

The background of the slide is a colorful illustration. At the top, there's a city skyline with various buildings in shades of blue. Two hot air balloons, one red and yellow striped and the other blue and white striped, float in the sky. Below the skyline, a large white rectangular box contains the main title. In the foreground, there's a green park area. On the left, a man in a blue sweater and dark pants stands looking at his phone. In the center, a woman in a red and white striped shirt and dark pants walks a brown dog. To her right, a group of people are sitting on the grass, some with laptops. On the far right, a woman in a blue skirt and red top sits on a wooden bench. A young boy in a white shirt and blue pants walks towards the center. The overall scene depicts a busy, healthy community.

UIA YEAR OF DESIGN FOR HEALTH

AN EMERGENCY APPROACH TO THE DESIGN AND CONSTRUCTION OF THE GHANA INFECTIOUS DISEASE CENTRE IN THE TIME OF THE COVID- 19 PANDEMIC

BY
Arc. Fiifi Y. Sam-Awortwi



My name is Arc. Fiifi Yasebi Sam-Awortwi and I would be representing UIA –Region V(Africa) in this years design for health event.

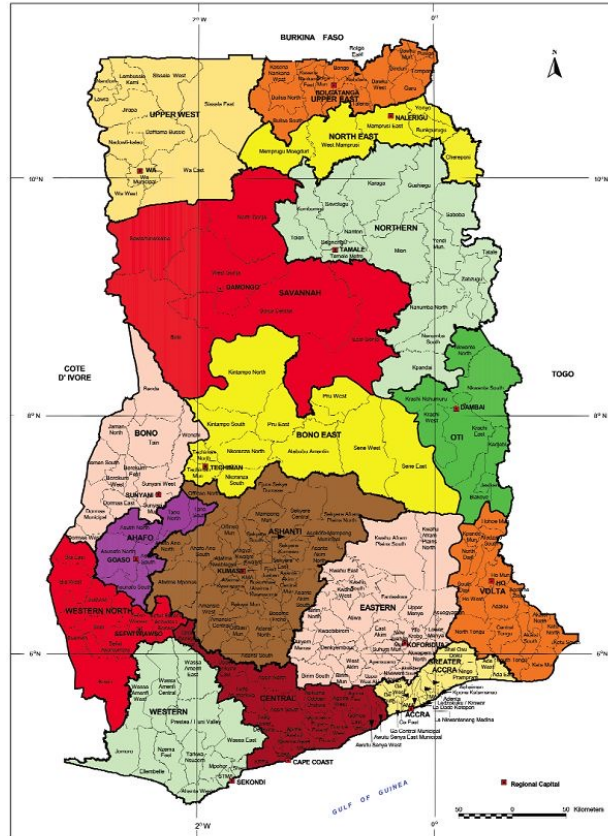
I am the deputy Construction Project Manager and Member of the Design Team for the Ghana Infectious Disease Center (GIDC) situated at Kwabenya, a suburb of Accra, Capital of Ghana.

This facility is a 108 Bed infectious Disease Centre , **designed and built within 3 months during the period of lockdown** by the Built Environment Professionals and Private Sector players, with support from the Ghana Army and other Government Agencies.

This presentation is based on my personal experience and research while working on the project.



A little about my country Ghana.....



Location - West Africa

Population - 31 million

Land Area - 238,535 km²

Capital City- Accra

Major Exports

- Gold, Cocoa



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BRIEF OVERVIEW.....

Rapid Process of events . . .

Research, Design Process, Working Teams

Construction Process



The Project is private sector led and was initiated by a philanthropist ,Senyo Hosi and his team of private sector leaders of industry through an SPV...



GHANA **COVID-19** PRIVATE SECTOR FUND

In the atmosphere of Patriotism and Volunteerism, the Ghana Institute of Architects offered its services as its Cooperate Social Responsibility and rallied allied professionals in the built environment to participate.



GHANA INSTITUTE OF
ARCHITECTS



GHANA INSTITUTION
OF ENGINEERS



GHANA INSTITUTION
OF SURVEYORS



GHANA INSTITUTE
OF PLANNERS



GHANA ARMED
FORCES

FIRST EVER PROJECT UNDERTAKEN JOINTLY BY THE BUILT ENVIRONMENT PROFESSIONAL ORGANISATIONS!



**UNIVERSITY
OF GHANA**

Noguchi Memorial Institute
for Medical Research



**GHANA
MEDICAL
ASSOCIATION**



PROJECT ACCOUNTANTS



EY

Building a better
working world

PROJECT AUDITORS



MENDANHA & SOUSA

CONSTRUCTION

**The
Multimedia
Group**

MAIN MEDIA PARTNERS

Citi 97.3



DESIGN BRIEF / OBJECTIVES

- QUICK CREATION OF A SPACE FOR CONTAINMENT (TEMPORAL STRUCTURES WERE UP FOR CONSIDERATION)
- MINIMISING THE RISK OF INFECTION TO HEALTHWORKERS
- DIGNIFYING PLACE FOR THE SICK



APPROACH – 2 PRONGED STRATEGY -“DESIGNING AND BUILDING”

CORE DESIGN DELIVERY TEAM



Arc. Kofi Essel Appiah
PROJECT MANAGER



Arc. Fiifi Y. Sam-Awortwi
DEPUTY PROJECT MGR.



Arc. Ruth-Anne Richardson
PROJECT ARCHITECT



Arc. Richard Dadey
HEALTHCARE CONSULTANT

CORE CONSTRUCTION DELIVERY TEAM



Lt. Col AB Tekyi
PROJECT MANAGER.-ARC.



Arc. Fiifi Y. Sam-Awortwi
DEPUTY PROJECT MGR.



Capt. KA Arthur
CIVIL ENG./OPERATIONS



Lt.(GN) M Bampoe
CIVIL ENGINEER/SAFETY.



Flt. Lt. INA Tetteh
PROJECT ARCHITECT



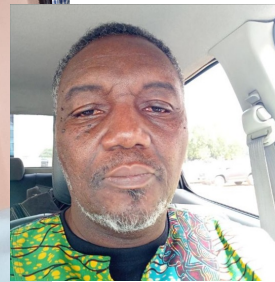
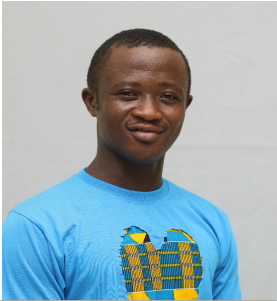
Capt. FS Khako
ARCHITECT

CONTRACTOR

Mendanha and Sousa Construction Ltd.



CORE DELIVERY/ SUPPORT TEAM....



REFERENCE MATERIALS, RESEARCH ... AND INSPIRATION...

Many reference materials were sought,
But with the **urgent nature of this assignment**, our main reference document was;

'GUIDELINES FOR COVID-19 QUARANTINE AND TREATMENT CENTERS IN THE ETHIOPIAN CONTEXT'

Produced by the Association of
Ethiopian Architects (AEA action against
Covid-19 task force) as a
recommendation to the Federal
Ministry of Health.



Public Document shared on AUA
social media handle

GUIDELINES FOR COVID-19
QUARANTINE AND TREATMENT
CENTERS IN THE ETHIOPIAN
CONTEXT

**GUIDELINES FOR COVID-19
QUARANTINE AND TREATMENT
CENTERS IN THE ETHIOPIAN
CONTEXT**

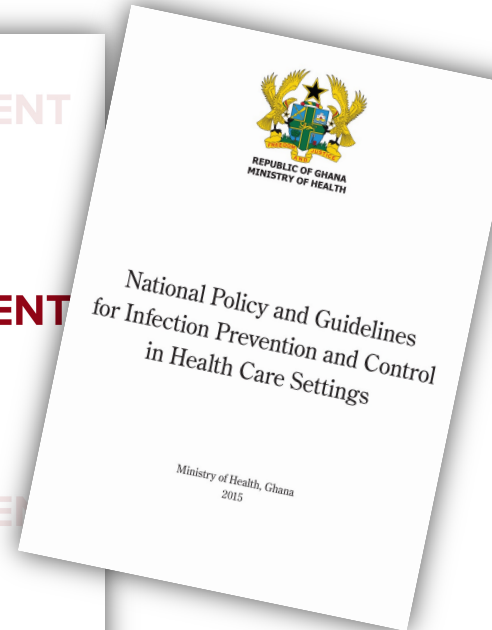
GUIDELINES FOR COVID-19
QUARANTINE AND TREATMENT
CENTERS IN THE ETHIOPIAN
CONTEXT

**SPATIAL AND ENGINEERING REQUIREMENTS OF THE PHYSICAL
STRUCTURE**

PRODUCED BY THE **ASSOCIATION OF ETHIOPIAN ARCHITECTS**
'AEA ACTION AGAINST COVID-19' TASKFORCE
AS A RECOMMENDATION TO THE FEDERAL MINISTRY OF HEALTH

First Edition
31 March 2020

■ ■ አ.አ.ማ
■ ■ AEA
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ASSOCIATION OF ETHIOPIAN ARCHITECTS



1,000 hospital built in 10 Days in Wuhan!!

CONTEXT

GUIDELINES FOR COVID-19 QUARANTINE AND TREATMENT CENTERS IN THE ETHIOPIAN CONTEXT



This document was readily useful at this moment due to the following reasons;

Summarised and straight to the point, addressed the basics.

The Contents of this guideline largely covers the following areas;

- Nature of the Covid-19 Virus
- Review of existing local and international standards
- Case studies on Covid-19 Quarantine and Treatment Centers
- **Spatial and Engineering requirements and recommendations for the physical structure for Covid-19 Quarantine and Treatment makeshift Hospital**

PROJECT SITE . . .

+Ga East Municipal Hospital

+Defects liability period

+Designated as a centre for isolation and treatment of Covid Cases in the South.



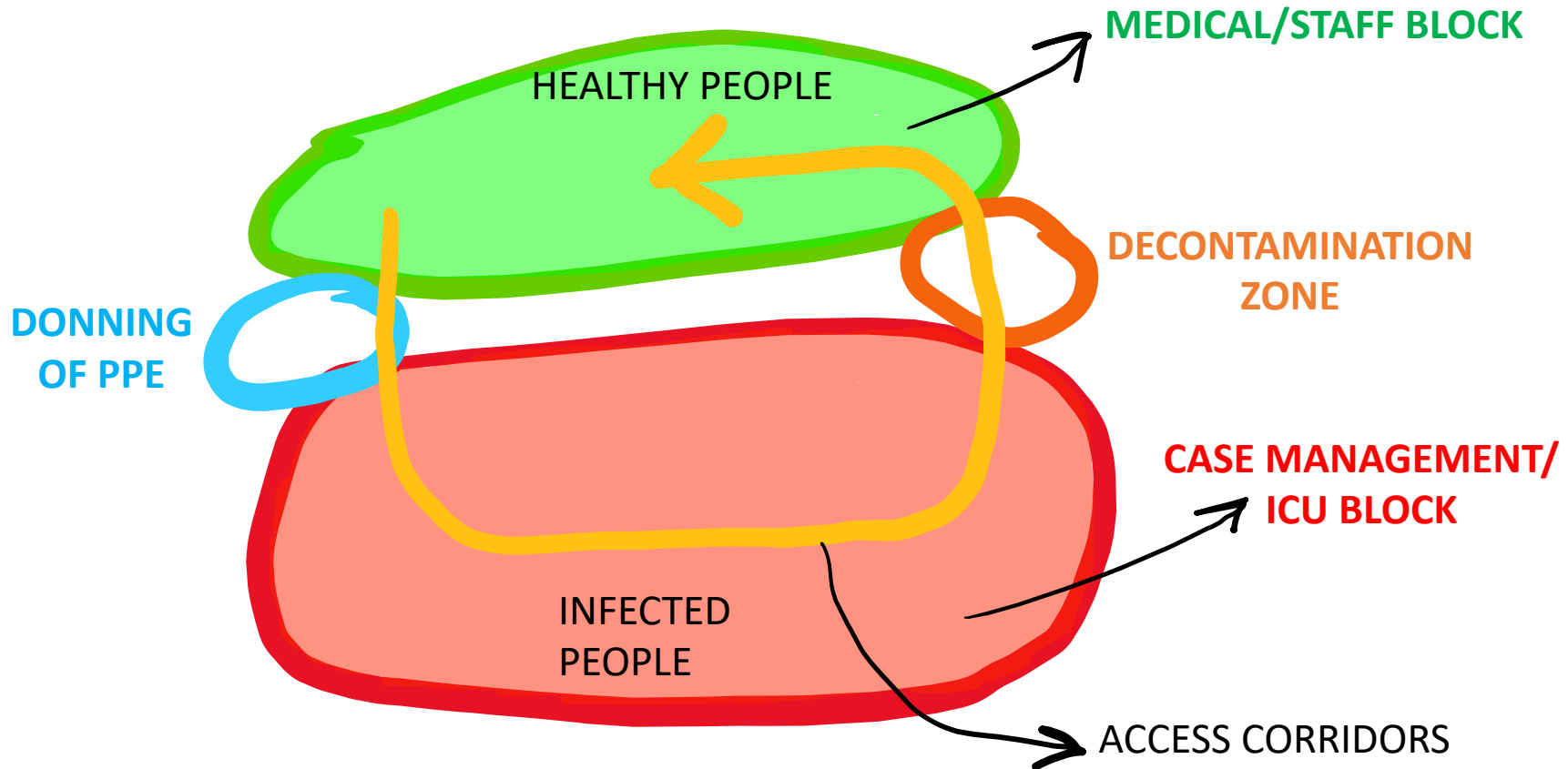
Site Selection. . . .

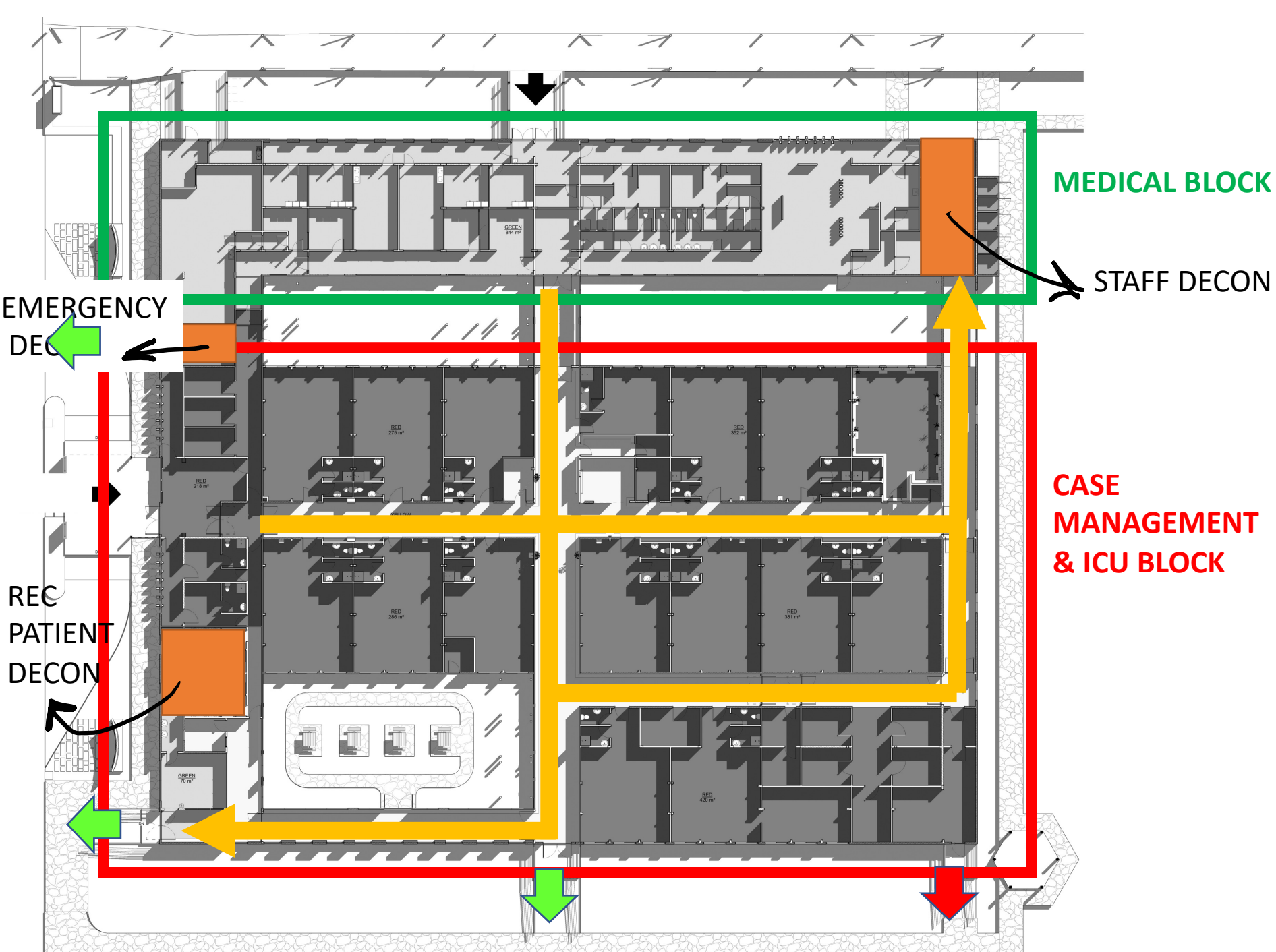
- Properly Zoned.
- Existing medical facilities to support the IDC.
- Medical staff here had already been trained to handle COVID-19

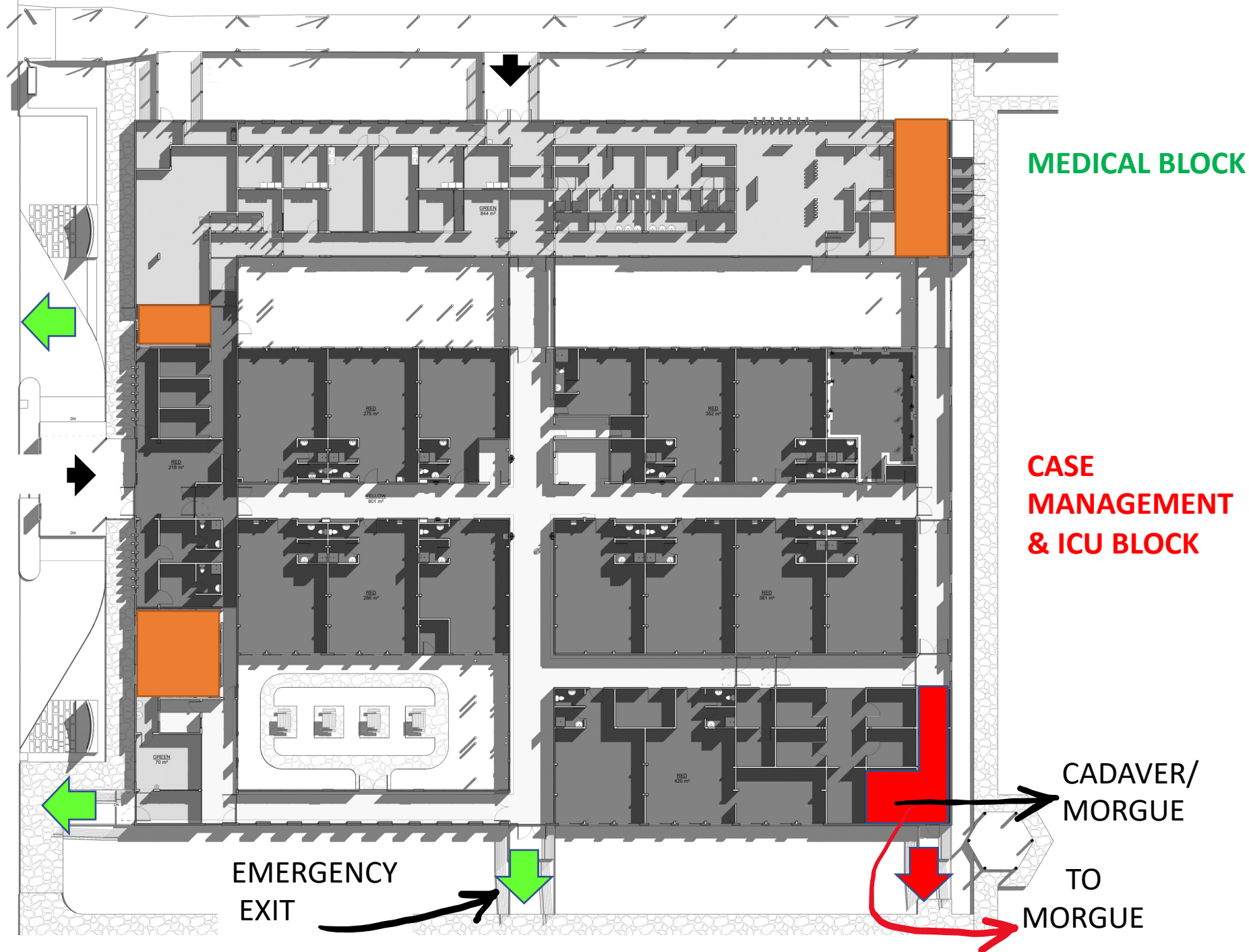
Translating the Literature into Architecture.... **DESIGN CONCEPT**

FACILITY USERS - **HEALTHY PEOPLE** AND **INFECTED PEOPLE**

NEED TO ZONE THE SPACES and create DEFINED CIRCULATION PATHS according to the HEALTH STATUS OF THE USER







**BSL 2.5
LABORATORY**

ADMINISTRATIVE

CLINICAL STAFF

**GREENERY/
SEPARATION**

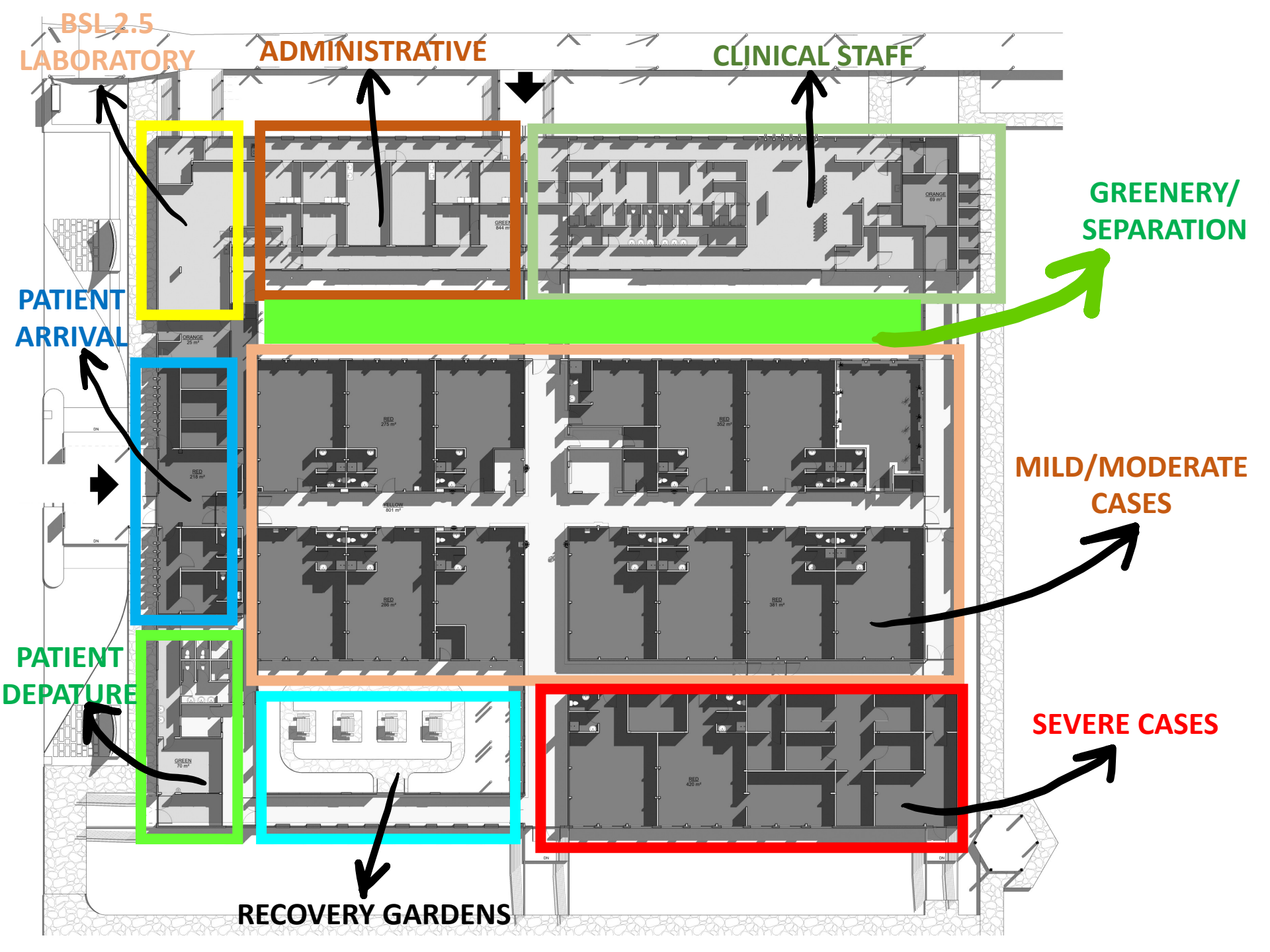
**PATIENT
ARRIVAL**

**PATIENT
DEPARTURE**

**MILD/MODERATE
CASES**

SEVERE CASES

RECOVERY GARDENS



STAFF & PATIENT ROUTES

TRIAGE

PRE TRIAGE/EN T.LOBBY

DECON ROOM

WAITING LOUNGE

HYGIENE AREA

DONNING AREA

CHANGING ROOMS

STAFF LOUNGE

NURSES STATION

DECON ROOM

CADAVA

ICU



GHANA INFECTIOUS DISEASE CENTRE- ANIMATION



Building Foot Print = 3,870 Sqm

Untitled Map
Write a description for your map.

- Legend
- Alameda Police Station
 - GA EAST MUNICIPAL HOSPITAL
 - Obama Alameda Energy Commission
 - Frederick Senior High School
 - Transitional Place
 - Higgins & Gills





DESIGN REVIEW SESSION - LABORATORY CONSULTANT



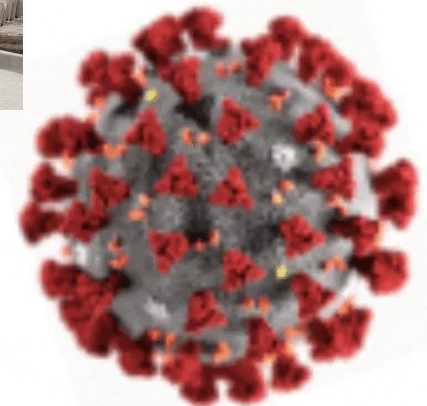
DESIGN/CONSTRUCTION REVIEW SESSION - WHOLE TEAM

COVID-19 Containment- AIRBORNE DISEASE CONTROL BY HVAC SYSTEMS

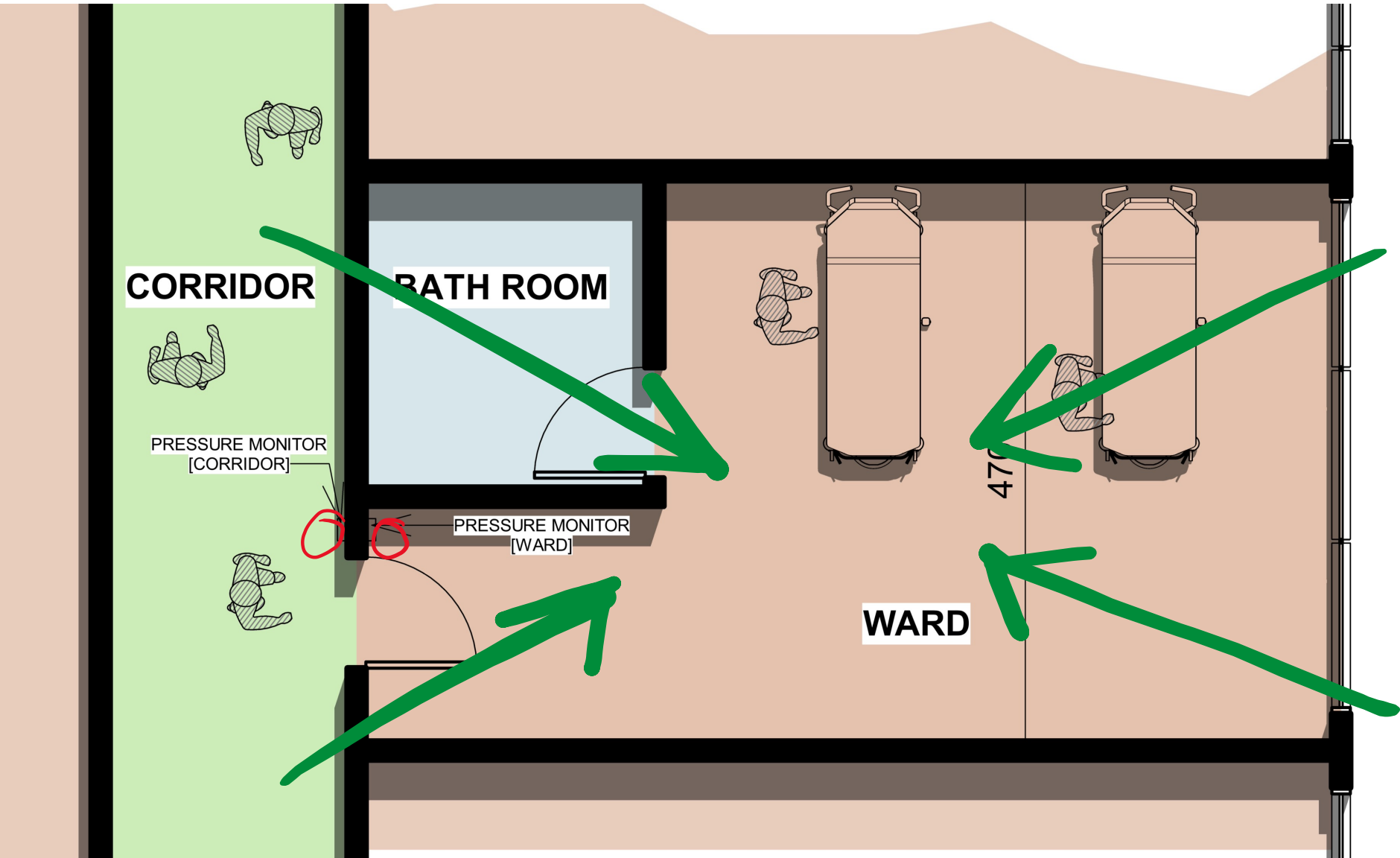
This portion of the research/Ref. material is by courtesy of Atlabach Consulting with its lead Consultant being **Robert Bachynski P.Eng** , a member of **ASHRAE** (American Society of Heating, Refrigeration and Air Conditioning Engineering)



ING. SAMUEL MAGNUS
ASIEDU



CONCEPT OF NEGATIVE PRESSURE

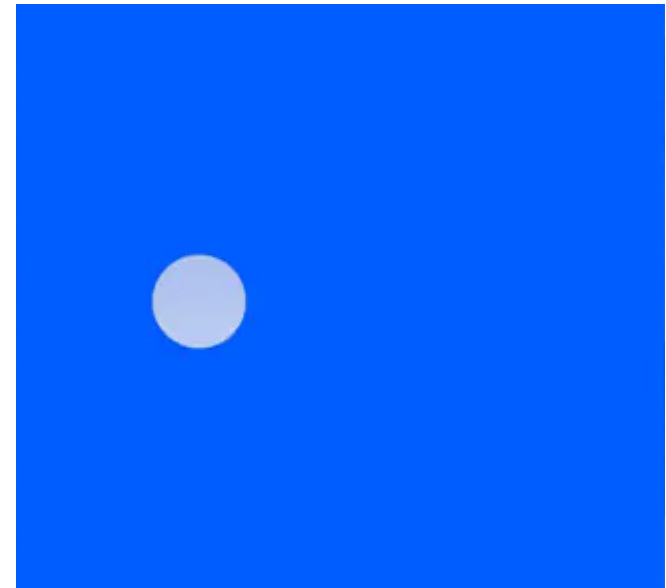
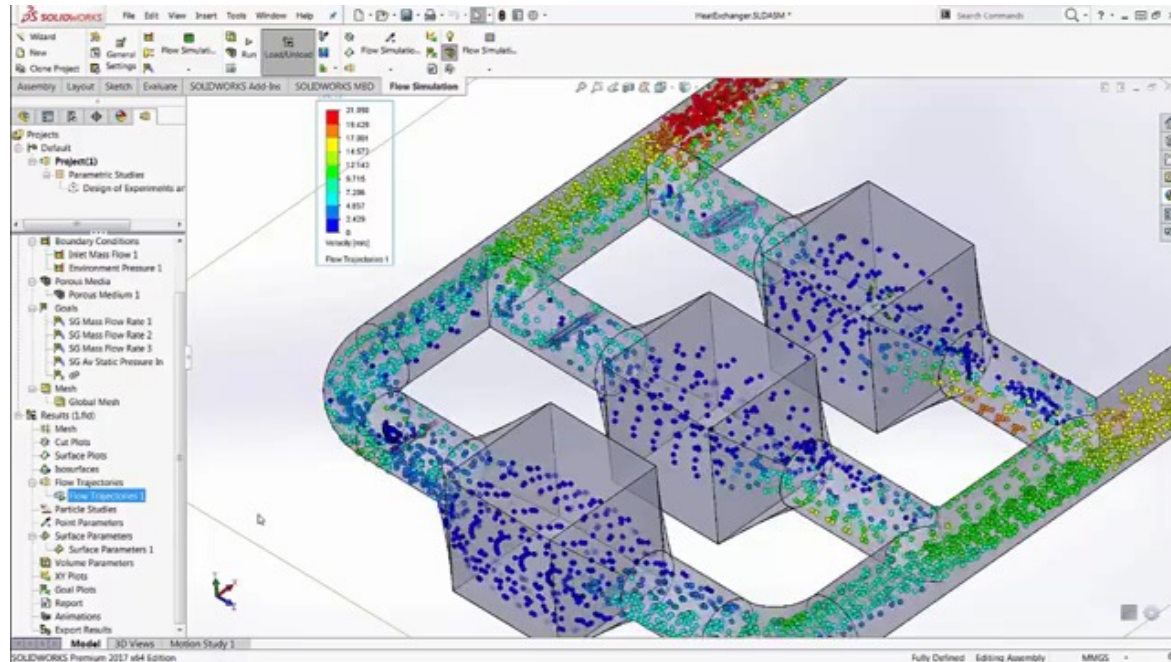


AIRBORNE DISEASE CONTROL BY HVAC SYSTEMS

-Air Change Rate and Dilution

-Relative Humidity (RH)

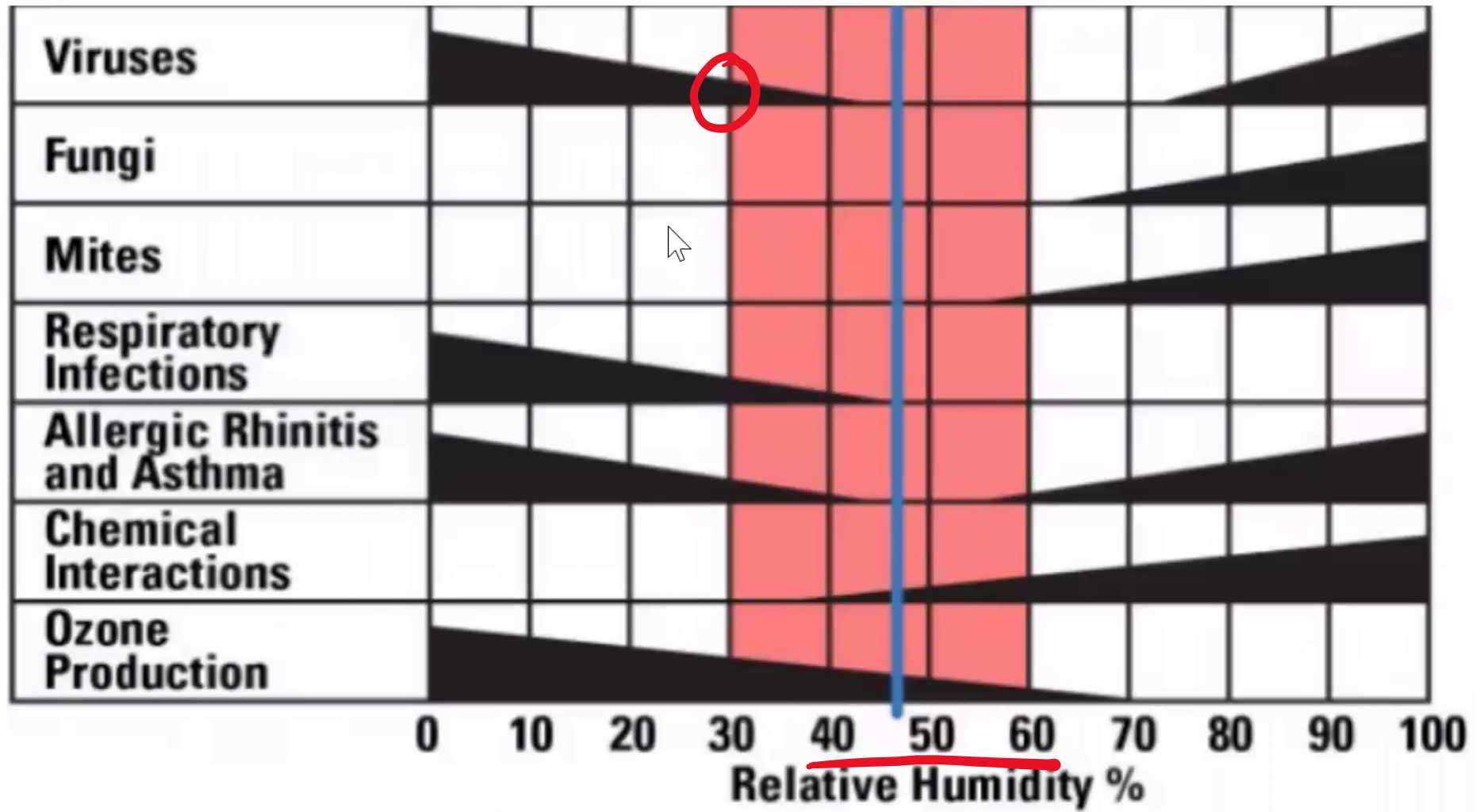
-Computational Fluid Dynamics (CFD) Modelling



Time to Provide 99% Dilution

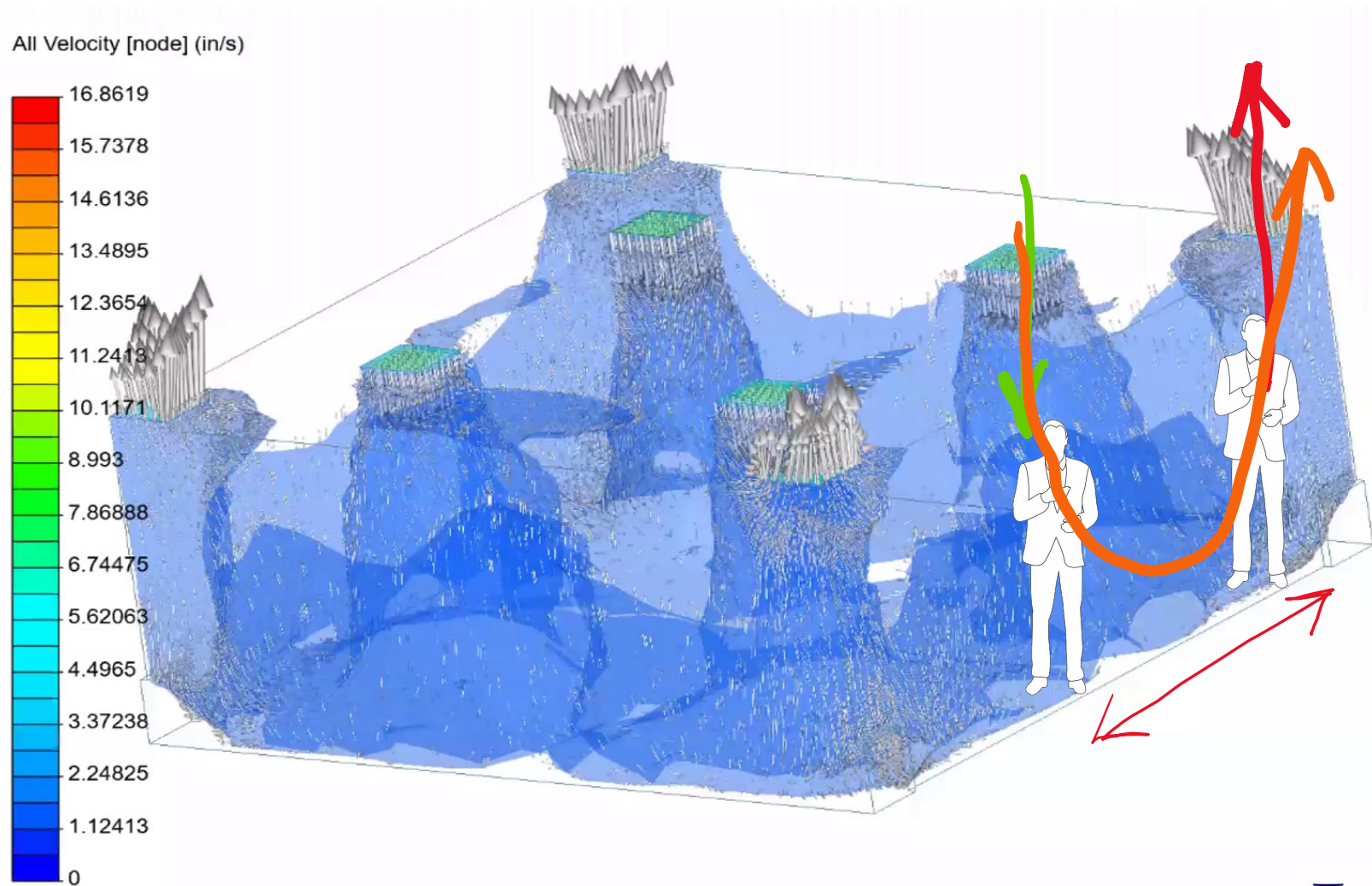
Air Changes Per Hour	Time Minutes
4	104
6	69
8	52
10	41

RELATIVE HUMIDITY- RH

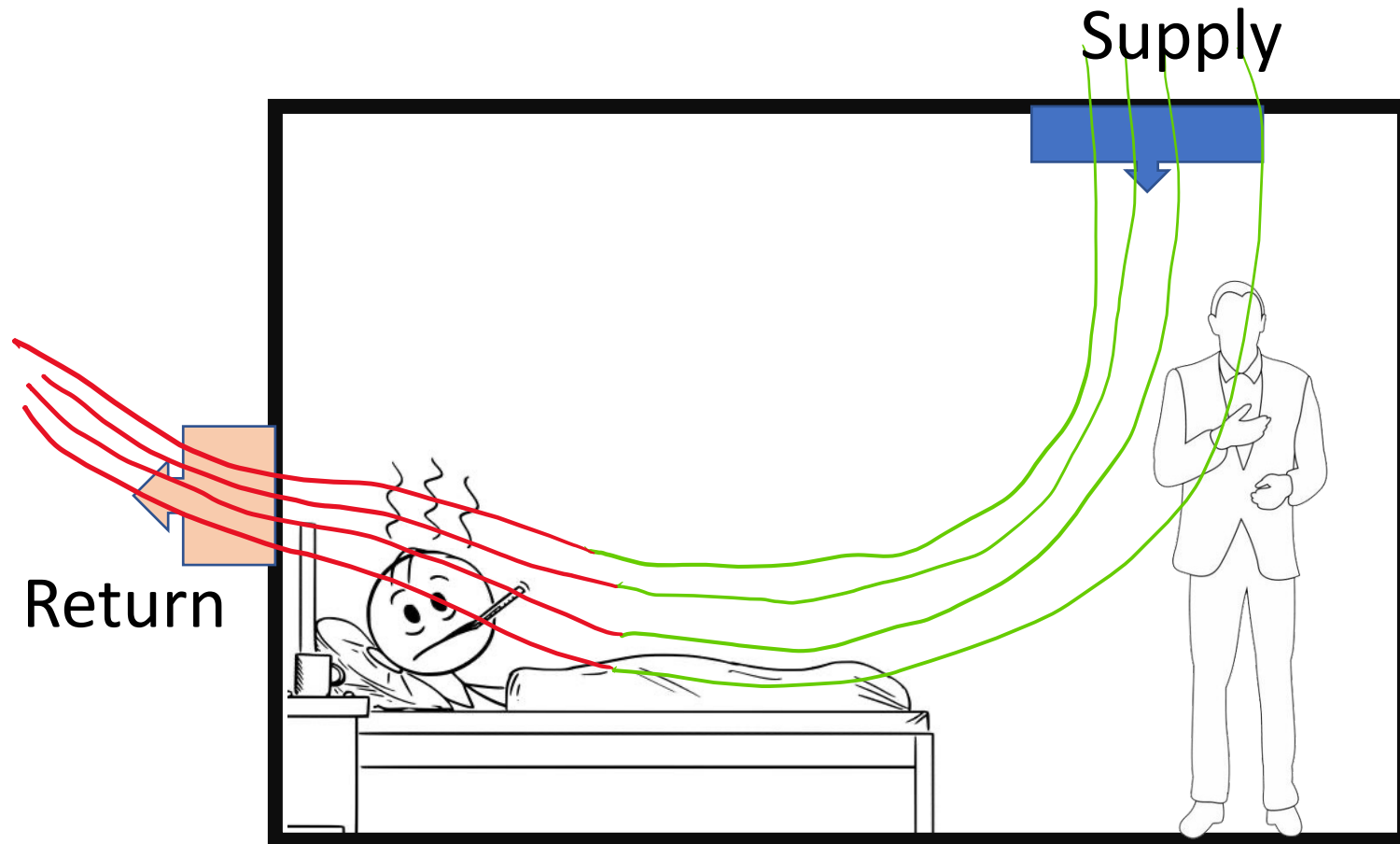


Optimum Humidity Range for Human Comfort and Health [ASHRAE]

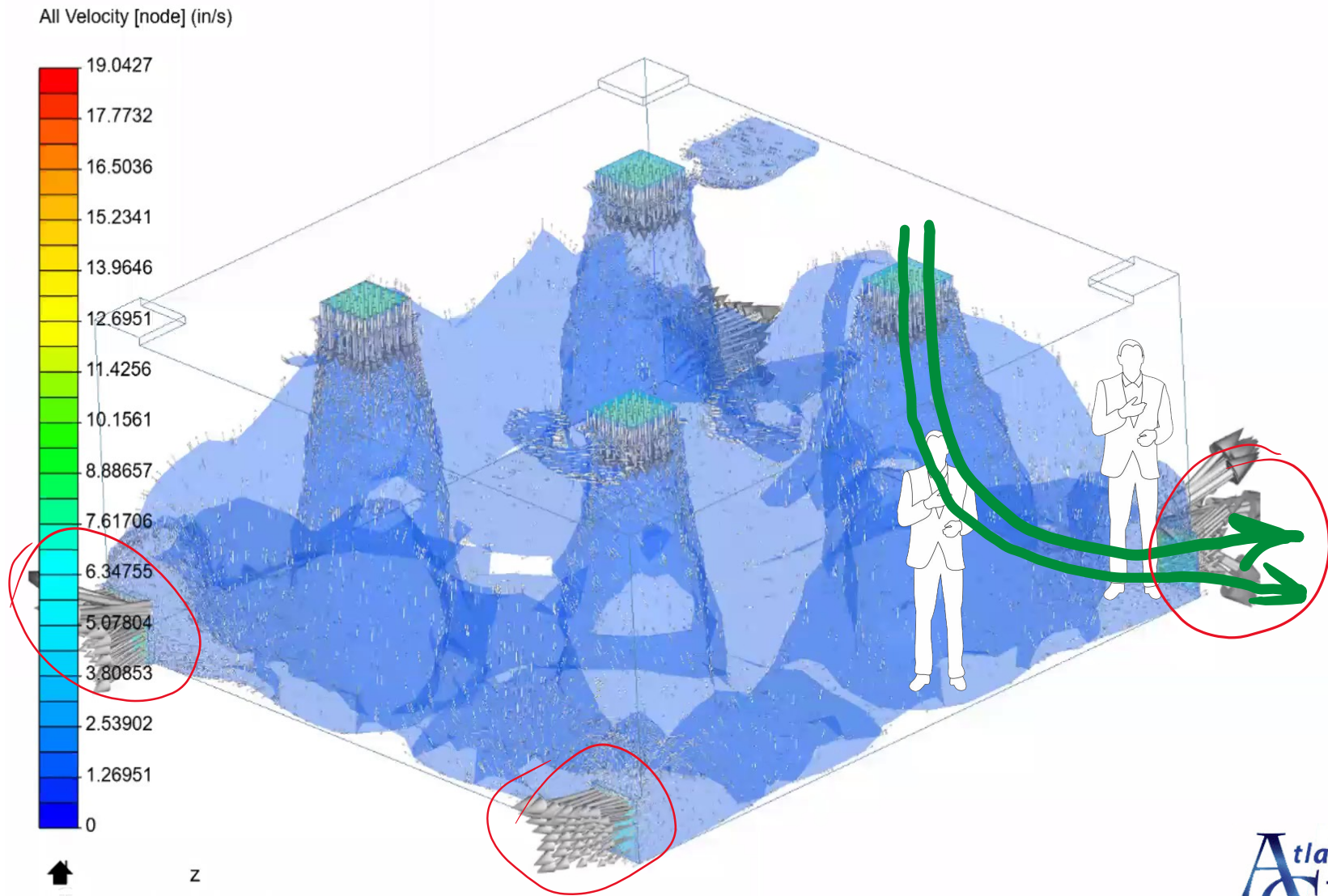
CFD Modelling of an HVAC system (6ACH) Ceiling Return



AIRBORNE DISEASE CONTROL BY HVAC SYSTEMS



CFD Modelling of an HVAC system (6ACH) Floor Return



AIRBORNE DISEASE CONTROL BY HVAC SYSTEMS

UVC Lighting and Filtration

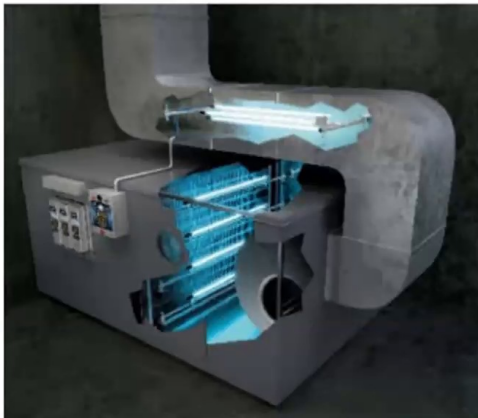
- + Radiation with wavelengths between 200 and 290 nm
- + Established to be able to kill the Corona Virus

Corona Virus's Can be filtered and disinfected to 99.99% efficiency with the use of UVC lighting and Merv 15 filtration.

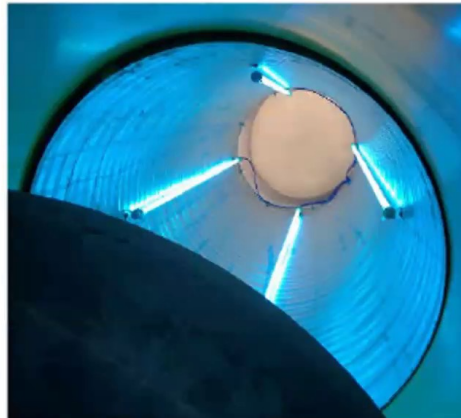
Applications.....



Air Handler Disinfection



AHU / RTU & Airstream Disinfection



Make-Up Air & Exhaust Disinfection



Room / Surface Disinfection (unoccupied)

HVAC Airborne Disease Control Trends

Past

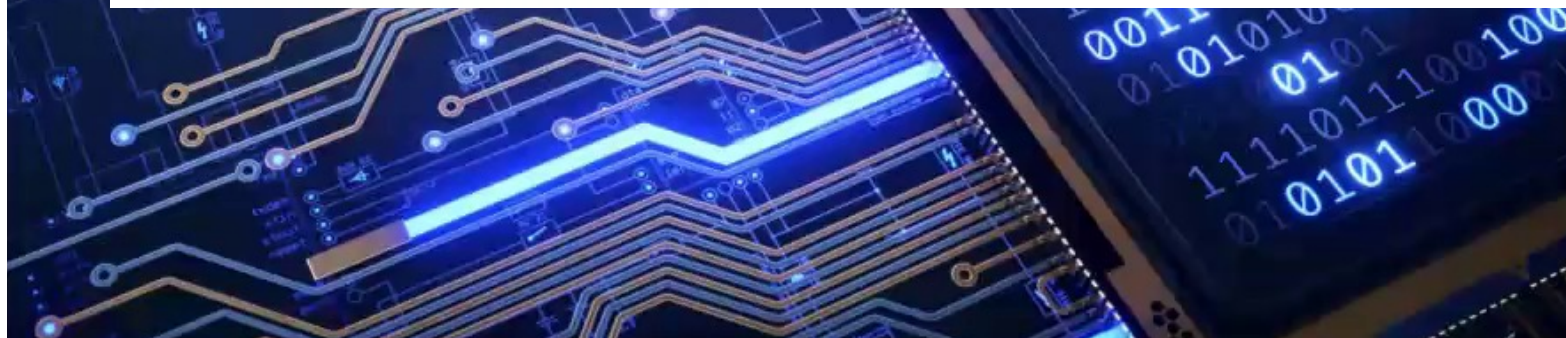
- Occupancy Indoor Air Quality Complaints
- Air Sampling and Lab Testing
- HVAC Assessment and Recommendations

Present

- COVID-19 Pandemic
- ASHRAE COVID-19 Recommended Practices
- Installation of COVID-19 HVAC Controls

Future

- Unknown Potential Hazards
- Machine Learning Indoor Air Quality Algorithms
- Smart Buildings Proactively Protecting Occupants





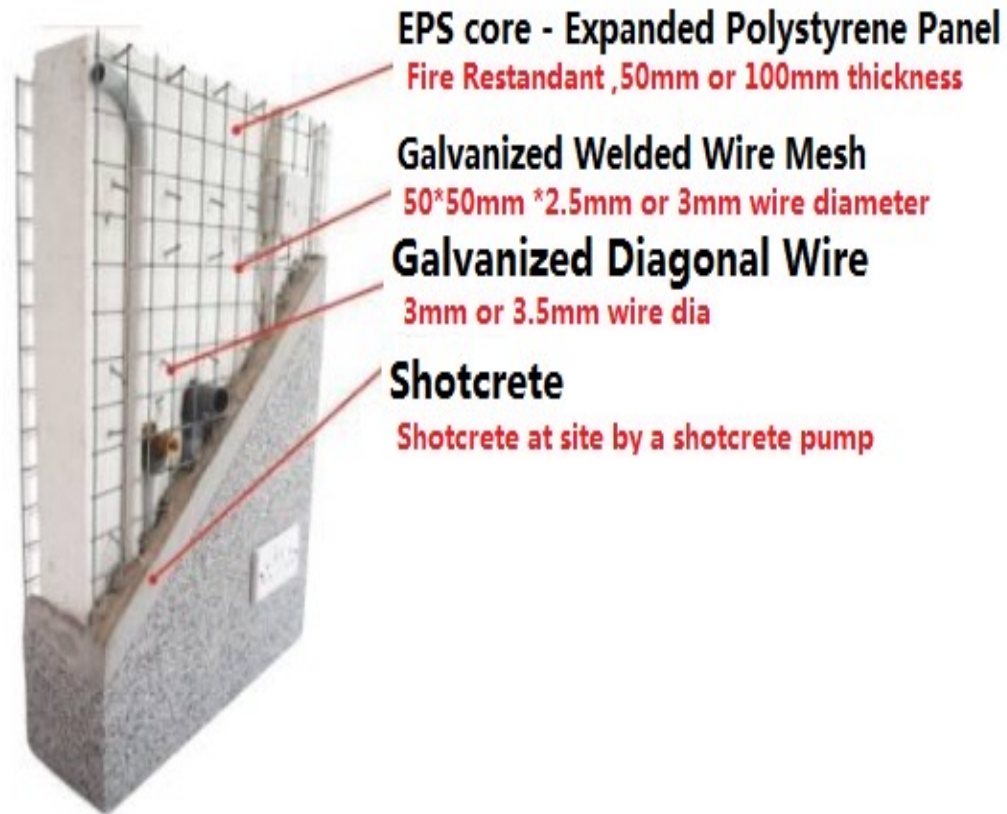
LATE NIGHT WORKS. . . .

GHANA INFECTIOUS DISEASE CENTRE- CONSTRUCTION TECHNOLOGY

EVG 3D CONSTRUCTION SYSTEM

Expanded polystyrene sandwiched in wire mesh and finished with micro concrete

- ✓ Fast and Simple to erect
- ✓ Materials are recyclable
- ✓ No formwork needed
- ✓ Simple installation of utilities
- ✓ Elimination of additional beams and columns
- ✓ Less heavy components(easy handling)
- ✓ Provides Excellent thermal insulation
- ✓ Design flexibility
- ✓ Monolithic structure
- ✓ Better Earthquake resistance
- ✓ Lower Construction Costs



GHANA INFECTIOUS DISEASE CENTRE- CONSTRUCTION TECHNOLOGY



MATERIALS

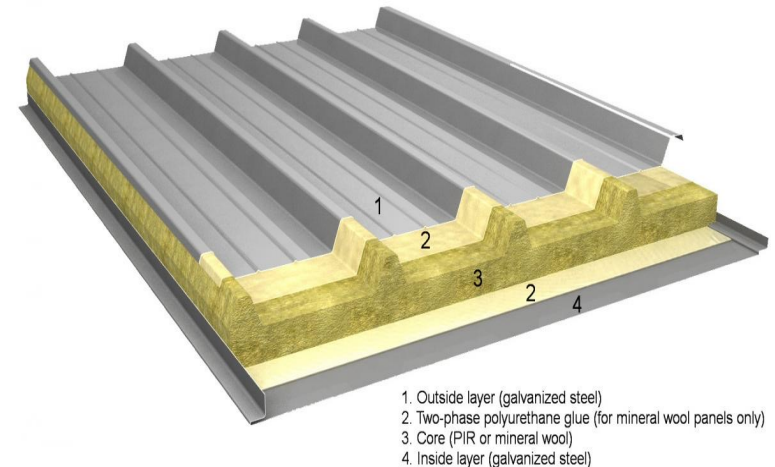
Floor Slabs - In-Situ Reinforced Concrete Slab

Roof Construction - Concrete Filler Slab with Polystyrene

Roof Construction - Steel Sheets on Timber Rafters

Walls - 3-D Wire Panel with 'Shot-Crete' Both Sides

Flooring - Epoxy Flooring



ENERGY MEASURES

Insulation of Roof

Insulation of External Walls

Air Conditioning with Air Cooled Chiller

Energy-Saving Light Bulbs- Internal Spaces

GHANA INFECTIOUS DISEASE CENTRE- NOTABLE FEATURES

Green Building- Edge Certified

Exemplary Achievement in

23% Energy Savings

28% Water Savings

31% Less Embodied Element in Material



- Negative Pressure Within the Building
- One way traffic for Patients and for staff
- Antimicrobial paints
- Hands free sensor faucets and doors in certain areas.

TOTAL PROJECT COST = \$7,500,000.00 !!

- Building Structure
- Medical Equipment
- All other running cost expenses.



GHANA INFECTIOUS DISEASE CENTRE CONSTRUCTION MILESTONES



AERIAL VIEW-CONSTRUCTION PERIOD

GHANA INFECTIOUS DISEASE CENTRE CONSTRUCTION MILESTONES



AERIAL VIEW-COMPLETED



VIEW TO MAIN ENTRANCE



NURSES' STATION



TYPICAL 6 BED WARD



CORRIDOR



WAITING LOUNGE

FACTORS LEADING TO THE SUCCESS OF THE PROJECT...

Exigencies of the time

Leadership of the Private Sector

Support of the Government

Commitment of the Consultants

Discipline and Consistency of the Military

Benevolence of the Ghanaian People



CONCLUSION !!. . . .

With our **EMERGENCY APPROACH** to this project, we relied on the

Experience of local health care facilities designers

inputs from health sector **Practitioners**. (Doctors, Lab technicians, Nurses, facilities managers etc.)

Literature/research on the subject matter.-----which was our tool for the numerous review sessions during design and construction.

THANK YOU FOR YOUR ATTENTION.

