

## **EPA SUBMISSION BY CONSULTANTS' TEAM LEADER G LAMBERT- ARCHITECT**

- 1. Name of Project -** Faculty of Health Sciences Building Project
- 2. Name of Company/  
Institution-** The University of Guyana
- 3. Contact Details-** Dr. Rudolph Cummings-Dean UG Faculty of Health Science  
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- 4. Document  
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- 5. Description of Site-** The building site measures approximately 140' x 135' located directly north of the existing Faculty of Health Science Building on Area "L" Block "M" Turkeyen Greater Georgetown, Guyana.
- 6. The Project Design-**

The building (See Figure 1) is a "L" Shaped 45' wide 3 storey steel framed Building, having 117' on its north-south wing, and 90' on its east- west wing.

The building will accommodate, classrooms, anatomy, microbiology, and bio-chemistry laboratories on the ground floor; classrooms on the first floor, and offices and conference rooms on the second floor, having a total building floor area of 22,275 Square feet.

During the construction process, the building operations will use the existing, GWI & GPL infrastructure, but will provide its own waste disposal/management systems.

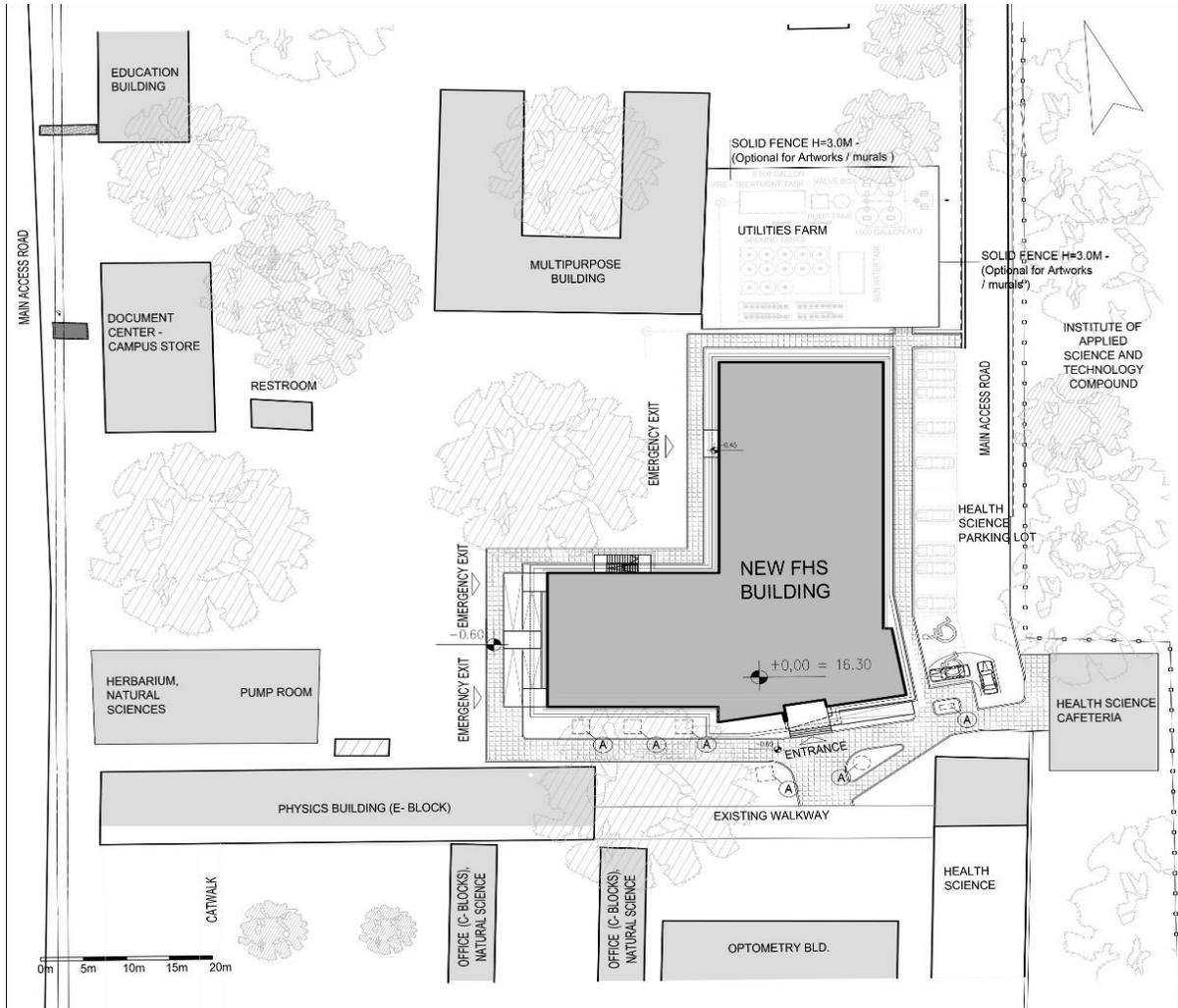
The building is designed as a L-shape three storey building, located in the SE corner of the project site. (*Fig. 1*). The Main Entrance is located in the SE corner, which provides easy access from the parking and the main access road. Also, the entrance is located close to the existing entrance of the present FHS Building and its sheltered walkway, provides stress-free circulation of students between the two Faculty contiguous buildings, and the entire Campus. This solution also provides an option for direct linkage between both FHS buildings. This location of the main Entrance enhances the circulation ergonomics among the entire campus master plan. The two emergency exits accommodate the emergency evacuations from ground, first and second floors, and are positioned at the western side of the north-south wing, and at the eastern side of the east-west wing of the building. These exists provide egress and ingress to a defined green open area populated a luxuriant mature saman tree, forming a beautiful landscaped background, and a pleasant space for recreational activities of the entire campus students and staff.

The parking area has capacity for 17 vehicles, including 2 places for use by physically disabled persons.

An external drainage system for collecting storm water. The new drainage will be aligned to the existing campus drainage network.

There are several spaces in and around the building for artworks (murals) monuments and sculpture installations.

The utilities farm will be located north of the building (see Figure 1), directly west of the access road, and fenced with restricted access to students. A portion of the fence is identified for inclusion of artworks correlated by the University's Department of Creative Arts, for designs of murals and paintings.



**Fig.1. Building location**

The Laboratories (except the Skills lab) are located on the ground floor, and are provided with storage rooms. Lab equipment and a 4 theatre-styled classrooms are also located on the ground floor. These labs will have office space for a Technologist/supervisor. Labs will have antechambers as cloakrooms and storage.

The first floor is designed to accommodate 350 students and Staff, and for study and recreation groups, five Classrooms with capacity for 50 students each, and two Classrooms for 75 students each, and a Common Room.

The second floor will accommodate the Administration Block in the North-south wing, while the FHS Library (with a Reading & Study Lounge), along with two Classrooms of 50 students each. At full capacity this second floor is designed for an estimated 230 students and Staff.

## SUSTAINABLE AND GREEN BUILDING INITIATIVES

### - Thermal Insulation & passive shading:

50mm polyurethane as thermal insulation is to be installed on the roof. Thermal insulation for external walls was not considered due to the fact that the applicable standard (ASHRAE 90.1) for the relevant region does not require it, especially considering the budget constraints. The building does have thermal mass which would absorb and dampen swings in external temperature. Similarly, solar shading has been employed on the building.

The consultant has performed simulation for the shading and positioning of the Vertical louvers / Fins. Based on the results from simulation the Consultant has determined the optimal positioning and specific tilt/angle for the louvers on the different elevations in order to increase their efficiency.

Based on the results from design building simulations, the following solutions for external Fins shading have been utilized:

**Table 1 Recommendation on the tilt of the Shading Fins**

Elevation	Recommended option for the Fins tilt
South	10 deg. tilt of the Fins
West	-30 deg. tilt of the Fins
North	-10 deg. tilt of the Fins
East	20 deg. tilt of the Fins

The ASHRAE 90(2010 version 1) has been applied for energy performance, based on Guyana's Climatic Zone (Zone 1), with ASHRAE Standards for non-residential building surfaces, for all exposed surfaces (except the roof and framed walls).

### - Use of Natural ventilation and passive energy in the design:

Mechanically operable windows on external walls have been designed to have minimum free area of 4% of the floor area of the effective rooms area, to facilitate single sided natural ventilation.

### - Incorporation of solar power for secondary lighting:

Considering the latitude of Georgetown (6.5°N) the whole roof area is suitable for placement of PV panels. with preference for the Southern and Eastern & Western slopes of the roof

A futuristic plan for installation of solar power can be easily incorporated into the building. The wiring for connection, battery storage and configuration has been catered for based on system specifications. All Photovoltaic (PV) solar installations would be in keeping with the National Electrical Code 2019 (NEC).

The design provides DB as shown in Tab.2 below. As it might be seen for almost all of the components the proposed design meets the requirements set in the DB at almost 100%, just with few minor deviations. The Circulation area is the only component where the design solution exceeds noticeably the estimation of the DB (with +36%), but it has to be considered that the Design team has implemented all possible mitigation measures for optimization of the Circulation areas, including

double-loaded corridors, one staircase, reduced length of the corridors on the 1st and the 2nd floor, optimized width of the corridors. As additional mitigation measure, could be considered the optimization of area for the staff offices, where the required accommodation in terms of number of staff was achieved within 21% less area in comparison with the estimation in the DB. The total GFA of the building is 43 481 sq.ft.

### The Electrical Design

The Electrical system is designed in accordance with the National Electrical Code (NEC) and has been approved by the Government Electrical Inspectorate (GEI).

An overview of the design process is summarized below.

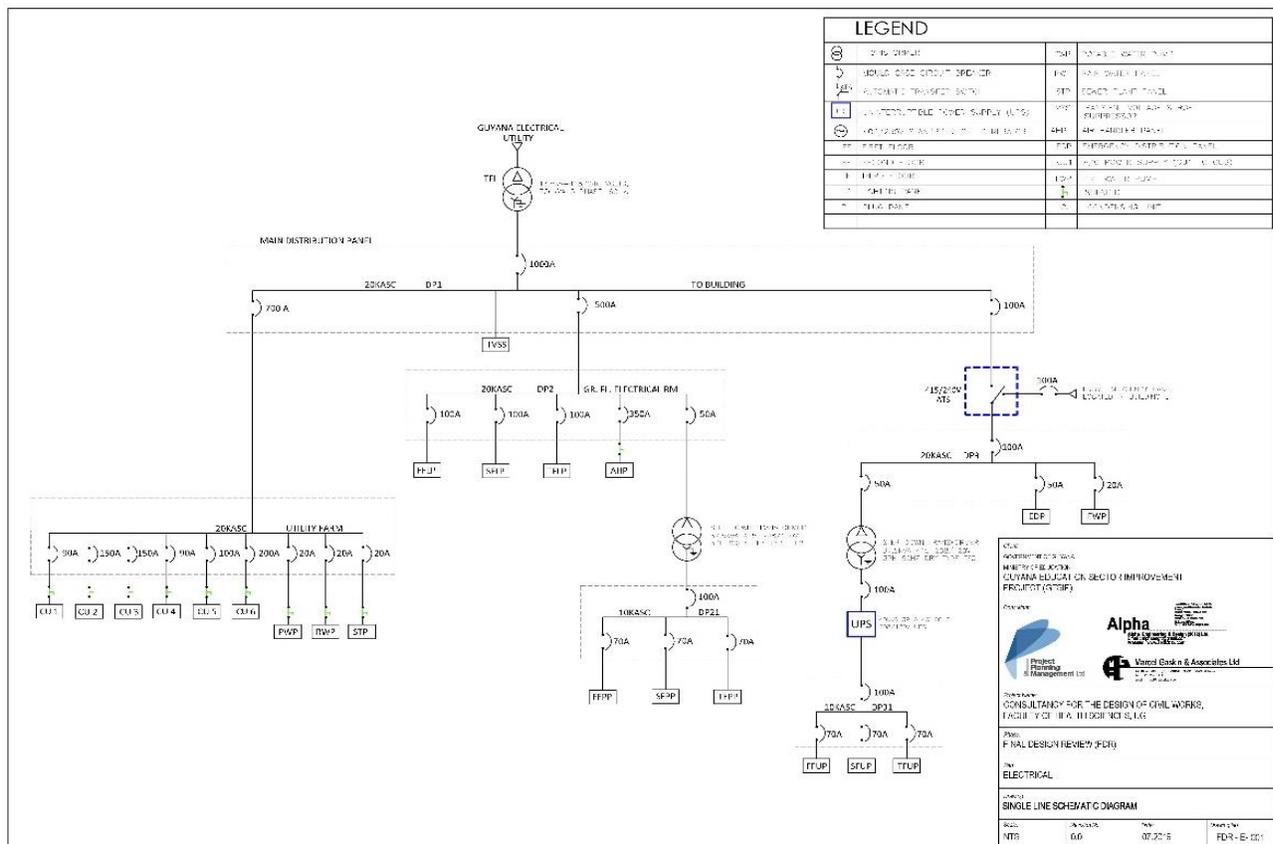
- General electrical requirements (e.g receptacles)
- Specialized electrical requirements (Like HVAC and WWTP)
- Internal and external Lighting Systems
- Electrical power distribution systems

The final electrical schematic Fig 2 below represents the electrical designs for the Building.

**Table2. showing the Building/Room Accommodation**

1	DESIGN BRIEF REQUIREMENTS					DESIGN PROVISION					RATIO
	2	3	4	5	6	7	8	9	10	11	12
space/function	capacity (seats)	no.	unit area (sq.ft)	approx. area (sq.f)	% of GFA	capacity (seats)	no.	unit area (sq. ft)	Total area (sq. ft)	% of GFA	DB to CD ratio
Common Classroom	50	11	850	9350	25%	50	11	861	9472	22%	101%
Common Classroom	75	2	1200	2400	6%	75	2	1206	2412	6%	100%
Research Laboratory	10	1	750	750	2%	10	1	689	689	2%	92%
Haematological/ Bio Chem Lab	30	1	1500	1500	4%	30	1	1550	1550	4%	103%
Microbiology with wet prep room	30	1	1750	1750	5%	30	1	1981	1981	5%	113%
Anatomy Lab	30	1	1500	1500	4%	30	1	1550	1550	4%	103%
Skills Lab	30	1	2000	2000	5%	30	1	1981	1981	5%	99%
Health Sciences Library	60	1	2000	2000	5%	60	1	1981	1981	5%	99%
Staff Offices	n/a	n/a	n/a	6250	16%	72	15	n/a	4908	12%	79%
Board room	n/a	1	300	300	1%	25	1	344	344	1%	115%
Common rooms	n/a	0	0	0	0%	n/a	2	1496	1496	2%	n/a

Sub-total			11850	27800				27727		99%
ancillary spaces				2880	8%			2756	6%	96%
building services				1440	4%			1270	3%	88%
Circulation				5760	15%			7858	18%	135%
Gross Floor Area (GFA)				37880				43 481		115%
Footprint				12627				14 494		115%



**Fig 2. Electrical Schematic**

Load requirements for the building were determined to be 750kVa with majority of the load demand from the 200 Ton VRF (Variable Refrigeration Flow) HVAC system. The proposed location for the transformer is in the area north of the building near the external services see 1.6.2 below.

*Standby power is designed and specified in accordance with the design brief. The building is connected to the existing generator in Building L, with emergency power being supplied to the lighting and fire protection and warning services.*



**Fig 3. Transformer Location**

Due to the unreliable power supply and voltage fluctuations experienced on the UG campus an uninterruptible power supply (UPS) was designed to regulate the voltage to within acceptable limits based on the proposed equipment to be utilized. The UPS feeds electrical sub-panels on each floor which are dedicated to computers and sensitive equipment.

Power receptacles for each room were located based on the code specifications and Client requirements from the design brief, which included outlets at stations, fixed seating, AV power and ceiling projectors.

Lighting has been designed in accordance with the requirements for the facility. The final lighting layout is configured to the size and layout of each room. LED light fixtures were specified to reduce power demand and allow flexibility in the system.

The electrical designs were reviewed and compared with the final Architectural Ceiling plan and HVAC layout to identify any conflicts between the disciplines. Where conflicts were identified the drawings were revised and updated for the contract documents. A full set of the electrical designs are included

## **1. Potable Cold Water Supply**

The domestic cold water supply shall be delivered from above ground storage tanks of approximately 20,000 gallons in total. A dedicated potable water duplex pump set with duty/standby capabilities and auto changeover shall feed sinks, wash hand basins and bib taps throughout the building. PRVs shall be strategically located throughout the pipework network to provide adequate system balance and to minimize leakage at joints. A multimedia depth filter shall be installed as part of the potable water system.

## **2. Hot water**

Hot water at specific lab locations shall be provided by tank-less, instantaneous water heaters. Client is still to provide those locations. Tank-less water heaters are more energy efficient than the storage type.

## **3. Rainwater Harvesting System**

A 7000 gallon below ground concrete tank with elastomeric cementitious coating supplied c/w submersible pump assembly with pressure tank, valves and pipework and UV disinfection unit. Electronic controller, solenoid valve, gauges, overflows and downspout filters shall also be installed as part of the packaged rainwater harvesting system

## **4. Sanitary Drainage**

Soil, waste and vent pipes within the confines of the building have been designed to flow into the building drains & sewers with final connection into a 9000 gallons Pre-treatment tank and 4 No. 1500 gallons Aerobic Treatment Units (ATU) assembly. Final discharge of effluent will first be treated by 2 No. UV disinfection units before being released into a surface drain or water way.

## **5. Pipework**

Schedule 40 PVC pipework shall be utilized for the potable water supply. DWV SCH 40 PVC for drainage. CPVC for hot water pipes.

## **6. Fixtures**

The plumbing fixtures to be specified in the rest room areas shall be of the automatic flush valve type throughout c/w sensors. Faucets (automatic) to facilitate cold water and hot water supply. Low flow fixtures and faucets shall be incorporated in the design.

## **7. Fire Protection**

The Fire Protection system for the building is designed in accordance with The Guyana Fire Services and NFPA standards. Where contradiction occurs between the two, the requirements of the Guyana Fire Services take precedence. As a summary to these criteria, the following design approach is offered. The building will be protected by a class II Hose Reel Standpipe System with hose cabinets, pressure reducing valves, drains etc. located throughout the building. The system will be served from water storage tanks with a total fire water reserve capacity of 6000 gallons (60 minutes) through the use of a dedicated hose reel fire water simplex pump set c/w jockey pump. The pump shall be sized to ensure a minimum residual head of 65 PSI and a minimum flow of 100 GPM.

Hydrants as desired by the Water Department of the Guyana Fire Services shall also be installed. Fire Water pipework installed internally and externally shall be routed in black steel. Pipework installed below ground shall be schedule 40 PVC.

The Hose Reel System design and installation will perform in accordance with NFPA 14 and NFPA 20. Portable Fire Extinguishers and are located throughout the building to give the highest level of protection required for Class A, B, C & K types of fires; 10lbs multipurpose dry chemical fire extinguishers are located throughout the building with travel distances to any no further than 15.25 m from an extinguisher. Neon extinguisher signs will identify each extinguisher .

The combined system shall initiate an alarm at the FACP when activated.

All plumbing plant and equipment will be interface-able with the BMS. Controllers to be by the respective equipment vendors with BMS interface-ability.

## **8. Project Expenditure &**

### **Size-**

The project is projected to incur an expenditure of over US\$6M, with equipment and furniture projected to cost over US1M. It is expected over its duration to accommodate the following group of workers-

<b>Type of workers</b>	<b>Approximate Numbers</b>
Site Supervisor	<b>1</b>
General Foreman	<b>1</b>
Health, Safety & Environment Officer	<b>1</b>
Technicians	<b>2</b>
Carpenters	<b>10</b>
Welders	<b>5</b>
Masons	<b>10</b>
Steel Benders/fixers/Riggers	<b>10</b>
Painters	<b>10</b>
Heavy Equipment Operators	<b>5</b>
Mechanics	<b>4</b>
Truck/Roller Drivers	<b>6</b>
Traffic Control Officer	<b>1</b>
Semi-Skilled Workers	<b>14</b>
Labours	<b>20</b>
<b>Approximate Total</b>	<b>100</b>

## **9. Project Objective-**

The project is expected to facilitate the construction of a new Faculty of Health Science building that would: -.

- ✓ Improve on a sustainable basis, the capacity of The University of Guyana to specify world class medical education.
- ✓ Reinforce the University of Guyana’s role as a leader in the development of the nation by providing internationally accredited tertiary education and research facilities.

- ✓ Enhance the University of Guyana’s ability to generate income that will sustain and enable the continual development of tertiary education and research in Guyana.
- ✓ Create a purpose-built building for the Faculty of Health Sciences that reflects the importance placed on its students, staff and its role in the university.
- ✓ Create a working and learning environment that specifies inspiration for students and staff, contributing to their well-being and supporting them to achieve their full potential.
- ✓ Create a sense of connectivity and shared values between staff and students across all disciplines throughout the building.
- ✓ Ensure that the building is accessible and welcoming to all users.

**10. Project Duration-**

The project is expected have a construction period of approximately 18 months.

**11. Environmental Management Plan (In reference to the EP Act of 1996 (Amended in 2005))**

The design of the building caters for the protection of users from biological and environmental risks and minimizes the potential health risks to its users.

**Table 3- Summary of the Project Impact Analysis (EMP)**

Environment Ranking Criteria	Details
D-Duration of incidence	Short term (2 years ≥ 1); Medium term (2-3 years); Long term-( ≤3 years)
PO-Probability of Occurrence	H-High=3; Moderate=2; Low=1
GE-Geographic Extent -	Within FHS=1; Within Campus=2; Outside Campus=3
R-Reversibility	Reversible=1; Irreversible =2
NI-Nature of Impact	Beneficial + +1; Adverse+-1
Risk Score=(D+PO+GE+R) x NI	
Symbol- -ve Negative; +ve Positive	
S- Significance	Beneficial Impacts- High≥+9; Moderate ≥6-8; Low ≥+5 - Adverse Impacts- High≥-9; Moderate -6 ≥-8; Low≤-5

- a)** With respect to the effect of piles being driven, and the potential impact on nearby buildings, the contractor will erect appropriate sound barriers and use a variable frequency hammer over pile heads, to mitigate this short-term low probability impact.
- b)** With respect to the impact of construction debris on the campus community the contractor will confine waste to appropriate safe waste disposal areas, ensuring waste disposal operatives have safety gear and equipment, in order to mitigate this short-term low probability impact.
- c)** All site generated sewage will be disposed by portable w.c cubicles, to ensure that untreated sewage is not discharged in campus drains.
- d)** The impact of short-term low probability air pollution generated by construction plant and equipment, will be mitigated through use of low CO<sup>2</sup> emitting machinery, and water spraying.

**12. Environmental Closure Plan.**

The approach for closure of the UG FHS Project will be closure by removal, as all construction waste, plant, vehicles, decontamination of site and equipment and removal of temporary Offices at attainment of practical completion of the building; the supervising Consultants will review the Contractor’s Closure Plan when the Projects Bidding process is completed, and EPA will be issued with that Report for its **Certification of Closure**..

**13. Alternative access for UG FHS Students & Staff (See Figures 1-7).**

Access to the UGFHS and the Canteen at the north east point of the existing building will be facilitated through rebuilding existing walkways to make all ingress& egress and emergency exists wheelchair accessible.



**Figure 1-Main Access to Site (there will be installed at the entrance, temporary metal ramp over northern drain of the main road, in order to temporarily use the UG Playfield to allow rotation/loading of 75' R.C Piles on site)**



**Figure 2-Main Site Access with the Canteen at its South// eastern side, access to which will be from the walkway on the existing FHS east side(see Figures 6 & 7)**



**Figure 3-Existing FHS East walkway to its Main Entrance to be rebuilt & upgraded before construction phase of Project**



**Figure 4-Existing covered walkway to the existing UG FHS, site barriers to be erected between walkway and site.**



**Figure 5-Main access to existing UG FHS through covered walkway to be rebuilt & made wheelchair accessible-Project Site shown at right**



**Figure 6-Walkway directly east of FHS to be used as emergency exit during project, for Building and Canteen. To be repaired for wheelchair accessibility.**



**Figure 7-Walkway directly east of FHS to be used as emergency exit during project, for Building and Canteen, the main site shown above.**