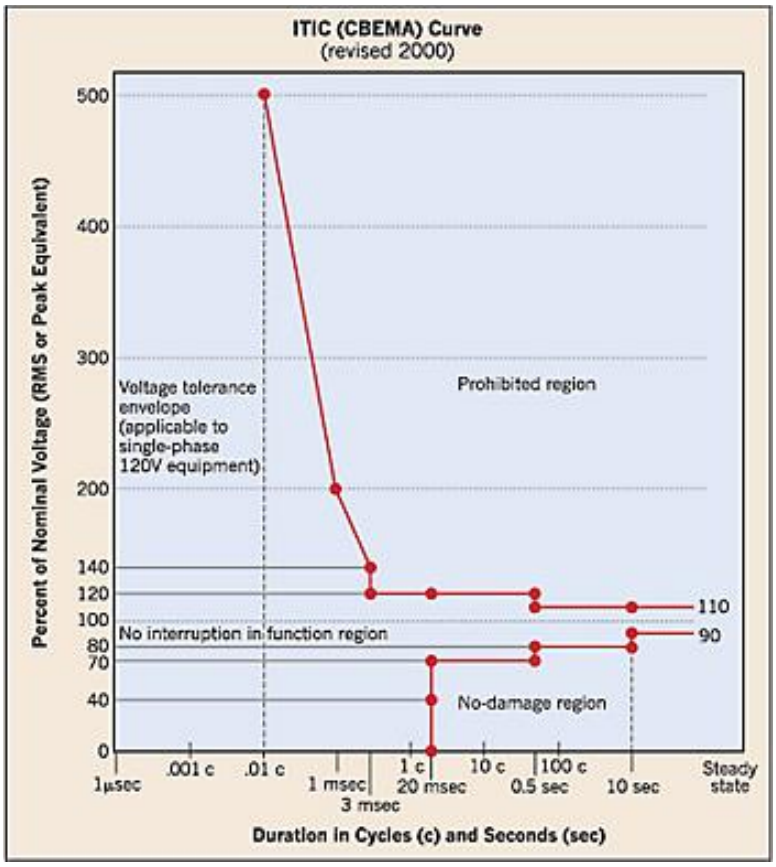
a) Age of component;
b) Normal expected life considering its quality and durability;
c) Duty Cycle;
d) Hours of operation;
e) Maintenance practices;
f) Obsolescence of the component; and
g) Current condition.

6.2.2 Validation report shall at a minimum provide the following:

a) Verification in accordance with the current edition of NETA: STANDARD FOR ACCEPTANCE TESTING SPECIFICATIONS for Electrical Power Equipment and Systems. Ensure individuals performing electrical tests are competent not only to perform the tests, but also to evaluate the results and make sound judgments on the condition of electrical equipment;
b) Provide specific details of the survey, inspection and operational tests;
c) Identify/summarize all major and/or urgent issues;
d) Financial comparisons;
e) Deficiencies along with recommendation and cost shall be describe in paragraph form; and
f) Photograph(s) shall be provided for each deficiency.

6.2.3 The report shall provide details such as but not limited to:

a) Undertake study and report on the power quality and make recommendation for power quality enhancement with power conditioner, voltage regulator and/or central UPS system. Provide a 7 day power quality analysis to determine the quality of the power and the requirement for power conditioners. Power quality analysis to be done using a power quality analyzer such as the Fluke 430 series. Power quality analysis shall be conducted to assess the supply voltage tolerances, dips and swells, harmonic distortion, flickers, transient and frequency of power outages in the area. For the purpose of establishing the power quality levels, we recommend that the engineer provide a report base on the Information Technology Industry Council (ITIC) power tolerance curve as shown below:



b) Undertake Standby power services inspection and tests to validate the existing installation in conformance with CSA C282-09 Emergency electrical power supply for buildings. Carry out the Annual inspection and test requirements (Table 5) and Quinquennial (every five years) inspection and test requirements (Table 6). Any faults or defects are to be reported at the completion of the inspection and tests;

c) Undertake a study to determine which part of the existing building systems should be retained and/or upgraded using the NETA test criteria and tables. The equipment to be studied shall include, but shall be not limited to the following:

- Switchgear and switch board assemblies;
- Transformer Liquid filled;
- feeder cables low voltage (600V maximum);
- switches low voltage;
- cutouts;
- circuit breakers;
- protective relays;
- ground fault protection; and
- transfer switch;

d) Undertake Earthing & Bonding inspection and tests to validate the existing installation. Any faults or defects are to be reported at the completion of the inspection and tests;

e) Undertake Lightning System inspection and tests to validate the existing installation. Any faults or defects are to be reported at the completion of the inspection and tests.

f) DFATD will replace the Fire Alarm panel. However, undertake a fire alarm system inspection to evaluate what equipment can be retained with the new fire detection/alarm central panel;

g) Undertake a study to provide a means of connecting a load bank for the generator. Provide a

recommendation for the best option of providing the means of transfer for:

- A permanent load bank connection; or
- A connection for portable load bank.

Take into consideration the availability of portable load banks in the local area.

h) Undertake a study of Chancery lighting fixtures and make recommendation for the best option for conversion to LED lighting. The options are to install a remote driver (retrofit kit) in existing fixtures or replace with new LED fixtures. Take into consideration the age of the existing fixture, long term cost, certification/recertification of the fixture and warranty;

i) Undertake evaluation of existing IM/IT clean grounding infrastructure for compliance to EIA/TIA-607-B; and

j) Identify code deficiencies and make recommendations to repair and/or replace.

6.3 Scope for Space Optimization Fit-up area

6.3.1 The requirements for the Space Optimization (fit-up) are intended to set minimum criteria and provide guidance to the Consultant who is mandated to complete the electrical design.

a) Existing panel boards for branch circuits to supply normal and clean(UPS) power outlets, lighting and mechanical equipment;
b) telephone & security raceway systems, cable TV, etc.;
c) wiring and raceways;
d) interior lighting;
e) emergency lighting;
f) exit signs and directional exit signs;
g) fire detection/fire alarm system;
h) surge suppression as required
i) grounding and bonding;
j) administration (construction drawings, shop drawings, record drawings, samples, codes, attendance at meetings, permit fees, etc.);
k) certificate of completion
l) system start-up, testing, balancing, adjusting and commissioning;
m) occupancy and maintenance (O&M) manuals;
n) list of spare parts; and
o) Others as outlined throughout the project brief.

6.3.1.1 Complete the design of the electrical systems based on requirements contained in the project brief. These requirements are intended to set minimum criteria and provide guidance to the consultant who is to complete the electrical design.

6.3.1.2 All drawings and calculations shall be certified by the selected proponent's Professional Engineer.

6.3.2 General Requirements

6.3.2.1 Electrical systems and equipment shall be compatible and coordinated with mechanical, architectural, structural and other building systems including interior design, security, communications, etc. All electrical systems shall become integral part of the architectural design, well incorporated into the building functional design and shall be aesthetically pleasing.

6.3.2.2 It shall be possible to shutdown major equipment for maintenance without affecting critical loads in the building.

6.3.2.3 Code deficiencies that relate to life safety, particularly combustible material in the plenum should be remedied. Strict adherence to the letter of the code is often impossible. In such cases, the application of an alternative solution which demonstrates the performance level for the building will have to be developed to achieve an equal or greater level of safety. Consultants should be expected to work closely with the Departmental Representative as well as with the host country fire protection authority.

6.3.2.4 All system fault current levels shall be determined and all equipment rated to withstand fault current stresses. Minimum interrupting capacity for any breaker and any other electrical device shall not be less than 10,000A.

6.3.2.5 Provide suitable maintenance access panels and openings for all electrical systems and equipment. Provide sufficient clearances from building structure or other equipment to allow for removal and replacement for all electrical systems and equipment. Distribution junction boxes shall be accessible at all times. Provide for portable mechanical Lockout / Tag out devices to isolate electrical equipment.

6.3.2.6 It shall be possible to shutdown major equipment for maintenance without affecting critical loads in the building.

6.4 PERFORMANCE REQUIREMENT

6.4.1 System Requirements

6.4.1.1 The new and existing electrical systems must be responsive to the functional requirement of the modified area. They shall be designed, constructed to, and commissioned to ensure the following:

- Occupant safety;
- Occupant comfort;
- Reliability;
- Maintenance and operation simplicity;
- Energy conservation;
- Cost effectiveness;
- Economy of installation; and
- Availability of spare parts.

6.4.1.2 Posted operating instructions in English are required for manually operated electrical systems. They shall consist of simplified instructions and diagrams of equipment, controls and operation of the systems, including selector switches, main and emergency side circuit breakers (switches) etc. Instructions shall be framed and posted adjacent to the major equipment of the system.

6.4.1.3 Systems shall be selected and designed to meet the requirements stipulated in this project brief. System selection and design shall consider parameters such as but not limited to performance, service, and maintenance.

6.4.1.4 All systems shall provide pollutants-free operation. Systems shall be designed to use a minimum amount of energy consistent with required performance standards.

6.4.1.5 The electrical power supply design concept shall incorporate highest standards to insure reliability and minimal disruptions to continuity.

6.4.1.6 Any new power feeders shall incorporate 100% sized neutral conductors.

6.4.1.7 The system, fixtures and equipment selection shall be based on an anticipated minimum life expectancy of 25 years life cycle costing analysis. Select the systems, fixtures and equipment for their performance, reliability, durability, sustainability, flexibility, accessibility and ease of operation and maintenance, availability of parts, total cost of ownership, and operational economy / low maintenance costs.

6.4.1.8 Establish and support the new electrical demand load by engineering calculations and submit to the Departmental Representative for record purposes. Systems shall be selected and designed to meet the requirements stipulated in this performance brief. System selection and design shall consider performance, service, and maintenance.

6.4.2 Energy Conservation

6.4.2.1 Conservation of energy consumed by electrical systems is dealt with in the area of lighting and control. Illumination within an area shall be provided by the most efficient luminaires available for use in that area, paying close attention to lamp and driver types.

6.4.2.2 Lighting control systems shall ensure that lights in an unoccupied area are not left on. Where required multi-level lighting control should be provided to allow illumination levels to be modified to accommodate changing tasks.

6.4.2.3 All new luminaires chosen for use in an area are to be LED and of the most efficient type practical for use in this location given operational requirements, task requirements and architectural ceiling finishes. LED luminaires shall be the primary source throughout the building.

6.4.2.4 Existing fluorescent luminaires shall be assessed for their compliance with IESNA RP-1 for glare reduction. If deemed acceptable each fixture shall undergo a lamp replacement from fluorescent lamp to LED tube complete with remote driver.

6.4.2.5 New lighting control should give consideration to daylight harvesting.

6.4.2.6 Lighting load should be 30% more efficient than the alternative compliance path using the Space by Space method of ASHRAE 90.1 – 2007.

6.4.3 Seismic and Critical Infrastructure Protection

6.4.3.1 All primary equipment, such as light fixtures shall be provided with seismic restraints. Electrical infrastructure and cable trays shall remain fully operational during and after earthquakes.

6.4.3.2 All major pieces of electrical equipment, cable trays and conduit above 50mm shall be provided with a Seismic Restraint System to ensure that the building is kept operational after a seismic event. The equipment and its restrainers shall satisfy the more stringent quality and design requirements of the local and the Canadian codes and standards for protection from seismic loads.

6.4.3.3 Provide seismic restraints on internal light fixtures and cable trays to protect personnel and the facility from falling objects. With t-bar ceilings, independent chain anchors for light fixtures shall be required to reduce the effect of a collapsed ceiling.

6.4.3.4 Refer to - Structural Engineering Section and the applicable codes and standards for seismic design criteria.

6.5 CODES STANDARDS AND GUIDELINES

6.5.1 Codes, Standards and Guidelines for Electrical Engineering.

6.5.1.1 Electrical systems shall meet or exceed the requirements of the following codes, standards and Guidelines. In case of conflict the most stringent requirement shall apply:

a) CAN/CSA C22.1 Canadian electrical Code, Part 1 2009;
b) National Building Code of Canada (NBCC) 2015) and supplements;
c) BS 7671 IEE Wiring Regulations latest edition;
d) Canadian Standards Association (CSA) or equivalent (EN54, FM, UL, ULC, EC or CE);
e) CAN/ULC S524-06: Installation fire alarm system;
f) CAN/ULC-S536 latest edition: Standard for the Inspection and Testing of Fire Alarm Systems;
g) CAN/ULC-C537latest edition: Standard for the Verification of Fire Alarm Systems;
h) NFPA 20-Standard for the Installation of Stationary Pumps for Fire Protection;
i) Treasury Board Chapter 3.4 Standard for Fire Alarm Systems;
j) CSA-B72-M87 Latest edition Standard for Lightning Protection;
k) BS EN/IEC 62305 Latest edition Standard for lightning protection systems;
l) CSA C282-09 Emergency electrical power supply for buildings;
m) All other applicable Treasury Board Standards and Guidelines;
n) National Fire Code of Canada of Canada (NFCC);
o) ASHRAE 90.1 – 2007 Energy Standard for Buildings;
p) Model National Energy Code of Canada for Buildings;
q) Illuminating Engineering Society of North America (IESNA) and/or Chartered Institution of Building Services Engineers (CIBSE) lighting guide 7: Office lighting; and
r) Canada Labour Code Part IV.

6.6 ELECTRICAL SERVICE AND DISTRIBUTION

6.6.1 Secondary Electrical Distribution

6.6.1.1 The distribution system shall be TN-S topology from the main distribution panels all the way to the final sub-circuit.

6.6.2 Secondary Branch Power and lighting distribution

6.6.2.1 The secondary branch power distribution shall be classified as follows:

a) Normal power: Loads to be placed under normal power are
   I. Convenience outlets;
   II. Interior lighting;
   III. exit lights throughout the building;
   IV. Mechanical equipment; and
   V. Loads which become apparent during the design and working drawing phase.

b) The Clean power to be supplied by the new building central UPS. The loads which are to be placed under clean (UPS) power are those which are intolerant to micro interruption. The equipment to be placed under clean power are:
   I. Power outlet to PCs and printers; and
   II. Identified outlets in any newly renovated telecommunication closet and other special rooms.

6.6.2.2 Panel Boards for Normal and Clean (UPS) power shall be fed from existing electrical rooms.

6.6.2.3 With the exception of lighting and receptacle/outlet distribution panels, fusible switches may be considered if specific design considerations warrant their application, such as in electrical coordination of electrical over-current devices.

6.6.2.4 All clean power distribution panels and power panels serving telecommunications equipment and security equipment shall be protected from voltage surges by the installation of TVSS complying with ANSI/IEEE C62.41 - category "B". TVSS to have the lowest possible clamping voltage and be able to provide 140 KA (8/20) surge protection in accordance with UL 1449 and NEMA LS-1.

6.6.3 Raceways

6.6.3.1 The raceway system shall consist of Electrical Metal Conduit (EMT) conduits, rigid conduit, metallic cable tray, trunking and other raceways that comprise the horizontal pathways and backbone pathways of the electrical infrastructure. Non-metallic raceways shall only be acceptable when installed in masonry and concrete walls and floors and embedded in a minimum of 50mm of concrete.

6.6.3.2 Communication raceways are to have adequate clearance to reduce EMF interference.

6.6.3.3 Install raceways parallel or perpendicular to building lines.

6.6.3.4 Independent raceways are required for power, fire alarm, and security/telecommunications horizontal pathways. The telecommunications pathway (metallic conduit and cable tray) serves all telecommunications needs, including voice and data.

6.6.3.5 The fire alarm system shall be in a metal conduit, with a minimum inside diameter of 19 mm or incorporated in a fire rated cable having a metal armour or sheath.

6.6.3.6 All empty conduit systems shall be provided with adequate strength nylon pull-cords and shall have plastic bushings at each end of the conduit.

6.6.3.7 Power conduits to be provided with a ground conductor.

6.6.3.8 Use of non-combustible flexible armoured conduit or flexible armoured cable shall be limited to final connections to equipment, e.g., motors, lighting, fixtures, etc., and lengths kept as short as practical. Use of flexible cable/conduit not to exceed 2 m at each respective connection unless approved by Departmental Representative.

6.6.3.9 Suitable clearances to be maintained to avoid conductor exposure to excessive heat. Communication raceways are to have adequate clearance to reduce EMF interference.

6.6.4 Conductors and Cables

6.6.4.1 Power cables and conductors shall be rated specifically for its application. Voltage drop shall not exceed 2% for the feeders from CDP/Switchboard to the panel boards and 3% from the distribution panel to the rated load (outlet/light fixtures).

6.6.4.2 Any new feeders from Building central distribution panels (CDP) shall consist of copper conductors in conduit. **Subject to Departmental Representative approval and compliance with the Canadian National Building Code (NBC) strict requirement for non-combustible construction, conductor in conduit may be substituted with power feeder in cable tray if and only if the propose feeders meet or exceed both the NBC low flame spread rating and low smoke classification.**

6.6.4.3 Power cable and conductors in the ceiling plenum shall be installed in either metal conduit or in a minimum 300mm trunking

6.6.4.4 Fire alarm system wiring shall be solid copper and installed in conduit or fire rated cable with sheath. Stranded wiring shall not be used.

6.6.4.5 Cable utilized for fire alarm shall meet or exceed the test method for cable under fire condition IEC60332-1, DIN VDE 0266 and DIN 4102 part 12 rated for use in the case of fire ≥90 minutes.

6.6.4.6 Branch circuit conductors shall be copper, minimum 2.5 mm², rated at 90ºC with approved 0.6/1 KV insulation.

6.6.4.7 Only copper conductors are acceptable where the conductor is purchased as part of the equipment.

6.6.4.8 All feeders and branch circuits will incorporate 100% neutral sized conductors. Common neutral wire is not acceptable for clean (UPS) power branch circuit wiring.

6.6.4.9 Power conduit to have a ground conductor. Conduit shall not be utilized as a ground conductor. All cable and conduit systems to be protected from atmospheric and mechanical damage.

6.6.4.10 Avoid the use of single conductor armoured cables where electromagnetic interference may become an issue.

6.6.4.11 Insulated conductors to be colour coded.

6.6.5 Wiring Devices (outlets/receptacles, boxes and switches)

6.6.5.1 Outlets and switches shall be specification grade (of the highest quality).

6.6.5.2 Contractor is required to submit samples of all types of switches and receptacles to the Consultant and Departmental Representative for approval before purchasing equipment.

6.6.5.3 The main outlet distribution shall be from normal and clean power distribution panels. Where required, dedicated outlets shall connect to these distribution panels. Dedicated outlets are stand-alone single outlets fed from their own circuit breaker.

6.6.5.4 Electrical outlets shall be for operation on 240 V, 50 Hz, the BS 1363 type (British 13 A / 230-240 V, 50 Hz, earthed), with USB ports, grounded according to Section Grounding and Bonding below. Typical receptacle is shown below:

6.6.5.5 Unless it is rated for 16 amp capacity, all the BS 1363 outlets shall be either protected by:

a) Maximum 13 amp breakers; or
b) 16 amp breakers with a Fused Connection Unit (FCU) fused at 13 amps and positioned directly after each branch circuit breaker and before the first outlet. If utilized, the FCU's for each panel board shall be grouped together near the panel and readily accessible.

6.6.5.6 **Ring Main circuit distribution is not acceptable. All distribution branches shall be done under the radial final circuit arrangement**.

6.6.5.7 Ungrounded outlets are not allowed.

6.6.5.8 Power outlet location details shall be coordinated by the Consultant's engineering team with the Departmental Representative. Furniture and equipment locations shall be integral into the design process.

6.6.5.9 Every computer workstation location near permanent partition walls shall have a minimum of 3 double clean (UPS) power outlets next to voice/data outlet. Provide a maximum of 4 workstations per clean power circuit. The design load for each computer workstation regardless of the number of outlets shall be 180 watts. The Departmental Representative will indicate all locations for voice data locations for computers.

6.6.5.10 Every printer/fax location near permanent partition walls shall have a minimum of 3 double power outlets connected to dedicated Clean (UPS) Power circuit. Computers and printers shall not be combined together on the same circuit. Estimate 500 watts for each printer/fax station. The Departmental Representative will indicate all locations for printer/fax stations

6.6.5.11 Provide dedicated power circuit for all photocopies and shredder. The Departmental Representative will indicate all locations for photocopiers and shredder.

6.6.5.12 For the kitchenette/lunch rooms, make allowance for a minimum of 4 single or 2 double outlets above the counter on 2 dedicated circuits.

6.6.5.13 Prior to completion of the design; for workstations not located near permanent partition walls close coordination with Departmental Representative is required for delivery of power and IT to the workstation.

6.6.5.14 Requirement for any new floor boxes shall be equipped with two double outlets connected to the Clean (UPS) Power distribution system. Each Floor box shall also have a provision for four RJ45 telecommunication ports. Provide a separate circuit per floor box.

6.6.5.15 Provide convenience/housekeeping receptacles in corridor located at every 9 m on centre and 4.5 m from corridor end for cleaning purposes. Enclosed offices with permanent partitions shall have a minimum of three (3) convenience outlets (normal power) on three perimeter walls.

6.6.6 Identification

6.6.6.1 Identify all equipment, wiring, raceways and control operating devices by function in accordance with applicable local codes, standards and regulations. All equipment identification shall be with permanent name plates in English.

6.6.6.2 Re-Identify distribution panels to match new layout. All distribution panels shall have a complete and typewritten "Circuit Directory", in English permanently installed on the distribution Panel.

6.6.6.3 Electrical circuits and conductors shall be identified at the distribution panel.

6.6.6.4 Each switch control and receptacle face plate shall have the circuit and distribution panel number identification neatly installed on it using some form of self-adhesive labelling or identification system.

6.6.6.5 Provide identification at each motor starter, disconnect switch and /or controls.

6.6.6.6 Conduit systems or cables are to be colour coded on the exterior with colour bands indicating system type as follows:

System	Primary colour // Secondary colour
Fire Alarm	**Red**

Normal/Emergency Power	**Yellow**
Clean Power (UPS)	**Yellow // Red**
Ground	**Green**
BMS	**Grey**
Information Technology (IT)	**Orange**
Internet	**Orange // Yellow**
Security	**Blue**
IDACS	**Blue // Yellow**
CSAS	**Blue // Black**
CCTV	**Blue // Green**

6.6.6.7 Colour coded bands shall be within 150 mm of any termination point and within 150 mm of every junction box. The bands shall be in close proximity (no greater than 150 mm apart) and each band shall be no less than 25 mm wide.

6.7 LIGHTING

6.7.1 Interior Lighting and Illumination Levels

6.7.1.1 Lighting shall be designed to assist in defining the overall building architecture, address organizational safety and security requirement and address the multiple task requirements of individuals.

6.7.1.2 Consideration shall be given to design for glare, contrast, visual comfort and colour rendering and correction. Flexible task luminaries and furniture with built-in luminaires, although not part of these standards, are an integral part of the lighting design and should be included. The two systems will ensure that the lighting application meets the recommended lighting quality and lux level at the working surface.

6.7.1.3 The arrangement of lighting fixtures shall be such as to provide an illumination with uniformity of 0.8 (minimum / average = 0.8) over the work area and provide maximum flexibility in rearrangement of the space. Lighting designs should take into account the anticipated light obstruction and absorption of the partitions and systems furniture screens (usually measuring between 1370 - 1675 mm.

6.7.1.4 Provide special lighting for artwork location to be identified by DFATD.

6.7.1.5 Illumination levels for interior office space are expressed as minimum acceptable values of average maintained horizontal lux level over the working plane, or at floor level for support spaces. Lighting levels are calculated using Illumination Engineering Society of North America (IESNA) acceptable practices (see latest editions of IESNA Reference Lighting Handbook and ANSI/IES-RP1, Office Lighting).

6.7.1.6 Typical default parameter to be used in interior lighting calculations for LED lighting is 0.85.

6.7.1.7 Interior illumination levels are as follows:

a)	entrance lobby	325 lux
b)	waiting area	325 lux
c)	visitor orientation areas	150 lux
d)	washrooms	220 lux

e)	corridors	220 lux
f)	circulation spaces	220 lux
g)	workstations	500 lux*
h)	conference and meeting rooms	0 - 500 lux (fully dimmable)
i)	kitchen(s)	500 lux
j)	library	500 lux
k)	elevator(s)	220 lux
l)	stairwells	220 lux
m)	electrical / mechanical rooms	500 lux
n)	telephone closet and DP	500 lux
o)	multi-purpose room	0 - 500 lux (fully dimmable)
p)	interview booths (public side)	750 lux
q)	interview booths (Can. side)	500 lux
r)	storage rooms	325 lux
s)	Inspection area	325 lux

6.7.1.8 Workstation value can be reduced to 400 lux provided the lighting system has sufficient flexibility to permit the luminaires to be readily relocated at minimum cost to suit workstation locations and lighting circuits are arranged with adequate capacity to handle 20% of additional luminaires if required.

6.7.2 Lighting Fixtures

6.7.2.1 New LED fixtures shall have lamps with a colour rendering index above 85 with a colour temperature of 3500°K. New fixture shall be compatible with both type of ceiling finishes (suspended and open ceiling) and shall be utilized throughout the office space areas. The new layout should match the workstation positions and the required level of lux for each definite location.

6.7.2.2 Luminaires and associated fitting should always be of high end commercial design. Careful consideration to be taken in the design of lighting systems regarding servicing and replacement of LED lamps and driver.

6.7.2.3 All interior lighting should be the most energy efficient. LED is the preferred lighting source.

6.7.2.4 All fixtures installed in a T-bar ceiling shall be independently supported from the ceiling structure by means of two (2) stainless braided steel cable 1.5mm diameter minimum, secured to the underneath of the concrete slab.

6.7.2.5 Luminaires designed for standard use of lenses shall accept lenses and louvers of a minimum 16 mm thickness.

6.7.3 Lighting Control

6.7.3.1 Provide and install a low voltage lighting control system to allow scheduling of lighting, occupancy sensing and daylight harvesting. The segregation of activities within a space shall form the basis on which to select switching zones and control arrangement.

6.7.3.2 Along with low voltage switches, provide and install automatic control in the offices and open areas which shall consist of either ceiling/wall mounted passive infrared or dual technology (ultrasonic/passive infrared) motion control to ensure a manual-on/off and automatic off feature. Automatic off setting to be between 30 sec to 30 minutes of the person leaving the space. Pre-set all sensors to 30 minutes on completion of installation.

6.7.3.3 Provide a daylight harvesting system designed with the use of Photo sensors to adjust based on the available daylight by dimming or switching lights off during the day to take advantage of available sunlight and maintain a minimum recommended light level according to the needs and use of the space.

6.7.3.4 A master lighting control panel to be located in Main Receptionist Office.

6.7.3.5 Circuit breakers shall not be used as manual lighting control and the use of contactors shall be limited to allow zone segregation for possible system maintenance requirements.

6.7.4 Emergency / Exit / Night lighting

6.7.4.1 Design emergency lighting system to conform to the new layout in accordance with the requirements of the applicable codes, standards and regulations.

6.7.4.2 A combination of emergency/night lights and Exit signs shall provide to an average level of illumination not less than 10 lux and never less than a minimum of 1 lux at floor or tread level in principal access routes to exits, corridors, and rooms where the public may congregate.

6.7.4.3 Emergency lighting battery packs conversion kit module shall provide for a minimum of 2 hour duration service. Battery packs to be provided with a self-diagnostic circuitry card (auto-test)

6.7.4.4 Provide new Exit sign light fixtures in pictogram format conforming to The BS/EN 60598-2-22. New exit signs to be LED illuminated complete with directional signs where required to clearly demonstrate egress and direction to egress. All exit signs to be provided with a battery pack providing a minimum of 2 hour duration service. Battery packs to be provided with a self-diagnostic circuitry card (auto-test).

6.7.4.5 All LED illuminated signs shall be integral part of the Chancery signage system as described in Architectural and Interior Design.

6.8 OTHER ELECTRICAL SYSTEMS

6.8.1 Motors

6.8.1.1 Determine the characteristics and operating sequences of the mechanical equipment and ensure that the proper starters, auxiliary components, and disconnects are clearly provided for.

6.8.1.2 All mechanical rotating (fan, motor, etc) equipment to be provided with unfused disconnecting means/switch at each unit.

6.8.1.3 Preference shall be given to high efficiency design motors. Motors 550 W (¾ HP) or larger shall be three phase.

6.8.1.4 Three phase motors shall have single phase protection.

6.8.1.5 Final motor connections shall be made with liquid-tight flexible metallic conduit.

6.8.1.6 Motors shall be earth bonded using an insulated bonding conductor originating from electrical panel.

6.8.2 Building Grounding Bonding System and lightning

6.8.2.1 The exiting electrical grounding system shall be a low impedance (5 ohms or less) earth ground grid system bonded to the lightning system.

6.8.2.2 All non-current carrying metallic portions of electrical equipment shall be grounded. This includes but is not limited to all distribution panels, motor frames, conduit, cable trays, mechanical ventilation ducts, etc.

6.8.2.3 All metallic cable trays or conduit systems shall have separate designated grounding conductors.

6.8.2.4 The system shall meet CAN/CSA-B72, Installation Code for Lightning Protection Systems, BS EN IEC 62305 standard for lightning protection and local lightning protection codes and standards. In case of conflict the most stringent code shall apply.

6.8.2.5 Ensure down cables are connected to ground rods below grade and sufficiently clear from building foundations. All metallic equipment and roof projections shall be bonded to roof cables. Ensure proper bonding of both the lightning and building grounding system.

6.8.3 Information Technology (IT) Grounding and bonding system

6.8.3.1 Provide a copper bus bar minimum size 6mm thick x 50mm wide x 200mm long next to the position of the backboard in each of the telecom closets (TRs), DP, DCC, MSR, and IDACS (CESS) rooms;

6.8.3.2 Interconnect a separate 70 mm² insulated green or green/yellow ground conductor in conduit/sleeves from the building main IT grounding (earthing) bus bar in the electrical room to the ground (earthing) bus bars in the telecom closets (TRs). DP, DCC, MSR and IDACS (CESS) rooms;

6.8.3.3 Install a 3 meter by 16 mm² insulated green or green/yellow conductor to each bus bar in the telecom closets, DP, DCC, MSR, and IDACS rooms to be coiled and left in the room. This will be utilized by others; and

6.8.3.4 Bond all cable trays and conduits entering each room to the bus bar in the room with a 16 mm² insulated green or green/yellow

6.8.4 Uninterruptible Power System (UPS)

6.8.4.1 Provide a central UPS in place of the existing isolation transformer designed for the new Chancery clean power network as described in this section. The UPS units shall be provided with a minimum of 15 minutes of battery capacity to allow for an orderly shutdown in case of generator failure.

6.8.4.2 UPS capacity shall be sized with 15% spare capacity.

6.8.4.3 The UPS shall serve clean power infrastructure only. Non-critical loads shall be served by the normal distribution system.

6.8.4.4 The UPS power system shall be a three-phase continuous duty, on-line double conversion solid state system. The UPS shall consist of the UPS module, battery back-up, internal static bypass and shall be equipped with input harmonic filter to minimize current load on the generator providing back-up power.

6.8.4.5 Provide external maintenance bypass.

6.8.4.6 Battery cabinet shall feature valve regulated, high rate discharge VRLA sealed, lead-calcium batteries. Batteries shall be flame retardant in accordance to UL 92V2. Batteries to be of the highest quality and shall be provided with a 10 year pro-rated warranty.

6.8.4.7 A battery management system shall automatically test the battery string(s) to ensure that the battery is capable of providing greater than 80% of its rated capacity. The battery test shall be able to detect the following:

a) open battery string /cell;
b) shorted battery string/cell; and
c) battery capacity (runtime) less than 80% full capacity.

6.8.4.8 The UPS shall include all instruments and controls for proper system operation. The system status control panel shall have an appropriate audible / visual alarm to alert operators of potential problems. The control panel indicators shall include but shall not be limited to the following monitoring and alarm functions:

a) NORMAL: indicate that local power in available;
b) BYPASS: indicate that the load has transferred to the bypass circuit;
c) BATTERY: indicate that the normal power has failed and the battery is supplying power to the inverter. A text message shall indicate if the battery charge is low or if the battery is installed or disconnected.
d) ALARM: indicate that the UPS has detected an alarm.
e) EVENT: display the list of active system events and a historical log of system events.
f) CONTROL: display a system control screen. Allow selection of operating mode, normal, bypass, charger on/off and power module on/off
g) SETUP: allow display contract, date and time information
h) RETURN: confirm selection or return to previous screen.
i) UPS shall have an audible alarm and alarm silence button. The alarms shall also be transmitted to the BMS.

6.8.4.9 Manual OFF function shall permit tripping of the UPS unit including input, output and DC circuit breaker.

6.8.5 Fire Detection / Alarm System

6.8.5.1 Design a new addressable microprocessor-based system complete with automatic detectors and audible signal devices provided throughout the building.

6.8.5.2 Configure the fire detection / alarm system such that loss of function on one floor does not disable the system on other floors. Data communication link between control units, annunciators, active field devices and supporting field devices shall be class A.

6.8.5.3 If deemed code compliant the new installation to include existing wiring in locations not effected by the fit-up.

6.8.5.4 The monitoring of the fire detection / alarm system and the security systems shall be established in consultation with the Departmental Representative. Provide a dry contact for connection to an auto-dialler

by others.

6.8.5.5 Verify requirement for duct type smoke detectors. If required they will be provided at both the supply side of all recirculating air handling systems when the air handling system serves more than one floor area. System zoning will be in accordance with all relevant building codes and standards.

6.8.5.6 The main fire detection / alarm system control panel to be located in the main receptionist office with remote annunciator (repeater panel) in the guard booth of the main guardhouse

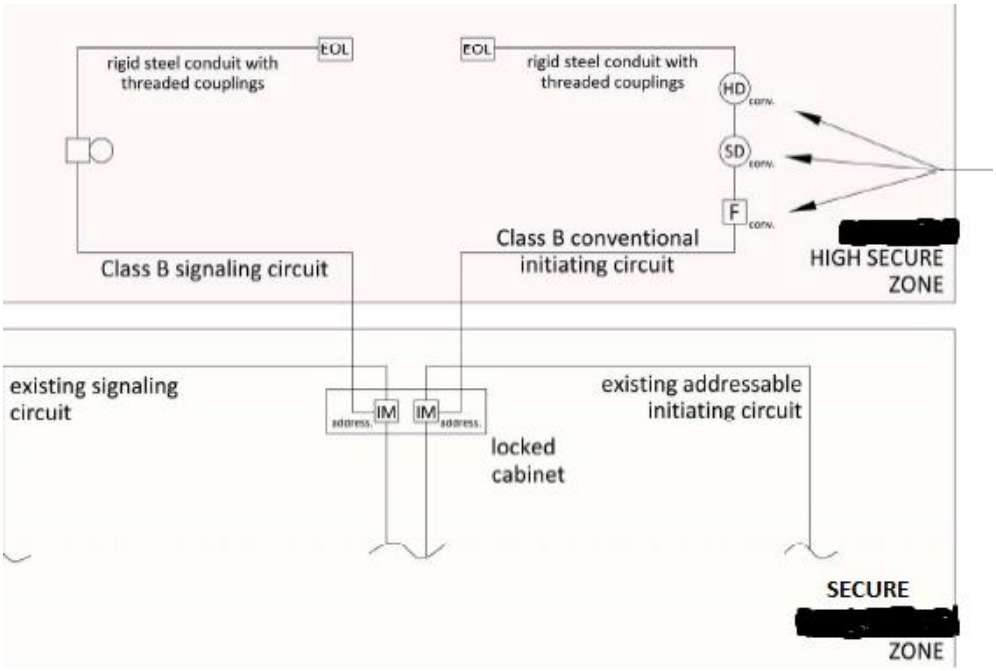
6.8.5.7 Locate audible signal devices below the level of suspended ceilings on permanent interior walls, and not on the moveable partitions. Where required, audible signal device may be mounted in the suspended ceilings in such a manner not to impose the weight of the audible signal device on the acoustic ceiling tile. **Ensure audible signals sound level shall be at minimum 65 dBA but not less than 10 dBA above the ambient noise level throughout the office areas.** If possible a minimum of two (2) distinct audible appliance circuits (NAC) shall be provided.

6.8.5.8 Fire pump electrical connections shall be compliant to NFPA 20.

6.8.5.9 Provide audible/visual signal appliances in the public areas.

6.8.5.10 System verification shall be in accordance with ***CAN/ULC-S537 Standard for the Verification of Fire Alarm Systems.***

6.8.5.11 Modify devices located within the High Secure Zone. They shall be non-addressable and be connected on a Zone Addressable module located outside the High Secure Zone in accordance to the sketch below.



6.9 Scope of work for swing space

6.9.1 Scope

6.9.1.1 Design electrical systems for the new swing space layout within the Chancery as specified based on the requirements within the brief and the additional information provided. The area of fit-up will be in the garage area and further detailed on architectural drawings.

6.9.1.2 Disconnect and remove HID light fixtures not required in the garage area to be utilized as swing space.

6.9.1.3 Provide power to equipment in the swing space from circuits in the nearest electrical room. The electrical design and installation for the above mentioned area shall include, but shall not be limited to the following:

a) Normal power branch circuits to supply:
- Mechanical equipment,
- Normal power outlets,
- Interior lighting,

- Emergency Lights; and
- Exit lights;

b) Clean Power branch circuits to supply:
- Clean power outlets

c) Wiring and raceways;
d) Exit and exit directional signs;
e) emergency lighting;
f) grounding and bonding;
g) fire detection/fire alarm system;
h) system start-up, testing, balancing, adjusting and commissioning;
i) administration (construction drawings, shop drawings, record drawings, samples, codes, attendance at meetings, permit fees, etc);
j) certificate of completion and performance verification;
k) occupancy and maintenance (O&M) manuals;
l) list of spare parts; and
m) others as outlined throughout the project brief..

6.9.2 Secondary Branch Power and lighting distribution

6.9.2.1 Provide branch circuits in the new fit-up layout as required.

6.9.2.2 The new circuits required are to be classified as follows:

a) Normal power for convenience outlets, interior/exterior lighting, mechanical equipment, motor control centers, photocopiers, kitchen equipment, water coolers and items not defined as clean power and
b) Clean power for stabilized computer grade electrical power for electronic equipment, computer workstation outlets.

6.9.3 Raceways

6.9.3.1 All new raceway systems shall consist of Electrical Metal Conduit (EMT) conduits, trunking, cable tray and other raceways that comprise the horizontal pathways and backbone pathways of the electrical infrastructure. Metallic raceways shall be used in plenum spaces.

6.9.3.2 Enclosed metal trunking is acceptable as long as the BS7671 regulation 521 is strictly adhered to. The use of PVC conduit or PVC covered flex is not permitted within the ceiling.

6.9.3.3 For power outlets along the wall three compartment trunking (power and IT) is acceptable.

6.9.3.4 The use of power poles for power circuits at the workstation away from the wall is acceptable only with approval by the Departmental Representative.

6.9.3.5 Communication raceways are to have adequate clearance to reduce EM interference.

6.9.4 New Lighting Fixtures

6.9.4.1 All new LED luminaries chosen for use in this area shall be as per Art 6.7.2.

6.9.5 Lighting Control

6.9.5.1 Localized manual switches to be utilized as a means of lighting control.

6.9.6 Fire Detection / Alarm System

6.9.6.1 Modify existing microprocessor-based fire detection/alarm system loops to suit the new layout as required codes, standards and regulations throughout the new swing space.

6.9.6.2 The existing building Fire Alarm System shall control all detection, supervision, and signalling within the confines of the new space in parallel with alterations to the building system.

6.9.6.3 **Ensure audible signals sound level shall be at minimum 65 dBA but not less than 10 dBA above the ambient noise level throughout.**

End of Electrical Engineering

Information Communication Technology (ICT) and Multimedia Requirements

Section 7

Critical Infrastructure, Seismic Upgrades & Space Optimization

Nairobi, Kenya

SECTION 7 – INFORMATION COMMUNICATION TECHNOLOGY (ICT) AND MULTIMEDIA REQUIREMENTS

7.1 SCOPE AND GENERAL REQUIREMENTS

7.1.1. SCOPE

Provide ICT infrastructure as specified herein to meet the DFATD technical performance standards. The work shall include, but is not limited to the following:

a) Infrastructure for DFATD Voice/Data Networks.
b) Infrastructure for DFATD IP Based Services (Public Phone, Internet, IPTV, IP CCTV, ex.)
c) Infrastructure for Cable Television (CATV).
d) Multimedia (Audio/Video Systems).

7.1.2. GENERAL REQUIREMENTS

ICT installations shall be coordinated with mechanical, architectural, structural, interior design and life safety requirements. All systems shall become an integral part of the complete design package, well incorporated into building functional design and shall be aesthetically pleasing.

7.1.3. PERFORMANCE REQUIREMENTS

- Infrastructure and equipment shall be fail-safe and meet design requirements of a quality consistent with anticipated minimum life expectancy of 25 years.
- Infrastructure and equipment selection shall be justified in accordance with the project requirements. The selection shall consider performance, service and maintenance, as well as reliability, durability, sustainability, flexibility, accessibility and ease of operation and maintenance by non-specialized personnel, availability of parts, total cost of ownership, and operational economy.
- Infrastructure and materials shall provide pollutants-free operation. DFATD sustainability policies shall be respected for all electrical work. Refer to Part (1) General Project requirements.

7.1.4. DESIGN

7.1.4.1. Requirements

- In order to achieve flexibility and thorough integration between building architecture and engineering systems, a concept for ICT infrastructure that supports the distribution of the selected systems should be established during the architectural schematic design. The locations of vertical/horizontal pathways, closets, equipment rooms, ICT distribution equipment should be established before the architectural concept is finalized.
- All ICT systems and equipment shall be configured in a manner that is readily and safely accessible for routine maintenance and repair.
- Lighting in equipment rooms should be laid out so as not to interfere with equipment.
- The equipment distribution will be laid out to minimize the effects of external or internal electrical disturbances. This means disturbances from building equipment such as large motors, air conditioning, etc., shall not impact on operation of sensitive equipment.

7.1.4.2. Drawings
The following drawings are expected to be a part of the design package (expected to be delivered in PDF and CAD file format):

7.1.4.3. ICT Raceway Plan
This plan will illustrate all ICT raceways. The plan should give a clear depiction of **all** ICT vertical and horizontal raceways including backbone conduit, level 0/1 trays in the floor and in the plenum; locations and types of each voice/data outlet/box/column. The plan should differentiate between all types of voice/data outlet installations. It should also include a detailed legend with descriptions of each. It will be used in conjunction with a consolidated services plan and reflected ceiling plan to ensure proper access and space considerations have been given to the plenum/floor. Also included in the plan is a list of details for each technical room describing any special works such as backboards or millwork (detailed in this brief).

7.1.5. Meeting/Conference Rooms A/V Design Package

A detailed audio/video design package for the meeting/conference rooms. This package will include but not be limited to the following:

7.1.5.1. Statement of Work
A summary of required audio/video work. This will include a detailed bill of quantities (BOQ) with a list of all planned equipment. An installation plan; which should include:

- System screen and flow design.
- An outline of planned acceptance testing.
- An outline of planned client training.
- A list of training material to be provided.
- On-going support procedures.

7.1.5.2. General Audio/Visual Design Layout
A technical drawing that will illustrate the location of main audio/video equipment (displays, speakers, video conference cameras, control panels…) and furniture in the meeting/conference rooms (lecterns, equipment racks or custom furniture).

7.1.5.3. Detailed Audio/Visual Design
A technical drawing for the meeting/conference rooms illustrating all audio/video and control equipment listed in the BOQ; as well as **each** link and input between all systems. This plan should be detailed and should clearly indicate all connections between each audio/video and control node in the plan.

7.2 Applicable Codes and Standards

7.2.1. Code Compliance Requirements

Refer to Section (1) General Project Requirements - 1.3 Applicable Codes and Standards, for a complete description of the code compliance requirements.

7.2.2. Specific Codes and Standards

- Electronic Industries Alliance / IT Industry Association (EIA/TIA) Standards.
- EIA/TIA Standard 568: Commercial Building IT Wiring Standard (and related bulletins)
- EIA/TIA Standard 569: Commercial Building Standard for IT Pathways and Spaces (and related bulletins)
- EIA/TIA Standard 606: Administration Standard for the Commercial IT Infrastructure (and related bulletins)

- EIA/TIA Standard 607: Commercial Building Grounding (Earthing) And Bonding Requirements for IT (and related bulletins)

7.3 Detailed Requirements – ICT & Multimedia

7.3.1. ICT Wiring, Raceways, and Outlets

7.3.1.1. Wiring

DFATD supplies installs and maintains its own proprietary voice and data systems within the High Commission. DFATD will supply and install all of the required internal cabling and ICT equipment throughout the High Commission. ICT is however expected that the general contractor and his subject matter experts will provide the back boxes, support frames, faceplates, **and plugs** (RJ45 & fiber-optic) for all voice, data, and multimedia drops detailed in this brief.

7.3.1.2. Raceways

ICT raceways include all conduit, cable trays (both mesh and enclosed) and trunking systems used to carry ICT services from technical rooms to points of service (computers, telephones, WiFi access points, or any IP based Government of Canada nodes). The general contractor (and his specialists) must ensure:

- All conduit used must be ridged steel threaded EMT unless otherwise specified.
- All conduit used must be color coded as outlined in the Electrical Part (6) of this project brief.
- All raceways must be grounded as outlined in the Electrical Part (6) of this project brief.
- When selecting the size of the ICT conduit or tray; the general contractor (and his specialists) will consider the following:
  i. Each workstation will require 4x Cat6 UTP cable. Conduit/Tray will be wired for a fill ratio of 40% in accordance with DFATD cabling standards. See
  ii.
  iii. Figure 1 for fill ratio details.
  iv. There will be no consecutive 90 degree bends or (3) consecutive 40 degree bends in conduit installed in the plenum. Access boxes must be used to avoid consecutive bends. The size of the access box installed will depend on the bend radius of the cable expected to pass through ICT. Access boxes in the plenum smaller then 100mm L x 100mm W x 50mm D will not be acceptable in any scenario.
  v. No conduit run shall be longer than 10 meters without an access box.
    - All access boxes and raceways should be accessible. Cable trays require a **minimum** of 6 inches of clearance for proper access.
    - No raceways can be used in the public zone. Any areas accessible to the public will be restricted to steel conduit to restrict access.

Figure 1 - CAT6 UTP Cable Fill Ratios

Plenum

Cable	Type	O.D.	No. of Cables at 40% Conduit Fill Based on Trade Size of the Conduit (inches)								
			0.75	1	1.25	1.5	2	2.5	3	3.5	4
Category 6											
Cat 6	4 pr F/UTP	0.255	3	6	9	14	24	38	55	75	98

7.3.2. ICT Raceway Types

7.3.2.1. Backbone Conduit

Backbone conduit is defined as a collection of steel EMT conduits interconnecting all the technical rooms (TC, DP, MSR, IDACS). These conduits must be secure steel EMT (threaded) unless otherwise specified. These conduits must be clearly marked in accordance with this brief. All backbone conduits must be terminated on a "C" channel 280mm below or above a backboard. All conduits must have a nylon pull string installed for cable pulling.

7.3.2.2. Level 0 Raceways

Level 0 raceway is defined as a raceway (cable tray or conduit system) to carry all non-government or "external" voice/data services (example: television, outside internet service, A/V) to the appropriate technical room. This raceway can only be installed in the public and operational zones. This raceway can be combined with the Level 1 raceway if a cable tray with a physical divider is used.

7.3.2.3. Level 1 Raceways

Level 1 raceway is defined as a raceway (cable tray or conduit system) to carry all DFATD voice/data (as well as other DFATD IP services) services to the nearest TC within the appropriate zone. This raceway cannot cross between zones.

7.3.2.4. Level 2 Raceways

Level 2 raceway is defined as a raceway (cable tray or conduit system) to carry all DFATD classified data services to the nearest classified communications center (CCC). This raceway will be installed in the secure and high secure zone **only** and must be "secure". Secure with respect to the level 2 raceway will be defined as threaded 19mm steel EMT conduit from CCC to each outlet; **or** a sealed raceway system from CCC to each outlet. All cable carried in the raceway must not be exposed at any point and the raceway must be clearly marked as per section (6). This raceway cannot be combined with any other raceway.

7.3.3. Outlets

The installation of all voice/data outlets, boxes and columns is the responsibility of the general contractor (and his specialists). A minimum of 1x 19mm flexible steel conduit will be connected to each voice/data outlet, box, or column. Metal flex conduit will be secured to the box and to the cable tray with the appropriate fitting and locknut. Conduit will extend horizontally/vertically through the floor or plenum to the appropriate raceway. Nylon pull string will be installed in **all** conduit runs.

- All voice/data outlets/boxes/mini-columns shall be installed using one of the combinations of Legrand products detailed in the sub-sections below. If the specific Legrand models are not available**,** a local solution can be deployed **if the general contractor (and his specialists) adhere to the following:**

    I. If the selected products are Legrand, the general contractor (and his specialists) must submit the specification sheets to DAFTD for approval prior to procurement/installation.
    II. If the selected products are not Legrand, the general contractor (and his specialists) must submit the specification sheets along with a sample to DFATD for inspection/approval.
    III. The number and type of plugs requested in the design is respected.
    IV. The products are certified at a similar level (CAT6, USB 3.0). All RJ45 plugs must be certified CAT6. Every plug supplied will be inspected and tested by a Canadian security representative.

V. All locally supplied RJ45 plugs, boxes, and frames must be on site (even if not installed) for a Canadian inspection a minimum of 3 months prior to project completion date.

7.3.3.1. Voice/Data Outlets in Wall

Voice/Data wall outlets will be flush with the wall and 400mm from the floor (to center) unless otherwise specified. Voice/Data wall outlets will be Legrand Mosaic products or equivalent (must be approved by DFATD). Wall skirting is also acceptable. See figure 2 & 3.

Figure 2 - Voice/Data Outlet In-Wall Box Detail

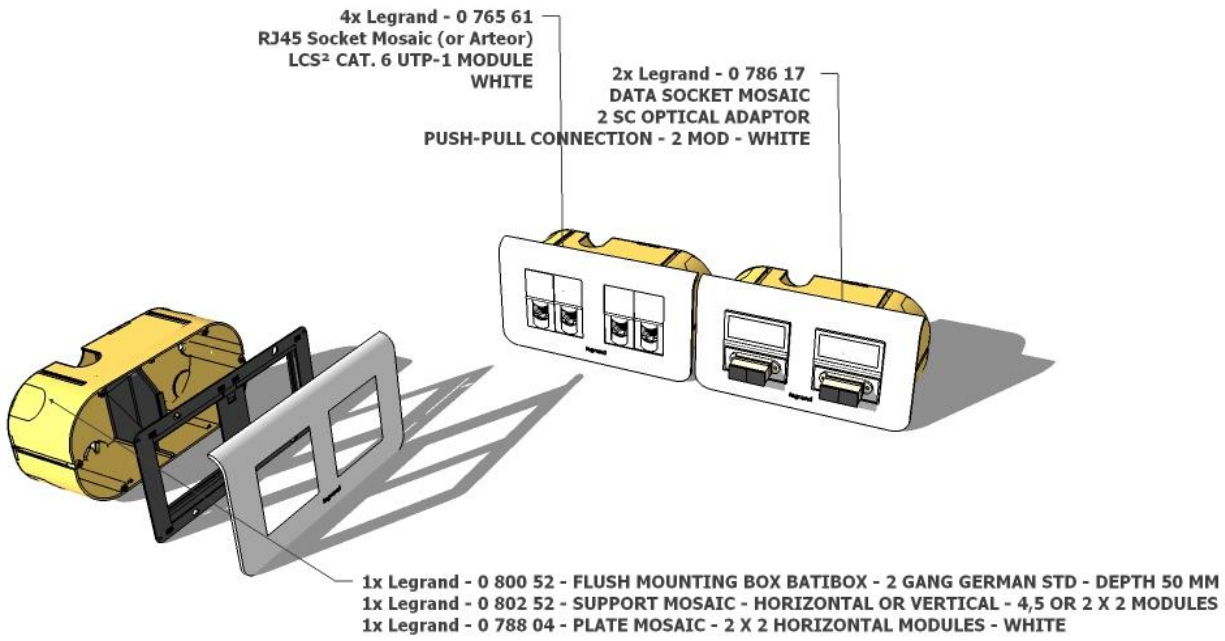
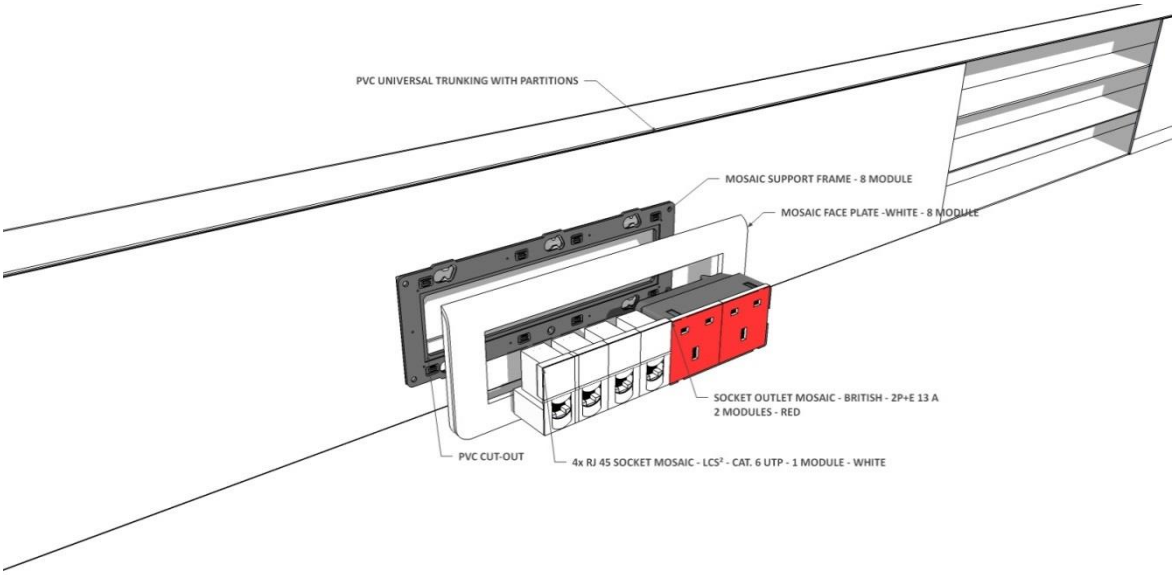


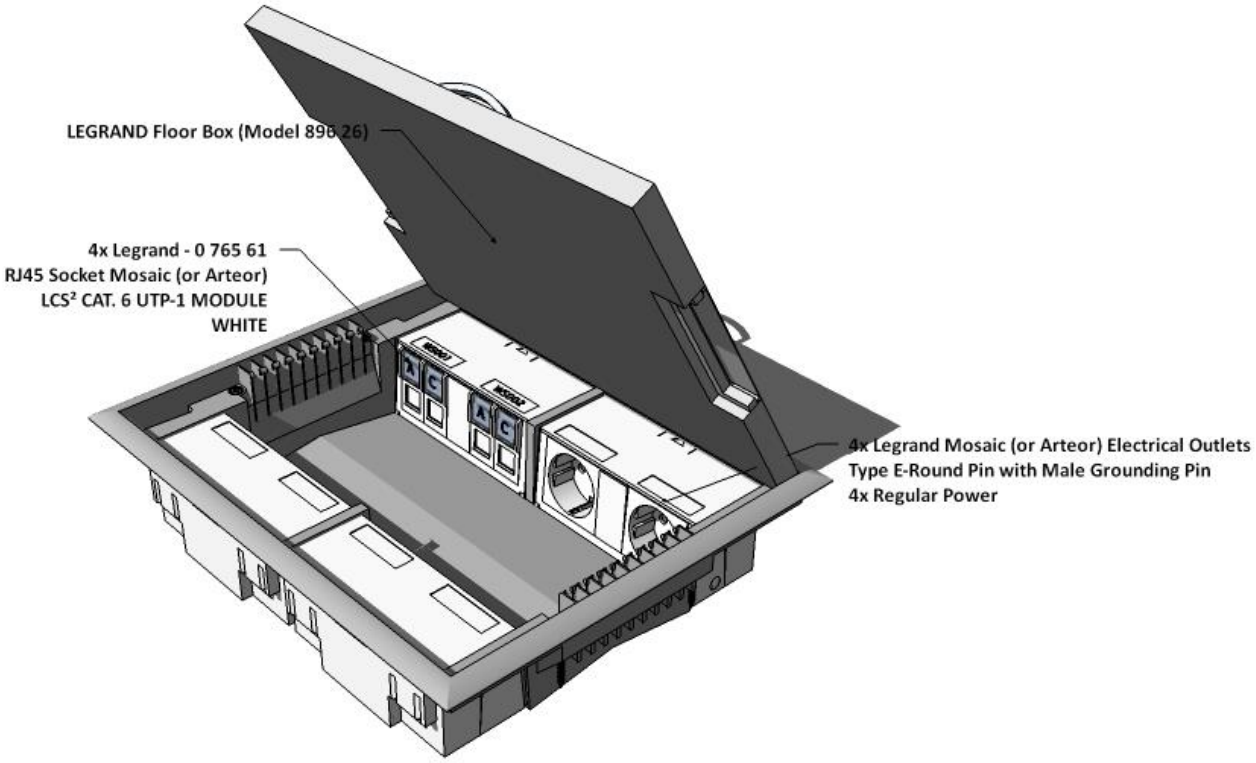
Figure 3 - Voice/Data Outlet Wall Skirting Box Detail



7.3.3.2. Voice/Data Floor Box (Conference/Meeting Rooms)

Unless otherwise specified, voice/data outlets in the floor for meeting and/or conference rooms will use floor boxes. Floor boxes will be Legrand Mosaic products or equivalent (must be approved by DFATD).

Figure 4 - Voice/Data Floor Box (Meeting Room)



7.4 Meeting Room with Video Conferencing

Provide multimedia backbone for audio/video fit-up as per

& **Figure**

Figure

Figure 5 - Meeting Room with Video Conferencing - Layout

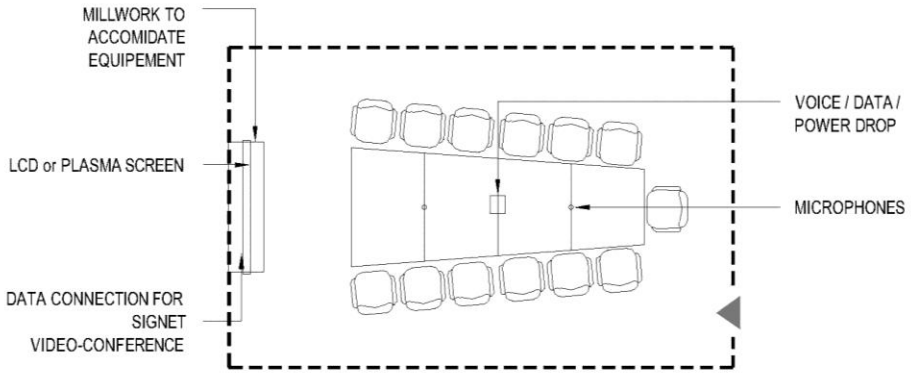
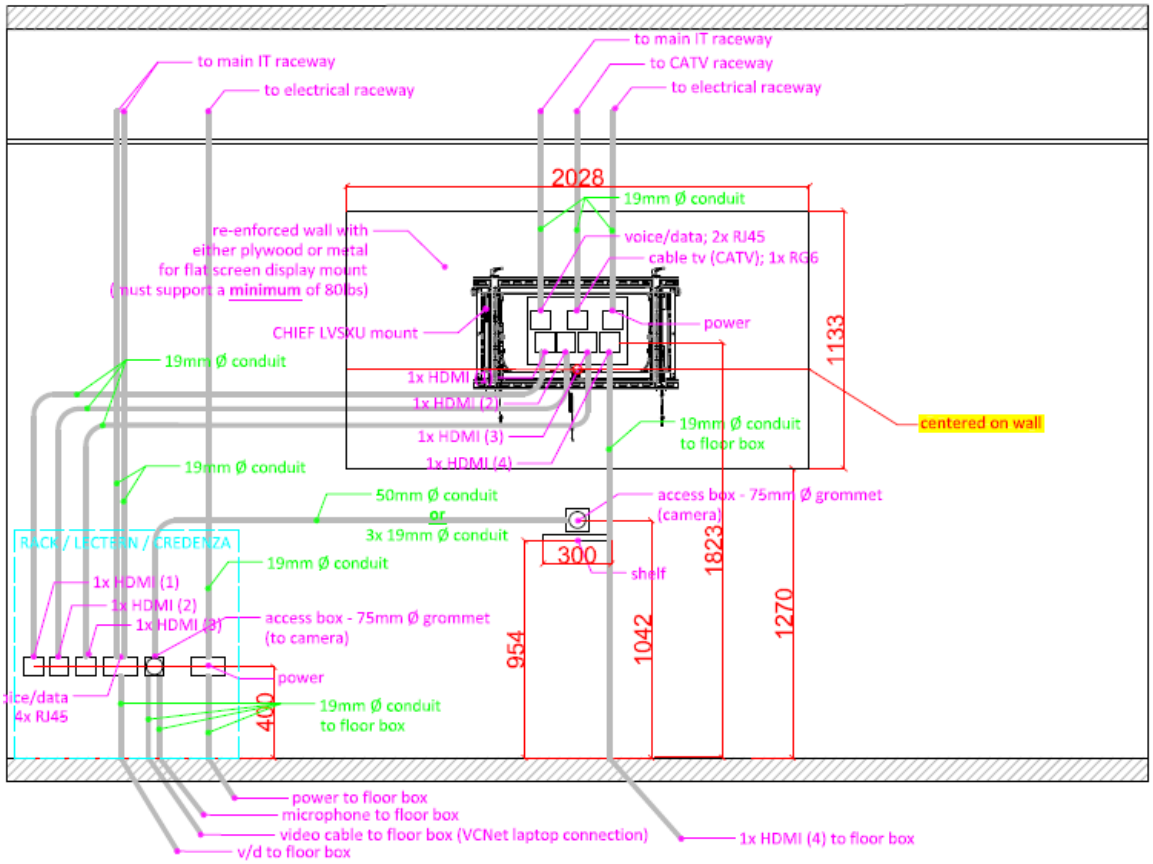


Figure 6- Meeting Room with Video Conferencing - Feature Wall Design



7.5 Meeting Room

Provide multimedia backbone for audio/video fit-up as per Figure &

Figure

Figure 7 - Proposed Meeting Room Layout

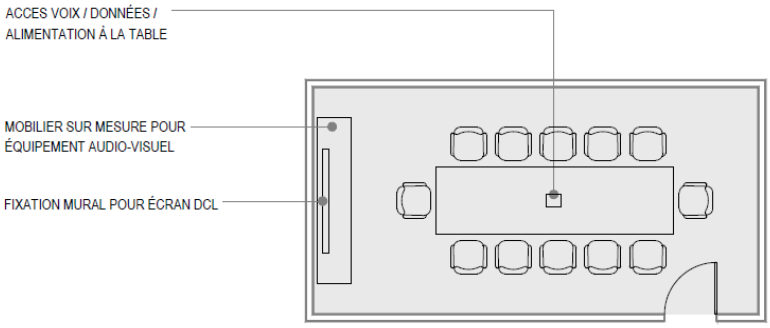
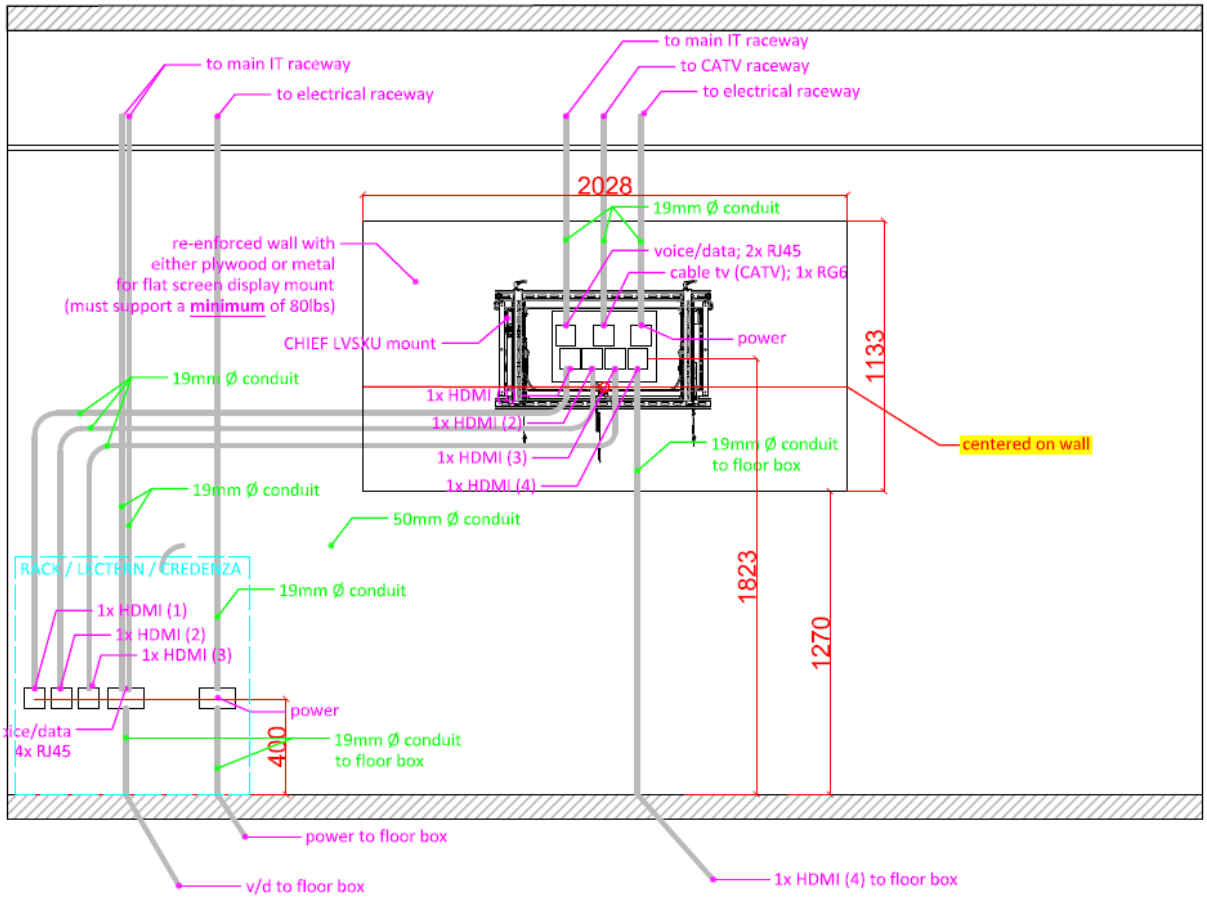


Figure 8 - Proposed Meeting Room - Feature Wall Design



7.6 Multi-Purpose Room (MPR)

7.6.1. Construction

7.6.1.1. Audio/Video Fit-up

The general contractor (and his specialists) will provide (supply and install) a complete audio/video fit-up for the MPR. The fit-up will be based on the following functionality is requirements:

i. The Meeting Room can be setup in various configurations, from two separate rooms to a single large meeting open space.
ii. All Meeting rooms will be equipped with AV equipment and one room will have VTC capabilities.
iii. The Meeting Rooms AV/ VTC equipment will be managed by a single control system with several touch panels.
iv. The room will be furnished with several tables accommodating up to thirty (39) participants
v. 8x floor box under the tables will house the DFATD departmental network.
vi. The networks will be extended to an access enclosure embedded into the table allowing users to bring their laptops into the room and connecting them via Ethernet cable.
vii. A signal path will be required from the access enclosure to the equipment rack and from the equipment rack to the display.

7.6.1.2. Sources

i. IP-based videoconferencing system operating on a standalone network.
ii. IPTV from the local provider.
iii. A standalone PC. Keyboard and mouse will be controlled via a Fiber USB transmitter/receiver.
iv. The video and audio content of a departmental laptop connected via the access enclosure in the table. It is recommended that the laptops have an HDMI or Display Port output.

7.6.1.3. Destinations

i. The IP-based videoconferencing system allowing presentation content to be transmitted during unclassified videoconferences
ii. Two 90-inch displays, for VTC and presentation purposes, will be located along opposite walls.
iii. For detailed viewing (i.e., with clues), the smallest recommended display should have an image height of 24.0 inches (610mm)
iv. For inspection viewing (i.e., without clues), the smallest recommended display should have an image height of 36.0 inches (914mm)

7.6.1.4. Functional Requirements

Video:

i. The displays will have a 16:9 screen format and be capable of supporting resolutions up to 1,920 x 1,080p @ 60Hz
ii. High resolution computer-video content from laptops will be displayable onto the displays
iii. Laptops will be connected to an access enclosure in the table via an HDMI to HDMI, DisplayPort to HDMI, or VGA to VGA cable
iv. The video signal of departmental laptops can be sent to any display in meeting room.
v. The design will allow sources of varying resolutions, horizontal and vertical frequencies, and aspect ratios to be scaled to a common HD resolution seamlessly

Audio:

i. High fidelity audio from the laptops will be distributed via an audio system (speaker locations TBD)
ii. Laptops will be connected to the access enclosure via an HDMI to HDMI, DisplayPort to HDMI, or stereo 3.5mm cable.
iii. High fidelity audio from the one audio input will be distributed to the audio system.
iv. The lecterns and tables will be fitted with a surface-mounted microphone, which will be used during unclassified videoconferences or briefings.

Control:

i. Control of the AV/VTC system in meeting room will be achieved via a color touch panel located on the tables or lecterns.
ii. The touch panels will allow users to initiate unclassified videoconferences or briefings as well as display departmental laptop content.
iii. The touch panels will allow users to control room lighting.
iv. The touch panels will allow users to control room motorized window treatments.

7.6.1.5. Support

The general contractor (and his specialists) will provide a full service support contract on the A/V fit-up that includes, but may not be limited to the following:

- A three year warranty on the installation. This includes equipment, as well as the installation. There will be no charge for any new equipment or labour within the contract term.
- In the event a repair is required, a technician will be deployed within 48hrs of diagnosis.
- Technical support via telephone is available during normal working hours.
- The support contract should be renewable at the end of the term (and price re-negotiated).

7.6.1.6. Mechanical: Refer to part 5 (Mechanical Requirements).

7.6.1.7. Electrical: Refer to part 6 (Electrical Requirements).

7.7 Multi-Purpose AV Room

7.7.1. Size and Location

The AV room should be roughly 15m^2. The Location is to be determined and as needed. Refer to blocking diagram

7.7.2. Construction

No special considerations detailed in this section. For Mechanical, refer to part 5 (Mechanical Requirements) and for Electrical refer to part 6 (Electrical Requirements).

7.7.3. Other Works

- Millwork required: Plywood backboard painted in flat gray flame retardant paint. The backboard will have a thickness of 20mm; width of 1200mm; height of 1200mm. The backboard will be installed centrally on a wall 900mm from the finished floor. The backboard will have 4x metal stand-offs that will extrude the backboard 200mm off the wall.
- Metal “C” channel is required above and below the backboard in order to support the backbone conduit.

- All backbone conduits terminating in this room should be finished 280mm above or below the backboard on the “C” channel with a plastic bushing. All conduits will be clearly color coded as per section 1.2.
- The following backbone conduit (PVC) are required in the Multi-Purpose AV Room:
    - 2x 100mm conduit to DP backboard

7.8 Services

7.8.1. Telephone Service

Government of Canada will supply and install the voice networking system including the Private Branch Exchange (PBX), associated hardware and internal wiring.

7.8.2. Internet/Data Service

Government of Canada supplies, installs and maintains its own secure Global Network (SIGNET) Communications System. The department will supply and install (SIGNET) equipment and associated internal cabling. This system shares the same conduit network infrastructure with the High Commission telephone (voice) networking system (MITNET).

End of ICT and Multimedia Requirements

Physical Security Upgrades

Section 8

Critical Infrastructure, Seismic Upgrades & Space Optimization

Nairobi, Kenya

SECTION 8 – PHYSICAL SECURITY UPGRADES

Additional information on Physical Security will be provided to the winning A&E firm.

8.1 PHYSICAL SECURITY UPGRADES

8.1.1 GENERAL

8.1.1.1 The scope of work for the security upgrades is as follows, but is not limited to:

a) Replace the North Eastern lobby curtain wall framing and glazing and install new structural steel reinforcement;
b) Replace the existing ribbon windows at the third floor northeast elevation and install a new steel plates to the block knee walls below the windows;
c) Replace the vertical strip windows at the two stairwells at the northeast elevation, including the replacement of the glazing and framing;
d) Replace the existing glazing at all other exterior facades (northwest, southwest and southeast elevations). Maintain the existing aluminium window frames at these locations if possible;
e) Improve the force protection at the lower portion of the northeast curtain wall by providing and installing a new security fence, or alternatively, a new layer of internal secondary glazing;
f) Supply and install anti-shatter film to internal glazed partitions;
g) Replace the existing skylight glazing and framing.

8.2 CHANCERY WINDOWS

8.2.1 OUTLINE

Windows are unavoidable weak points in the envelope of a building. Experience has shown that the majority of injuries that occur following an explosion are a result of debris generated by the failure of window panes. Enhancing these weaker areas of the building envelope will result in a substantial improvement towards occupant safety and survivability.

8.2.2 ELEMENT SCOPE

8.2.2.1 All external glazing, including curtain walls, strip windows, punched windows, and skylights shall be replaced and upgraded to blast rated systems.

8.2.2.2 Specific glazing sections shall also be upgraded to resist forced entry attack.

8.2.3 BLAST DESIGN CONSTRAINTS

8.2.3.1 The new windows, frames and their connections shall be rated to a blast performance level based on the following standards (or equivalent):

- ***ISO16933:2007***: *Glass in building - Explosion – resistant security glazing - Test and classification for arena air-blast loading*, achieving a hazard rating that will be given upon contract award.
- ***GSA Standard*** *Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings*, achieving a hazard rating that will be given upon contract award.

8.2.3.2 **Blast loadings** will be defined as a TNT charge size at standoff distance, and will be provided under separate cover.

8.2.3.3 Design connection details for all new blast windows such that they can adequately transfer the defined blast loads into the existing structure.

8.2.3.4 Verify the capacity of the existing structure to accommodate the loading imposed by the defined blast loads. Design structural reinforcing or secondary framing systems as required to accommodate any loading that exceeds the capacity of the existing structure.

8.2.4 FORCED ENTRY DESIGN CONSTRAINTS

8.2.4.1 All glazing within 3 metres above ground shall resist forced entry attacks, and shall meet the performance level based on the following standard:

- ***BS EN 1627-1630:2011****: Pedestrian doorsets, windows, curtain walling, grilles and shutters – Burglar Resistance.* Specific hazard rating shall be given upon contract award.

8.2.4.2 Combined blast and forced entry windows may not be available, or suitable as the stiffness required for forced entry may impose excessive loading on the existing structure under blast loads. Secondary forced entry systems (to the blast resisting system) are permissible to provide the required level of forced entry resistance. Systems such as steel plating or other physically resistant lightweight materials may be utilized provided they meet the specified standard.

8.3 INTERNAL GLAZING

8.3.1 ELEMENT SCOPE

8.3.1.1 Anti-shatter film and silicone shall be applied to all internal glazing, including glazed partitions.

8.3.2 DESIGN CONSTRAINTS

8.3.2.1 Anti-shatter film must be rated to the following performance standards (or equivalent):

- ***ISO16933:2007***: Glass in building - Explosion –resistant security glazing - Test and classification for arena air-blast loading, rating to be confirmed upon contract award.
- ***GSA Standard*** Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings, rating to be confirmed upon contract award.

8.3.3 SUITABLE RETROFIT METHODS

One or a combination of the following blast mitigation strategies may be suitable options for the retrofit of existing windows to meet the design constraints listed in Section 8.3.2.

8.3.3.1 **Window Film**

Window film is a thin coating of laminate which is adhered to the inner surface of a window to mitigate bomb blast and forced entry. In the event of a blast, the film holds the shattered fragments of glass together as to prohibit the number of fragments entering occupied space.

- Window Film shall meet or exceed the following specifications:
  - Tensile Strength: 25,000 PSI (172 MPa)
  - Break Strength: 180 Pounds per Inch (Width) Avg. (315 N/cm)
- Suitable products include:
  - Madico Safety-Shield LCL 800-XSR
  - Pentagon Protection FT800
  - 3M ULTRA600

8.3.3.2 **Structural Sealant**

Window film (see Section X.4.1 “Window Film”) can be anchored using a structural sealant. The purpose of the sealant is to anchor the window film to the frame, thus keeping panes of glass from entering occupied space.

- Structural sealant is to meet or exceed the following specifications:
  - Tensile Strength: 350 PSI (2.41 MPa)
  - Tear Strength: 49 Pounds Per Inch (86 N/cm)

- Structural sealant is to be installed to the following specifications:
  - The structural sealant must have at least a ½ inch adhesion to the window frame (this doesn't included gaskets, if applicable).
  - The structural sealant must have at least a ½ inch adhesion to the window film (this does not include un-filmed glass).
- Suitable products include:
  - Tremco Proglaze SSG
  - Dow Corning 995 Structural Glazing Sealant
  - 3M Impact Protection Adhesive

8.4 EXTERNAL DOORS

8.4.1 ELEMENT SCOPE

8.4.1.1 External doors are supplied by DFATD. All details and design criteria will be provided to the winning proponent.

End of Physical Security Upgrades

Specialty Room Data Sheet Examples

Section 9

Critical Infrastructure, Seismic Upgrades & Space Optimization

Nairobi, Kenya

3.0 | Room Data Sheets

Staff Lunchroom

Function

- staff lunchroom
- lounge
- breakout space
- barrier free design
- operation zone

Lighting

- Task lighting LED Fixture with LED tube 20w T8
- Ambiance Lighting LED
- Light Level: 0 - 500 lux
- Emergency lighting
- Lighting Control: Dual technology sensor with dimming capability.
-

Finishes

- All finishes to be approved by GAC interior designer

Electrical

- 5-20R duplex receptacle located above the kitchen counter as per NEC and connected on a 20 amps circuit.
- One duplex receptacle per fridge
- One duplex receptacle for microwave
- One duplex receptacle for the dishwasher
- One duplex receptacle on three walls of the room
- Each appliances to be on its own circuit
- All 5-15R receptacle connected on a 15 amp circuits

Furnishings

Mechanical

- HVAC provided from the main building system. The amount of cooling and heating must be sufficient to maintain design criteria of the project brief part 5.
- Appropriate air circulation to control the environment and to avoid migration of odour to the surrounding
- Exhaust rate of 1.5 l/s per m²
- Provide hot and cold domestic water to the sink complete with isolating valves under the sink
- Provide water treatment if the water is not potable
- Make the connection fo the dishwasher
- Provide a hot water tank if there is no hot water available from the base building
- Provide cast iron drainage connected to the main building drain pipe.
- Lunchroom shall be an individual zone

Equipment

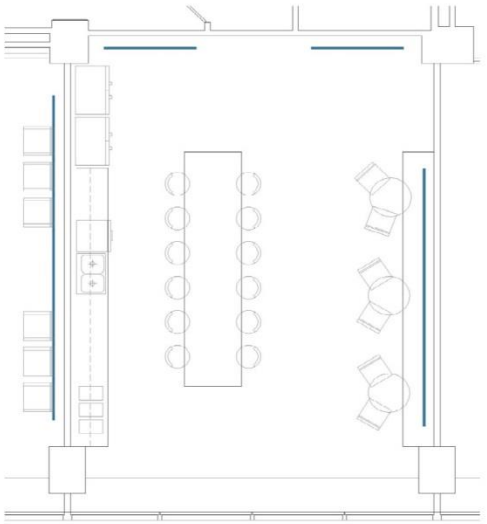
- Wall mount phone (provide by GAC)
- 75" wall mount TV display (provided by Landlord)

Communications

- Level 1 systems: Provide 1X V/D wall drop @ phone height (1 X RJ45 each)
- Level 0 systems: Provide 1X V/D wall drop behind TV (2 X RJ45 each)

Special construction

Indicative Layout



3.0 | Room Data Sheets

Meeting Room - Medium

Function
- to provided audio-visual requirements to seat 8 - 14

Finishes
- All finishes to be approved by GAC interior designer
- office level finishes suitable for representation purposes
- durable for high level of traffic
- translucent film on partitions

Furnishings
- flexible and fixed furniture (conference table and chairs, credenza / storage unit)
- photographic prints, map, clocks as required
- drapes, blackout roller shades (track system and fabrics)
- smart board, widescreen or standard format, size varies to match conference room size

Equipment
- Computer (provided by GAC)
- 2 X Phones, regular & conference, (provided by GAC)
- 80" Wall mount TV display (provided by Landlord)
- Cisco Video conferencing equipment (provided by GAC)
- Evoko Room Manager at exterior of entrance door (provided by GAC)
- Wireless AV controller (provided by Landlord)
- Sound system (provided by Landlord)
- A/V equipment (provided by Landlord). Final equipment list TBD after proposal acceptance.

Communications
- Level 0 & 1 systems: Provide 1X V/D wall drop within millwork (2 X RJ45 & AV each)
- Level 0 systems: Provide 1X V/D wall drop behind the TV (2 X RJ45 & AV each)
- Level 0 & 1 systems: Provide 4X V/D wall drops (2 X RJ45 & AV each)
- Level 0 & 1 systems: Provide 1X floor boxes (4 X RJ45 & AV & power each)
- Level 1 systems: Provide 1X V/D drop on exterior wall of entrance door (2 X RJ45 each)
- A/V interconnections within room (provided by Landlord). Final connections list TBD after proposal acceptance

Lighting
- LED fixture with LED Tube 20w T8.
- Combination task lighting and moderate ambiance lighting LED preferred
- Light Level: 0 - 500 lux variable
- Lighting Control: Controller fully dimmable multi programmable, to incorporate controls of equipment and environment. Suggested source Crestron
- Night Light / Emergency Lighting

Electrical
- Two duplex receptacle located adjacent to the Voice Data/cable outlet
- One duplex receptacle on each hard wall of the room
- All wall receptacle connected on a 15 amp circuit from the normal power panel
- Each floor receptacles will be fed from their own circuit
- Provision for a wall mounted receptacles at the main screen location.
- Provision for point of connection at the drop down projector in ceiling.

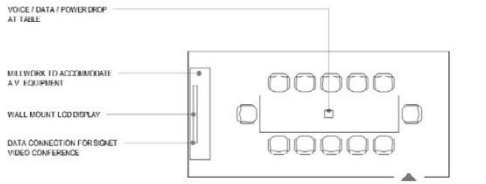
Mechanical
- HVAC provided from the main building system. The amount of cooling and heating must be sufficient to maintain design criteria of the project brief part 5.
- Control to maintain the comfort level whatever the occupancy is.
- Meeting rooms shall be an individual zone

Acoustical
- STC Rating: 45

Special construction
- A\V infrastructure required in walls and floor.
Conduit and raceway infrastructure
- Provision for Audio Visual system with wall mount speakers and microphone
- Provision for Cable TV

Indicative Layout 30 sq.m

ARRANGEMENT 1



ARRANGEMENT 2