A TECHNICAL REPORT

ON

**ADJUDICATION OF CIVIL ENGINEERING CONTRACTS IN NIGERIA, STRATEGIES FOR RESOLVING ISSUES AND WAY FORWARD**

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**ABSTRACT**

Respiratory buildings are buildings which are designed and constructed to house or accommodate respiratory equipment. They are also designed for the treatment of patients with respiratory diseases. These respiratory equipment include, humidifier, oxygen tank, and oxygen concentrator.

There are benefits of these automated respiratory devices. The changes in respiratory rate occurs in advance of other vital sign changes such as heart rate, blood pressure, illnesses such as asthma and bronchitis and also infectious diseases such as COVID-19. Recent technological advances in sensor technology which leads to the manufacture of these respiratory devices can empower doctors and nurses to continuously and accurately monitor the respiratory rate of patients. There is an ever changing case mix on general wards or hospitals with increasing number of patients with respiratory problems needing more complex care and procedures. This requires a more proactive and standardized approach to the early detection of patient’s deterioration and monitoring of vital signs. Lack of automation has been cited as one possible reason why doctors and nurses do not always prioritize respiratory rate monitoring. Automated respiratory equipment makes it easier and faster to treat patients with respiratory problems.

COVID-19 is respiratory disease it is a virus which causes pneumonia to the affected person thereby making it difficult for the infected person to breathe. These automated respiratory devices which help the doctors and nurses responsible for the treatment of these patients easier and faster and it will enhance quick recovery of the patients.

**CHAPTER ONE**

**INTRODUCTION**

**ENGINEERING**

Engineering is the use of scientific principles to design, build machines structures and other items including bridges, tunnels, roads, vehicles and buildings. It is the application of science and math to solve problems. Engineers figure how things work and find practical uses for scientific discoveries.

**WHO IS AN ENGINEER?**

Engineers are practitioners of engineering who are professionals who invent, design, analyze, build and test machines, complex systems, structures and materials to fulfil functional objectives and requirements while considering the limitations imposed by practicality, regulation, safety and cost. Engineers design, evaluate, develop, test, modify, modify, install, inspect and maintain variety of products and systems.

**BRANCHES OF ENGINEERING**

There are six major branches of Engineering

1. Civil engineering
2. Mechanical engineering
3. Chemical engineering
4. Electrical engineering
5. Management engineering
6. Geotechnical engineering

Other branches of engineering include

1. Mechatronics engineering
2. Biomedical engineering
3. Agricultural engineering
4. Aeronautical engineering etc

**CIVIL ENGINEERING**

Civil engineering is a discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, dams, canals, airports, sewage systems, pipelines, structural components of buildings and railway.

Civil engineering has other sub divisions which include

1. **Coastal engineering:** which is concerned with managing coastal areas
2. **Construction engineering:** which involves the planning and execution, transportation of materials, site development based on hydraulic, environmental, structural and geotechnical engineering.
3. **Earth quake engineering:** It involves designing structures to withstand hazardous earth quake exposures.
4. **Forensic engineering:** It is the investigation of materials, products, structures, structures or components that fail or do not operate or function as intended, causing personal injury or damage to property.
5. **Geotechnical engineering:** It deals with the study of rocks and soil supporting civil engineering systems

**Transportation Engineering:**  It involves specifying, designing, constructing and maintaining transportation infrastructure which includes street canals, railways, airports, ports and mass transits.

**Other branches include**

1. Water resource engineering
2. Structural engineering
3. Municipal engineering.

**WHO IS A CIVIL ENGINNER?**

A civil engineer is a trained engineering professional who draw a strong knowledge of physics, mathematics and design to plan, oversee or provide advice on the construction of public infrastructure.

**DESIGN OF A BUILDING**

Building design refers to the broadly based architectural, engineering, and technical applications to the design of buildings.

**INNOVATION**

Innovation is a new idea, creative thoughts, and new imaginations in form of a device or method. Innovation is often viewed as the application of better solutions that meet new requirements, unarticulated needs, or existing market needs. Innovation often manifests itself via the engineering process. Such innovation takes place through the provision of more effective products, processes, services, technologies, or business models or buildings that are available.

**DISEASE OUTBREAK**

In epidemiology, an outbreak is a sudden increase in occurrence of a disease in a particular time and place. It may affect a small localized group or impact upon thousands of people across an entire continent it may also affect the whole world.

**AUTOMATED RESPIRATORY BUILDINGS**

Automation is the technology by which a process or procedure is performed with minimal human assistance

The respiratory system is the biological system consisting of specific organs and structures used for gas exchange in animals and plants. Respiratory organs in animals includes lungs which have the trachea alveoli and bronchi.

Automated respiratory buildings are automated buildings which are built to house or keep automated respiratory devices used in treating patients with respiratory problems. These devices require less human operation which makes them more accurate in dealing with respiratory issues.

**HEALTH WORKERS:**

These are trained medical practitioners who provide basic health and medical care within an area or community. And they are capable of providing preventive, promotional, and rehabilitation care to that area or community.

**CHAPTER 2**

**LITERATURE REVIEW**

**COVID-19**

COVID-19 is an illness caused by a coronavirus. Human coronaviruses are common and are typical associated with mild illness, similar to the common cold.

Figure 1.1

Figure 1

These coronaviruses get into the body of humans thus making it difficult for them to breathe. Coronaviruses may be serious or mild such as:

* Fever
* Cough
* Difficulty in breathing
* Blue lips or face
* Persistent pain or pressure in the chest
* Confusion
* Excessive drowsiness.

Symptoms may take up to 14 days to appear after exposure to the virus. Coronaviruses are mostly spread from infected persons through:

* Respiratory droplets when you cough or sneeze
* Close personal contact, such as touching or shaking hands
* Touching something with the virus on it, then touching your eyes, nose or mouth before washing your hands

These viruses are not known to spread through ventilation systems or through water.

The best way to prevent the spread of this disease is to:

* Wash your hands often with soap and water for at least 20 seconds;
* Avoid touching eyes, nose, nose and mouth especially with unwashed hands;
* Stay at home if you are sick to avoid spreading illnesses to others.

The disease started in early 2020 generating headlines all over the world because of the unprecedented speed of its transmission. Its origin is a food market in Wuhan china in December 2019. Coronavirus virus took its name from its looks, corona represents a crown like spike on the outer surface of the virus.

Figure 2.1

Figure 2

Bats are the primary reservoir of the viruses.

Coronaviruses belong to the coronavirodae family in the nidovirales order. It is minute in size and contain single stranded RNA as a nucleic material. The sub group of coronavirus family alpha, beta, gamma, and delta coronavirus. The severe acute respiratory syndrome coronaviruses (SARS-COV), H5N1 influenza A H1N1 2009 and Middle East. Respiratory syndrome coronavirus (MERS-COV) cause acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) which leads to pulmonary failure and results to fatality. These viruses were thought to infect only animals until the world witnessed a severe acute respiratory syndrome outbreak caused by SARS-COV, 2002 I Guangdong, China. Only a decade later, another pathogenic coronavirus known as Middle East respiratory syndrome caused a pandemic across the world.

Figure 3

Figure 3.1

**DESIGN OF AUTOMATED BUILDINGS**

*Table 1*

**Automated building design**

Applied computing

Arts and humanities

Architecture (buildings)

Computer aided designs

Physical sciences and engineering

Engineering

Computer aided design

**BUILDING AUTOMATION**

Building automation is the automatic centralized control of a buildings heating, ventilation and air conditioning, lightening and other systems through a building management system or building automation system (BAS). The objective of building automation are improved occupant comfort, efficient operation of building systems , reduction in energy consumption and operating costs, and improved life cycle of utilities.

Building automation is an example of a distributed control system the computer networking of electronic devices designed to monitor and control the mechanical, security, and flood safety, lightening (especially emergency lightening), HVAC and humidity control and ventilation systems in a building. BAS core functionality keeps building climate within a specified range, provides light to rooms based on an occupancy schedule, monitors performance and devices failures in all systems and provides malfunction alarm to build maintenance staff. A BAS should reduce building energy and maintenance cost compared to a non-controlled building. Most commercial, institutional and industrial building built after 2000 include BAS.

**AUTOMATED RESPIRATORY BUILDING DESIGN**

The design of an automated respiratory building is very necessary now due to the outbreak of the pandemic (COVID19). As civil engineers we should be able to give our own contribution towards trying to solve the problem of the fast spreading pandemic by designing and constructing automated respiratory buildings. Since the disease affects the respiratory system and makes breathing difficult, the presence of automated respiratory buildings is very important. Since the building is automated with a lot of respiratory devices, there will be reduction in human labour or human intervention in dealing with the cases. This automated building will be designed and computerized to collect, store and display patients’ information. The design of these automated hospitals will help deal with emergencies of the COVID-19 faster and better and this will also make work easier and more comfortable for health workers and reduce risk against their lives. Health workers are at the frontline of the COCID-19 outbreak response and as such are exposed to hazards that put them at risk of infection, therefore the design of these automated respiratory buildings will reduce the level of exposure to infection. The respiratory buildings will be constructed in isolated areas since the disease is highly contagious, the building will be highly computerized for effective data collection of patients and also devices for administration of drugs. These buildings will also be designed with proper heating, ventilation, air conditioning lightening and proper movement systems such as elevators and escalators. Also the buildings will be equipped with proper respiratory devices such as;

* ***Automated oxygen delivery devices:*** they are closed loop devices designed to automatically adjust oxygen flow according the patients’ oxygenation. The operation of the oxygen delivery system depends on a microcontroller, an electromagnet valve, and a pulse oximeter.

Figure 4

* ***Automated breathing metabolic stimulator:*** this is a piece of research equipment used to stimulate human breathing through stimulating human respiration.

Figure 5.1

Figure 5

* ***Oxygen concentrator:*** this is a device that concentrates the oxygen from a gas supply by selective removing nitrogen to supply an oxygen enriched product gas stream.

Figure 6.1

Figure 6

* ***Nebulizer:*** a nebulizer is a drug delivery device used to administer medication in the form of a mist inhaled into the lungs.

Figure 7.1

Figure 7

* ***Oxygen tank:*** this is a device that is an oxygen storage vessel, which is either held under pressure in gas cylinders, or liquid oxygen in a cryogenic storage tank

Figure 8

Advantages of designing these automated respiratory buildings include

* Optimization of the documentation of the COVID-19 patient encounters
* Improving communication of information to physicians
* It will improve access to the COVID-19 patient medical information
* Reduction of errors
* Reduction of paper
* Forming a data repository for further research on the COVID-19
* Improving reimbursement for services rendered to the COVID-19 patients

**CHAPTER THREE**

**METHODOLOGY**

The design of the automated respiratory buildings include three distinct phases. The first is the definition and planning for the building project itself which includes project request, strategic plan, facilities needs assessment, specific program, and concept design.

Second is the preparation of schematic design development, construction documentation, and securing a building permit.

The third phase covers bidding, construction, licensing, and evaluation.

Table 2

Land use approval planning, design and construction building permit approved

Project request

Strategic plan

Needs assessment

Specific program

Concept design

Schematic development

City land use permit process

OSHPD building permit process

Design development

Conditional use permit and environmental impact report submission

Preliminary submittal

Construction documents

Building permit submital

Building permit

Public hearings

Bidding/construction

Licensing

Evaluation

Inspection

**CHAPTER FOUR**

**ANALYSIS OF RESULT**

**STATISTIC OF CORONA VIRUS CASES OF THE WORLD AND FIVE MOST AFFECTED COUNTRIES ACROSS THE WORLD AS AT 9TH APRIL, 2020**

Table 3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Total Cases** | **New Cases** | **Total Deaths** | **New Deaths** | **Total Recovered** | **Active Cases** |
| World | 1,623,130 | +19,478 | 97,235 | +1,543 | 366,407 | 1,159,488 |
| USA | 469,421 | +855 | 16,710 | +19 | 25,937 | 426,774 |
| Spain | 157,022 | +3,800 | 15,843 | +396 | 55,668 | 85,511 |
| Italy | 143,626 | Not known | 18,279 | Not known | 28,470 | 96,877 |
| Germany | 118,235 | Not known | 2,607 | Not known | 52,407 | 63,221 |
| France | 117,749 | Not known | 12,210 | Not known | 23,206 | 82,333 |

Nigeria has a total of 288 cases as at 9th April, 2020 with 51 recovered and 7 deaths.

Figure 9.2

Figure 9.1

Figure 9

**CHAPTER 5**

**CONCLUSION/RECOMMENDATION**

**CONCLUSION**

In conclusion we have seen in the previous chapters what COVID-19 is its symptoms and ways in which it can be prevented. Also the nature of the disease was explained and how it is transmitted from person to person and the statics of cases in some countries was also shown. We have also been able to understand the role which civil engineers can play to help health workers and the infected people. The design of these innovative respiratory buildings will go a long way in helping the quick and effective recovery of COVID-19 patients in Nigeria and reduce the risk faced by health workers as the cases in Nigeria are at a high increase.

**RECOMMENDATION**

After the extensive research conducted, the following recommendations were obtained;

1. The government should improve the health sector of the country in order to prepare for future outbreak of diseases
2. Civil engineers should play their own role effectively by designing and constructing more health centers in the country as the number of diseases affecting people keep increasing.
3. Due to the lockdown caused by the COVID-19 pandemic the government of Nigeria should distribute relief materials to the less privileged to enable their survival
4. Government should also improve the electricity condition across the entire country to help and encourage Nigerians observe the lock down law effectively.