NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF SCIENCE AND TECHNOLOGY

COURSE CODE: EHS 312

COURSE TITLE: HOUSING AND BUILDING CONSTRUCTION

COURSE GUIDE

EHS 312
HOUSING AND BUILDING CONSTRUCTION

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Published by
National Open University of Nigeria

Printed 2014

ISBN: 978-058-881-7

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INTRODUCTION

Housing and Building Construction is a two- credit unit course available to all students of Environmental Health in the 300 level and any other student interested in understanding the importance of healthy housing and building construction in health promotion and protection. The state (ventilation, size etc) of a house where people resides is important in the protection and promotion of the health of its dwellers. Many health problems are either directly or indirectly related to the building itself, due to the construction materials that were used and the equipment installed, the size or design of the individual dwellings. The home also has a broad influence on the psychosocial and mental wellbeing by providing the basis for place attachment and identity as well as a last refuge from daily life. That means to live in an adequate shelter means more than a roof over one's head; it means it must be free from all factors that may affect its inhabitants. Hence, there is need for you to understand its importance and role in health promotion.

WHAT YOU WILL LEARN IN THIS COURSE

The course content consist of a unit of the course guide which tells you briefly what the course is about, what course materials you need and how to work with such materials. It also gives you some guideline for the time you are expected to spend on each unit in order to complete it successfully.

It guides you concerning your tutor-marked assignment which will be placed in the assignment file. Regular tutorial classes related to the course will be conducted and it is advisable for you to attend these sessions. It is expected that the course will prepare you for challenges you are likely to meet in the field of Environmental Health practice.

COURSE AIM

The course aim is to provide you with an understanding of housing and building construction. It is intended to let you appreciate the position occupied by housing and building construction in the promotion, protection and maintenance of health of individuals and families in our houses.

COURSE OBJECTIVES

To achieve the aim set out, the course has a set of objectives. Each of the 14 units has specified objectives which are stated at the beginning of the unit. You are advised to read the objectives before you study the unit because you may need to make reference to them during your study to

check on your own progress. It is also good that you endeavour to check the unit objectives after completion of each to ensure that you are satisfied with what you have read.

After going through the course, you should be able to:

- explain the concept of housing and housing terminologies
- enumerate housing standards state the factors affecting qualities of housing standards
- describe the relationship between housing and health
- understand the concept of building technology including drawing and reading of plans
- explain housing codes, edicts, or ordinances, laws and legislation of the local, state and federal governments levels
- discuss the principle of damp proofing
- explain the enforcement mechanism of housing and building laws and regulations
- enumerate role of environmental health professionals in building approval and registration.

WORKING THROUGH THIS COURSE

To complete this course you are expected to read each study unit, read the textbooks and other materials which may be provided by the National Open University of Nigeria. Each unit contains self-assessment exercises. In the course you would be required to submit assignment for assessment. At the end of the course there is final examination. The course should take at least about 14 weeks to complete.

Listed below are the components of the course, what you have to do and how to allocate your time to each unit, in order to complete the course successfully and timely.

The course demands that you should spend good time to read and my advice for you is that you should endeavour to attend tutorial session where you will have the opportunity of comparing knowledge with colleagues.

COURSE MATERIALS

The main components of the course material are:

1. The Course Guide
2. Study Units
3. References/Further Reading
4. Assignments
5. Presentation Schedule

STUDY UNITS

There are 4 modules broken into 14 study units.

Module 1

Unit 1	Definitions, Scope, Concept of Housing and Housing Terminologies
Unit 2	Relationship between Housing and Health
Unit 3	Factors Affecting Qualities of Housing Standards and Minimum Requirements
Unit 4	Safety and Emergency Provisions in Standard Housing
Unit 5	Professional Groups Involved in Maintaining Building and Housing Standards
Unit 6	General Characteristics of Housing Standard in the Tropics and its Challenges

Module 2

Unit 1	Introduction to Building Technology
Unit 2	Application of Technical Drawing, Reading and Interpretation of Building Plan/Drawings

Module 3

Unit 1	Understand the Preliminaries and the General Principle of Selecting and Preparing Sites to Receive Various Types of Foundations
Unit 2	Understand the Principles of Damp-Proofing in Building
Unit 3	Building Plan Processing, Approval and Certification for Occupancy

Module 4

Unit 1	Housing codes, Edicts, Ordinances, Laws and Legislation of the Local, State, Federal Governments and International Levels.
Unit 2	Enforcement of Housing and Building Laws and Regulations
Unit 3	Role of Environmental Health Professionals in Building Approval and Registration.

In module 1, the first unit focuses on the definitions, scope, concept of housing and housing terminologies, unit 2 looked at the relationship between housing and health. Unit 3 examines the factors affecting the qualities of housing and building standards. Unit 4 concentrated on

safety and emergency provisions in standard housing while unit 5 considered the professional groups involved in maintaining building and housing standards and unit 6 looked at the general characteristics of housing standard in the tropics and its challenges.

Module 2, unit 1 basically concentrated on introducing building technology to the students, unit 2 is on application of technical drawing, reading and interpretations of building plan.

Module 3, unit 1 deals with understanding the preliminaries and the general principle of selecting and preparing sites to receive various types of foundations, unit 2 is on understanding the principles of damp-proofing in building which is essential in preventing dampness in buildings structures, unit 3 looked at the criteria for building processing, approval and certification for occupancy

Module 4, unit 1 will deal with introduction to housing codes, edicts, ordinances, laws and legislation of the local, state, federal Governments and international levels.

Unit 2 will be on enforcement of housing, building laws and regulations and its challenges, while the last but not the least is unit 3 which is on the roles of environmental health professional in building approval and registration.

Note that each unit consists of one or two weeks work and include an introduction, objectives, main content, reading materials, exercises, conclusion, summary, tutor-marked assignments (TMAs), references and other resources. The various units direct you to work on exercises related to the require reading. In general, the exercises test you on the materials you have just covered or require you to apply it in a way that will assist you to evaluate your own progress and to reinforce your understanding of the material. Alongside the TMAs, these exercises will help you achieve the stated learning objectives of the individual units and the course as a whole.

PRESENTATION SCHEDULE

Your course materials have important dates for the early and timely completion and submission of your TMAs and attending tutorials. You are expected to submit all your assignments by the stipulated time and date and guard against falling behind in your work.

ASSESSMENT

There are three parts to the course assessment and these include self assessment exercises, tutor-marked assessments and the written examination or end of course examination. It is advisable that you do all the exercises. In tackling the assignments, you are expected to use the information, knowledge and techniques gathered during the course. The assignments must be submitted to your facilitator for formal assessment in line with the deadlines stated in the presentation schedule and assignment file. The work you submit to your tutor for assessment will count for 30 per cent of your total course work. At the end of the course you will need to sit for a final end of course examination of about three hours duration. This examination will count for 70 per cent of your total course mark.

TUTOR-MARKED ASSIGNMENT (TMA)

The TMA is a continuous component of your course. It account for 30 per cent of the total score. You will be given four (4) TMAs to answer. Three of this must be answered before you are allowed to sit for the end of course examination. The TMAs would be given to you by your facilitator and returned after you have done the assignment. Assignment questions for the units in this course are contained in the assignment file. You will be able to complete your assignment from the information and material contained in your reading, references and study units. However, it is desirable in all degree level of education to demonstrate that you have read and researched more into your references, which will give you a wider view point of the subject.

Make sure that each assignment reaches your facilitator on or before the deadline given in the presentation schedule and assignment file. If for any reason you can not complete your work on time, contact your facilitator before the assignment is due to discuss the possibility of an extension. Extension will not be granted after the due date unless there are exceptional circumstances.

TEXTBOOKS AND REFERENCES

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FINAL EXAMINATION AND GRADING

The end of course examination on housing and building construction will be for about 3 hours and it has a value of 70 per cent of the total course work. The examination will consist of questions, which will reflect the type of self-testing, practice exercise and tutor-marked assignment problems you have previously encountered. All area of the course will be assessed.

The time between finishing the last unit and sitting for the examination is to be use to revise the whole course accordingly. You might find it useful to review your self-test, TMAs and comments on them before the examination. The end of course examination covers information from all parts of the course.

COURSE MARKING SCHEME

Assignment	Marks
Assignments 1- 4	The, best three of the TMAs will be selected to make 30% of the course marks.
End of course examination	70% of overall course marks
Total	100% of course materials

FACILITATORS/TUTORS AND TUTORIALS

There are 15 hours of tutorials provided in support of this course. You will be notified of the dates, times and location of the tutorials as well as the name and the phone number of your facilitator, as soon as you are allocated a tutorial group.

Your facilitator will mark and comment on your assignments, keep a close watch on your progress and any difficulties you might face and provide assistance to you during the course. You are expected to mail your tutor-marked assignment to your facilitator before the schedule date (at least two working days are required). They will be marked by your tutor and returned to you as soon as possible.

Do not delay to contact your facilitator by telephone or e-mail if you need assistance.

The following might be circumstances in which you would find assistance necessary, hence you would have to contact your facilitator if:

- you do not understand any part of the study or the assigned readings
- you have difficulty with self-tests
- you have a question or problem with an assignment or with the grading of an assignment.

You should endeavour to attend the tutorials, this is the only chance to have face to face contact with your course facilitator and to ask question which are answered instantly. You can raise any problem encountered in the course of your study.

To gain more benefit from course tutorials prepare a question list before attending them. You will learn a lot from participating actively in discussions with your colleagues.

SUMMARY

Housing and building construction is a course that intends to provide you with the concept of housing, its construction, uses to human beings and promotion of the health of its dwellers in both urban and rural environment.

Upon completing this course, you will be equipped with the knowledge of housing, its requirements in health promotion, the need to ensure appropriate inspection in all communities at an appropriate time to ensure the improvement of the health status of its dwellers and the protection of the health of all members of the communities around.

You will be able to distinguish between a healthy house and an ordinary shelter, you will be able to also suggest to people on the quality materials required in building a healthy house, you will appreciate the role of all professionals involved in maintaining the housing standards in both constructions and maintenance. You will also know the role that can be played by individuals, the community, the government, international agencies as well as nongovernmental organisations in the prevention and control of communicable diseases, chronic diseases, tropical neglected diseases and accident related conditions that are likely to be spread when housing facilities are abused or poorly maintained.

In addition, you will be able to answer questions on the subject such as:

- What does healthy housing means?
- Of what importance is the knowledge of a healthy housing?

- Enumerate factors affecting qualities of housing standards
- Who are the professional groups involved in the maintenance of housing standard?
- What are the preliminaries involved in the construction of various types of building?
- What are the criteria for the approvals and awarding certifications of occupancy in housing?
- What are the safety and sanitary requirements in buildings?
- What are the enforcement mechanism of housing laws and regulations?
- What is the role of environmental health professionals (EHP) in building approval and registration?
- What are the challenges in the performance of the functions of EHP in processing building approvals

The above list is just a few of the questions expected and is by no means exhaustive. To gain more from this course you are advised to consult relevant books, journals and websites. You need to practically be visiting practicing and licensed professionals to enable you share their experiences with on current and emerging issues in building and housing sector in your environment, this will enable you widen your knowledge on the topic.

I wish you success in this course. It is my hope you will find it both illuminating and useful.

MAIN COURSE

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MODULE 1

UNIT 1 DEFINITIONS, SCOPE, TYPES, CONCEPT OF HOUSING AND HOUSING TERMINOLOGIES

CONTENTS

1.0 INTRODUCTION

Housing is one of the essentials of life to every human being. It is next to air and water in order of human requirement. It is required for

physiological and psychological comfort of man. There are different types of housing structures in the world. The type and quality depends on many factors including socio-economic factors, literacy level, culture, nature of soil, etc. The quality of housing occupied by people plays a decisive role in the health status of the residents. Many health problems are either directly or indirectly related to the building itself, due to the construction materials that were used and the equipment installed, or the size or design of the individual dwellings. The home also has a broad influence on the psychosocial and mental wellbeing by providing the basis for place attachment and identity as well as a last refuge from daily life. To live in an adequate shelter means more than a roof over one's head: It means to have a home, a place which protects privacy, contributes to physical and psychological well-being, and supports the development and social integration of its inhabitants – a central place for human life. Evidence has shown that those that have the least resources at their disposal suffer the worst housing conditions while those with best resources are likely to provide for themselves a house with all the facilities that qualify it to be a sanitary or standard house. Type of houses differs from urban to rural, one community to another and from one country to another, but the requirements and criteria are basically the same.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define house and housing
- enumerate housing scope
- define dwelling
- explain the concepts of housing and housing terminologies.

3.0 MAIN CONTENT

3.1 Definitions of House

Princeton's Word Net defines house as explained in Wikipedia, the free encyclopaedia as:

a) a structure that provides privacy and protection from danger
b) protective covering that provides protection from the weather
c) temporary housing for homeless or displaced persons
d) the condition of being protected

While, Kernerman English Learner's Dictionary defines house:

e) as protection from harm or something unpleasant
f) a place where you are protected from harm or something unpleasant

g) a place where somebody who is in danger can live temporarily to protect from unpleasant experiences.

And Webster Dictionary defines house as “that which covers or defends from injury or annoyance; a protection; a screen.

1. A house is a building or structure that has the ability to be occupied for habitation by humans or other creatures. The term house includes many kinds of dwellings ranging from rudimentary huts of nomadic tribes to complex structures composed of many systems. English-speaking people generally call any building they routinely occupy "home"

2. Omi’s Public and Community Health Dictionary defines house as ‘a man-made physical structure which is designed to serve as a shelter and which contribute to his healthy existence. it could be residential or non residential but built to meet physiological, psychological and social needs of man”

The social unit that lives in a house is known as a household. Most commonly, a household is a family unit of some kind, though households may be other social groups, organisations or individuals.

The English word *house* derives directly from Old English *Hus* meaning "dwelling, shelter, home, house," which in turn derives from Proto-Germanic *Khusan* (reconstructed by etymological analysis) which is of unknown origin. The house itself gave rise to the letter 'B' through an early Proto-Semitic hieroglyphic symbol depicting a house. The symbol was called "bayt", "bet" or "beth" in various related languages, and became *beta*, the Greek letter, before it was used by the Romans.

House and shelter are interchangeably used and might mean the same in the English sense of it but a house is more permanent than a shelter. Random House Webster’s College Dictionary defines shelter as “something beneath, behind, or within which one is covered or protected, as from storms or danger; refuge. (1) the protection or refuge afforded by such a thing(2) a building serving as a temporary refuge or residence, as for homeless persons or abandoned animals to act as a shelter for; afford shelter to.(4) to provide with a shelter; place under cover.”

3.2 Scope of Housing

According to the World Health Organisation Expert Committee on the Public Health Aspects of Housing (1961), the scope of housing in relation to health consists of the following:

a. Town and country planning
b. The design and arrangement of the dwelling unit
c. The use of space by the occupants
d. The maintenance of the structure, i.e., the house in general, including dwelling areas
e. The availability of community facilities and services, including those for local circulation and transport.

These aspects of housing are best handled by public health experts, such as environmental health officers, sanitary engineers as well as other professionals who also play vital roles (e.g., town planners, architects, mansions, psychologists, sociologists, etc.). (WHO, 1961), (Arokoyu & Adeyemo, 2002).

3.3 Types of Houses

Houses can be built in a large variety of configurations. A basic division is between free-standing or detached dwellings and various types of attached or multi-user dwellings. Both may vary greatly in scale and amount of accommodation provided. Although there appear to be many different types, many of the variations listed below are purely matters of style rather than spatial arrangement or scale. Some of the terms listed are only used in some parts of the English speaking world and Nigeria in particular.

3.3.1 Detached Single-Unit Housing

- **A-frame:** so-called because of the appearance of the structure, namely steep roofline. The Addison house: a type of low-cost house with metal floors and cavity walls made of concrete blocks, mostly built in the United Kingdom and in Ireland during 1920 through 1921 to provide housing for soldiers, sailors, and airmen who had returned home from the First World War. The Airey house: a type of low-cost house that was developed in the United Kingdom in the 1940s by Sir Edwin Airey, and then widely-constructed between 1945 and 1960 to provide housing for soldiers, sailors, and airmen who had returned home from World War II. These are recognisable by their precast concrete columns and by their walls made of precast "ship-lap" concrete panels.
- **Bungalow:** any simple, single-story house without any basement.
- **Cottage:** is usually a small country dwelling, but weavers' cottages are three-storied townhouses with the top floor reserved for the working quarters.
- **A farmhouse:** is the main residence house on a farm, or a house built with the same type of styling - located anywhere

- **Mansion:** a quite-large and usually-luxurious detached house. See also: Manor house, and Georgian house above
- **Manufactured house**: a prefabricated house that is assembled on the permanent site on which it will sit.
- **Prefabricated house**: a house whose main structural sections were manufactured in a factory, and then transported to their final building site to be assembled upon a concrete foundation, which had to be poured locally.
- **Ranch:** a rambling single-story house, often containing a garage and sometimes constructed over a basement.

3.3.2 The Detached Single-Family House

Is any free-standing house that is structurally separated from its neighbouring houses, usually separated by open land, making it distinctive from such dwellings as duplexes, townhouses, and condominiums.

3.3.3 Semi-Detached Dwellings

- **Duplex house**: commonly refers to two separate residences, attached side-by-side, but the term is sometimes used to mean stacked apartments on two different floors (particularly in urban areas such as New York and San Francisco). (See Two decker) The duplex house often looks like either two houses put together, or as a large single home, and both legally and structurally, literally shares a wall between halves. The duplex home can appear as a single townhouse section with two different entrances, though the occasional duplex with a shared common entrance and entry hall have been constructed. The jargon terms "triplex" and "four-plex" are contrived names that refer to similar structures with three or four housing units, or floors if referring to apartments, and again the characteristic sharing of structural walls, as are the townhouse and six pack forms that adapted the savings in materials and costs of a shared load bearing wall.
- **Semi-detached:** two houses joined together; compare duplex.

3.3.4 Attached Multi-Unit Housing

Specific terms under various American federal, state, or local laws dealing with fair housing, truth in advertising, and so forth, have been prescribed and engender specific legal meanings. For example, in American housing codes, all "apartments" must contain a kitchen, bathing facilities, and a sleeping area, or else that term may not be used. This generates various differences within the English-speaking world, and the terms such as "single-family", "two-family", or "three-family"

building, residence, house, home, or property can be generic and thus convey little or no building plan (style of building) information. Such terminology is most common in advertising and real-estate markets that offer leasing of such units, or sales of such buildings.

- **Apartment:** A relatively self-contained housing unit in a building which is often rented out to one person or a family, or two or more people sharing a lease in a partnership, for their exclusive use. Sometimes called a flat or digs (slang). Some locales have legal definitions of what constitutes an apartment. In some locations, "apartment" denotes a building that was built specifically for such units, whereas "flat" denotes a unit in a building that had been originally built as a single-family house, but later on subdivided into some multi-unit house type.
- **Apartment building**, **Block of flats:** A multi-unit dwelling made up of several (generally four or more) apartments. Contrast this with the two-family house and the three-family
- **Barracks:** A type of military housing, formerly connoting a large ″open bay″ with rows of bunk beds and attached bathroom facilities, but during the most recent several decades for the American Armed Forces most of the new housing units for unmarried servicemen have been constructed with a dormitory-style layout housing two to four servicemen. This dormitory-styling providing additional privacy has been found to promote the retention of trained personnel in the all-volunteer Armed Forces of the United States.
- **Flat:** In Great Britain and Ireland including Nigeria, this means exactly the same as an "apartment". This term means an apartment that takes up an entire floor of a large house.
- **2-Flat**, **3-Flat**, and **4-Flat** houses: Houses or buildings with 2, 3, or 4 flats, respectively, especially when each of the flats takes up one entire floor of the house. There is a common stairway in the front and often in the back providing access to all the flats. 2-Flats and sometimes 3-flats are common in certain older neighbourhoods.
- **Housing cooperative** (or **Co-op**): A form of ownership in which a non-profit corporation owns the entire apartment building or development and residents own shares in the corporation that correspond to their apartment and a percentage of common areas.
- **Penthouse:** The top floor of multi-story building
- **Rooming house:** A type of single room occupancy building where most washing, kitchen and laundry facilities are shared between residents, which may also share a common suite of living rooms and dining room, with or without board arrangements. When board is provided (no longer common), a common dining time and schedule is imposed by the landlord

who in such cases also serves as an innkeeper of sorts. In Australia and the United States, any housing accommodation with 4 or more bedrooms can be regarded as a rooming house if each bedroom is subject to individual tenancy agreements. Nigeria is studying this to enable it develop its own codes.

- **Tenement:** A multi-unit dwelling usually of frame construction, quite often brick veneered, made up of several (generally many more than four to six) apartments (i.e. a large apartment building) that can be up to five stories. Tenements do not generally have elevators. In the United States the connotation sometimes implies a run-down or poorly-cared-for building. It often refers to a very large apartment building usually constructed during the late nineteenth to early twentieth century era sited in cities or company towns.
- **Terraced house:** Since the late 18th century is a style of housing where (generally) identical individual houses are conjoined into rows - a line of houses which a built directly on to each other built with shared party walls between dwellings whose uniform fronts and uniform height created an ensemble that was more stylish than a "*rowhouse*"..
- **Tower block** or **Apartment tower**: A high-rise apartment building.

3.3.5 Multifamily Home Feature

Tenants usually have some portion of the basement and/or common activity.

Fire regulations aggressively require a separate emergency exit for all apartments under U.S. laws and national fire codes. Utilities are either paid as part of the rent, or (now predominant) the units have separately provided heat, air conditioning, electrical distribution panels and meters, and sometimes (uncommonly) water metering, separating all secondary housing costs by rental unit. Common lighting may or may not be off a separate meter and circuitry in subdivided former single family dwellings.

Leasehold documents will specify other common factors such as specific parking rights, rights to common spaces such as lawn and gardens on the premises, storage or garage (usually a detached unit, that cannot economically be converted into an additional housing unit) facilities and details such as who has responsibility for upkeep, snow removal, lawn care, and so forth.

3.3.6 Movable Dwellings

- **Park home** also called **Mobile home:** it is a prefabricated house that is manufactured off-site.
- **Tent:** usually a lightweight, moveable structure.

3.4 Concepts of Housing and Housing Terminologies

"Healthy housing" must be a comprehensive concept taking into consideration a variety of factors contributing to the quality of housing and housing environments. A healthy home is not a specially designed house, but is also represented by a residential setting that is capable to fulfill the expectations of the residents. Nevertheless the definitions vary from country to country. In England social housing is defined "as housing that is subsidised (irrespective of tenure and ownership – whether exclusive or shared – or financial arrangements), that will be available to people who cannot rent or buy houses generally available on the open market."

Social housing in England is provided by housing associations and local authorities and is mostly built for rent. The finances for building social housing are provided by national government grants to the housing associations.

Social housing in *Germany* is considered to be that kind of housing "which, because of its size, facilities and rent or sales price is intended, and appropriate, for a broad section of the population. The German definition of social housing refers predominantly to a subsidy system. It can be regarded as housing provided for low income groups or others who cannot expect to get housing through the market (e.g. disabled people)." The subsidies are provided in form of subsidies by the Bund, Länder and municipalities for the construction of social housing for rent, on conditions that enables landlords to fix a lower rent and to accommodate special social groups of tenants. The Länder are responsible for the 'convention rules' for housing and the implementation of these rules is delegated to the municipalities. The subsidies exist also for buying private homes when the buyer cannot afford the price valid on the market. Applicants are graded on point systems which are based on current living conditions and membership of a target group.

3.4.1 Affordable Housing

However, while the phrase "affordable housing" has been bandied about in recent times, it is instructive to point out that we seem to have rather missed the point. Affordable housing is a term used to describe dwelling

units whose total housing costs are deemed "affordable" to a group of people within a specified income range. Although the term is often applied to rental housing that is within the financial means of those in the lower income ranges of a geographical area, the concept is applicable to both renters and purchasers in all income ranges. In the United States and Canada, a commonly accepted guideline for housing affordability is a housing cost that does not exceed 30per cent of a household's gross income. Housing costs considered in this guideline generally include taxes and insurance for owners, and usually include utility costs. When the monthly carrying costs of a home exceed 30–35 per cent of household income, then the housing is considered unaffordable for that household.

3.4.2 Healthy Housing

The present-day concept of healthy housing embodies the physical structure that man uses for shelter and the environs of that structure, including all necessary facilities, services, equipment, and devices needed or desired for the physical and mental health and the social well-being of the family and individual. When applied environmental health in relation to health in Africa to the situation in most African countries 'healthy housing' is a complex business involving elements of environmental health, planning, architecture, engineering, economics, finance, cultural and social traditions, and the behavioural sciences which are so intertwined that it is difficult to isolate single elements for study, analysis, and discussion.

3.4.3 Rural Housing

Traditional village settlements are some of the oldest forms of human organisation, with varying degrees of self-government, and have of late increasingly become victims of the rural-urban migration. The rural population lives in dwellings built by themselves according to traditional patterns from locally available materials, such as mud bricks, bamboo, thatch roofing, and timber.

The relative habitability of these rural dwellings varies widely from one area to another and from household to household. Considerable disparities of living conditions also exist in the rural villages when compared with urban settlements, and these have rendered the rural areas unattractive. Lack of infrastructures such as recreation facilities, transportation, and opportunities for work are among the obvious factors that continually attract rural populations to the cities.

3.4.4 Transitional Settlements

In the majority of African towns and cities much of the urban deterioration and poor standards of living can be attributed to an earlier rural-urban influx. Workers were attracted by the higher incomes and the social amenities and freedoms of urban life, illusory though they sometimes turned out to be. Temporary huts and makeshift accommodation were replaced by the cheapest forms of housing, and these were erected when there was little control of building and sanitation. Overcrowding and its related health problems were therefore an unsurprising result.

The degree to which squatter communities grow varies from place to place, and is also related to the ability of municipalities to exercise regulatory control or to invest in municipal housing programmes. A growing number of settlements are transitional and provide what is usually meant to be a temporary measure half-way between the rural setting that the inhabitants want to leave behind and the urban way of life which they are reaching out for and hope to be integrated in. Frequently, however, the change is not completed: stagnation sets in, and the so-called transitional settlements tend to become permanent.

Such settlements often become very large; at the worst they consist of extensive areas of hutments without the basic sanitary facilities of water supplies, waste- disposal systems, or health and social welfare services. The mixed populations, which are frequently drawn from different areas, present serious racial, religious and sociological problems because of their lack of cohesive functional organisations. Several of the major types of transitional settlements are the results of:

(1) Unscheduled population movements due to displacement of communities from their normal residences as a result of natural disasters (floods, hurricanes, fires, drought) or through socio-political upheavals (wars, strife, etc);
(2) Scheduled mass-movements of population as a result of social or political conventions, religious or secular festivals, and pilgrimages to holy cities;
(3) Movable dwellings used for short periods by holiday-makers and tourists, for youth camps and similar groups, and on a long-term basis by nomadic groups or others who for financial or social reasons use caravans and mobile homes for permanent residence;
(4) Planned short-term settlements, mostly for workers on major engineering projects such as dams and roads (often no provision is made for wives and children who are expected to remain at the home base); and

(5) Uncontrolled settlements found on the periphery of large cities as a result of an attempt by work-seeking people to get as near as they can to the urban setting.

Most transitional settlements are often located beyond municipal boundaries, and are thus regarded as the financial and moral responsibility not of the municipality, but of some more remote level of administration. The need to improve transitional settlements is great and the following two strategies might be followed to achieve this:

(1) Replace sections of shanty towns and squatters' communities with permanent housing and provide complete services;
(2) Supply marginal land with the basic sanitary services and allow newcomers to purchase the land, by making regular contributions over a long period, and to construct their own homes with locally available building materials.

3.4.5 Permanent Housing

In most cases permanent houses conform to properly laid down town plans and building codes. The housing conditions may however vary on account of the age of construction of the dwelling and the use to which it has been subjected. Three major categories generally defined for permanent housing are:

(1) sound housing with no defects or slight defects, which are normally correctable by regular maintenance (examples of this might be poor paintwork, slight damage to steps, small cracks in walls or in plaster, broken window glass, and slight wear in floors or door sills);
(2) deteriorating housing which needs more repairs than would be provided in the course of regular maintenance and has one or more defects which must be corrected if the unit is to continue to provide safe and adequate shelter (examples of this would include shaky steps, holes, open cracks or missing materials over a small area of floor, wall, or roof; and rotten window or door frames); and;
(3) dilapidated housing, which would not provide safe and adequate shelter because it would require extensive repair or rebuilding due to one or more critical defects (examples of this might be holes, open cracks or missing materials over a large area of floors, walls, roofs or other parts of the building; and sagging floors or walls).

4.0 CONCLUSION

The word "house" and "shelter" have been used interchangeably depending on the issues under reference. The meaning of 'dwelling' and 'housing' is also the same in ordinary discuss but not exactly the same as illustrated above, though this depends on the country and the environment of the user. Therefore the concepts and terminologies in housing also differs from one society to another, however, the most important thing is the salient meaning refers to the same thing. Many factors must be noted as responsible for making a house a health place for living which include appropriate site selection, use of durable and qualitative materials, use of skilled and experience labour force etc. It important for professionals like you understands when to use what terminology and when not use it. You should not refer to a shelter or any structure as a healthy house until it satisfies the physiological, psychological and social needs of man. In Nigeria today, using this definitions, many structures sited in the Government Reserved Areas (GRAs) cannot be qualified to be called houses or healthy house due to overcrowdings (social and physical), inappropriate sanitary facilities and heavy security cover using huge iron rods which disturbs and tempers with the comfort of the users**.**

5.0 SUMMARY

In this unit a simple explanation of the basic concepts and meanings of housing, shelter, dwellings, rural housing, affordable housing, traditional settlements, transitional housings etc were explain. The scope of housing and the various terminologies used in various field of endeavour but very relevant to environmental health profession were discussed and explained. The scope, with its variance from one place to another emphasise the need for appropriateness of town and country planning, the design and arrangement of the dwelling unit, the use of space by the occupants, the maintenance of the structure, i.e., the house in general, including dwelling areas and the availability of community facilities and services, including those for local circulation and transport. The good qualities of a house improves on the health status of the dwellers and the presence or absence of some important features could also make or mar a house such as supply as ample water, appropriate drainage, use of durable materials during the constructions, maintenance of sanitary facilities, adequate space within its vicinity, absence of dampness, provision of adequate lighting, ventilations (natural and artificial), waste collection and disposal etc as enumerated in the unit are very important.

6.0 TUTOR-MARKED ASSIGNMENT

Assess your own house and document what qualifies it to be a healthy house or otherwise.

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UNIT 2 RELATIONSHIP BETWEEN HOUSING AND HEALTH

CONTENTS

1.0 INTRODUCTION

In our previous unit we discussed some basic issues on housing this include the definitions and concepts in housing. We also learnt about some practices of man which affects quality of housing. In this session we will examine in details the relationship between housing and health of the dwellers. We will discuss how sanitary housing improves, maintain and promote the quality of the life of the dwellers and how ill health and poor hygiene practices of dwellers affect the quality of a sanitary housing and, of course, instead of providing the basic needs of the dwellers it become a source of infection and disease spread.

Housing conditions affect people's health. Inadequate housing causes or contributes to many preventable diseases and injuries, including respiratory, nervous system and cardiovascular diseases and cancer. Poor design or construction of homes is the cause of most home accidents. In some European countries, they kill more people than do road accidents. Use of proper building materials and construction could prevent indoor pollutants or mould, causing asthma, allergies or respiratory diseases. About every tenth lung cancer case results from radon in the home. Appropriate design can prevent both exposure and the risk to health. (WHO, Regional Office for Europe 2010) Towards safe and adequate housing, WHO/Europe seeks to assess and quantify the effect on health of housing conditions and how housing risks contribute to environmental and health inequalities.

With international experts, WHO/Europe evaluates the health gains from implementation of local plans for housing rehabilitation, and sets health priorities related to various technical aspects of housing. Priority issues include thermal comfort and energy, indoor environmental conditions, home safety, and residential housing environment.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- enumerate the health principles of housing
- identify types of health principles of housing
- explain the principles of health needs
- discuss principles of health action
- examine the relation of housing and environmental health.

3.0 MAIN CONTENT

3.1 Health Principles of Housing

There has been a lot of controversy about the relationship between housing and health over the years, concerning the social factors that affect health, such as human behaviour and practice. These are difficult to measure or observe, because of their less definite character, unlike physical conditions such as the influence of indoor air pollution on acute respiratory infections or poor sanitation on gastro-intestinal (feaco-oral) diseases which can be proved scientifically and epidemiologically.

Research conducted so far on ways of overcoming these difficulties suggests that such housing health links, which are not clearly understood, may be stated or defined in the form of "principles", i.e., guiding rules of thought and action. Many of the principles can be modified to suit specific situations or the prevailing conditions of an area or locality (climate, culture) and preferences of the people, e.g., location of houses, type of building materials and design to use, availability of resources for improving housing standards, etc. Health principles are different from housing standards or codes, which are official norms based on selected principles prescribed for particular communities at specific times. Standards or codes, on the other hand, are adapted from principles and limited in scope.

3.2 Types of Health Principles of Housing

The World Health Organisation has formulated two sets of health principles of housing as follows:

Principles related to health needs: These concern the interactions of man with housing, i.e., man's use of the house and its influences on human health.

Principles related to health action: These suggest appropriate health actions (steps) that can be taken to increase the protective qualities of housing against health hazards.

3.3 Principles of Health Needs

The principles of health needs are made of six, most of which have sub-divisions.

- *Protection against communicable diseases.*

Communicable diseases can be reduced if houses are provided with facilities for safe water supply, sanitary disposal of excreta, including waste water (sewage) and solid waste (household waste), adequate drainage of surface water and necessary provisions for domestic hygiene and safe food, storage, preparation, cooking, eating, etc.

- *Protection against injuries, poisoning, and chronic diseases.*

Housing should protect the occupants from avoidable injuries, poisonings and exposures that contribute to chronic diseases and malignancies.

- *Reducing psychological and social stress to a minimum.*

*H*ousing may promote mental well-being and reduce psychological stress significantly, since the home is known to be free of dangers.

- *Improving the housing environment.*

The neighborhood and community, as well as the dwelling itself do affect human health a great deal.

- *Enabling individuals make informed use of housing*.

Health also depends on how the residents use their houses.

- *Protecting people at special risk.*

The dwelling conditions of certain groups of people put them at special health risk, leaving them especially vulnerable to multiple health

hazards (WHO, 1989, 1961; Schaefer, 1987; Wilkie, 1959; WHO, 1991).

3.4 Principles of Health Action

The principles of health action in relation to housing are derived from three social facts of life that affect human health.

a. Poverty is a major barrier to improved housing and, hence, to a country's socio economic development;
b. Housing decisions are highly decentralised and fragmented, i.e., government agencies, house builders, and families are involved;
c. The health aspect of housing are poorly understood and not considered in government, community and family decisions.

The principles of health action which deal with the ways the community can take action to raise the standard of housing quality include the following:

1. Health advocacy in housing decisions should be strongly emphasised by public health or environmental health authorities and other related agencies and interest groups at administrative levels and through various channels of communication.
2. In government circles, health advocacy should focus on a broad range of policy issues rather than housing alone, e.g., socioeconomic development, policies on taxation and financing of housing scheme on the owner occupier basis, land and housing tenure, local governments, urbanisation management, family planning, etc.
3. To implement socially desirable policies, health advocacy should cut across various sectors and integrate into the technical and social process that can be utilised to develop and maintain community resources. Along with economic issues, health should be considered in the processes of development planning and management, urban and land use planning, setting of housing standards and regulations, design and construction, including monitoring and surveillance, to provide necessary information for future planning.
4. For housing policies and standards to be effective, extensive public and professional education is required to promote the provision and use of adequate information in ways that will improve health status. In view of the fact that the construction and use of housing are determined by people's choices and behaviours, education should be broad-based and targeted at a wider audience. These include householders, architects, local builders, manufacturers and dealers of building materials, as well

as public health personnel (public health physicians, environmental health officers, sanitary engineers, primary health care workers, and policy leaders or managers of government departments or agencies etc.

5. Finally, in dealing with the needs and problems of housing (human habitats), community involvement at all levels is paramount, as this enhances self-help efforts, neighbourhood help and communal co-operatives. Apart from individuals who own houses, community support is also needed to enable people make informed use of housing and improve their living conditions. The objective is to assist individuals meet their housing needs economically, which can be achieved through the establishment of a permanent dialogue between communities and the government.

By so doing, the community can be properly guided to get the necessary support in addressing its housing problems (Park, 2007; WHO, 1961, 1987, 1989, 1991).

3.5 Examine the Relationship of Housing and Environmental Health

Sofoluwe documented the relationship between good housing and environmental health as follows;

"Good housing forms an important aspect .of environmental health. According to World Health Organisation experts, houses should provide as few opportunities as possible for the direct transmission of disease and should encourage healthful habits-among the occupants, (WHO, 1961). All public health authorities and experts agree that the standard of housing in a community affects the quality of health within the community. It is however very difficult to say specifically, what are the effects of housing on health.

That is, it is not possible to say with certainty that a particular man has a particular disease because he lives in a bad house, just as one can do for bad water or bad waste disposal. This is because many other interrelated _factors are often present with bad housing ((Lun, 1961).

Reports from the literatures have not helped the situation much (Willie 1959), Benjamin 1953). These factors are particularly important in the developing countries 'where poverty, malnutrition, lack of education and medical care together with lack of knowledge relating to disease prevention and personal hygiene, play important role on the health of the people. Many research workers and writers like Mackintosh (1965), Sofoluwe (1969). Salvato (1958) Wilner *et al.* (1962) Haddock (1961)

Stockwell (1962), Halli-day (1928), Wright & Wright (1942), have related certain ill health to specific poor conditions of housing. Studies in the United States of America quoted by Salvato (1958) and others like Schorr (1970), Britten (1942) and Fisher & Pierce (1967) showed that when people live in slum areas, the rate at which they have communicable diseases is about 65 per cent higher than national average. Also during the cholera outbreak in Ibadan in 1970-1971, the people who live in built-up slum areas reported more cases than those in planned areas. The studies in the U.S.A. also show that tuberculosis rate is about eight (8) times as high in slum areas as the national average that infant death rate is five times higher, juvenile delinquency is two (2) times higher and life expectancy is about 6.7 years shorter among slum dwellers than the national average. It was also reported that the frequency of fire outbreak was 1.5 times more in slum areas than the national average.

To determine scientifically further, the effects of housing factors on health, the WHO commission studies and found relationship between some conditions/elements that have direct negative effect on the health of its occupants as shown in the table below;

Table 2.1: WHO Technical Report on Inadequate Housing (2006)

Housing Factor	**Health Effect**
CO, NO2, Formaldehyde	Respiratory effects and poisoning
Pesticides and chemical household products	Allergies, respiratory effects, poisoning
Cockroaches	Allergic effects
Accessibility Accidents and social effects	Home fires / fire detectors Fire-related injuries and mortality
Sanitation and hygiene	equipment Infectious diseases, diarrhoea, etc.

4.0 CONCLUSION

In the above discuss, we have discussed the relationship between sanitary housing that support the needs of its dwellers and their health. Sanitary or healthy housing has all facilities, equipments, services and devices needed or desired for healthful living; we have seen that all houses are shelters but not all shelters are houses.

A “house” which does not have all the facilities, equipments, services and devices needed or desired for healthful living is not a house but a mere shelter and therefore may not support the desired growth and

development. Human practices in a house also determine its quality, hence good sanitation, cleanliness; good maintenance culture will increase the lifespan of a house and enable it to support healthful living. The specifications in the unit are mostly that of WHO and each environment is allowed to adapt it to its own needs and circumstances and therefore are not cast on a stone.

5.0 SUMMARY

In this unit you learnt the principles related to health needs which concerns the interactions of man with housing, i.e., man's use of the house and its influences on human health, Principles related to health action which suggests appropriate health actions (steps) that can be taken to increase the protective qualities of housing against health hazards. It discussed the principles of health action that is those actions and practices that may affect the quality of a house such as poverty which is considered as a major barrier to improved housing and, hence, to a country's socio economic development, some government policies and decisions that are highly decentralised and fragmented, i.e., government agencies, house builders, and families are involved and the role house plays in health promotion are poorly understood and not considered in government, community and family decisions. Individuals concentrate on the beauty of a house rather than its specification, government is concerned about space management and cost while families and communities are very interested in their homogeneity and cultural values of their dwellings. The most important of all is the ability to take cognisance of all the above and ensure the house has facilities and structures that support healthful living. This is the main concern of an environmental health practitioner.

6.0 TUTOR-MARKED ASSIGNMENT

List two (2) principles each of health needs and health action in housing. Enumerate five relationships between housing and environmental health.

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UNIT 3 FACTORS AFFECTING QUALITIES OF HOUSING STANDARDS AND MINIMUM REQUIREMENTS

CONTENTS

1.0 INTRODUCTION

In the previous session, we have seen the relationship between housing and health. We have discussed those principles that enumerated the human needs and actions/decisions that affect the qualities of the house. When considering standards in housing, the most important and essential goals to consider include disease prevention, protection against adverse weather and climate, as well as the security of life and property. These are achievable when housing meets the basic requirements for

human habitation. To do that there must be set standards to enforce. Standards could be defined as official norms (guiding principles) created and used for determining or regulating the conditions (physical and social) under which people can live without jeopardising their health. They are the useful and firmly established concepts among public health authorities concerned with housing. Therefore to achieve these standards, some basic requirement must be provided for the inhabitants of any house or building. This unit discusses such standards and the basic requirements needed to ensure healthy living in the houses.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- describe housing standards
- enumerate various types of housing standards
- discuss the minimum (basic) housing standards
- discuss the basic human requirements in housing
- explain protective requirements at home.

3.0 MAIN CONTENT

3.1 Types of Housing Standards

Housing standards are of different types:

Minimum Standards: Are the rock bottom conditions below which no housing should be allowed to exist. They are critical conditions that must be followed for the occupants to attain maximum health benefits in the residential environment, e.g., ventilation and illumination, water supply, waste disposal facilities, etc.

Desirability Standards: These are aimed at fulfilling human comfort and convenience.

Target Standards: These are normally tailored towards the achievement of specific objectives of living within a given time frame, after which they may be altered or cease to exist as the situation warrants, e.g., Millennium Development Goals of reducing by half, populations without water supply and basic sanitation by 2015.

The human requirements of healthy housing are physiological and social in nature. Some of them may be stated precisely, while others must be put in less exact terms. When the basic human requirements are clearly defined, they can be seen in their true perspectives, as essential means for meeting or satisfying the human needs. Examples include ceiling the

height of a room, room and window sizes, means for safe disposal of waste and water supply, ventilation and illumination, etc.

Furthermore, housing standards also vary from one country to another and from region to region, because of the difference in climate, culture or traditional customs, social practices, choice of building materials, levels of income or economic status. It must be stated here that housing standards are not ends in themselves, but only means to an end in public health, which is the attainment of the ultimate goal of health, physically, mentally, and socially and, by extension, the establishment and maintenance of world peace (WHO, 1961; Schaefer, 1987; FMENV, 2005).

3.2 Basic Housing Standards

Housing, like other aspects of environmental health and sanitation, is aimed at fulfilling four key objectives of health to which public health programme are directed. These are as follows:

- the prevention of premature death
- the prevention of disease, illness and injury
- the attainment of efficiency of living
- the provision of comfort.

In realisation of these, the World Health Organisation (WHO) has set out the standards for meeting the fundamental human needs in the residential environment, which include the following:

(i) Design requirements of dwelling units,
(ii) Requirements for household services and facilities,
(iii) Physiological requirements,
(iv) Requirements for town, village and regional planning.
(v) Protective requirements,
(vi) Requirements for special groups (e.g., the elderly and handicapped).

3.3 Design Requirements of Dwelling Units

3.3.1 Space Requirement

The amount of space for occupants in the dwelling unit is determined by many factors such as culture, tradition, custom, social and economic status of the people involved. Space is measured by area and by volume. The cubic air space per occupant in a dwelling unit varies with the floor area, the height of the ceiling, the rate and means of ventilation, the

thermal (temperature) and illumination requirements, etc. Also, the number of rooms required for each household varies.

However, the following are the recommended standards:

(i) Each room should have adequate floor space of at least 120sqft(1 2x1 0)40m2 (4m x 3.3m);
(ii) A maximum cubic air space of 500 cubic ft;
(iii) A minimum total area of windows in each habitable room of 1/8 (one-eighth) of the total floor area;
(iv) A separate room(s) provided for cooking, eating (dining) and leisure, except for families with one room for two adults or husband and wife.

3.3.2 Provision of Privacy

The definition of privacy varies according to culture and patterns of living. Thus, people have different views about privacy.

In some areas, privacy is regarded as seclusion in individual rooms. There is also the privacy of vision, restricting the possibility of looking into a dwelling unit through the doors or windows.

(i) Ideally, each member of a household should have a separate room, except husband and wife as in developed countries, but this does not apply in all situations.
However, the provision of a room separate from the sleeping room, for leisure activities and for intra and inter family social use, is the recommended standard. This room is called the parlour or living room in Nigeria and other parts of the world.
(ii) Adolescents or adult members of opposite sex should not share bedrooms, except husband and wife for moral reasons.
(iii) The location and arrangement of bedroom should be such that they do not open directly into each other or bathroom or water closet apartment (toilet).
(iv) Toilet facilities or water closet provisions in the house should be in a separate room for privacy and hygienic purposes.
(v) The location of windows should be such as to provide the privacy of vision, i.e., restrict the possibility of looking into the room, while ensuring adequate ventilation and lighting.

3.3.3 Functional Use of Rooms

For proper maintenance of healthy conditions in the residential environment, a house should have separate areas outside the dwelling

unit for rearing of domestic animals and storage of working implements (WHO, 1989, 1987, 1961; WAHEB, 1991).

3.4 Requirements for Household Services and Facilities

The minimum standards set for basic household services and facilities to meet human needs are as follows:

- Water supply in the building and facilities for safe disposal of household refuse;
- Facilities for proper disposal of excreta or (sewage), including waste water and drainage of surface water;
- Facilities for washing of clothes, kitchen utensils, bathing and compound cleaning;
- Facilities for food storage, preparation, cooking and consumption, including storage of personal belongings.

3.4.1 Water Supply

Water to be used for human consumption should be readily available in sufficient quantities that meet both national and international standards for drinking water quality (WHO, 2010; FMENV, 2005).
It should be clean, potable and not contain any chemical substances, microorganisms and other substances in quantities that may endanger human health.

- It should be supplied by sanitary plumbing or other water supply systems from approved sources to the house or court yard near the dwelling unit, as to facilitate easy transport of water to the house. The location of the source of water should be within a minimum distance of 30 metres from sources of pollution.
- It should be made available in such quantities that will be enough to carry out domestic chores, cleaning and personal hygiene. For example, the World Health Organisation (WHO 1961), West Africa Health Examination Board (WAHEB, 1991), and Federal Ministry of Environment Nigeria (FMENV 2005) have recommended at least 270 litres of water per person per day in urban areas, and 120 litres per person per day for rural communities.

For those using private water suppliers in rural areas, at least 45 litres per person per day is ideal.

The recommended sources of potable water for use in houses include the following:

Improved drinking water facilities

- Piped water into dwelling (plot or yard)
- Public tap/standpipe
- Tube well/borehole
- Protected dug well
- Protected spring
- Rain water collection

Source: WHO! UNICEF, 2006

3.4.2 Excreta Disposal

- Every house should have adequate sanitary latrines/toilets designed to prevent flies, other pest vectors, contamination of water supplies and top soil.
- The latrine/ toilet should provide adequate privacy for the occupants/users.
- The latrine/ toilets should be adequate to serve the household family members as required.

Examples of improved latrines/ toilets approved for dwelling units are shown below.

Improved latrine / toilet facilities

- Flush /poor flush toilet
- Piped sewer system
- Septic tank
- Pit latrine
- Unknown place/not known where
- Ventilated improved pit latrine (VIP)
- Pit latrine with a slab
- Composting toilet

Source: WHO/ UNICEF, 2006

Recommended latrine/ toilet facilities for households/ dwelling units

1 - 10 persons 1 toilets / latrine
11 - 20 persons 2 toilets / latrines
21 - 40 persons 3 toilets / latrines

50 - 75 persons 4 toilets / latrines
75 - 100 persons 5 toilets / latrines

For more than 100 persons 1 more toilet for every additional 30 persons (FMENV, 2005).

3.4.3 Refuse Disposal

- Every house should be provided with a sanitary waste bin having a tight filling cover for collection and storage of household waste.
- A waste collection shed should be provided in storey buildings with more than 4 floors (FMENV, 2005).

3.4.4 Washing and Bathing Facilities

- Every household should have a room separate from the kitchen as bathroom and equipped with wash basin facilities, if affordable.
- The dwelling unit should also have a place for the washing of clothes (laundry) with adequate facilities for disposal of waste water.
- Bathroom should not be less than 1 .5m.

3.4.5 Cooking Dinning and Storage Facilities

The minimum standard concerning the provision of hygiene facilities for the storage, preparation, serving and consumption of food are aimed at keeping food stuffs wholesome and free from contamination. They are as follows:

- Adequate device or equipment for cooking food, consisting of preferably smokeless fuel, venting of smoke fumes, fuel has open flame, provision for safe storage of reserve fuel that in the dwelling unit, prevention of fire hazards.
- Adequate kitchen sink separate from a lavatory basin for food preparation and the washing of utensils.
- Food storage facilities consisting of separate facilities for dry storage of nonperishable food stuffs and facility for perishable foods to prevent spoilage.
- Storage facilities for cooking utensils, cleaning equipment and materials, etc.

3.5 Human Requirements in Housing

3.5.1 Physiological Requirements

This set of human requirements deals with how the conditions of dwellings affect the body processes, health growth and development. For the body to function optimally, it requires the right temperatures (thermal conditions), moisture, a minimum amount of noise and reasonable supply of pure air and sufficient light.

i. Provision of heating and cooking facilities in the dwelling unit to maintain optimum thermal conditions adequate for proper regulation of body processes comprising.
   - Gravity or mechanical ventilation or radiant energy generated from heated panels to keep the house hot in cool climate.
   - Both artificial and natural ventilation systems in warm climates to control heat.

ii. Facilities for control of excessive noise consisting of these:
   - installation of devices with sound absorbing materials in the building
   - community planning by restriction of noisy operations from residential areas
   - judicious use of noisy equipment and appliances in the dwelling.

iii. Prevention of dampness by a lying of cement mortar consisting of 1 part of cement to 3 parts of fine grain sand.

iii. Adequate ventilation to:
   - keep concentrations of toxic substances in air to a minimum to avoid hazards to health;
   - keep concentrations of non-toxic substances to a minimum to avoid undesirable reactions, e.g., cough or sneezing;
   - create a comfortable environment or conditions free from unpleasant odour.

iv. Adequate illumination (lighting) by both natural and artificial to enable occupants see what they are doing.

3.5.2 Protective Requirements

Protective requirements provide safe environments for family members against home accidents, disease vectors (insects and rodent), unwanted animal and human intrusion as well. Human dwellings, therefore, should have these:

i. Adequate safe guards against structural failures comprising:

- durable materials for roofs, walls, doors and windows;
- seasoned and treated wooden members with approved chemicals against termite attack;
- good design engineering and construction of the structure, e.g., good foundation and masonry.

ii. Fire prevention devices consisting of:
- at least three (3) fire escape routes to the outside of the house

ii. Prevention against falls comprising:
- cleanable non slippery and smooth floor surface
- strong hand rails installed and logically placed with adequate illumination at changes in elevation
- guard rails (75-90cm) installed at balconies and low window sills. Not porous enough to allow small children to pass through.

iii. Protective devices against natural hazards consisting of:
- lightening rod installation to prevent thunder/ lightening
- proper location (approve site) and construction of dwellings.

v. Facilities for prevention of insect and rodent vectors consisting of:
- window/door screens and fly catchers in dwelling against mosquitoes and other flying insects and
- flat proofing construction and installation to prevent rat ingress.

vi. Protective facilities and devices against dangerous animals and human intrusion consisting of:
- Sound construction of the housing structure and installation of hard ware (burglar proofs) on doors, windows and other openings to prevent marauders.

3.5.3 Town, Village and Regional Planning Requirements

Town, village and regional planning are important to healthful housing in many ways.

1. Aid in the proper location of residential neighbourhood and management for meeting the human health needs
2. Protection of the neighbourhood against external hazards, e.g., noise pollution, heavy traffic due to proximity of industrial operations in residential settlements
3. Facilitate the proper allocation and efficient use of scare resources (manpower, time money, etc) to achieve the optimum result of human benefits and satisfaction

4. Guide in decision-taking in the efficient use of resources for the management of housing programmes
5. Facilitate the process of land use planning and implementation without disrupting human values
6. Facilitate the planning of circulation facilities (traffic facilities) without disrupting normal community units and activities
7. Aid in the site planning of neighborhoods with provisions for social amenities (neighbourhood store, open spaces, places for informal meeting) and future community development
8. Create opportunities for the zoning and establishment of social institutions and facilities (schools, recreation, transport, water supply, etc.).

3.5.4 The Village, Town and Regional Planning Requirements Consist of the Following:

1. A master plan (blue print) prepared for the logical growth and development of towns, villages and regions
2. Must be implemented, since conditions vary between and within countries. Generally, they serve as guide, but can be modified by countries to suit their circumstances.

3.5.5 Minimum Housing Standards in Nigeria

The basic minimum requirements set for housing in Nigeria are as follows:

i) Site

The soil (land) should be porous and well-drained:

- it should not be liable to flooding
- it should be free from pollution
- reclaimed site should be allowed to settle for at least 10-20 years before development.

ii) Plot area built upon

- the building structure should occupy not more than 50per cent of the plot area (site) for residential purposes
- For non -residential buildings, it should not exceed 75per cent of the plot area (site).

ii) Set back

- adequate space should be allowed all round the building to ensure ventilation and lighting
- it should be at least 1/3 of the build-up area in rural areas and 2/3 in urban areas.

iii) Foundation of building

This is the first part of the building that is built to the ground level.

- the depth of excavation should be at least 30cm, depending on the soil type
- it should be laid with concrete made up of one (1) part of cement to three (3) parts of sand and six (6) parts of gravel (1 :3:6) or 1:4:8, one(1) part cement, four (4) parts of sand eight (8) parts of gravel
- The concrete (casting) should be made to 15cm thick all over the excavated foundation for bungalows or 23cm thickness for other buildings in normal soil (WAHEB, 1991).

v) Damp proof course (DPC)

This refers to the top most section of the foundation wall laid with cement mortar to prevent moisture rising through the walls of the building (capillary attraction), causing dampness.

- it should be laid with a layer of cement mortar of 1.3cm to 2.5cm thickness
- the cement mortar should consist of 1 part of cement to 3 parts of sand and mixed with water.

vi) Room sizes

- the living room should be at least 12m2 of the floor area and cubic air space of at least 400cubicft. (121m3)
- the height of the room to the ceiling should be 2.7 meters on the average
- width should be 2.4 meters.

vii) Ventilation

- windows should open directly to the external air and placed in opposite directions of the walls or adjacent to ensure “through and through ventilation” or cross ventilation

- the area of each window should not be less than of the floor area of the room.

viii) Lighting

Day light (natural light) should neither cause undue glare nor be more than 1per cent of the half of the floor area.

ix) Kitchen

- the kitchen should not be less than 2.0m2 and located within the building.

x) Bath room

- it should be located within the dwelling unit (building)
- it should be at least 1 .5m2.

xi) Persons per room

- 1 room for at least 2 persons (adults)
- 2 rooms for at least 3 persons (adults)
- 3 rooms for at least 5 persons (adults)
- 4 rooms for at least 7 persons (adults)
- Above 5 rooms for at least 10 persons (additional 2 persons for each room)

Note that a child above 10 years is regarded as an adult and should be so considered in calculations.

xii) Water supply

- water should be adequate (in both quantity and quality) made readily available always and free from microbial and chemical contaminants
- it should be piped by sanitary plumbing into the building or courtyard or within a reasonable distance for easy transportation into the dwelling.
- the source of water should be located at least 30 meters away from sources of possible contamination.

xiii) Excreta disposal

- there should be a sanitary latrine/toilet provided for safe disposal of human excreta (sewage), including waste water (sullage).

- the latrine/toilet facility must be the type recommended by WHO/UNICEF, 2005 (See Table 2).

ix) Refuse (solid waste) disposal

- each dwelling should have facilities for refuse collection and storage in a sanitary dustbin with a tight fitting cover to exclude pest and odour nuisance
- a sanitary refuse shed with roof should be provided for waste storage, prior to final disposal.

x) Drainage of surface water

- Adequate drainage of rain water and waste water should be provided and well maintained.

xi) Animal rearing

- A separate accommodation should be provided for rearing of domesticated livestock (animals and poultry birds) (WHO, 1961; WHO, 1991; WHO/UNICEF, 2005; FMENV, 2005; Park, 2007).

3.6 Characteristics of Urban and Rural Housing

The general objective of housing is shelter against adverse weather and climatic conditions, plus other hostile forces that may pose risk to human health. Both aim at fulfilling the fundamental human needs for healthy living and survival.

The concern requirements for portable water supply, safe disposal of waste including excreta, surface water drainage, safe food preparation and storage, personal and domestic hygiene, washing and general cleaning, structural safety, etc. are what charaterise urban and rural housing

3.6.1 Urban Housing

An urban area has been defined as a man-made environment encroaching and replacing a natural setting and having a relatively high concentration of people whose economic activity is largely non-agricultural. This definition does not include the rural village.

Urban housing, therefore, includes the pattern of settlements and the associated factors present in the environment that may increase the risk of or protect against communicable and non-communicable diseases, injuries and other environmental health hazards (WHO, 1991). In

developing countries, rapid population growth and rate of rural urban migration have resulted in the emergence of slum settlements in the cities where most of the people live in filthy and pest-infested environments. A UN-HABITAT Survey on slums in 2001 revealed three (3) out of ten (10) urban residents lived in slum areas, with Africa habouring 71.9 per cent of the urban population as slum dwellers. Statistics also show per cent of the world's population are in the cities, but this figure is expected to rise to 2/3 by 2030. The developing countries harbour the fastest growing cities, and the fastest neighbourhoods are in the slums.

This scenario, according to experts, depicts grave health dangers, as the cities are the locus of extreme poverty and foci of disease transmission. The inhabitants lack basic facilities, and services due to poor housing that make life miserable (UN-HABITAT, 2007; UN-HABITAT, 2005; FNENV, 2005; WHO, 1991).

3.6.2 Rural Housing

The characteristics of rural housing are less complex than urban housing, owing to a number of factors that come into play, which include socio-cultural and economic factors. In a typical rural setting, traditional custom is a strong determinant of housing standards and characteristics. Rural housing differs markedly from urban housing in many respects, in terms of structural designs, construction and standards, as well as the uses by the residents. Unlike the urban settlements, rural housing is not based on planning because of a lack of planning and regulation of standards. However, the basic requirements for healthy living in both urban and rural housing are the same, e.g., water supply, basic sanitation, adequate space, ventilation/lighting, structural safety, etc. The only major difference between the two is the absence of community services and facilities in the neighbourhood and the hazard arrangement of the settlement in rural housing without planning (WHO, 1961).

Most countries, however, have minimum standards established for rural housing (Park, 2007). In the Nigerian context, the local government authorities have powers to make bye- laws for proper town and village planning, building regulations and implementation of housing policies, but these have been neglected.

4.0 CONCLUSION

In this unit we have examined the standards of housing and the minimum requirements of each segment in relation to environmental health practice. Two types of housing standards were enumerated, i.e.

desirability and target standards. Various elements such as ventilation, lighting, water requirements, toilets requirements, DPC, drainage requirement either it is open or closed drainages etc were examined and standard set for all. What is mentioned in this unit is a minimum requirement and depends on other factors. Sanitation authorities are at liberty to set new standards if studies in a particular environment show that this minimum standard is unacceptable due to prevailing circumstances. The requirements in urban and rural setting might differ on some issues such as on wastes and requirement for water supply as explained above. In rural environment, traditions and customs might force a slight shift in some circumstances. There is the need for an environmental health practitioner to be able to scan his/her environmental as an act appropriately without compromising the principles of the health promotion and protection.

5.0 SUMMARY

In this unit we defined "standards" as official norms (guiding principles) created and used for determining or regulating the conditions (physical and social) under which people can live without jeopardising their health. Therefore to achieve these standards, some basic criteria must be used to give a guide to people and enforcement personnel. These requirements must be provided for the inhabitants of any house or building. This unit discussed such standards and the basic requirements needed to ensure healthy living in the houses in relations to all human needs such as portable water requirement, toilet requirements, privacy, washings requirements, etc basically all there were aimed at fulfilling four key objectives of health to which public health programmes are directed, these are the prevention of premature death, the prevention of disease, illness and injury, the attainment of efficiency of living and the provision of comfort to the inhabitants. These standard set varies between the rural and urban areas. Therefore it is important to study the resources available in your environment and the socioeconomic situation of your people before enforcing these standards.

6.0 TUTOR-MARKED ASSIGNMENT

Assess the current provisions of health requirements in the house you live and compare with the standards in this unit and enumerate only five (5) deficiencies.

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UNIT 4 SAFETY AND EMERGENCY PROVISIONS IN STANDARD HOUSING

CONTENTS

1.0 INTRODUCTION

In the previous unit, we have learnt how housing requirements are very necessary and the various standards set to ensure the protection and promotion of health. However, as part of the requirements, there is the need to have safety and emergency provisions so that if all what is planned failed due to natural or manmade causes the consequences will be minimal. Satisfying life activity in a safe and pleasant environment is a source of health and well-being to all inhabitants. Yet, the physical, psychological and organisational home environment is all too often responsible for injury and disease in our houses. This unit will examine these safety and emergency requirements that should be put in place in our houses and those issues that should be considered during construction that will provide the maximum safety to its dwellers. It is the responsibility of all dwellers in a compound to contribute in making their environment very safe for living, in fact a safety programme need to be prepared for all to participate either at home, offices and any public place where people gather for a while. You are to ensure such safety measures and programmes are complied with. There are many safety measures to be considered. But this unit will focus more on safety against fire. Fire safety within the home is an extremely important issue,

especially in mixed use premises and where unrelated occupiers, who live independently from one another, share common areas of the same building.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define safety in housing
- enumerate reasons for the need for safety precautions in housing
- explain safety and emergency provisions in housing
- discuss method for carrying out a risk assessment in houses
- explain the general principles of fire safety.

3.0 MAIN CONTENT

3.1 Definition of Safety

Safety according to Encarta dictionary refers to freedom from danger: protection from, or not being exposed to, the risk of harm or injury or lack of danger, inability to cause or result in harm, injury, or damage or a place or situation where harm, damage, or loss is unlikely.

Safety in relation to housing refers to a situation and/or condition in a dwelling place of man where all facilities, equipments, devices and structures provided are placed and manipulated to support healthful living of man and the environment. It implies that all devices and equipments that can help to reduce hazards due to unforeseen situations and circumstances must be put in place and ensured that it is all working in perfect order. Such devices and instruments include safe stairs, dry and smooth floor, fire extinguishers, warning signs and labels, ample sources of light etc.

3.2 Reasons for the Need for Safety Precautions in Housing

A lot of resources are used to build up a house for self and family or for renting and take huge resources also to provide the facilities and equipments in the house. These facilities must be protected against all form of partial or total damage, therefore there is the need to provide additional resources to provide some services such as maintenance of electricity facilities, plumbing system, building structure and to also procure those devices and equipments that could be used to either prevent completely or reduce the negative effect that might challenge those planned facilities when there is emergency situation in the premises. Therefore the main reasons for providing these safety facilities among others are:

- to eliminate all forms of risks that has potentials for injury, disease or/death
- to reduce, to the barest minimum, any damage or risk arising from failure of any system in the premises
- to safeguard the resources invested in the premises so as to maximise its utilisation
- to be able to have some form of alert that will help dwellers prepare or take measures against risks and dangers

You may wish to consider the reasons in the following way:

1. Moral

- duty of reasonable care in the house
- unacceptability of putting health and safety of residence/occupants at risk
- society's attitude to moral obligations of protecting lives and property
- making the moral case to owners and managers of houses and estates.

2. Legal

- the preventive (enforcement)
- punitive (through criminal sanctions)
- And compensatory effects of law.

3. Economic

Direct and indirect costs associated with incidents and/or unhealthy houses and their impact on the insurers, owners and managers (includes insured and un-insured costs)

3.3 List Safety and Emergency Provisions in Housing

Barry (1999), in "The Construction Buildings" discussed these provisions which is adopted here explained that fire safety regulations are concerned to assure a reasonable standard of safety in case of fire outbreak. The application of the regulations is directed to the safe escape of people from buildings in case of fire rather than the protection of the building and its contents.

The requirements to the building regulations are concerned to:

3.3.1 Means of Escape

The requirements for means of escape from one and two storey houses are that each habitable room either opens directly on to a hallway or stair leading to the entrance, or that it has a window or door through which escape could be made and that means are provided for giving early warning in the case of fire. With increased height and size, where floors are more than 4.5 m above ground, it is necessary to protect internal stairways or provide alternative means of escape. Where windows and doors may be used as a means of escape their minimum size and the minimum and maximum height of window must be defined.

3.3.2 Smoke Alarms

To ensure the minimum level of safety it is recommended that all new houses should be fitted with self-contained smoke alarms permanently wired to a separately fused circuit at the distribution board. Battery-operated alarms are not acceptable. Where more than one smoke alarm is fitted they should be interconnected so that the detection of smoke by any one unit operates in all of them. Some mechanism should be developed for rural areas since the above may not be applicable.

3.3.3 Internal Fire Spread (Linings)

Fire may spread within a building over the surface of materials that encourage spread of flame across their surfaces, when subject to intense radiant heat, and those which give off appreciable heat when burning.
There is the need to have some classification of the performance of linings relative to surface spread of flame over wall and ceiling linings and limitations in the use of thermoplastic materials used in roof lights and lighting diffusers since we are yet to develop such in the country for now.

3.3.4 Internal Fire Spread (Structure)

The premature failure of the structural stability of a building during fires is restricted by specifying a minimum period of fire resistance for the elements of the structure. An element of structure is defined as part of a structural frame, a load bearing wall and a floor.

The requirements are that the elements should resist collapse for a minimum period of time in which the occupants may escape in the event of fire. Periods of fire resistance vary from 30 minutes for dwelling houses with a top floor not more than 5 m above ground, to 120 minutes

for an industrial building, without sprinklers, whose top floor is not more than 30 m above ground.

3.3.5 Resistance to the Passage of Heat

Before the advent of oil and then gas as fuels for heating, it was possible to heat individual rooms by means of solid fuel burning open fires or stoves and people accepted the need for comparatively thick clothing for warmth indoors in winter.

With the adoption of oil and gas as fuels for heating it was possible to dispense with the considerable labour of keeping open fires and stoves alight and the considerable area required to store an adequate supply of solid fuels. With the adoption of oil and gas as fuel for heating it was practical to heat whole buildings and there was no longer the inconvenience of cold corridors, toilets and bathrooms and the draughts of cold air associated with open fireplaces. The population increasingly worked in heated buildings, many in sedentary occupations, so that tolerance of cold diminished and the expectation of thermal comfort increased.

Of recent years the expectation of improved thermal comfort in buildings, the need to conserve natural resources and the increasing cost of fuels have led to the necessity for improved insulation against transfer of heat. To maintain reasonable and economical conditions of thermal comfort in buildings, walls should provide adequate insulation against excessive loss or gain of heat, have adequate thermal storage capacity and the internal face of walls should be at a reasonable temperature.

For insulation against loss of heat, lightweight materials with low conductivity are more effective than dense materials with high conductivity, whereas dense materials have better thermal storage capacity than lightweight materials.

Where a building is continuously heated it is of advantage to use the thermal storage capacity of a dense material on the inside face of the wall with the insulating properties of a lightweight material behind it. Here the combination of a brick or dense block inner leaf, a cavity filled with some lightweight insulating material and an outer leaf of brick against penetration of rain is of advantage.

Where buildings are intermittently heated it is important that inside faces of walls warm rapidly, otherwise if the inside face were to remain cold, the radiation of heat from the body to the cold wall face would make people feel cold. The rate of heating of smooth wall surfaces is

improved by the use of low density, lightweight materials on or immediately behind the inside face of walls.

The interior of buildings is heated by the transfer of heat from heaters and radiators to air (conduction), the circulation of heated air (convection) and the radiation of energy from heaters and radiators to surrounding colder surfaces (radiation). This internal heat is transferred through colder enclosing walls, roofs and floors by conduction, convection and radiation to colder outside air.

3.4 Suggested Method for Carrying Out a Risk Assessment in Houses

The process can be broken down into five steps:

- identify fire hazards
- identify people at risk
- evaluate, remove or reduce risk and protect against remaining risk
- record, plan and inform or train
- review.

Step 1: Identify the hazards within the premises

For a fire to start, three things are needed: a source of ignition, fuel and oxygen. If any one of these is absent, a fire cannot start. Taking measures to avoid the three coming together will therefore reduce the chances of a fire occurring.

Sources of ignition: identify potential sources of ignition, i.e. sources of heat which could get hot enough to ignite any materials around them. In premises covered by this guide they may include:

Smokers' materials such as cigarettes, matches and lighters (if people smoke within the premises); naked flames, for example candles and night lights; electric, gas or oil-fired heaters (fixed or portable); boilers; cookers, toasters and other kitchen equipment (especially when shared); faulty or misused electrical equipment; electric blankets, computers, TVs, washing machines and dryers; lighting equipment (fixed and movable), for example halogen lamps and table lamps; the electrical installation itself, the gas installation, arson attack; and in larger or mixed use properties, any plant rooms etc.

Sources of fuel: anything that burns is fuel for a fire. Things that will burn reasonably easily and are in large enough quantity to provide fuel for a fire or cause it to spread to another fuel source are potential

hazards. In premises covered by this guide they may include the following, but this list is not exhaustive: furniture, furnishings, textiles, bedding, clothing and curtains, laundry; accumulations of unwanted mail, waste paper, cardboard, newspapers and magazines (including that awaiting recycling collection); waste storage and refuse containers; flammable liquid-based products such as paint, varnish, thinners, adhesives, white spirit, methylated spirit and cooking oils; liquefied gas (LPG), paraffin, heating oils and petrol; paper products, packaging materials, stationery, advertising material and books; decorations for seasonal and religious occasions.

Others are Plastics and rubber such as videotapes, polyurethane foam-filled furniture and polystyrene-based display materials; and wall, floor and ceiling coverings and surface finishes.

Compliance with these regulations will reduce the risk these items present.

Particular care should be taken when premises are undergoing alteration, repair or redecoration. During such times flammable materials that would not normally be present may be stored in the premises, possibly in escape routes or in rooms which are otherwise unused. Care should be taken as to where and how these products are stored. Premises which normally have good fire precautions and present a low fire risk may have their fire safety compromised by temporary careless storage of these products or by the disabling of fire precautions during the period of the works.

Sources of oxygen: the oxygen source will be the air in the building.
Where only normal natural domestic ventilation is provided the risk will generally be normal.

Step 2: Identify people at risk

It is necessary to identify those who will be at risk if there is a fire and where they are likely to be found. In premises covered by this guide these will generally be residents and their visitors and anybody working in the premises such as a caretaker or cleaner and any visiting contractors. Only in buildings with mixed residential and commercial use are there likely to be other people to consider.

The risk assessment should consider people at risk, who may include: people asleep (who will be disorientated and slow to respond); people who are unfamiliar with the premises (guests and visitors); people with disabilities (including mobility impairment and hearing or vision impairment); people who may have some other reason for not being able

to leave the premises quickly (such as parents with young children); people who are sensorial impaired due to alcohol, drugs or medication; unaccompanied children and young people; anyone working in enclosed, isolated parts of the building; and anyone who has difficulty understanding English.

In evaluating the risk to people with disabilities it may be necessary to discuss their individual needs with them or seek professional advice.

Step 3: Evaluate, remove or reduce risk and protect against remaining risk

Hazards should be removed where it is practicable to do so, and where they cannot be removed they should be reduced as far as possible. What is considered reasonable in a particular case will depend on an evaluation of the potential to cause harm and the chance of that harm occurring. Some simple examples are given below:

- replace portable heating appliances with fixed convector heaters or a central heating system;
- ensure electrical sockets are adequate in number and sited appropriately to avoid overloading and trailing leads;
- ensure electrical, mechanical and gas equipment is installed, used, maintained and protected in accordance with the manufacturer's instructions;
- ensure all furniture complies with the furniture and furnishings
- ensure combustible items such as furniture, laundry and decorations are stored properly and are kept away from potential ignition sources such as
- cookers, heaters and boilers;
- ensure refuse is properly stored and disposed of; and
- in crowded accommodation, provide adequate shelving and cupboard space so that everyday items are not in proximity to cookers, heaters and so on.

Having taken measures to remove or reduce fire hazards as far as is practicable, arrangements need to be put in place to protect people from the remaining fire risk as far as is reasonably possible by ensuring that adequate fire precautions are in place to warn people in the event of a fire and to allow them to escape to a place of safety.

Step 4: Record, plan, inform, instruct and train

It is a good idea for everyone to keep a written record of their fire safety risk assessment. If you have five or more employees (including any who work part-time and not necessarily at the particular premises being risk-

assessed) and if the premises are licensed, or if an alterations process takes place.

Significant findings should include details of:

The fire hazards that have been identified (but ignore trivial things such as a tin of solvent-based glue)

The actions taken, or which will be taken, to remove or reduce the chance of a fire occurring (preventive measures)

Persons who may be at risk, particularly those especially at risk;

The actions taken, or which will be taken, to reduce the risk to people from the spread of fire and smoke (protective measures)

The actions people need to take if a fire occurs. This will include any special arrangements made with staff such as housekeepers or others (the emergency plan)

Any information, instruction and training identified as being needed, and how it will be given; and

Any discussions that have taken place with residents (or, with staff).

It is recommended that a record of the significant findings of the fire risk assessment is kept in all cases, even where it is not a requirement to do so. A format should be developed to be used for the information collection.

An appropriate emergency plan should be put in place. In most residential accommodation this is unlikely to extend beyond advising residents what to do in the event of a fire or fire alarm and how to contact the fire and rescue service. In large or mixed use premises a more sophisticated plan may be necessary. The responsible person must provide any employees with appropriate information and training on risks identified in the risk assessment and information on fire safety measures and procedures for the premises. There is no requirement under the FSO to provide training to residents, but providing them with basic information on fire precautions is a simple and effective way of reducing fire risk in the premises.

Step 5: Review

The risk assessment and the general fire precautions in the premises should be reviewed regularly. There is no specific timescale for this

other than where there is a reason to suspect that it is no longer valid or where there has been a significant change in the premises. In practice the fire precautions should be kept under constant review. Where problems are identified they should be dealt with as soon as possible.

3.5 Explain the General Principles of Fire Safety

a. Escape routes

This section provides guidance on the general principles relating to escape routes along with examples of typical escape route solutions for different building layouts. Most residential premises covered by this guide will be considered as 'normal' risk. This is based on the general assumption that the occupants are able-bodied and will be capable of using the means of escape unaided to reach a place of ultimate safety, and that there are no unusually high risk elements. If this is not the case or there are other factors which present a higher than normal risk then additional measures may be required.

b. Layout of accommodation units themselves must be considered

Poor layout within a unit of accommodation can present a fire risk to the occupant before he or she is able to reach the escape route. Ideally, sleeping areas or rooms should be closer to the exit door to the accommodation than living areas or kitchen facilities wherever possible; fire risks such as the storage of significant quantities of flammable materials and ready sources of ignition should be removed or reduced. If it is not possible to do so, the risk should be regarded as 'higher' and the property may need a higher level of fire safety protection than normal. Other examples of higher risk might include very large premises, premises where there are integral commercial uses, and those with unusually poor levels of construction or with complicated layouts. Similarly, the occupancy of the building may present a higher than normal risk, thereby warranting a higher level of protection –for example where significant numbers of occupiers have limited mobility or are unable to move without assistance, or premises catering for people subject to alcohol or substance misuse.

Conversely, some premises present a risk which can be regarded as 'low'. Examples may include premises with all of the following characteristics:

- a low occupancy level and all the occupants are able-bodied and capable of using the means of escape without assistance;

- very little chance of a fire occurring and few, if any, highly combustible or flammable materials or other fuel for a fire;
- where fire cannot spread quickly throughout the property and will be quickly detected so people can make their escape; and
- where there is more than one acceptable escape route.

The guidance on acceptable standards for escape routes in this document is based upon 'normal' risk.

When considering the safety of the existing escape route, in addition to the occupant profile it is necessary to consider:

- the layout and complexity of the route;
- the travel distance to a place of safety;
- the type of construction and state of repair; and
- the presence of other fire safety measures such as automatic fire detection and warning systems, emergency lighting or fire suppression systems.

In all buildings a fully protected escape route (staircase) offering 30 minutes fire resistance is the ideal solution and it will usually be appropriate for all bedsit-type accommodation. However, in lower risk buildings (i.e. single household occupancy of up to four storeys and low risk shared houses), due to the lower risk and shorter travel distance to the final exit, this need not be insisted upon as long as all the following conditions are met:

- the stairs should lead directly to a final exit without passing through a risk room;
- the staircase enclosure should be of sound, conventional construction throughout the route;
- all risk rooms should be fitted with sound, close-fitting doors of conventional construction (lightweight doors and doors with very thin panels should be avoided); and
- an appropriate system of automatic fire detection and warning is in place.

An alternative solution is possible in low risk two storey shared houses. Where the first floor is no more than 4.5 metres above ground level, rooms used for sleeping could be provided with access to a suitable escape window from the first floor leading to a place of ultimate safety. In this situation consideration of the internal escape route is not essential. The option of escape windows will only be acceptable if they meet the relevant requirements, if it is necessary to pass through the common escape route to reach the escape window, consideration should be had to the travel distance involved. Where the common escape route

is not a protected route, unusually long travel distances may be unacceptable and other fire precautions may be necessary (this will not usually be the case in conventional houses).

In the worst-case scenario, it may be that the requirements of the paragraphs above cannot be provided and the only exit internally is through a risk room. Whilst this should always be avoided where possible, in some cases it may be impracticable to do so. Where this is the case it may exceptionally be possible to accept exit via a risk room provided the exit from the bottom of the staircase at ground floor level is possible in more than one direction (i.e. via either the front or the rear rooms). 30-minute fire resisting construction and fire doors between each of the ground floor rooms and the staircase will be required alongside an enhanced system of automatic fire detection. Where escape from the bottom of the staircase is only possible in one direction, a further alternative might be the installation of a water suppression system. These arrangements will generally be unsuitable for bedsit-type occupation.

When fire starts, if there are no fire safety measures in place then the people have to escape fast before they become affected or trapped in the fire. The presence of fire safety measures extends this time. In practice this means the installation of some form of fire warning and detection system and an escape route which will remain unaffected by the fire for sufficient time to allow people to reach a place of safety. By necessity, the travel distance along the escape route must be limited.

Limiting the travel distance from rooms to a place of safety reduces the risk of people being trapped by a fire on their escape route. This guidance does not set a maximum travel distance, as this should be considered in the context of overall risk. However, previous standards have suggested maximum safe distances. For example, nine metres was considered the maximum acceptable distance from a room exit door to a place of relative safety. This is a useful reference but need not be applied as a rigid standard, and may be increased or decreased depending upon the level of risk once the appropriate fire prevention measures have been put in place. When assessing travel distances, the distance should be considered from all parts of the premises to the nearest place of relative safety, which is:

- a protected stairway enclosure (storey exit);
- a separate fire compartment from which there is a final exit to a place of ultimate safety; or
- the nearest available final exit.

If there is a suitable second staircase or exit or if there are additional fire safety measures (an enhanced system of fire detection and warning, for example, or a water suppression system), the premises may be considered lower risk and the travel distances and levels of protection may be adjusted accordingly where this lower risk can be demonstrated.

In single room units or other accommodation which has an exit door leading directly to a protected stairway enclosure or a separate fire compartment from which there is a final exit to a place of ultimate safety, it will only be necessary to consider the travel distance from the furthest point within the unit to that exit door. It is unlikely that in the types of accommodation covered by this guide the distance will be so large as to have any impact on safety, but if such cases do arise then additional safety measures may be appropriate. In any event, cooking facilities within these rooms should, wherever possible, be sited away from the exit door so as not to prejudice it in the event of fire.

In units with more than one room leading off an internal lobby or hallway (flats), the travel distance within that lobby/hallway will need to be considered. If it is unusually large or there are a large number of rooms leading off it (for example a large flat in multiple occupation), the travel distances may necessitate making the internal lobby/hallway a fire Protected route; or it may necessitate the provision of an alternative exit or additional fire safety measures such as enhanced fire detection and warning system or an automatic water suppression system. Doors to sleeping rooms within the unit should, wherever possible, be closer to the exit door than doors to higher-risk rooms such as kitchens and communal living rooms.

In more complex buildings, such as those with more than one escape route or with complex layouts, greater attention to travel distances will be required by occupants.

These are by no mean exhaustive but just to provide you some guide to the situations. Where the structure differs from what is described above some procedures must be quickly thought of. All measures are taken to reduce or eliminate lost of lives and property

(Above is adopted from housing safety guidance on fire safety provision for certain types of existing structures by the Chattered Institute of Environmental health and the Chief Fire Officers Associations UK 2005)

3.6 Protective Requirements

Protective requirements provide safe environments for family members against home accidents, disease vectors (insects and rodent), unwanted animal and human intrusion as well. Human dwellings, therefore, should have these:

i. Adequate safe guards against structural failures comprising:
   - durable materials for roofs, walls, doors and windows;
   - seasoned and treated wooden members with approved chemicals against termite attack;
   - good design engineering and construction of the structure, e.g., good foundation and masonry.

ii. Fire prevention devices consisting of at least 3 fire escape routes or egress to the outside of the house

iii. Prevention against falls comprising:
   - cleanable non slippery and smooth floor surface;
   - strong hand rails installed and logically placed with adequate illumination at changes in elevation
   - guard rails (75 90cm) installed at balconies and low window sills.

iv. Protective devices against natural hazards consisting of:
   - lightening rod installation to prevent thunder/ lightening and
   - proper location (siting) and construction of dwellings.

v. facilities for prevention of insect and rodent vectors consisting of:
   - window/door screens and fly catchers in dwelling against mosquitoes and other flying insects and
   - flat proofing construction and installation to prevent rat ingress.

vi. Protective facilities and devices against dangerous animals and human intrusion consisting of sound construction of the housing structure and installation of hard ware (burglar proofs) on doors, windows and other openings to prevent marauders

4.0 CONCLUSION

Safety precautions are necessary due to emergencies at home and elsewhere. Therefore any environmental health practitioner, who sometimes acts as safety officer, must be very current in understanding the various elements that could serve as potential risk at home and design some safety measures against it. It is important for you to inform and educate people on the reasons why they need to invest on safety and its measures. The assessment of risks in houses must be a collective role of both the safety officers and the dwellers. There must be a collective

resolve by all stakeholders to be part of the safety and emergency plan at home, the community and the general environment. There might be variations from one house to another in the safety requirements in each house especially against fire which is our focus of discussion in this session, also between rural and urban areas, but the principles are same i.e. protecting lives and property of dwellers and their environment.

5.0 SUMMARY

The unit explained in details the safety precautions in buildings or house and the various reasons why we must provide safety measures in our houses. It explained that fires in buildings generally start from a small source of ignition, the 'outbreak of fire', which leads to the 'spread of fire' followed by a steady state during which all combustible material burns steadily up to the final 'decay stage'. It is in the early stages of a fire that there is most danger to the occupants of buildings from smoke and noxious fumes. Building regulations set standards for means of escape, limitation of spread of fire and containment of fire. To be able to tackle emergency situations in any premises there is the need for an appropriate assessment of the risks involved and the various methods have been explained which included early identify fire hazards, identify people at risk, valuate, remove or reduce risk and protect against remaining risk, systematic and adequate record, planning and information dissemination or training of personnel including inhabitants and finally consistent review of the process to see which one need change, improvement and modification. The unit had dwelled also on the need to provide protective requirements, provide safe environments for family members against home accidents, disease vectors (insects and rodent), unwanted animal and human intrusion as well. These are all measures emphasised to ensure safety of houses and its inhabitants.

6.0 TUTOR-MARKED ASSIGNMENT

1. Define safety in housing.
2. State two reasons for the need for safety precautions in housing.
3. List five steps in carrying out a risk assessment in houses.

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UNIT 5 PROFESSIONAL GROUPS INVOLVED IN MAINTAINING BUILDING AND HOUSING STANDARDS

CONTENTS

1.0 INTRODUCTION

The functions of safety provision and maintenance of housing standard earlier discussed in Unit 2 are usually performed by highly skilled professionals in the health and environmental sciences. The professionals work sometimes as individuals but mostly as a team in same organisation or in their different organisation, it might be in one project or different projects, each professional understand the role of his/her colleague and hence the need to update the inventory of those that are primarily responsible for maintaining standards in the construction and maintenance of houses. Each of the professional is either a primary or secondary stakeholder in the exercise and the function of each must be recognised and appreciated for the public to understand that all of them are important. The building and housing environment is a dynamic industry and hence each day new crop of professional and service providers are emerging, however, the most important is they are all meant to ensure quality building construction and maintenance of housing standards in our society. This unit will highlight these professionals and the basic functions they perform.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- list the professionals responsible for maintaining housing and building standards
- enumerate the function of each professional stakeholder in maintaining standard in housing.

3.0 MAIN CONTENT

3.1 The Professional Groups

The professional is grouped into two, they are:

Primary Stakeholders
Secondary Stakeholders

The primary stakeholders are those skilled professional that are trained, licensed and provided with professional seals to perform a professional role by their respective registering councils during the provision of the following services:

- Site selection and analysis
- Site sketching, drawing and approval
- Building plan processing and approval
- Building construction process
- Building inspection and supervision
- Occupancy processing and approval.

These professionals includes, but not limited to:

Town/Urban Planner or city planner is a professional who works in the field of urban planning/land use planning for the purpose of optimising the effectiveness of a community's land use and infrastructure. They formulate plans for the development and management of urban and suburban areas, typically analysing land use compatibility as well as economic, environmental and social trends. In developing their plan for a community (whether commercial, residential, agricultural, natural or recreational), urban planners must also consider a wide array of issues such as sustainability, air pollution, traffic congestion, crime, land values, legislation and zoning codes. The importance of the urban planner is increasing throughout the 21st century, as we begin to face issues of increased population growth, climate change and unsustainable

development. An urban planner could be considered as a green collar profession.

Urban planners are usually hired by developers, private property owners, private planning firms and local/regional governments to assist in the large-scale planning of communal and commercial developments, as well as public facilities and transportation systems. Urban planners in the public role often assist the public and serve as valued technical advisors in the myriad web of the community's political environment. Related disciplines include regional, city, environmental, transportation, housing and community planning.

Land Surveyor- One of the primary roles of the land surveyor is to find the boundary of a person's property. That boundary is described in legal documents and the land surveyor follows that description and locates the boundary on the physical land and marks it, so the owner knows what land he owns. As an example, such a legal description may refer to a point as being 120.25 feet south of some existing marker. The land surveyor in that case would find the existing marker and use measuring instruments to find the point 120.25 feet south of that, and place a new marker at that location. These markers are called monuments. Surveying or land surveying is the technique, profession, and science of accurately determining the terrestrial or three-dimensional position of points and the distances and angles between them. These points are usually on the surface of the Earth, and they are often used to establish land maps and boundaries for ownership or governmental purposes.

Architect - An architect is a person trained in the planning, design and oversight/supervision of the construction of buildings. To practice architecture means to offer or render services in connection with the design and construction of a building, or group of buildings and the space within the site surrounding the buildings that have as their principal purpose human occupancy or use.

Professionally, an architect's decisions affect public safety, and thus an architect must undergo specialied training consisting of advanced education and a practicum (or internship) for practical experience to earn a license to practice architecture. The practical, technical, and academic requirements for becoming an architect vary by jurisdiction.

The terms architect and architecture are also used in the disciplines of landscape architecture, naval architecture and often information technology (for example a software architect). In most of the world's jurisdictions, the professional and commercial uses of the terms "architect" and "landscape architect" are legally protected.

Quantity Surveyor- A quantity surveyor (**QS**) is a professional working within the construction industry concerned with building costs. The profession is one that provides a qualification gained following formal education, specific training and experience that provide a general set of skills that are then applied to a diverse variety of problems. Predominantly these relate to costs and contracts on construction projects.

Environmental Health Practitioner - Environmental Health Professional is defined as a person working in an environmental health position and who has at least a diploma or graduate degree obtained from an approved training institution who has acquired relevant practical and theoretical knowledge and skills has been certified and licensed by established regulatory authority to practice and provide environmental health services in the country of domicile.

Environmental Health Officers (**EHO**s) are responsible for carrying out measures for protecting public health, including administering and enforcing legislation related to environmental health and providing support to minimise health and safety hazards. They are involved in a variety of activities, for example inspecting food facilities, investigating public health nuisances, and implementing disease control. Environmental health officers are focused on prevention, consultation, investigation, and education of the community regarding health risks and maintaining a safe environment. Environmental health officers are usually employed by local government or state health authorities to advice on and enforce public health standards. However, many are employed in the private sector and in the military.

Cartography is the study and practice of making maps. Combining science, aesthetics, and technique, cartography builds on the premise that reality can be modelled in ways that communicate spatial information effectively. Modern cartography is closely integrated with geographic information science (GIScience) and constitutes many theoretical and practical foundations of geographic information systems.

Cartographer - *"Cartographer"* A medieval depiction of the Ecumene (1482, Johannes Schnitzer, engraver), constructed after the coordinates in Ptolemy's Geography and using his second map projection. The translation into Latin and dissemination of *Geography* in Europe, in the beginning of the fifteenth century, marked the rebirth of scientific Cartography, after more than a millennium of stagnation.

Engineers (Building, Electrical, Mechanical etc), - Architectural engineering, also known as building engineering, is the application of engineering principles and technology to building design and construction. Definitions of an architectural engineer may refer to:

- An engineer in the structural, mechanical, electrical, construction or other engineering fields of building design and construction.
- A licensed engineering professional in parts of the United States.
- In informal contexts, and formally in some places, a professional synonymous with or similar to an architect. In some languages, "architect" is literally translated as "architectural engineer."

Structural engineering involves the analysis and design of physical objects such as buildings, bridges, equipment supports, towers and walls. Those concentrating on buildings are responsible for the structural performance of a large part of the built environment and are, sometimes, informally referred to as "building engineers". Structural engineers require expertise in strength of materials and in the seismic design of structures covered by earthquake engineering. Architectural Engineers sometimes practice structural as one aspect of their designs; the

structural discipline when practiced as a specialty works closely with architects and other engineering specialists.

Mechanical engineering and electrical engineering engineers are specialists commonly referred to as "MEP" (mechanical, electrical, and plumbing) when engaged in the building design fields. Also known as "building services engineering" in the United Kingdom, Canada, and Australia. Mechanical engineers design and oversee the heating ventilation and air conditioning (HVAC), plumbing, and rain gutter systems. Plumbing designers often include design specifications for simple active fire protection systems, but for more complicated projects, fire protection engineers are often separately retained. Electrical engineers are responsible for the building's power distribution, telecommunication, fire alarm, signalisation, lightning protection and control systems, as well as lighting systems.

3.2 Secondary Stakeholders

These are those semi skilled or technicians, or those skilled in their field but do not provide direct service in technical land use of in building construction and utilisation but their services are required as a support service or as technical service but have no license to certify any action without the approval of the primary stakeholder.

These non-professionals includes, but not limited to:

3.2.1 Draft Man

This is a visual artist who specialises in artistic drawings. Or is a person who prepares technical drawings and plans under the direction of an architect or engineer. In the past, drafters sat at drawing boards and used pencils, pens, compasses, protractors, triangles, and other drafting devices to prepare a drawing by hand. During the late 1980s and early 1990s, drawing boards became largely superseded by the application of Computer Aided Design and Drafting (CADD) systems for the creation of technical drawings. Consequently, some drafters may be referred to as CADD operators.

3.2.2 Lawyers

A lawyer, according to Black's Law Dictionary, is "a person learned in the law; as an attorney, counsel or solicitor; a person who is practising law." Law is the system of rules of conduct established by the sovereign government of a society to correct wrongs, maintain the stability of political and social authority, and deliver justice. Working as a lawyer

involves the practical application of abstract legal theories and knowledge to solve specific individualised problems, or to advance the interests of those who retain (i.e. hire) lawyers to perform legal services. The role of the lawyer varies significantly across legal jurisdictions, and so it can be treated here in only the most general terms or in relation to housing administration and management.

Conveyancing is the drafting of the documents necessary for the transfer of real property, such as deeds and mortgages. In some jurisdictions, all real estate transactions must be carried out by a lawyer (or a solicitor where that distinction still exists). Such a monopoly is quite valuable from the lawyer's point of view; historically, conveyancing accounted for about half of English solicitors' income (though this has since changed), and a 1978 study showed that conveyancing "accounts for as much as 80 per cent of solicitor-client contact in New South Wales." In most common law jurisdictions outside of the United States, this monopoly arose from an 1804 law that was introduced by William Pitt the Younger as a *quid pro quo* for the raising of fees on the certification of legal professionals such as barristers, solicitors, attorneys and notaries. This function of lawyers is also giving them a brisk business through property administration, registration and deed of assignment.

3.2.3 Land Administrators

Land management is the process of managing the use and development (in both urban and rural settings) of land resources. Land resources are used for a variety of purposes which may include organic agriculture, reforestation, water resource management and eco-tourism projects

3.2.4 A Drafter, Draftsperson, or Draughtsman

Is a person who makes a drawing (technical or otherwise). A professional drafter who makes technical drawings is sometimes called a *drafting technician*. People who communicate with technical drawings, (those who design and those who are trades people), may use technical standards that define practical symbols, perspectives, units of measurement, notation systems, visual styles, or layout conventions. These enable a drafter to communicate more concisely by using a commonly-understood convention. Together, such conventions constitute a visual language, and help to ensure that the drawing is unambiguous and relatively easy to understand.

3.2.5 Masons - Masonry

Is the building of structures from individual units laid in and bound together by mortar; the term *masonry* can also refer to the units themselves. The common materials of masonry construction are brick, stone, marble, granite, travertine, limestone, cast stone, concrete block, glass block, stucco, and tile. Masonry is generally a highly durable form of construction. However, the materials used, the quality of the mortar and workmanship, and the pattern in which the units are assembled can significantly affect the durability of the overall masonry construction

3.2.6 Labourers

A labourer is a person doing one of the construction trades, traditionally considered unskilled manual labour, as opposed to skilled labour. In the division of labour, labourers have all blasting, hand tools, power tools, air tools, and small heavy equipment, and act as assistants to other trades, e.g., operators or cement masons. The 1st century BC engineer Vitruvius writes in detail about labourer practices at that time. In his experience a good crew of labourers is just as valuable as any other aspect of construction. Other than the addition of pneumatics, labourer practices have changed little. With the advent of advanced technology and its introduction into the construction field, the labourers have been quick to include much of this technology as being labourers work.

4.0 CONCLUSION

The roles in maintaining standards in building construction and its maintenance are performed by different professionals. The list is inexhaustive and the functions are performed depending on the available laws and regulations, level of knowledge and awareness, availability of the relevant professionals either in rural and/or urban environment. The current situations in Nigeria are poor information on the relevant laws and regulations. The professionals are very few in any part of the country. Majority of professional wants to practice in urban areas to enable them get high pay. Enforcement of some of the available laws has been difficult due to poor enforcement procedures and poor court system. However, where there is team work among the professionals the service is improved and better quality houses will be built and maintain. To facilitate the practice of maintaining standard in housing can only be enhanced if the feeling of superiority of one profession over the other is eliminated or reduced to the barest minimum.

5.0 SUMMARY

In this unit you learnt that the major or primary stakeholders in the practice of building construction and its maintenance is performed by skilled professionals such as town planners, quantity and land surveyors, environmental health practitioners, engineers etc. They are generally responsible for site selection and analysis, site sketching, drawing and approval, building plan processing and approval, building construction process, building inspection and supervision, occupancy processing and approval etc. There are some unskilled participants in building construction and maintenance, but their roles are very important for the skilled professional to perform their duties. For the purposes of ensuring appropriate service to the field both must work together and appreciate the role of each. That conducive approach is required the quality of our houses to be maintained and support healthful living.

6.0 TUTOR-MARKED ASSIGNMENT

1. List five (5) Professional responsible for maintaining housing standards.
2. Enumerate two (2) function of each professional stakeholder in maintaining standard in housing.

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UNIT 6 GENERAL CHARACTERISTICS OF HOUSING STANDARDS IN THE TROPICS AND ITS CHALLENGES

CONTENTS

1.0 INTRODUCTION

We have learnt in the previous units that good housing forms an important aspect of environmental health. Many professionals are involved in its maintenance of standards. We also noted the expressions of World Health Organisation experts that says, houses should provide as few opportunities as possible for the direct transmission of disease and should encourage healthful habits-among the occupants, (WHO, 1961). We are in agreement that all public health authorities and experts agree that the standard of housing in a community affects the quality of health within the community. Therefore we need to understand that there are some factors that are particularly important in the developing countries such as poverty, malnutrition, lack of education and medical care together with lack of knowledge relating to disease prevention and personal hygiene, play important role on the health of the people. Many research workers and writers like Mackintosh (1965), Sofoluwe (1969). Salvato (1958) Wilner *et al.* (1962) Haddock (1961) Stockwell (1962), Halli-day (1928), Wright & Wright (1942), have related certain ill health to specific poor conditions of housing. Studies in the United States of America quoted by Salvato (1958) and others like Schorr (1970), Britten (1942), Fisher & Pierce (1967) showed that when people live in slum areas, the rate at which they have communicable diseases is about 65 percent higher than national average. Also during the cholera outbreak

in Ibadan in 1970-1971, the people who live in built-up slum areas reported more cases than those in planned areas. The studies in the U.S.A. also show that tuberculosis rate is about eight times as high in slum areas as the national average, that infant death rate is five times higher. Juvenile delinquency is two times higher and life expectancy is about 6.7 years shorter among slum dwellers than the national average. It was also reported that the frequency of fire outbreak was 1.5 times more in slum areas than the national average. In view of these there is the need for us to specifically study some general factors affecting healthful housing in the tropics. This discuss is adopted from the chapter on "Housing in the tropics" by Prof. Sofoluwe in his book.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- describe tropical zone
- identify specific (challenges) factors affecting healthful housing in the tropics.

3.0 MAIN CONTENT

3.1 Tropical Zone

Microsoft Encarta (2009) describe tropics, as "two parallels of latitude on the terrestrial globe lying equidistant from the equator from latitude 23°27' north to 23°27' south, the most northerly and southerly points on the earth's surface at which the sun is perpendicular at noon on at least one day of each year.

Between these latitudes are all those points on the earth's surface over which the sun is almost directly overhead during the entire year. The tropic north of the equator is called the tropic of cancer, because the sun at the summer solstice (at which time it is vertically over the tropic) enters the constellation of cancer; the southern one is, for a similar reason, called the tropic of Capricorn. This belt of the earth's surface is known as the torrid zone". Therefore, when some diseases are described as tropical diseases it is referred to as illnesses that either occur uniquely in tropical and subtropical regions, which is rare, or, more commonly, are either more widespread there or more difficult to prevent or control—mainly for reasons of climate, poverty, and primitive sanitation conditions. West Africa and indeed Nigeria is very much situated in the tropics with all the characteristics of the tropics available in the country.
There are certain important factors which make the provision of good and sanitary houses difficult and almost impossible in the tropics. The most important of these factors are climate, poverty, inadequacy or lack

of mortgage facilities, scarcity of skilled personnel, reliability on imported materials, rapid population growth and family set-up, poor sanitation, insect pests and other vermin. These factors are discussed below.

Climate

Two basic differences exist between houses in the tropics and houses in the cooler regions of the world (Oakley, 1961). In temperate regions, houses are designed so that heat produced within the houses is retained as much as possible while in the tropical regions houses are designed so that the heat produced in the houses is eliminated as quickly as possible. In the cooler places, there is no fear that direct rays of the sum may heat the walls of the houses and male them too hot, while in the tropics, houses must he designed to prevent as much as possible the direct sun rays from the walls.

As far as housing is concerned, the climatic conditions in the tropics can be divided into two main groups (Atkinson, 1953; Lee, 1947; Nickson, 1948; Drew and Fry, 1947). These are:

(a) the warm humid climatic conditions and
(b) the hot-dry climatic conditions.

a) Housing in warm-humid climate

This type of climatic condition is found very close to the equator. The temperature range is very low and the relative humidity is very high. Houses are better one room thick in plan with very big windows. In order to reduce the effects of direct sun rays on the walls, houses should be planned so that the long axes are in east-west direction, provision of verandah will ensure that roof over hangs the walls adequately Multi-storey houses are advantageous, since near the surface of the land, the higher one goes up, the faster the breeze and the more comfortable it is inside the houses, especially during the hot periods. Walls should not be too thick and should be made of materials which have poor heat capacity. The walls are better brightly, painted and roofs constructed of materials that will reflect much of the sun rays. The windows should be large and made of wooden, metal or glass louvres. Louvred windows are advantageous in this region because they could be used to regulate the amount of ventilation and can admit fresh air while rain water is kept out.

b) Housing in hot-dry regions

This type of climate is found around the Southern border of the hot deserts in the northern hemisphere and the north border of the hot deserts in the southern hemisphere. The daily range of temperature is high and relative humidity is low. The sky is often cloudless and the effect of sun is direct and strong. The wind is strong and hot during hot periods. House plans should be inward looking into the courtyard to reduce the effects of the strong wind and sun (Oakley 1961).

The walls should be thick and made of materials that have great capacity for heat. The windows should be small and located high to reduce the direct effects of the strange and dusty wind. Flat and thick roofs are also advantageous to cool the inside of the houses during the day.

3.2 Poverty and Housing in the Tropics

Poverty affects housing in two ways in the developing countries.

(a) It causes individuals to build substandard houses without necessary facilities.
(b) It limits the ability of the governments to provide enough houses to the people.

In many developing countries land belong to individual, so t is very easy for people to obtain land for building houses. Since the majority of the people have very low income, it is not possible for them to set aside adequate capital for building decent houses. In many towns where people secure building plots from family land free of charge, the people put up all sorts of shanties to live in. This practice is often too difficult for the town planning authorities to control or prevent. The authorities are baffled by the number of people involved and by the fact that they are unable to provide, alternate decent buildings for the people concerned.

Various governments in the developing countries have very small revenues for execution of welfare projects for the people. It is therefore impossible for them to provide decent houses for everybody. The few governments which are lucky to have revenue for housing schemes are often hindered by political and other forces.

There are many steps which developing countries can take to reduce the effects of poverty on housing programmes. The first and perhaps, the most expensive but difficult to do is to plan their development schemes in such a way that many people do not have to drift from their natural habitats to urban centres. If this is considered and taken care of during

planning, the governments will find it relatively easy to provide for those who must live in the towns. To ensure that people have decent houses in their natural habitats, governments should adopt aided self help approach. Under this approach the governments can provide technical supervision and loans for those essential materials which have to be imported. The use of local materials must be encouraged as much as possible. The shape of a building for minimum cost has been given by Davis and White (1961). This is given as follows.

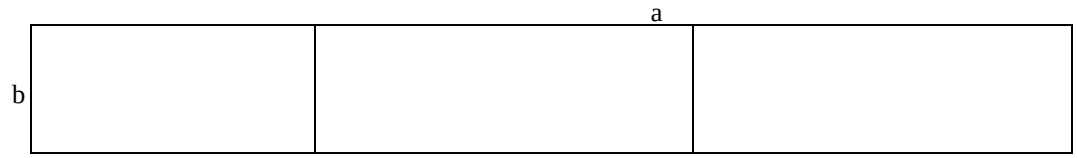

Fig. 6.1: Wall Plan for Minimum Wall Cost

If length of the building = a
Breadth of the building = b
No. of rooms =n
Area (A) =ab

$b = \frac{A}{a}$

Total length of walls (I) = 2a + 2b + b(n — 1)
= 2a + (n + 1)b

$= 2a + (n + 1)\ \frac{A}{a}\ (r)$

for minimu1 $\frac{dl}{da} = 0$

$\frac{dl}{da} = 2 - \frac{(n + 1)A}{a^2} = 0$

$a^2 = \frac{(n + 1)A}{2}$

$a = [A\frac{(n + 1)A}{\sqrt{2}}]^{\frac{1}{2}}$

From equation (r)

$I \quad \frac{2a^2 + (n + 1)A}{a}$

$I \min \frac{(n + 1)A + (n + 1)A}{a}$

$= \frac{2A}{a}(n + 1) = 2b(n + 1)$

$a^2 = \frac{(n + 1)ab}{2}$

$a = \frac{(n + 1)b}{2}$

$b = \frac{2a}{n + 1}$

$\frac{a}{b} = \frac{n + 1}{2}$

$I\ min = 2a + 2(h + 1)A;\quad b = \frac{2A}{n + 1}$

Example:

The plan area of a house = 500 sqm
No. of room = 4
For minimum wall length $\frac{a}{b} = \frac{4 + 1}{2}$

Where a = length of room
b = breadth of room

$\frac{a}{b} = \frac{5}{b}$ $b = \frac{2a}{25}$

$a \times b = 500$

$\frac{2a^2}{5} = 500$ $a^2 = \frac{2,500}{2}$

a = 35.3m

b = 14.1m

3.3 Inadequacy of Mortgage Facilities

In most of the developed countries, there are many finance houses, banks and other agencies which are ready to give loans to qualified applicants to enable them buy or build their own houses. In a place like Israel, the mortgage schemes arc so efficient and reliable that parents often take endowment schemes for their children early at birth to enable the children own their own houses when they marry later in life. In many developing countries, as already mentioned, money is very scarce. There are very few finance houses to give mortgage loans. The few ones that exist are inefficiently run. They often award loans based on other considerations apart from the abilities of the applicants to repay with the

results that the small capitals they have are often wasted on few influential people who are not in position to pay back the loans.

3.4 Scarcity of Skilled Personnel

This is not a serious problem as far as private houses are concerned. However, it is a very serious problem affecting execution of big housing schemes. For private houses, there is-adequate number of craftsmen like bricklayers, carpenters, plumbers and electricians who are able to provide the necessary labour required. Though the workmanship of some of the houses built by these craftsmen may be poor, with moderate supervision they are able to build houses up to two storeys without any-serious danger to human health. There are very few middle and senior cadre technical personnel like technical officers, engineers, architects and quantity surveyors to plan and execute housing programmes.

3.5 Reliability on Imported Materials

This is one of the most important factors which affect provision of sanitary houses in the developing countries. The majority of the materials used for building houses are imported from the developed countries with the result that the materials are very expensive and may not be available in adequate quantity. Even some materials -which are being manufactured locally, require some ingredients which have to be imported. Cement is one of the materials which are always in short supply. It is common to have 50kg of cement costing more than N5.00 (7.5 dollars). Steps are being taken to encourage the use of local material for building. Wood is an important material which is being popularised. Many people are still suspicious to use the local materials. Various governments should intensify research into the use of local materials for all aspects of housing. The research activities must be backed with public enlightenment and demonstrations to enable the people adopt the new materials being investigated. Among the important areas where researches and developments are needed are:

(a) the use of wood for walls and floors,
(b) the use of local laterite and clay for bricks and, blocks,
(c) the use of local clay for soil pipes and sewers,
(d) the use of local clay for roofing tiles,
(e) preservation of roofing grasses to make them resistant to termites and fire (South Pacific Commission, 1954).

3.6 Rapid Population Growth

The developing countries are characterised by rapid population growth. This baffles all the planning programmes of many governments. Many

cities and towns in the developing countries have very high growth rate. The provisions of social amenities like housing, water supply and health programmes are unable to keep pace with the rates of population increase. The urban centres of the developing countries therefore harbour worst slums in the world.

The best approach to the solution is to spread out the siting of industries and other employment opportunities so that people will not have to flock to few urban centres to look for jobs. Also the various governments should pursue radical progranmes on slum clearance. The conventional approach whereby the government wait- until money is available to develop few square meters of slum areas is slow and conservative. Investigations have shown that many people continue to live in slums because they have no money to build houses in modern planned-areas. One approach which can quicken the pace of slum clearance-from the town and city centers in the developing countries is for the governments to declare-the slums as government land. Industrialists both foreign and local who are looking for land to build factories should be encouraged or compelled to buy land from the slum areas instead of acquiring land in the outskirts of the towns and cities. The money paid for such land will help the slum dwellers to move to planned areas. If the governments have to subsidies this approach, the subsidy will not be as high as that for the-conventional approach

3.7 Family Set Up

Many well-planned and properly-executed housing estates have been turned to slum areas as soon as people from slum town centers are housed there. A flat built for a family of six may contain more than twenty people. This is because of the extended family pattern which allows even distant relatives to have rights to live with the owners of the flats. In many areas, the house planners and designers do not consider the prevailing customs when planning housing programmes. It is not uncommon for these planners to build houses for polygamous communities similar to those for monogamous people.

3.8 Poor Sanitation

Environmental sanitation is in a very poor state in many different parts of the developing countries. Only very few cities have modem sewage disposal systems.

The majority of the towns and cities practice primitive bucket-latrine system or other systems like the pit latrine, the septic tanks or deposition of excreta into surrounding bush. The waste water from the kitchens, the bathrooms, the laundry and surface run-off from rain are discharged into

open gutters which are often blocked by refuse. It is often very sickening to observe decent houses being surrounded with filth. For many months during the wet periods, roads leading to many decent houses are not motorable. Foul smell from blocked gutters fills the atmosphere around all the houses. In many newly developed areas, the roads have no provision for eliminating slum water. This often forms breeding spots for mosquitoes.

Many town authorities are very poor. The methods of collecting taxes and rates are very inefficient because many well-to-do people either do not pay at all, or pay what is grossly incompatible with their property. To wait until the governments are able to have money to build modern sewers may be to wait indefinitely. The governments should design sewers for different areas of the towns and cities and legislate that house owners should construct the portion of sewers which passes through the front of their houses, except for houses along the roads where trunk sewers of large diameters-are involved. The landlords along, such trunk sewers should be made to pay money equivalent to what landlords in other areas spend to construct their sections of the sewers. The construction of the sewers by the landlords should be supervised by the government sanitarians and engineers to ensure that the sewers comply with government specifications.

In many cities and towns, there are town planning authorities who control the qualities and standard of houses to be built. Unfortunately when the plans of such houses have been approved, many authorities do not ensure that the landlords build what is approved. The authorities should always follow the progress of construction of all houses whose plans have been approved through different stages to completion. On completion, the houses should be inspected and issued with certificate of occupancy by sanitarians before people are allowed to move into them. This programme should always be honestly and diligently carried out. These provisions must be included in relevant local government bye laws and there must be provision that will ensure compliance.

3.9 Insect Pests and other Vermin

All the developing countries are in the tropical or sub-tropical zones. Many pathogenic bacteria and vectors which cause very serious diseases find the climate suitable for their proliferation. For this reason, occupants of tropical houses are constantly being troubled by vectors like mosquitoes, houseflies, tsetse flies and black flies.

It is important to try as much as possible during construction to include devices which will prevent these vectors from the tropical houses. Also,

the physical environment of tropical houses must be such that will not encourage breeding of the vectors.

4.0 CONCLUSION

Tropical zone has some unique characteristics in terms of its climate, heat and cold both at extreme end, humid and dry heat with abundant sunshine, windy and with sometime high temperature that favours the breading of vectors and vermin. The countries that are located in this geographical zone share many things in common. Some disease conditions are peculiar to the zone.

The stakeholders in this zone need to understand their situation both natural and artificial to enable them handle housing issues with care and with consideration of the time of extreme heat which require house to provide some relief from the heat and provide warmness when it is extremely cold. Choice of building materials, site, socioeconomic situation of the owners, rural and urban characteristics must be considered by the stakeholders to enable the houses be described as healthful house.

5.0 SUMMARY

In this unit you were made to understood that there are certain important factors, some are natural for instance climate while some are artificial such poor sanitation, which make the provision of good and sanitary houses difficult and almost impossible in the tropics. The most important of these factors discussed in this unit are climate, poverty, inadequacy or lack of mortgage facilities, scarcity of skilled personnel, reliability on imported materials, rapid population growth and family set-up, poor sanitation, insect pests and other vermin. Some of the factors are more pronounced in one country than another while some are all available in one country such as Nigeria.

6.0 TUTOR-MARKED ASSIGNMENT

List 10 factors that make it difficult to provide healthful housing in the tropics.

7.0 REFERENCES/FURTHER READING

Amadi, A. N. (2011). *ABC of Environmental Health*. Owerri: Readon Publishers Ltd. in collaboration with Ugooma Printing and Publishing Co.

Sofoluwa, G. O, & Bennen, F. J.(1985). *Principles and Practice of Community Health in Africa*. Ibadan: University Press Ltd.

MODULE 2

Unit 1 Introduction to Building Technology
Unit 2 Application of Technical Drawing, Reading and Interpretation of Building Plan

UNIT 1 INTRODUCTION TO BUILDING TECHNOLOGY

CONTENTS

1.0 INTRODUCTION

In the previous Module, we concentrated on housing and its related matters including factors affecting housing in the tropics such as poverty, climate. It is a well know fact that a house started from a simple structure initiated by an owner through expression of his wish to have a building called a house. That idea is espresso either in writing or verbally to a professional who put those thoughts on paper through some form of drawings initially as a sketch, later as a professional drawing, another professional cost it to give an ides of the financial implication, later a builder handles the construction etc. The building engineer works with men and materials and calls each material with the name known in the building industry. The building itself has parts and components which make up the whole of the house. These involve a lot of

communication and discussion and the process has its language and terminologies which you need to understand. Therefore this unit will highlight some key issues in building technology, its terms, its various parts and components. It is important to note and learnt these terminologies and know the part so that in the course of your supervision just terminologies will not put you off the discussion or away from what you want to do. This unit is mostly adopted from the book "Construction of buildings" by Barry and is fully acknowledged in the reference section of this course.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- discuss some building terms and terminologies
- describe building parts/components.

3.0 MAIN CONTENT

3.1 Some Building Teams

3.1.1 A Brick

A block, or a single unit of a ceramic material used in masonry construction, usually stacked together, or laid using various kinds of mortar to hold the bricks together and make a permanent structure. Bricks are typically produced in common or standard sizes in bulk quantities. They have been regarded as one of the longest lasting and strongest building materials used throughout history.

In the general sense, a "brick" is a standard-sized weight-bearing building unit. Bricks are laid in horizontal courses, sometimes dry and sometimes with mortar. When the term is used in this sense, the brick might be made from clay, lime-and-sand, concrete, or shaped stone. In a less clinical and more colloquial sense, bricks are made from dried earth, usually from clay-bearing subsoil. In some cases, such as adobe, the brick is merely dried. More commonly it is fired in a kiln of some sort to form a true ceramic.

3.1.2 Building Blocks

Building blocks are wall units, larger in size than a brick that can be handled by one man. Building blocks are made of concrete or clay.

- **Concrete blocks**

These are used extensively for both load bearing and non-load bearing walls, externally and internally. A concrete block wall can be laid in less time and may cost up to half as much as a similar brick wall. Lightweight aggregate concrete blocks have good insulating properties against transfer of heat and have been much used for the inner leaf of cavity walls with either a brick outer leaf or a concrete block outer leaf.

A disadvantage of some concrete blocks, particularly lightweight aggregate blocks, as a wall unit is that they may suffer moisture movement which causes cracking of applied finishes such as plaster. To minimise cracking due to shrinkage by loss of water, vertical movement joints should be built into long block walls, subject to moisture movement, at intervals of up to twice the height of the wall. These movement joints may be either a continuous vertical joint filled with mastic or they may be formed in the bonding of the blocks.

Because the block units are comparatively large, any settlement movement in a wall will show more pronounced cracking in mortar joints than is the case with the smaller brick wall unit. For some years it was fashionable to use concrete blocks as a fair face external wall finish. The blocks were accurately moulded to uniform sizes and made from aggregates to provide a variety of colours and textures. Blocks made to give an appearance of natural stone with plain or rugged exposed aggregate finish were used.

These special blocks are less used that they were, particularly because of the fairly rapid deterioration in the appearance of the blocks due to irregular weather staining of smooth faced blocks and the patchy dirt staining of coarse textured blocks.

Concrete blocks are manufactured from cement and either dense or lightweight aggregates as solid, cellular or hollow blocks. A cellular block has one or more holes or cavities that do not pass wholly through the block and a hollow block is one in which the holes pass through the block. The thicker blocks are made with cavities or holes to reduce weight and drying shrinkage. The most commonly used size of both dense and lightweight concrete blocks is 440mm long x 215mm high. The height of the block is chosen to coincide with three courses of brick for the convenience of building in wall ties and also bonding to brickwork. The length of the block is chosen for laying in stretcher bond. For the leaves of cavity walls and internal load bearing walls 100mm thick blocks are used. For non-load bearing partition walls 60 or 75mm thick lightweight aggregate blocks are used. Either 440 mm x 215mm or 390 x 190mm blocks may be used.

Concrete blocks may be specified by their minimum average compressive strength for:

- all blocks not less than 75mm thick and
- a maximum average transverse strength for blocks less than 75mm thick, which are used for non-load bearing partitions.

The usual compressive strengths for blocks are 2.8, 3.5, 5.0, 7.0. 10.0, 15.0, 20.0 and 35.0 N/mm2. This is the compressive strength of blocks.

3.1.3 Mortar for Brick Work and Block Work

Clay bricks are rarely exactly rectangular in shape and they vary in size. Some facing bricks are far from uniform in shape and size and if a wall were built of bricks laid without mortar and the bricks were bonded the result might be as shown, exaggerated, in Figure 1.1.

Because of the variations in shape and size, the courses of bricks would not lie anywhere near horizontal. One of the functions of brickwork is to support floors and if a floor timber were to bear on the brick marked A it would tend to cause it to slide down the slope on which it would be resting. It is essential, therefore, that brickwork be laid in true horizontal courses, and the only way this can be done with bricks of differing shapes and sizes is to lay them on some material which is sufficiently plastic, while the bricks are being laid, to take up the difference in size, and which must be able to harden to such an extent that it can carry the weight normally carried by brickwork.

The material used is termed mortar. The basic requirements of a mortar are that it will harden to such an extent that it can carry the weight normally carried by bricks, without crushing, and that it will be sufficiently plastic when laid to take the varying sizes of bricks. It must have porosity similar to that of the bricks and it must not deteriorate due to the weathering action of rain or frost. Sand is a natural material which is reasonably cheap and which, if mixed with water, can be made plastic, yet which has very good strength in resisting crushing. Its grains are also virtually impervious to the action of rain and frost. The material required to bind the grains of sand together into a solid mass is termed the matrix.

Fig. 1.1: A Pallet of Bricks Stacked without Mortar

3.1.4 Bonding Bricks

In building a wall it is usual to lay bricks in regular, horizontal courses so that each brick bears on two bricks below. The bricks are said to be bonded as they bind together by being laid across each other along the length of the wall.

The advantage of bonding is that the wall acts as a whole so that the load of a beam carried by the topmost brick is spread to the two bricks below it, then to the three below that and so on down to the base or foundation course of bricks.

The failure of one poor quality brick will not affect the strength and stability of the whole wall as the load carried by the weak brick and the two foundation bricks is transferred to the adjacent bricks.

Because of the bond, window and door openings may be formed in a wall, the load of the wall above the opening being transferred to the brickwork each side of the openings by an arch or lintel.

The effect of bonding is to stiffen a wall along its length and also to some small extent against lateral pressure, such as wind.

The four faces of a brick which may be exposed in fair face brickwork are the two, long, stretcher faces and the two header faces. The face on which the brick is laid is the bed. Some bricks have an indent or frog formed in one of the bed faces. The purpose of the frog or indent is to assist in compressing the wet clay during moulding. The frog also serves as a reservoir of mortar on to which bricks in the course above may more easily be bedded.

The thickness of a wall is dictated primarily by the length of a brick. The length of bricks varies appreciably, especially those that are hand moulded and those made from plastic clays that will shrink differentially during firing.

It has been practice for some time to describe the thickness of a wall by reference to the length of a brick as a 1 B (brick) wall, or a 2 B wall, rather than a precise dimension.

The external leaf of a cavity wall is often built of brick for the advantage of the appearance of brickwork. The most straightforward way of laying bricks in a thin outer leaf of a cavity wall is with the stretcher face of each brick showing externally. So that bricks are bonded along the length of the wall they are laid with the vertical joints between bricks lying directly under and over the centre of bricks in the courses under and over. This is described as stretcher bond as illustrated below. This wall is described as a B thick wall.

At the intersection of two half brick walls at corners or angles and at the jambs, sides of openings, the bricks are laid so that a header face shows in every other course to complete the bond, as illustrated below.

The appearance of a wall laid in stretcher bond may look somewhat monotonous because of the mass of stretcher faces showing. To provide some variety the wall may be built with snap headers so that a stretcher face and a header face show alternately in each course with the centre of the header face lying directly under and over the centre of the stretcher faces in courses below and above.

This form of fake Flemish bond is achieved by the use of half bricks, hence the name ‘snap header’. The combination and variety in colour and shape can add appreciably to the appearance of a wail. Obviously the additional labour and likely wastage of bricks adds somewhat to cost.

3.1.5 English and Flemish Bond

Because brick by itself does not provide adequate resistance to the transfer of heat, to meet the requirements of the building regulations for the conservation of fuel and power, it is used in combination with other materials in external cavity walling for most heated buildings. In consequence brick walling 1 B and thicker is less used than it was.

Solid brick walls may be used for heated and unheated buildings for arcades, screen walling and as boundary and earth retaining walling for the benefit of the appearance and durability of the material.

For the same reason that a B wall is bonded along its length a solid wall 1 B and thicker is bonded along its length and through its thickness.

The two basic ways in which a solid brick wall may be bonded are with every brick showing a header face with each header face lying directly over two header faces below or with header faces centrally over a stretcher face in the course below, as illustrated in Fig. 54.

The bond in which the header faces only show is termed ‘heading’ or ‘header bond’. This bond is little used as the great number of vertical joints and header faces is generally considered unattractive.

The bond in which header faces lie directly above and below a stretcher face is termed Flemish bond. This bond is generally considered the most attractive bond for facing brickwork because of the variety of shades of colour between header and stretcher faces dispersed over the whole face of the walling. Figure 1.2 illustrates brickwork in Flemish bond.

English bond, illustrated below, avoids the repetition of header faces in each course by using alternate courses of header and stretcher faces with a header face lying directly over the centre of a stretcher face below. The colour of header faces, particularly in facing bricks, is often distinctly different from the colour of stretcher faces. In English bond this difference is shown in successive horizontal courses. In Flemish bond the different colours of header and stretcher faces are dispersed over the whole face of a wall, which by common consent is thought to be a more attractive arrangement.

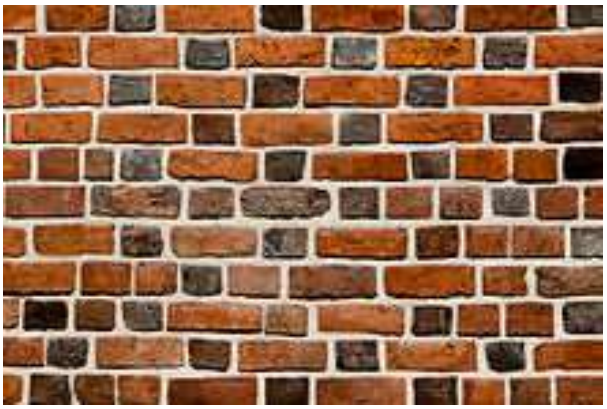

Fig. 1.2: A wall constructed in glazed-headed Flemish bond with bricks of various shades and lengths

3.1.6 Bond at Angles and Jambs

At the end of a wall at a stop end, at an angle or quoin and at jambs of openings the bonding of bricks has to be finished up to a vertical angle. To complete the bond a brick B wide has to be used to close or complete the bond of the B overlap of face brickwork.

As earlier stated, bricklaying work generally begins with the corners of the structure-to-be. These corners are built up on an appropriate foundation to a height of several bricks, using a gauge-rod to determine the exact height at which each course is to be laid. The remainder of the course is laid using a line strung between the corners to maintain the correct height for the newly laid bricks. After the bricks have been laid — but before the mortar has set — the mortar bed is tidied and finished, a process known as pointing.

Ordinarily, bricks — or parts of bricks — within a course, are arranged such that perpends do not vertically align in any two successive courses. If this rule is observed, then the weight acting on any brick is distributed across an area that widens with each downwardly successive course. There is a large variety of arrangements for the cutting and orienting of bricks guaranteeing that perpends never directly align from one course to the next. Any such arrangement is called a *Bond*.

A brick is given a classification based on its orientation relative to the viewer.

- **Stretcher**: A brick laid flat with the long narrow side of the brick exposed
- **Header**: A brick laid flat with the short end of the brick exposed.
- **Soldier**: A brick laid vertically with the long narrow side of the brick exposed.
- **Sailor**: A brick laid vertically with the broad face of the brick exposed.
- **Rowlock**: A brick laid on the long narrow side with the short end of the brick exposed.
- **Shiner**: A brick laid on the long narrow side with the broad face of the brick exposed.

Cut of a brick

Occasionally, a brick must be cut to fit a given space.

- **Quarter-bat**: A brick cut to a quarter of its length.
- **Half-bat**: A brick cut in half across its width.
- **Three-quarter-bat**: A brick cut to three-quarters of its length.

- **Queen closer**: A brick cut in half down its length.

3.1.7 A Concrete Slab

This is a common structural element of modern buildings. Horizontal slabs of steel reinforced concrete, typically between 100 and 500 millimeters thick, are most often used to construct floors and ceilings, while thinner slabs are also used for exterior paving. Ground supported slab - Suspended concrete slabs. Where ground under a floor is sloping, has poor or uncertain bearing capacity, or is liable to volume change due to seasonal loss or gain of moisture and a ground supported slab might sink or crack due to settlement, it may be wise to form the ground floor as a suspended reinforced concrete slab, supported by external and internal load- bearing walls, independent of the ground. Suspended concrete slabs are constructed with one of the pre-cast reinforced concrete plank, slab or beam and block floor systems described later for upper floors, because there is no ready means of constructing centering on which to cast an in-situ concrete floor. The one way spanning, pre-cast concrete floor bears on internal and external load bearing foundation walls with end bearing of at least 90 mm, and is built into the walls. The depth of the plank, slab or beams depends on the loads to be carried and the span between supporting walls.

3.1.8 The Wall

After the construction of the hardcore, the erection of the walls is commenced. This is again illustrated by the wall in Figure 1.3 the string is again attached to nails WZYX to form the rectangle as was one during the erection of the foundation walls the materials for the walls are then set up to form the walls. The space forming the doors into the rooms are left out when erecting the walls. When the walls reach the window level, the spaces for the windows are also left out. The door and window frames may be fixed during the erection of the walls. Alternatively the openings for the doors and windows may just be left until later so that the frames may be fixed when pastering is carried out. When the wall erection progresses to the top of the doors and windows, then the lintels must be constructed, the lintels are the structures constructed across the top of the door and window frames to support the weight of the building, see Figure 1.3 The lintel is normally made of reinforced concrete.

Fig. 1.3: The Lintel

Lintels are very important in all buildings especially in one or ‘more storey buildings, lintels must be provided. If lintels are not provided, the frames of the doors and the windows will bear the weight and the walls will crack at the roof level where the top of each walls is left at the same elevation or level. The steel bolts and nuts to anchor the roof brushes to the wall are then inserted into the walls. The lower ends of the bolts are enlarged to ensure that they cannot be easily pulled out.

In many cases, steel binds are employed in place of bolts and nuts. Whatever materials are used, it should be strong enough and fixed properly to ensure that the roof is not carried off by strong wind.

The walls of a house may be built of cement - sand blocks, cement soil blocks, soil bricks, tradition mud, wood, bamboos and other materials. Blocks, bricks and mud are most common because they are more durable and are fire resistant. Therefore they are safer.

3.1.9 Roof

The roofs
The section through a typical roof of a building is shown in Figure 1.4

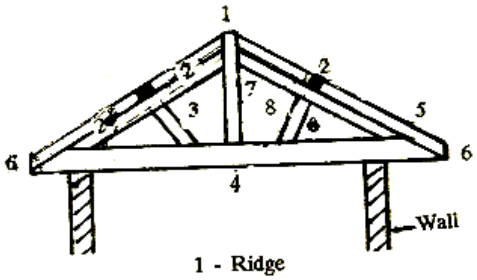

Fig. 1.4: Section of a Typical Roof

The tie beam holds the feet of the rafters and prevents the rafters from spreading out. The rafters carry the purlins which in turn carry the roofing materials or sheets. These support the principal rafters and prevent them from sagging.

The tie beams are normally made of 7.5cm by 10cm wood or 5cm by 15cm wood. The facial board is normally made of 2.5 by 30cm planks. The roof trusses should be constructed by competent carpenters. Roofing is a special aspect of the building construction. It should be properly carried out. The trusses require adequate quantities of nails of different sizes. The sizes vary according to the different sizes of planks used to form the trusses. Also the roofing sheets require special nails and washers to hold them to the purling. Many materials are employed as roofing sheets. The method of fixing the sheets vary with the type of materials employed. Corrugated iron sheets require nails and washers together with special leather below the washers. Whereas, the corrugated asbestos cement requires special nails and leather.

Functional Requirements

The functional requirements of a roof are:

- Strength and stability
- Resistance to weather
- Durability and freedom from maintenance
- Fire safety
- Resistance to the passage of heat
- Resistance to the passage of sound

Strength and stability
The strength and stability of a roof depend on the characteristics of the materials from which it is constructed and the way in which the materials are formed as a horizontal platform or as a triangular framework.

Flat roof

A roof may be constructed as a flat roof that is a timber, metal or concrete platform which is usually horizontal or inclined at up to 5° to the horizontal.

The strength and stability of a flat roof depend on adequate support from walls or beams and sufficient depth or thickness of timber joists or concrete relative to span to avoid gross deflection under the dead load of the roof itself and the load of snow and wind pressure or uplift that it may suffer.

Sloping roof

A sloping or sloped roof is inclined at between ***5°*** and 10° to the horizontal, either as a sloping platform or as a shallow frame. Both the monopitch roof and the butterfly roof are constructed with shallow timber or metal trussed rafters designed to support the dead load of the roof and imposed loads of snow and wind.

The butterfly roof is in effect two monopitch roofs which depend for support on a central beam which is carried on internal columns or end walls.

Both the monopitch and the butterfly roofs depend for strength and stability on the depth of the trussed rafters.

The monopitch roof with sloping soffit is constructed as a flat roof inclined out of horizontal, with timber or metal rafters providing strength and stability. Because of the shallow slope, this roof does impose some small lateral pressure on the wall under the lowest edge of the roof, which is designed to support both the lateral and horizontal pressure from the roof.

In many domestic and industrial buildings a thick concrete slab, supported on foundations or directly on the subsoil, is used to construct the ground floor of a building. In high rise buildings and skyscrapers, thinner, pre-cast concrete slabs are slung between the steel frames to form the floors and ceilings on each level.

A concrete slab may be prefabricated or in situ. Prefabricated concrete slabs are built in a factory and transported to the site, ready to be lowered into place between steel or concrete beams. They may be pre-stressed (in the factory), post-stressed (on site), or unstressed. It is vital that the supporting structure is built to the correct dimensions, or the slabs may not fit.

In situ concrete slabs are built on the building site using formwork - a type of boxing into which the wet concrete is poured. If the slab is to be reinforced, the rebars are positioned within the formwork before the concrete is poured in. Plastic tipped metal, or plastic bar chairs are used to hold the rebar away from the bottom and sides of the form-work, so that when the concrete sets it completely envelops the reinforcement. For a *ground slab*, the form-work may consist only of sidewalls pushed into the ground. For a suspended slab, the form-work is shaped like a tray, often supported by a temporary scaffold until the concrete sets.

The formwork is commonly built from wooden planks and boards, plastic, or steel. On commercial building sites today, plastic and steel are more common as they save labour. On low-budget sites, for instance when laying a concrete garden path wooden planks are very common. After the concrete has set the wood may be removed, or left there permanently.

In some cases formwork is not necessary - for instance, a ground slab surrounded by brick or block foundation walls, where the walls act as the sides of the tray and hardcore acts as the base.

Framing, in construction known as light-frame construction, is a building technique based around vertical structural members, usually called studs, which provide a stable frame to which interior and exterior wall coverings are attached, and covered by a roof made of horizontal ceiling joists and sloping rafters (or pre-fabricated roof trusses).

Modern light-frame structures usually gain strength from rigid panels (plywood and other plywood-like composites such as oriented strand board (OSB) used to form all or part of wall sections) but until recently carpenters employed various forms of diagonal bracing (called *wind braces*) to stabilize walls. Diagonal bracing remains a vital interior part of many roof systems, and in-wall wind braces are required by building codes in many municipalities or by individual state laws in the United States.

Light frame construction using standardised dimensional lumber has become the dominant construction method in North America and Australia because of its economy. Use of minimal structural materials allows builders to enclose a large area with minimal cost, while achieving a wide variety of architectural styles. The ubiquitous platform framing and the older balloon framing are the two different light frame construction systems used in North America.

The ceiling

This is the structure that bides the roof structure from the view of the occupants of the building. It prevents the heat or cold from the roof from affecting the building occupants. It also beautifies the room. The ceiling has its own logging structure just as the roof has its trusses. The ceiling logging structure may be made of 5cm by 5cm wood, by metals or by plastic. The ceiling may also be made with wood completely.

3.1.10 Rafter

Is one of a series of sloped structural members (beams) that extend from the ridge or hip to the wall-plate, down slope perimeter or eave, and that are designed to support the roof deck and its associated load. This is a type of beam that supports the roof of a building. In home construction rafters are typically made of wood. Exposed rafters can be a feature of traditional roof styles. In recent buildings there is a preference for engineered trusses (trussed rafters) on the grounds of cost, economy of materials, off-site manufacture and ease of construction, as well as design considerations such as span limitation and roof load.

3.1.11 Post and lintel

A timber frame building, a contemporary example of articulated post and beam (lintel) construction

Fig. 1.5: Stonehenge, an example of Neolithic architecture post and lintel construction

Post and lintel, or in contemporary usage post and beam, is a simple construction method using a lintel, header, or architrave as the horizontal member over a building void supported at its ends by two vertical columns, pillars, or posts. This architectural system and building method has been commonly used for centuries to support the weight of the structure located above the openings created by windows and doors in a bearing wall. In architecture, a post-and-lintel or trabeated system refers to the use of horizontal beams or lintels which are borne up by columns or posts. The name is from the Latin *trabs, beam*; influenced by *trabeatus*, clothed in the *trabea*, a ritual garment. There are two main force vectors acting upon the post and lintel system: weight carrying compression at the joint between lintel and post, and tension induced by

deformation of self-weight and the load above between the posts. The two posts are under compression from the weight of the lintel (or beam) above. The lintel will deform by sagging in the middle because the underside is under tension and the topside is under compression.

Arches- The biggest disadvantage to a post and lintel construction is the limited weight that can be held up, and the small distances required between the posts. Ancient Roman architecture development of the arch allowed for much larger structures to be constructed. The arcuated system, which involves the use of arches, replaced the post and lintel trabeated system in larger buildings and structures, until the industrial era introduction of steel girder beams.

4.0 CONCLUSION

Understanding the names and terminologies in building is important to you in all respect. Understanding the mix and types of materials and when each is used is equally important, especially for those houses in the tropics where toy function. All materials used in building for you to appreciate and approve its use must have the property of retaining heat during cold session and expel heat during hot season. It is equally important also to note that whatever action or inaction that takes place in the process of building a structure or a house, what matters is its support for healthy living in its final form when completed. And that is one of the areas you function most because you are now left to issues a certificate approving occupation of the building as fit for human habitation.

5.0 SUMMARY

In this unit some terminologies such as bricks, concrete blocks, mortar, bonding, Flemish and English bonding, roofs and its types, slabs and concrete slabs, framing and light-frame construction. The unit had explained the various terms and parts of building and the materials used in its construction. The various components of building in this unit are all important in providing the needed support for a healthful living when the house is finally completed. The materials used also will determine its durability and support for the needs of the occupants.

6.0 TUTOR- MARKED ASSIGNMENT

1. List 5 parts of building and their uses
2. Name two (2) types each of
3. Rafter
4. Slabs
5. Floors

6. Walls
7. Ceiling

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UNIT 2 APPLICATION OF TECHNICAL DRAWING AND READING OF BUILDING PLANS

CONTENTS

1.0 INTRODUCTION

In the last unit you have learnt the various parts that make up a building and the terminologies used in describing the various components of the building. You must have earlier also learnt that **"**a building is any independent structure comprising one or more rooms or other spaces, covered by a roof and usually enclosed by external walls or building walls which extend from the foundations to the roof" (WHO, 1967). The first step in the process of building, after site selection and land acquisition, is the drawing of a plan of the house. This is the actual representation of the proposed structure on paper which is usually done by draughts men. This unit will introduce you to the aspect of technical drawings, its applications and the various instruments used in the drawings. Indeed you will learn also the need on how to interpret building plans. This is necessary for you function as a sanitarian.

3.0 OBJECTIVES

At the end of this unit, you should be able to:

- define building plan
- describe sketches of building
- identify some instruments used in drawing and buildings
- discuss applications for technical drawing.

3.0 MAIN CONTENT

3.1 Definition of Building Plan

The West Africa Health Examination Board (WAHEB, 1991) also defines building plan as the drawing of the structure of a building made to scale on a piece of paper. It shows the site; elevation, cross section and other details of the building (e.g., roof plan, electrical installation, sanitary plumbing, size of doors and windows and their locations, etc.) The plan serves as a guide or road map for the builders, engineers and other workmen to follow correctly all details of the plan required during construction, so that the owner or developer gets what he wants. It also serves as a prerequisite for granting the title of ownership (property right) to individuals by the government which, in turn can, be used to facilitate business transactions and obtain a loan from a bank.

3.2 Sketch for a Building

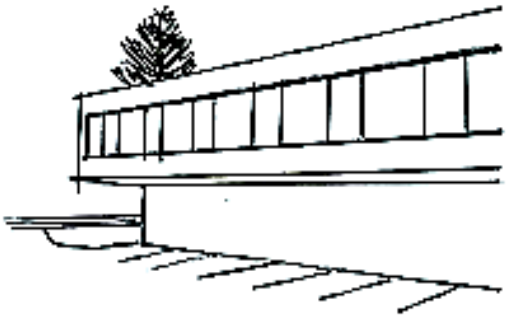

Fig. 2.1:

A sketch is a quickly executed freehand drawing that is not intended as a finished work. In general, sketching is a quick way to record an idea for later use. Architect's sketches primarily serve as a way to try out different ideas and establish a composition before undertaking a more finished work, especially when the finished work is expensive and time consuming. Architectural sketches, for example, are a kind of diagrams these sketches, like metaphors, are used by architects as a mean of communication in aiding design collaboration. These tools help architects to abstract attributes of hypothetical provisional design solutions and summarise their complex patterns, hereby enhancing the design process.

3.3 Site Plan

Site plan is an architectural plan, landscape architecture document, and a detailed engineering drawing of proposed improvements to a given lot.

A site plan "usually shows a building footprint, travel ways, parking, drainage facilities, sanitary sewer lines, water lines, trails, lighting, and landscaping and garden elements".[1]

Such a plan of a site is a "graphic representation of the arrangement of buildings, parking, drives, landscaping and any other structure that is part of a development project".[2]

A site plan is a "set of construction drawings that a builder or contractor uses to make improvements to a property. Counties can use the site plan to verify that development codes are being met and as a historical resource. Site plans are often prepared by a design consultant who must be either a licensed engineer, architect, landscape architect or land survey".

3.3.1 Site Analysis

Site analysis is an inventory completed as a preparatory step to site planning, a form of urban planning which involves research, analysis, and synthesis. It primarily deals with basic data as it relates to a specific site. The topic itself branches into the boundaries of architecture, landscape architecture, engineering, economics, and urban planning. Site Analysis is an element in site planning and design. Kevin A. Lynch, an urban planner developed an eight cycle step process of site design, in which the second step is site analysis, the focus of this section.

3.3.2 Site Plan Building Blocks

A site plan is a top view, bird’s eye view of a property that is drawn to scale. A site plan can show site:

- Property lines
- Outline of existing and proposed buildings and structures
- Distance between buildings
- Distance between buildings and property lines (setbacks)
- Parking lots, indicating parking spaces
- Driveways
- Surrounding streets
- Landscaped areas
- Easements
- Ground sign location.

Site planning in landscape architecture and architecture refers to the organisational stage of the landscape design process. It involves the organisation of land use zoning, access, circulation, privacy, security, shelter, land drainage, and other factors. This is done by arranging the

compositional elements of landform, planting, water, buildings and paving and building. Site planning generally begins by assessing a potential site for development through site analysis. Information about slope, soils, hydrology, vegetation, parcel ownership, orientation, etc. are assessed and mapped. By determining areas that are poor for development (such as floodplain or steep slopes) and better for development, the planner or architect can assess optimal location and design a structure that works within this space.

3.4 Identify Some Instruments Used in Drawing and Buildings

The list demonstrated here are not exhaustive, many modern instruments have being discovered and are currently in use by professionals. Some of the instruments are listed as follows;

Fig.2.2: Drafters at Work (Copying technical drawings in 1973)

Technical drawing, also known as drafting or draughting, is the act and discipline of composing plans that visually communicate how something functions or has to be constructed. Drafting is the visual language of industry and engineering. This need for unambiguous communication in the preparation of a functional document distinguishes technical drawing from the expressive drawing of the visual arts. Artistic drawings are subjectively interpreted; their meanings are multiply determined. Technical drawings are understood to have one intended meaning.

Manual or by instrument

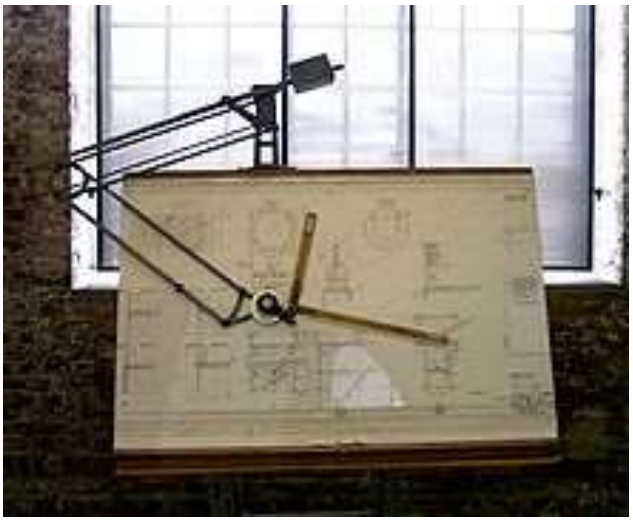

Fig. 2.3: A Drafting Table

Fig. 2.4: Technical Drawing Instruments

Fig.2.5: Stencils for Correct Technical Lettering

3.5 Application of Technical Drawings

The basic drafting procedure is to place a piece of paper (or other material) on a smooth surface with right-angle corners and straight sides—typically a drawing board. A sliding straightedge known as a T-square is then placed on one of the sides, allowing it to be slid across the side of the table, and over the surface of the paper.

"Parallel lines" can be drawn simply by moving the T-square and running a pencil or technical pen along the T-square's edge, but more typically the T-square is used as a tool to hold other devices such as set squares or triangles. In this case the drafter places one or more triangles of known angles on the T-square—which is itself at right angles to the edge of the table—and can then draw lines at any chosen angle to others on the page. Modern drafting tables (which have by now largely been replaced by CAD workstations) come equipped with a drafting machine that is supported on both sides of the table to slide over a large piece of paper. Because it is secured on both sides, lines drawn along the edge are guaranteed to be parallel.

In addition, the drafter uses several technical drawing tools to draw curves and circles. Primary among these are the compasses, used for drawing simple arcs and circles, and the French curve, typically a piece of plastic with complex curves on it. A spline is a rubber coated articulated metal that can be manually bent to most curves. Drafting templates are sold commercially by a number of vendors, usually customised to a specific task, but it is also not uncommon for a drafter to create their own templates.

This basic drafting system requires an accurate table and constant attention to the positioning of the tools. A common error is to allow the triangles to push the top of the T-square down slightly, thereby throwing off all angles. Even tasks as simple as drawing two angled lines meeting at a point require a number of moves of the T-square and triangles, and in general drafting can be a time consuming process.

A solution to these problems was the introduction of the mechanical "drafting machine", an application of the pantograph (sometimes referred to incorrectly as a "pentagraph" in these situations) which allowed the drafter to have an accurate right angle at any point on the page quite quickly. These machines often included the ability to change the angle, thereby removing the need for the triangles as well.

In addition to the mastery of the mechanics of drawing lines, arcs and circles (and text) onto a piece of paper—with respect to the detailing of physical objects—the drafting effort requires a thorough understanding

of geometry, trigonometry and spatial comprehension, and in all cases demands precision and accuracy, and attention to detail of high order.

Although drafting is sometimes accomplished by a project engineer, architect—or even by shop personnel such as a machinist—skilled drafters (and/or designers) usually accomplish the task and are always in demand to some level.

Today, the mechanics of the drafting task have largely been automated and accelerated through the use of computer-aided design systems (CAD). There are two types of computer-aided design systems used for the production of technical drawings" two dimensions ("2D") and three dimensions ("3D").

2D CAD systems such as AutoCAD or Micro Station replace the paper drawing discipline. The lines, circles, arcs and curves are created within the software. It is down to the technical drawing skill of the user to produce the drawing. There is still much scope for error in the drawing when producing first and third angle orthographic projections, auxiliary projections and cross sections. A 2D CAD system is merely an electronic drawing board. Its greatest strength over direct to paper technical drawing is in the making of revisions. Whereas in a conventional hand drawn technical drawing, if a mistake is found, or a modification is required, a new drawing must be made from scratch. The 2D CAD system allows a copy of the original to be modified, saving considerable time. 2D CAD systems can be used to create plans for large projects such as buildings and aircraft but provide no way to check the various components will fit together.

3D CAD systems such as Autodesk Inventor or solid works first produce the geometry of the part; the technical drawing comes from user defined views of the part. Any orthographic, projected and section views are created by the software. There is no scope for error in the production of these views. The main scope for error comes in setting the parameter of first or third angle projection, and displaying the relevant symbol on the technical drawing. 3D CAD allows individual parts to be assembled together to represent the final product. Buildings, aircraft, ships and cars are modelled, assembled and checked in 3D before technical drawings are released for manufacture.

Both 2D and 3D CAD systems can be used to produce technical drawings for any discipline. The various disciplines; electrical, electronic, pneumatic, hydraulic, etc, have industry recognised symbols to represent common components.

3.6 Reading and Interpretation of Building Plan

In most countries of the world, building regulation building approval is a multi-disciplinary task that involves more than one department. In Nigeria, building plan approval falls within 1 regional planning) and public health departments of the local governments and state, as applicable. However, in normal practice, the public health/ environmental health department is in control, and the plan is first submitted here.

After thorough checks and necessary comments or recommendations by the health officer (EHO), it is passed to the works engineer and lands department (urban and regional planning) for their input.

3.6.1 Aspects of the Building Plan to be checked

Important areas to be checked by the health officer during the vetting of the building plan are as follows:

i. The building site as to its suitability;
ii. Size of the building that is going into the plot in compliance with the building regulations;
iii. The size of the rooms in compliance with the regulations, as to adequacies;
iv. Availability, dimension or size and position of windows and doors to ensure proper ventilation and lighting as required;
v. Availability and adequacy of sanitary facilities (toilets, bathroom, kitchen, store) and their location in relation to living rooms, bed room, etc.;
vi. The distance between the building and set- back, including building line, and adjourning building or plots as provided in the building regulations;
vii. The total area built upon i.e. the area of the plot occupied by the building. This can be assessed by measurement of the building proper and subtraction from the plot area and finding the percentage. The 50per cent minimum allowable area built upon for residential buildings and 75 per cent for non-residential are used as a guide.

If the health officer (EHO) is satisfied that the plan meets all the above requirements, as stipulated in sanitary provisions of the building regulations, he may recommend it for approval. However, after approval has been granted, the health officer shall carry out follow- up visits to the site during construction until completion, to ensure that the regulations are not contravened, which is usually the case, if this aspect is neglected (WAHEB, 1991). The law also provides that no

reconstruction or amendments of existing buildings shall commence until the plan is submitted to the health officer for approval (FRN, 1963; FRN, 2007).

4.0 CONCLUSION

The need for all professional in the construction and maintenance of housing in our environmental to know some rudiments of what is involved to draw a building plan, the instruments used and the professionalism involved cannot be over emphasised. The practical demonstration of the use of the instruments is facilitated by the expertise of the user. New innovations that do not require physical handling of instruments are daily being discovered due the use of various computer soft wires. However due to the need for the younger ones to know what was used before these discoveries and its use in rural areas even as at now where electricity is still a luxury, there is the need for the understanding and training on the availability, utilisation and maintenance of these instruments.

5.0 SUMMARY

In this unit you learnt some basic drawing instruments and the various computer applications such as computer-aided design systems (CAD). The 2D CAD systems such as AutoCAD or micro station replace the paper drawing discipline. These are computer-aided design systems used for the production of technical drawings" two dimensions ("2D") and three dimensions ("3D") discussed in the unit. Sketches and use of drafting tables and the instruments on tables have been enumerated. You are encouraged to visit any Architect or construction unit of any ministry or offices to see more of these facilities to enable you appreciate what other professional do as a means of earning a living. You may not be able to draw a building plan, but you with knowledge you acquired in this unit you should be able to sketch out your building or site. You have also leant from this unit what to check for when you are inspecting a building plan. As an EHO you must ensure you the building site as to its suitability, the size of the building that is going into the plot in compliance with the building regulations. The unit have taught you to check for adequacy of the size of the rooms, availability, dimension or size and position of windows and doors to ensure proper ventilation and lighting, availability and adequacy of sanitary facilities, the distance between the building and set- back, including building line, and adjourning building or plots, the total area built upon i.e. the area of the plot occupied by the building. You reference is the current building regulations in your area.

6.0 TUTOR-MARKED ASSIGNMENT

1. Define building plan.
2. List five instruments used in building drawings.
3. What is the use of AutoCAD.
4. Visit any technical drawing room to see the instruments available there.

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MODULE 3

UNIT1 UNDERSTAND THE PRELIMINARIES AND THE GENERAL PRINCIPLE OF SELECTING AND PREPARING SITES TO RECEIVE VARIOUS TYPES OF FOUNDATIONS

CONTENTS

1.0 INTRODUCTION

In the previous unit we have learnt the definition of building and sketch plan, the description of site plan, you have also learnt some instruments used in drawings and buildings and how some instruments are applied for technical drawings etc. This unit will build on that and discuss the issues relating to the building sites and the foundation of buildings. We already have leant in the previous modules that building construction is the process of adding structure to real property. The vast majority of building construction jobs is small renovations, such as addition of a room, or renovation of a bathroom. Often, the owner of the property acts as labourer, paymaster, and design team for the entire project. However, all building construction projects include some elements in common – design, financial, estimating and legal considerations. Many projects of varying sizes reach undesirable end results, such as structural collapse, cost overruns, and/or litigation reason; those with experience in the field make detailed plans and maintain careful oversight during the project to ensure a positive outcome. The causes of these deficiencies can be complex but to avoid it all you must understand the necessary preliminaries that are involved and the principles of selecting and preparing sites with a view to take all precautions necessary in preventing dampness and its related problem.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- describe building site
- define site analysis
- list process involved in site analysis
- discuss foundation in building
- describe site investigation
- foundation construction
- site preparation.

3.0 MAIN CONTENT

3.1 Building Site

As in the house build anywhere in the world, the site for a tropical house must be free from all items arid activities that can adversely affect the health of the occupants or that can undermine the structural safety of the buildings. There must be legislations on the type of sites which are not suitable for houses. These legislations must be honestly and efficiently complied with. Sites which are not sanitary or cannot be made sanitary

must be avoided. Sites around noisy factories, busy highways, airports and market places are not ideal for residential houses. Uncontrolled tipping or poorly managed refuse tipping sites and poorly managed sewage treating plants must not be too close to human houses.

To ensure that the structural stability of the houses is not endangered, land reclaimed with refuse must not be used for building until certified suitable through scientific soil test, normally after 20 - 30 years since the last refuse was deposited. Water-logged areas which poor drainage must be avoided unless the drainage can be economically improved (Alcock, l948). The ground water must be at least 2 meters below the ground surface.

3.2 Site Analysis

Site analysis is an inventory completed as a preparatory step to site planning, a form of urban planning which involves research, analysis, and synthesis. It primarily deals with basic data as it relates to a specific site. The topic itself branches into the boundaries of architecture, landscape architecture, engineering, real estate development, economics, and urban planning. Site analysis is an element in site planning and design. Kevin A. Lynch, an urban planner developed an eight cycle step process of site design, in which the second step is site analysis, the focus of this section.

3.3 Processes Involved in Site Analysis

The site design process is divided up into three sections; research phase, analysis phase, and synthesis phase. These three phases are divided into the eight chronological steps in the design process.

- Research phase: The first step is defining the problem and its definition. This is part of the research phase. The site design and site planning process begins with the initial problem to be solved. This is started by a client contracting a planner to work with a particular site.
- Analysis phase: The next step involves programming the site as well as site and user analysis, which is focused on in-depth below. There are numerous site elements related to the analysis during this phase. This is part of the analysis phase in site planning.
- Synthesis phase: From the analysis, a programme is developed, which is part of the synthesis phase. The third step deals with schematic design of a site plan as well as a preliminary cost estimate for the site. Step four involves more developed designs and a detailed cost estimate. Step five is the construction

documents for the plan. Bidding and contracting for the project follows as step six. Construction then will take place as step seven. The final step, step eight, in the site design process is occupation and management of the site.

Elements: Numerous elements go into a given site analysis. These elements include location, neighbourhood context, site and zoning, legal elements, natural physical features, man-made features, circulation, utilities, sensory, human and cultural, and climate components. The following elements typically are considered in most sites:

- Location: The site should be related to major streets or landmarks previously existing. Aerial photographs help in this assessment stage. There should be documentation of distances and time from major places. This should be completed by either driving or walking the distance first-hand.
- Neighbourhood context: Zoning of the neighbourhood is important and information of this type can typically be found at the municipal planning department of the site. Numerous issues at this stage require direct observation. Features of this sort include architectural patterns, street lighting, and condition of existing buildings. This would also include the immediate surroundings of the site. The reaction of the surrounding buildings towards the site and people moving around should be analysed.
- Size and zoning: Site boundaries can be located by either verifying the dimensions physically or contacting the county tax assessor's office. Zoning classifications, set-backs, height restrictions, allowable site coverage, uses, and parking requirements are obtained by obtaining zoning classifications from a zoning map, which can be located from the city planning department.
- Legal: Typical legal information can be obtained from the deed to the property. The deed is held by the owner of the title insurance company. In this deed is information such as the property description, present ownership, and the governmental jurisdiction the site is located in, and the city or county.
- Natural physical features: Most of this information will be derived from the topographic features on the site. A contour map of this magnitude can be located from the survey engineer. Drainage problems as well as existing natural features of trees, ground cover, ground texture, and soil conditions on the site should be directly observed.
- Man made features: Features located on the site such as buildings, walls, fences, patios, plazas, bus stop shelters should be noted. The site and location of such features should be directly

measured. Documentation of existing historical districts should be made, some of which may already have reports completed. Locating this information can be done through the municipal planning department for the site.

- Circulation: The uses of streets, roads, alleys, sidewalks, and plazas are important in this inventory step. It is not necessarily an analysis of these elements but more an analysis of what occurs on these circulation gateways.
- Utilities: Information for utilities concerning the site can be found through the utility departments and companies in the local area. Generally this company has a print of the drawing of this information needed. Information in this print includes the location of all utilities and their locations around or on the site itself.
- Sensory: Much of the sensory information collected will be done through firsthand experience. This type of information is obtained from sketching and photographs (sometimes aerial photographs). Direct observation of other sensory elements of noise, odours, smoke, and pollutant areas must also be completed.
- Human and cultural: This information can be obtained through census statistics on the neighbourhood. Information regarding these statistics is available from the local municipal planning agency. This information includes activities among people on the site and their relationships to these activities.
- Climate: This information can be obtained through the local weather service. Conditions such as rainfall, snowfall, humidity, and temperature over months must be considered and analysed. The sun-path and vertical sun angles throughout an entire year are important to note.

3.4 Foundation in Buildings

The foundation of a building is that part of walls, piers and columns in direct contact with and transmitting loads to the ground. The building foundation is sometimes referred to as the artificial, and the ground on which it bears as the natural foundation.

Ground is the general term for the earth's surface, which varies in composition within the two main groups, rocks and soils. Rocks are hard, strongly cemented deposits such as granite, soils and clay. Rocks suffer negligible compression and soils measurable compression under the load of buildings.

The size and depth of a foundation is determined by the structure and size of the building it supports and the nature and bearing capacity of the ground supporting it.

3.4.1 Soil and its Types in Building

Soil is the general term for the upper layer of the earth's surface which consists of various combinations of particles of disintegrated rock such as gravel, sand or clay with some organic remains of decayed vegetation generally close to the surface.

3.4.2 Top Soil

The surface layer of most of the low lying land in this country, which is most suited to building, consists of a mixture of loosely compacted particles of sand, clay and an accumulation of decaying vegetation.

This layer of top soil, which is about 100 to 300mm deep, is sometimes referred to as vegetable top soil. It is loosely compacted, supports growing plant life and is unsatisfactory as a foundation. It should be stripped from the site of buildings because of its poor bearing strengths and its ability to retain moisture and support vegetation which might adversely affect the health of occupants of buildings.

3.4.3 Subsoil

Subsoil is the general term for soil below the top soil. It is unusual for a subsoil to consist of gravel, sand or clay. The majority of subsoils are mixes of various soils. Gravel, sand and clay may be combined in a variety of proportions. To make a broad assumption of the behaviour of a particular soil under the load on foundations it is convenient to group soils such as gravel, sand and clay by reference to the size and nature of the particles.

The three broad groups are coarse grained non-cohesive, fine grained cohesive and organic. The nature and behaviour under the load on foundations of the soils in each group are similar.

3.4.4 Coarse Grained Non-Cohesive Soil

Soils which are composed mainly of or combinations of, sand and soils gravel consist of largely siliceous, unaltered products of rock weathering. They have no plasticity and tend to lack cohesion.

3.4.5 Gravel

Gravel consists of particles of a natural coarse grained deposit of rock fragments and finer sand. Many of the particles are larger than 2 mm.

3.4.6 Sand

Sand is natural sediment of granular, mainly siliceous, products of rock weathering. Particles are smaller than 2 mm, are visible to the naked eye and the smallest size is 0.06 mm. Sand is gritty, have no real plasticity and can be easily powdered by hand when dry. Dense, compact gravel and sand requires a pick to excavate for foundation trenches. A test of the suitability of these soils as a foundation is that it is difficult to drive a 5 mm wooden peg more than some 150mm into compact gravel or sand. As a foundation for small buildings, such as a house, it is sufficient to spread and level a continuous strip of concrete in the excavated trenches as a level base for load bearing walls.

The continuous strip of concrete is spread in the trenches excavated down to an undisturbed level of compact soil. The strip of concrete may well need to be no wider than the thickness of the wall. In practice the concrete strip will generally be wider than the thickness of the wall for the convenience of covering the whole width of the trench and to provide a wide enough level base for bricklaying below ground. A continuous strip foundation of concrete is the most economic form of foundation for small buildings on compact soils.

3.4.7 Fine Grained Cohesive Soils

Fine grained cohesive soils, such as clays, are a natural deposit of the finest siliceous and aluminous products of rock weathering. Clay is smooth and greasy to the touch, shows high plasticity, dries slowly and shrinks appreciably on drying. Under the pressure of the load on foundations clay soils are very gradually compressed by the expulsion of water through the very many fine capillary paths, so that buildings settle gradually during building work and this settlement may continue for some years after the building is completed. The initial and subsequent small settlement by compression during and after building on clay sub soils will generally be uniform under most small buildings, such as houses, to the extent that no damage is caused to the structure and its connected services.

3.5 Site Investigation

To select a foundation from tables, or to design a foundation, it is necessary to calculate the loads on the foundation and determine the nature of the subsoil, its bearing capacity, it’s likely behaviour under seasonal and ground water level changes and the possibility of ground movement. Where the nature of the subsoil is known from geological surveys, adjacent building work or trial pits or borings and the loads on foundations are small, as for single domestic buildings, it is generally

sufficient to excavate for foundations and confirm, from the exposed subsoil in the trenches, that the soil is as anticipated.

Under strip and pad foundations there is a significant pressure on the subsoil below the foundations to a depth and breadth of about one-and-a-half-times the width of the foundation. If there were, in this area below the foundation, a soil with a bearing capacity less than that below the foundation, then appreciable settlement of the foundation might occur and damage the building. It is important, therefore, to know or ascertain the nature of the subsoil both at the level of the foundation and for some depth below.

Where the nature of the subsoil is uncertain or there is a possibility of ground movement or a need to confirm information on subsoil, it is wise to explore the subsoil over the whole of the site of the building.

As a first step it is usual to collect information on soil and subsoil conditions from the County and Local Authority, whose local knowledge from maps, geological surveys, aerial photography and works for buildings and services adjacent to the site may in itself give an adequate guide to subsoil conditions. In addition geological maps from the British Geological Survey, information from local geological societies, ordnance survey maps, mining and river and coastal information may be useful.

3.5.1 Site Visit

A visit to the site and its surroundings should always be made to record everything relevant from a careful examination of the nature of the subsoil, vegetation, evidence of marshy ground, signs of ground water and flooding, irregularities in topography, ground erosion and ditches and flat ground near streams and rivers where there may be soft alluvial soil. A record should be made of the foundations of old buildings on the site and cracks and other signs of movement in adjacent buildings as evidence of ground movement.

3.5.2 Trial Pits

To make an examination of the subsoil on a building site, trial pits or boreholes are excavated. Trial pits are usually excavated by machine or hand to depth of two (2) to four (4) m and at least the anticipated depth of the foundations. The nature of the subsoil is determined by examination of the sides of the excavations. Boreholes are drilled by hand auger or by machine to withdraw samples of soil for examination. Details of the subsoil should include soil type, consistency or strength, soil structure, moisture conditions and the presence of roots at all

depths. From the nature of the subsoil the bearing capacity, seasonal volume changes and other possible ground movements are assumed. To determine the nature of the subsoil below the foundation level it is either necessary to excavate trial pits some depth below the foundation or to bore in the base of the trial hole to withdraw samples. Whichever system is adopted will depend on economy and the nature of the subsoil. Trial pits or boreholes should be sufficient in number to determine the nature of the subsoil over and around the site of the building and should be at most say 30 m apart.

Ground movements that may cause settlement are:

(1) compression of the soil by the load of the building
(2) seasonal volume changes in the soil
(3) mass movement in unstable areas such as made up ground and mining areas where there may be considerable settlement
(4) ground made unstable by adjacent excavations or by dewatering, for example, due to an adjacent road cutting.

It is to anticipate and accommodate these movements that site investigation and exploration is carried out.

3.5.3 Functional Requirement

The functional requirement of a foundation is on its strength and stability. The requirements from the building regulations are, as regards 'Loading', that 'The building shall be so constructed that the combined, dead, imposed and wind loads are sustained and transmitted to the ground safely and without causing such deflection or deformation of any part of the building, or such movement of the ground, as will impair the stability of any part of another building' and as regards 'ground movement' that 'The building shall be so constructed that movements of the subsoil caused by swelling, shrinkage or freezing will not impair the stability of any part of the building'.

A foundation should be designed to transmit the loads of the building to the ground so that there is, at most, only a limited settlement of the building into the ground. A building whose foundation is on sound rock will suffer no measurable settlement whereas a building on soil will suffer settlement into the ground by the compression of the soil under the foundation loads.

Foundations should be designed so that settlement into the ground is limited and uniform under the whole of the building. Some settlement of a building on a soil foundation is inevitable as the increasing loads on the foundation, as the building is erected, compress the soil. This

settlement should be limited to avoid damage to service pipes and drains connected to the building. Bearing capacities for various rocks and soils are assumed and these capacities should not be exceeded in the design of the foundation to limit settlement.

In theory, if the foundation soil were uniform and foundation bearing pressure were limited, the building would settle into the ground uniformly as the building was erected, and to a limited extent, and there would be no possibility of damage to the building or its connected services or drains. In practice there are various possible ground movements under the foundation of a building that may cause one part of the foundation to settle at a different rate and to a different extent than another part of the foundation.

This different or differential settlement must be limited to avoid damage to the superstructure of the building. Some structural forms can accommodate differential or relative foundation movement without damage more than others. A brick wall can accommodate limited differential movement of the foundation or the structure by slight movement of the small brick units and mortar joints, without affecting the function of the wall, whereas a rigid framed structure with rigid panels cannot be to the same extent. Foundations are designed to limit differential settlement; the degree to which this limitation has to be controlled or accommodated in the structure depends on the nature of the structure supported by the foundation.

3.6 Foundation Construction

Strip foundations consist of a continuous strip, usually of concrete, formed centrally under load bearing walls. This continuous strip serves as a level base on which the wall is built and is of such a width as is necessary to spread the load on the foundations to an area of subsoil capable of supporting the load without undue compaction. Concrete is the material principally used today for foundations as it can readily be placed, spread and levelled in foundation trenches, to provide a base for walls, and it develops adequate compressive strength as it hardens to support the load on foundations. Before Portland cement was manufactured, strip foundations of brick were common, the brick foundation being built directly off firm subsoil or built on a bed of natural stones.

The width of a concrete strip foundation depends on the bearing capacity of the subsoil and the load on the foundations. The greater the bearing capacity of the subsoil, the less the width of the foundation for the same load.

A table in approved document A to the building regulations sets out the recommended minimum width of concrete strip foundations related to six specified categories of subsoil and calculated total loads on foundations as a form of ready reckoner. The widths vary from 250mm for a load of not more than 20kN/linear metre of wall on compact gravel or sand through 450mm for loads of 40kN/linear metre on firm clay, to 850mm for loads not exceeding 30kN/linear metre on soft silt, clay or sandy clay.

The dimensions given are indicative of what might be acceptable in the conditions specified rather than absolutes to be accepted regardless of the conditions prevailing on individual sites.

The strip foundation for a cavity external wall and a solid internal, load bearing wall would be similar to the width recommended in the Advisory Document for firm clay subsoil when the load on the foundations is no more than 50kN/linear metre. In practice the linear load on the foundation of a house would be appreciably less than 50kN/linear metre and the foundation may well be made wider than the minimum requirement for the convenience of filling a wider trench with concrete for the convenience of laying brick below ground.

The least thickness of a concrete strip foundation is determined in part by the size of the aggregate used in the concrete, the need for a minimum thickness of concrete so that it does not dry too quickly and lose strength and to avoid failure of the concrete by shear.

If the thickness of a concrete strip foundation were appreciably less than its projection each side of a wall the concrete might fail through the development of shear cracks by the weight of the wall causing a 450 crack. If this occurred the bearing surface of the foundation on the ground would be reduced to less than that necessary for stability.

Shear is caused by the two opposing forces of the wall and the ground acting on and tearing or shearing the concrete as scissors or shears cut or shear materials apart.

3.7 Site Preparation

Turf and vegetable top soil should be removed from the ground to be covered by a building, to a depth sufficient to prevent later growth. Tree and bush roots, that might encourage later growth, are grubbed up and any pockets of soft compressible material, that might affect the stability of the building, are removed. The reasons for removing this vegetable soil are firstly to prevent plants, shrubs or trees from attempting to grow under the concrete. In growing, even the smallest of plant life exerts

considerable pressure, which would quite quickly rupture the concrete over site. The second reason for removing the vegetable top soil is that it is generally soft and compressible and readily retains moisture which would cause concrete over it to be damp at all times. The depth of vegetable top soil varies and on some sites it may be necessary to remove 300mm or more vegetable top soil.

In practice most of the vegetable top soil over a building site is effectively moved by excavations for foundations, leveling and drain and other service pipes to the extent that it may be necessary to remove top soil that remains within or around the confines of a building.

3.7.1 Contaminants

There are some possible contaminants in or on ground to be covered by a building that may be a danger to health or safety. Building sites that may be likely to contain contaminants can be identified from planning records or local knowledge of previous uses. Sites previously used as asbestos, chemical or gas works, metal works, munitions factories, nuclear installations, oil stores, railway land, and sewage works and land fill are some examples given.

3.7.2 Site Drainage

Surface water (storm water) is the term used for natural water that is rainwater that falls on the surface of the ground including open ground such as fields, paved areas and roofs. Rainwater that falls on paved areas and from roofs generally drains to surface water.

3.7.3 Cement

The cement most used is ordinary Portland cement but there are many types in use in Nigeria and the West African sub region that are equally good. It is manufacture by heating a mixture of finely powdered clay and limestone with water to a temperature of about l2°C, at which the lime and clay fuse to form a clinker. This clinker is ground with the addition of a little gypsum to a fine powder of cement. Cement powder reacts with water and its composition gradually changes and the particles of cement bind together and adhere strongly to materials with which they are mixed, Cement hardens gradually after it is mixed with water. Some thirty minutes to an hour after mixing with water the cement is no longer plastic and it is said that the initial set has occurred. About 10 hours after mixing with water, the cement has solidified and it increasingly hardens until some seven (7) days after mixing with water when it is a dense solid mass.

4.0 CONCLUSION

In building construction and maintenance, it is necessary to understand that state of foundation as it is made is vital to the strength, survival and stability of the building. The type of soil on which it is placed now becomes paramount because foundation does not exist in a vacuum. There are some types of soils that do not support putting a foundation on it without adequate clearance, preparation and treatment. The use of sand, cement and gravels is a profession exercise. It is important for you to ensure that building engineers comply with the specification and the formula of the mix and the time duration required of all the mix for use in building. Some factors determine the quantity of cement, water sand to be used.

5.0 SUMMARY

in this unit you learnt that the site for construction must be adequately and professionally examined. The site design process is divided up into three sections as enumerated in the unit the first is the research phase followed by analysis phase and the final is synthesis phase. These three phases are divided into the eight chronological steps in the design process which involves a lot of procedures and steps and includes considering the location, neighborhood context, site and zoning, legal elements, natural physical features, man-made features, circulation, utilities, sensory, human and cultural, and climate components. These conditions or elements typically are considered in most sites proposed for construction. The foundation of buildings must be made in such a way to receive all the weight of the structure and must be well distributed to avoid sagging and cracking of the building, site investigation must be done to determine the type and nature of the soil, quality and previous use of the area, how to initiate foundation construction is vital and how to prepare sites for construction is also an issues that must be monitored to ensure healthy and strong building. These are very applicable to both urban and rural areas.

6.0 TUTOR-MARKED ASSIGNMENT

Write short notes on the following:

1. Building site and site analysis.
2. Processes involved in site analysis.
3. Foundation in building.
4. Site investigation.
5. Preparation of sites for construction.

7.0 REFERENCES/FURTHER READING

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UNIT 2 UNDERSTAND THE PRINCIPLES OF DAMP-PROOFING IN BUILDING

CONTENTS

1.0 INTRODUCTION

In the previous unit we have learnt that site for construction must be adequately and professionally examined. We have seen how site design process was divided up into three sections namely research phase then analysis phase and then synthesis phase. These three phases are also divided into the eight chronological steps in the design process which was listed as the location, neighborhood context, site and zoning, legal elements, natural physical features, man-made features, circulation, utilities, sensory, human and cultural, and climate components. In this unit we will progress to discuss damp proofing in building, its

importance, how it is constructed, the various materials that can be used for it and its uses. It is needless to say that any building without a DPC renders the foundation liable to problems that will be enumerated in the unit.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define terms in damp proofing
- state the materials used in damp proofing
- describe remedial damp proofing
- enumerate three(3) types of dampness
- list the health effects of dampness
- explain the prevention and treatment of dampness.

4.0 MAIN CONTENT

4.1 Damp Proofing

Damp proofing in construction is a type of waterproofing applied to building foundation walls to prevent moisture from passing through the walls into interior spaces.

4.1.1 **A Damp-Proof Course** (often abbreviated to DPC)

Is a horizontal barrier in a wall designed to resist moisture rising through the structure by capillary action - a phenomenon known as rising damp. It is also described as a thick plastic strip bedded into the mortar between two courses of bricks or blocks. It can often be seen as a thin plastic line in the mortar near ground level.

4.1.2 **Damp-Proof Membrane** (DPM)

DPM performs a similar function for a solid floor. Moisture resistance is not necessarily absolute: it is usually defined by a specific test method, limits, and engineering tolerances. In simpler words, DPC is used to stop dampness in buildings. In theory, due to capillary movement of water, water rises from earth to the building. Passing through foundation it rises higher to reach walls. Reaching water to walls may damage them by creating cracks, breaking cement-paint bonds and creating dark-spots on wall etc. So, to avoid water from reaching to walls, we lay DPC layer at plinth level (the joint level of walls and foundations). DPC layer is usually laid below all the walls unaffected from the issue that the respective wall is a load bearing wall or a partition wall. Usually, DPC

membrane is 4" to 9" wide. A DPM is usually a thick polythene sheet laid under the floor slab, to allow the slab to dry out and keep out groundwater. It is often laid on a bed of sand, to prevent the sharp edges of the hardcore damaging it.

To create a continuous barrier, pieces of DPC or DPM are welded together. In addition, the DPC is welded to the DPM around the outside edges of the ground floor, completely sealing the inside of the building from the damp ground under it.

In a cavity wall, there is usually a DPC in both the outer and inner wall. In the outer wall it is normally 150-200mm above ground level (the height of two-three brick courses). This allows rain to form puddles and splash up off the ground, without saturating the wall above DPC level. The wall below the DPC may become saturated in rainy weather. The DPC in the inner wall is usually below floor level, (under a suspended timber floor structure), or, with a solid concrete floor, it is usually found immediately above the floor slab so that it can be linked to the DPM under the floor slab. This enables installation of skirting boards above floor level without fear of puncturing it. Alternatively, instead of fitting separate inner and outer DPCs, it is common in commercial house building to use a one-piece length of rigid plastic, (albeit an angled section), which fits neatly across the cavity and slots into both walls (a cavity tray). This method requires the need for weep vents to enable rainwater ingress to drain from the cavities otherwise rising dampness could occur from above the DPC.

4.1.3 Rising Damp

In practice, almost never occurs. Nearly every occurrence of so called 'Rising Damp' can be properly diagnosed as related to condensation, penetrating damp, or the improper use of impermeable materials. For example, the widespread use of impervious gypsum plasters in solid wall, lime mortar constructed houses traps condensation and creates damp problems which are incorrectly interpreted by chemical salesmen and 'damp surveyors' as rising damp. Similarly, cement render applied to the outside of walls built in this way will create the same symptoms. It is vital to correctly diagnose causes of damp problems - many older, solid wall construction houses now have several useless injection damp proofing courses as a result of incorrect diagnosis. Rising damp in theory can occur for various reasons - the failure of an existing damp proof course, bridging due to the raising of external ground or internal floor levels, or in older buildings, the complete absence of a damp proof course.

Brick, stone and mortar are porous allowing damp from the ground to rise by capillary action, carrying with it ground salts including chlorides and nitrates. These salts from the ground can absorb moisture from the atmosphere leading to wall dampness in conditions of high relative humidity. Also they can ruin decorations and break down internal plaster. In older days, stone-slab was mostly used as DPC material. Building standards in many countries require most new buildings to incorporate a DPC/DPM at the time of construction. This may consist of a thin strip of plastic, a course of engineering brick or slate, or a layer of bitumen.

Barry (1999) in his book (Construction of buildings volume 1) had in details discussed DPC and its associated remedies and is produced for you below.

3.1.4 Damp-Proof Membrane

Concrete is spread over site as a solid base for floors and as a barrier to moisture rising from the ground. Concrete is to some degree permeable to water and will absorb moisture from the ground; a damp over site concrete slab will be cold and draw appreciable heat from rooms.

A requirement of the building regulations is that floors shall adequately resist the passage of moisture to the inside of the building. As concrete is permeable to moisture, it is generally necessary to use a damp-proof membrane under, in or on top of ground supported floor slabs as an effective barrier to moisture rising from the ground. The membrane should be continuous with the damp-proof course in walls, as a barrier to moisture rising between the edges of the concrete slab and walls.

A damp-proof membrane should be impermeable to water in either liquid or vapour form and be tough enough to withstand possible damage during the laying of screeds, concrete or floor finishes. The damp-proof membrane may be on top, sandwiched in or under the concrete slab.

Being impermeable to water the membrane will delay the drying out of wet concrete to ground if it is under the concrete, and of screeds to concrete if it is on top of the concrete.

3.1.5 Dam-Proof Membrane below Site Concrete

The obvious place to use a continuous damp-proof membrane is under the over site concrete. The membrane is spread on a layer of comparatively dry concrete, clinker or ash which is spread and levelled over the hardcore. The edges of the membrane are turned up the face of

external and internal walls ready for concrete laying so that it may unite and overlap the DPC in walls. The membrane should be spread with some care to ensure that thin membranes are not punctured by sharp, upstanding particles in the blinding and that the edge up stands are kept in place as the concrete is laid.

The advantage of a damp-proof membrane under the site concrete is that it will be protected from damage during subsequent building operations. A disadvantage is that the membrane will delay the drying out of the over site concrete that can only lose moisture by upwards evaporation to air.

Where under floor heating is used the membrane should be under the concrete.

3.1.6 Surface Damp-Proof Membrane

Floor finishes such as pitch mastic and mastic asphalt that are impermeable to water can serve as a combined damp-proof membrane and floor finish. These floor finishes should be laid to overlap the damp-proof course in the wall to seal the joint between the concrete and the wall.

Where hot soft bitumen or coal tar pitch are used as an adhesive for wood block floor finishes the continuous layer of the impervious adhesive can serve as a waterproof membrane.

The disadvantage of impervious floor finishes and impervious adhesives for floor finishes as a damp-proof membrane are that the concrete under the floor finish and the floor finish itself will be cold underfoot and make calls on the heating system and if the old floor finish is replaced with another there may be no damp-proof membrane.

3.1.7 Damp-Proof Courses in Cavity Wall

A cavity wall built as two leaves separated by a cavity. The purpose of the cavity is to act as a barrier to the penetration of rainwater to the inside of buildings. It is practice to build a cavity wall directly off the foundation so that the cavity extends below ground. A requirement of the Building Regulations is that the cavity should be carded down at least 150mm below the level of the lowest DPC.

A DPC in external walls should ideally be at the same level as the DPM in the concrete over site for the convenience of overlapping the two materials to make a damp-proof joint.

Where the DPCs in both leaves of a cavity wall are at least 150mm above outside ground level and the floor level is at, or just above, ground level, it is necessary to dress the DPM up the wall and into the level of the DPC. This is a laborious operation which makes it difficult to make a moisture tight joint at angles and intersections. The solution is to lay the DPC in the inner leaf of the cavity wall, level with the DPM in the floor.

Where the level of the foundation is near the surface, as with trench fill systems, it may be convenient to build two courses of solid brickwork up to ground level on which the cavity wall is raised. As little vegetable top soil has been removed the floor level finishes some way above ground and the DPM in the floor can be united with the DPC at the same level. The cavity insulation is taken down to the base of the cavity to continue wall insulation down to serve in part as edge insulation to the floor construction.

It is accepted practice to finish the cavity in external walling at the level of the DPC, at least 150mm above ground, where the wall is built as a solid wall up to the DPC. This form of construction may be used where the inner leaf of the cavity wall was built with light weight concrete blocks, used for their insulating property. These blocks fairly readily absorb moisture, expand when wet and might be affected by frost and deteriorate, whereas solid brickwork below ground will provide a stable base.

With this arrangement the requirements of the building regulations recommend the use of a cavity tray at the bottom of the cavity. This tray takes the form of a sheet of a flexible, impermeable material such as one of the flexible DPC materials which is laid across the cavity from a level higher in the inner leaf so that it falls towards the outer leaf to catch and drain any snow or moisture that might enter the cavity. The cavity thus acts as both tray and DPC to the cavity wall leaves.

In this detail of construction the under concrete insulation is below the lowest level of the cavity and should be turned up against the outer walls as edge insulation. A wall is a continuous, usually vertical structure, thin in proportion to its length and height, built to provide shelter as an external wall or divide buildings into rooms or compartments as an internal wall.

3.1.8 Prime Functions

The prime function of an external wall is to provide shelter against wind, rain and the daily and seasonal variations of outside temperature normal to its location, for reasonable indoor comfort. The basic function

of shelter may be served by crude systems of interlaced branches of trees covered with dried mud, the more permanent protection of a brick wall or a screen of sheets of glass fixed to or hung from a structural frame.

- **Strength and stability**

To provide adequate shelter a wall should have sufficient strength and stability to be self-supporting and to support roofs and upper floors. To differentiate the structural requirements of those walls that carry the loads from roofs and upper floors in addition to their own weight from those that are freestanding and only carry their own weight, the terms load bearing and non-load bearing are used. In practice non load bearing, internal walls are often described as partitions.

- **Thermal resistance**

For reasonable indoor comfort a wall should provide resistance to excessive transfer of heat both from inside to outside and from outside to inside during periods of cold or hot, seasonal, outside temperature

The materials that are most effective in resisting heat transfer are of a fibrous or cellular nature in which very many small pockets of air are trapped to act as insulation against the transfer of heat.

Because of their lightweight nature these materials do not have sufficient strength to serve as part of the structure of a wall by themselves. Lightweight insulating materials are either sandwiched between materials that have strength or behind those that resist penetration of wind and rain, or serve as internal wall finishes.

The majorities of walls for traditional small buildings, such as houses, are constructed with solid blocks such as brick or are framed from small sections of timber. Which one of the two types of wall is used will generally depend on the availability of materials, such as clay for making bricks, stone for making blocks or timber for frames.

Walls may be classified as solid or framed. A solid wall (sometimes called a masonry wall) is constructed of either brick, or blocks of stone, or concrete laid in mortar with the blocks laid to overlap in some form of what is called bonding or as a monolith, that is, one solid uninterrupted material such as concrete which is poured wet and hardens into a solid monolith (one piece of stone). A solid wall of bricks or blocks may be termed a block (or masonry) wall, and a continuous solid wall of concrete, a monolithic wall.

A frame wall is constructed from a frame of small sections of timber, concrete or metal joined together to provide strength and rigidity, over both faces of which, or between the members of the frame, are fixed thin panels of some material to fulfill the functional requirements of the particular wall.

Each of the two types of wall may serve as internal or external wall and as a load bearing or non-load bearing wall. Each of the two types of wall has different characteristics in fulfilling the functional requirements of a wall so that one type may have good resistance to fire but be a poor insulator against transfer of heat. There is no one material or type of wall that will fulfill all the functional requirements of a wall with maximum efficiency.

Traditional small buildings, such as houses, are commonly built as a square or rectangular box of enclosing walls as the most economical means of enclosing space. The walls of a single detached building are exposed on all sides to wind, rain and the variations of outside temperature.

Two buildings constructed on each side of a common separating wall, usually described as semi-detached, enjoy the advantage of a shared internal dividing wall and only three external walls exposed to wind and rain, as illustrated in Figure 2.1. A disadvantage of the shared dividing wall is that it may not serve as an effective sound barrier.

A continuous terrace of houses enjoys the benefit of shared, common dividing walls, reduction in exposure to wind and rain and the likely disadvantage of the poor sound insulation through two common dividing walls.

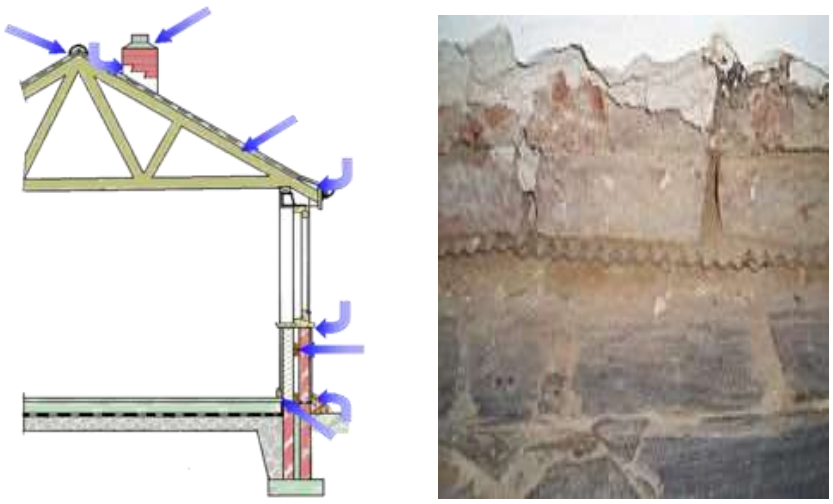

Fig. 2.1: Detail in this figure showing some of the causes of damp penetration

3.2 Materials Used for Damp roofing

Materials widely used for damp proofing include:

- flexible materials like hot bitumen, plastic sheets, bituminous felts, sheets of lead, copper, etc.
- semi-rigid materials like mastic asphalt
- rigid materials like impervious bricks, stones, slates, cement mortar or cement concrete painted with bitumen, etc.
- stones
- mortar with waterproofing compounds
- coarse sand layers under floors
- continuous plastic sheets under floors.

3.3 Remedial DPC

In old buildings there may be a DPC made from lead. The DPM may be non-existent, leading to damp problems, mold health issues or generally a poor indoor air quality, or it may rely on an impermeable floor finish such as ceramic tiles to keep most of the damp out.

Where a DPC is absent or inadequate, there are various means of retrofitting one. A common method in masonry walls is to drill holes into the wall at regular intervals and inject a penetrating liquid (e.g. silicone) into the holes. The chemical is absorbed into the masonry, where it cures to form a waterproof barrier. More recently, damp-proofing creams have been introduced which are faster to install and do not require specialised pumping equipment. Whether in liquid or cream form, the effectiveness of chemical damp-proofing products depends on a number of factors including product strength, the types of active ingredients in the formulation, the delivery system (e.g. solvents and surfactants), and the suitability of the system for the substrate that it is being injected into. Some forms of the chemical are odour-free; others have a strong odour.

Damp proofing remedies include:

- Silane diffusion: Utilising a concentrated thixotropic silane / silicone ‘cream’
- Siliconate transfusion: A gravity fed system with no wastage via hidden voids
- Siliconate injection: Recommended occasionally for single brick walls

Some DPC materials may contain asbestos fibers. This was more commonly found in the older, grey sealants as well as flexible tar boards. Other possibly hazardous materials include the use of lead sheets as a DPC material.

3.4 Enumerate Three (3) Types of Dampness

3.4.1 Structural Dampness

This refers to the presence of unwanted moisture in the structure of a building, either the result of intrusion from outside or condensation from within the structure.

A high proportion of damp problems in buildings are caused by the "big three"; condensation, rain penetration, and rising damp, although other causes of dampness such as pipe leakage and construction moisture should not be overlooked.

Dampness tends to cause secondary damage to a building. The unwanted moisture enables the growth of various fungi in wood, causing rot or mold health issues and may eventually lead to sick building syndrome. Plaster and paint deteriorate and wallpaper loosens. Stains, from the water, salts and from mold, mar surfaces. The highest airborne mold concentrations are found in buildings where significant mold infestation has occurred, usually as a result of severe water intrusion or flood damage Molds can grow on almost any surface and occurs where there is a lot of moisture from structural problems such as leaky roofs or high humidity levels. Airborne mold concentrations have the potential to be inhaled and cause serious health effects in humans.

Externally, mortar may crumble and salt stains may appear on the walls. Steel & iron fasteners rust. It may also cause a poor indoor air quality and respiratory illness in occupants. In extreme cases, mortar or plaster may fall away from the affected wall.

3.4.2 Health Effects of Structural Damp

Asthma is one of the most common health effects associated with structural dampness. Asthma is heightened due to condensation, moisture, humidity, and water intrusion, which all contribute to indoor moisture. Mold infestation is a major trigger for asthma. Aside asthma, other health concerns of mold are infections, allergenic or immunological illness, and nonallergic illness. Asthma is also triggered by the sensitisation of dust mites accruing humid, wet regions of a structure. Another health effect associated with structural dampness is the presence of bacteria in an indoor environment. Bacteria require

water to grow and multiply. Bacteria are source for the transmission of diseases, therefore putting occupants' health at risk by water intrusion into the indoor environment. Water removal and drying of wet building materials within 2 days will likely prevent mold and bacteria growth, therefore reducing occupants' vulnerability to disease.

A 2009 World Health Organisation report entitled "Children Living in Homes with Problems of Damp" stated that:

> Excess moisture leads – on almost all indoor materials – to growth of microbes such as moulds, fungi and bacteria, which subsequently emit spores, cells, fragments and volatile organic compounds into the indoor air. Moreover, dampness initiates chemical and/or biological degradation of materials, which also causes pollution of the indoor air. Exposure to microbial contaminants is clinically associated with respiratory symptoms, allergies, asthma and immunological reactions. Dampness has therefore been suggested to be a strong and consistent indicator of risk for asthma and respiratory symptoms such as cough and wheeze.

3.4.3 Identification, Prevention and Treatment

A wide range of instruments and techniques can be used to investigate the causes of moisture in building materials. When used correctly, they can provide a valuable aid to investigation. The competence and experience of the person undertaking the damp investigations is of greater importance than the kit he or she carries.

Most forms of dampness can be prevented by thoughtful building design and careful construction. In the UK, well built modern houses include damp proofing in the form of a synthetic damp-proof course (DPC), about 15 cm above ground level, to act as a barrier through which water cannot pass. Slate or "engineering bricks" with a low porosity were often used for the first few courses above ground level, and these can in theory help minimise the problem.

There are many approaches to the treatment of dampness in existing buildings. Key to the selection of an appropriate treatment is a correct diagnosis of the types of dampness affecting a building. Details of possible treatments for specific types of dampness are covered in the sections below.

The cause of the dampness must first be eliminated, by providing better drainage or fixing leaking pipes. Some processes describe several methods of treating rising damp, including the use of land-drains and the insertion of physical and chemical DPCs. Then, any affected plaster or mortar must be removed, and the wall treated, before replacing the plaster and repainting.

3.4.4 Humidity

Humidity occurs in indoor environments due to building related causes. Porous walls, rising damp, and leaks in the building are determinants for structural dampness due to elevated humidity levels. The construction of the building can also lead to humidity and unwanted moisture in the indoor environment Wet materials, such as lumber stored unprotected outdoors before construction, can lead to increased humidity indoors for up to the second year of occupancy in the building. Most commonly in residences, elevated relative humidity is produced by poor drainage systems. This leads to dampness in substructures such as crawlspaces and basements. The dampness results in vaporisation where water vapor is transmitted into the building's interiors. Water vapor may enter the building through supply air ducts in building slabs and circulated by warm forced air. Water vapor can also enter a building through leaky return air ducts in homes with crawlspaces.

Human occupancy adds a significant amount of humidity to the indoor environment. Personal activity as basic as breathing and perspiration are they add moisture to an indoor space. Cooking and showering raise humidity levels in the indoor environment, which directly affects the structural dampness of a home. Aspects of the home can also increase the humidity of a space. Items such as aquariums, indoor swimming pools, hot tubs, and even indoor plants add to the humidity of an indoor space. All of these attributes can increase the humidity of a home beyond its recommended thirty to fifty per cent.

Humidity levels in an indoor environment need to be accounted for based upon season and temperature. If humidity levels do not agree with the time of the year and the temperature during seasons, mold infestation and deterioration of the building will occur due to moisture. An acceptable humidity level in indoor spaces ranges from twenty to sixty per cent year round. However, levels less than twenty per cent in the winter and levels higher than sixty per cent in the summer are deemed unacceptable for indoor air quality. Structural dampness is likely to occur as well as an increase of health risks associated with moisture damage.

3.4.5 Prevention and Treatment

There are strategies to prevent water infiltration due to humidity into structures, as well as ways to treat human occupancy practices regarding humidity. Vapor retarders are materials that can be used to restrain uncontrolled airflow and water vapor into an indoor space. Vapor retarders are used to decrease the rate and amount of water vapor diffusion through ceilings, walls, and floors caused by humidity. It is made of thin, flexible materials and its coatings can be installed by trowels or brushes. Utilising vapor retarders in a building prevent structural dampness from occurring or continuing if it already exists. A strategy for reducing humidity levels in an indoor environment is by altering occupant activity and indoor mechanics. Kitchens and bathrooms need to have their own vents. Additionally, washing machines need to be vented outdoors. Both of these are important in order to decrease indoor moisture due to humidity caused by the activities occurring in these indoor spaces. Moisture sources, such as hot tubs or indoor swimming pools, should be covered by airtight lids when not in use, thus humidity levels stay low in the indoor environment.

3.4.6 Condensation

Condensation comes from water vapour within the building. Common sources may include cooking, bathing etc. The moisture in the air condenses on cold surfaces. Buildings with poorly insulated walls are very prone to this problem. It often causes damage similar to damp in a building and often appears in similar places. This is because it occurs in the "dead air" pockets that accumulate in both horizontal and vertical corners (i.e. out of circulating air patterns).

Moisture condenses on the interiors of buildings due to specific interactions between the roof and wall. Leaks most commonly occur on flat-roofed buildings. Certain building materials and mechanisms can be used to prevent condensation from occurring in these areas, therefore reducing structural dampness and potential mold infestation. In many cases, the insulation between the roof and wall is compressed, leading to a decrease in thermal resistance. Due to the lack of thermal resistance, condensation occurs, which leads to water damage in the indoor environment. In most cases where moisture is not addressed quickly enough, mold and mildew develop. Another issue is that wind washing up into the crevice where the roof and wall intersect reduces the efficiency of the insulation. These results in condensation and risk for mold growth. In the United Kingdom, condensation problems are particularly common between October and March - to the extent that this period is often referred to as the "condensation season."

- **Identification of condensation**

If it is suspected that the problem is condensation, then a room should be sealed off with a left running for the recommended time and then further instrument tests made. If the dampness has disappeared, then condensation is very likely the problem. Alternatively Humiditect cards or dataloggers (measuring air humidity, air temperature, and surface temperature) can be used as tools for diagnosing a condensation problem.

- **Treatment**

Typical remedies for condensation include increasing background heat and ventilation, improving the insulation of cold surfaces and reducing moisture generation (e.g. by avoiding the drying of clothes indoors).

- **Rain penetration**

Rain penetration (also known as "penetrating damp") is a common form of dampness in buildings. It can occur through walls, roofs, or through openings (e.g. window reveals).

Water will often penetrate the outer envelope of a building and appear inside. Common defects include:

- roof defects such as faulty flashing, cracked or missing slates or tiles
- faults in the brickwork or masonry such as missing or cracked pointing. Porous bricks or stones
- missing or defective mastic around windows and doors
- blocked weep holes
- missing or defective trays in cavity walls.

3.4.7 Walls

Rain penetration is most often associated with single-skin walls, but can also occur through cavity walls - e.g. by tracking across wall ties.

The most common sources of indoor moisture at the base of walls in buildings is from defective ground and surface drainage. This is due to rising ground levels and the failure of ground drainage systems. These defects are common nation-wide. Additionally, plumbing leaks and flooding from defective drainage and plumbing are also sources of moisture occurring on the base of walls in buildings.

- **Diagnosis of rising damp**

The first step in assessing damp is to check for standing water. Removing water with good drainage will remove any form of dampness. Once done, and dampness remains, the next step is to look for the presence of a damp-proof course. If a damp-proof course is present, it is likely to be functioning, as the materials from which damp proof courses are manufactured tend to have a long lifespan. However, it should be acknowledged that there are cases where existing damp proof courses fail for one reason or another.

One method that is often used to determine if the source of dampness is rising damp (rather than other forms of dampness) is to look for the presence of salts - in particular a tell tale "salt band" or "tide mark" at the peak of the damp's rise. Although this is a useful indicator, it is not completely reliable as salts can enter the fabric of the wall in other ways - e.g. unwashed sea sand or gravel used in the construction of the wall.

If there is no damp-proof course and rising damp is suspected (tide mark, moisture confined to lower section of wall etc...) then a number of diagnostic techniques can be used to determine the source of dampness. BRE Digest 245 states that the most satisfactory approach is to obtain samples of mortar in the affected wall using a drill and then analysing these samples to determine their moisture and salt content. The fact that this technique is destructive to the wall finish often makes it unacceptable to homeowners. It is for this reason that electrical moisture meters are often used when surveying for rising damp. These instruments are unable to accurately measure the moisture content of masonry (they were developed for use on timber), however the reading patterns that are achieved can provide useful indicators of the source of dampness.

3.4 Prevention and Treatment

Many experts in building constructions have argued many ways of treating dampness in building some of them are as follows.

3.5.1 Treatment of Rising Damp

In many cases, damp is caused by "bridging" of a damp-proof course that is otherwise working effectively. For example a flower bed next to an affected wall might result in soil being piled up against the wall above the level of the DPC. In this example, moisture from the ground would be able to ingress through the wall from the soil. Such a damp problem could be rectified by simply lowering the flower bed to below DPC level.

Where a rising damp problem is caused by a lack of a damp-proof course (common in buildings over approximately 100 years old) or by a failed damp-proof course (comparatively rare) there are a wide range of possible solutions available. These include:

- replacement physical damp proof course
- injection of a liquid or cream chemical damp proof course (DPC Injection)
- porous tubes
- electrical-osmotic systems
- land drainage.

BRE Digest 245 suggests that with the exception of replacement physical DPCs, only methods of treatment with third party accreditation (E.g. British Board of Agreement Certificate) should be considered. It then goes on to state that the only method of currently satisfying this requirement is DPC injection (liquid or cream) and that "this is the only method which BRE considers suitable where insertion of a physical DPC is not possible. The Royal Institute of Chartered Surveryors (RICS) publication "Remedying Damp" is more cautious about reliance on third party accreditation, casting doubt upon the validity of the test methods employed, arguing that trials are usually conducted using "specially built masonry panels - which do not match up in many respects to walls found in real properties," and that "if a DPC were proved to not work in a specially built masonry panel, this would be the more significant result. The MOAT No 39 test employed by the British Board of Agrément (BBA) in the UK is dismissed as "quite a clever test idea but in the author's opinion not actually replicating a real wall. Furthermore, the point is made that "BBA testing is paid for by manufacturers, and the results are not thought to be publicly available."[30]

In his book, Dampness in Buildings, Alan Oliver refers to research carried out in Belgium regarding the effectiveness of different types of rising damp treatments:

> In Belgium, at the Centre Scientifique et Technique de la Construction (CTSC, 1985), research was carried out on the effectiveness of the main retrofit DPCs found in Europe. It was generally found that physical DPCs performed best, followed by the various chemical DPCs, with electro osmosis and atmospheric syphons being the least effective.[31]

3.5.2 Replastering

Replastering will often be carried out as part of a rising damp treatment. Where plaster has become severely damaged by ground salts there is little argument about the need to replaster. However there is considerable debate about:

1. the extent of replastering required
2. the use of hard sand: cement renders to replaster as part of a rising damp treatment

BS6576:2005 states that "*the function of the new plaster is to prevent hygroscopic salts that might be present in the wall from migrating through to its surface, while still allowing the wall to dry.*" However, writing in the RICS publication "Remedying Damp", Ralph Burkin shaw claims that, "the plaster is really there for two main reasons." He accepts the need for replastering when significant amounts of ground salts have built up in the existing plaster, however he then goes on to say that replastering is often carried out to make up for an unreliable chemical DPC. He also suggests that damp-proofers have an incentive to carry out more replastering than is strictly necessary as it allows them to finish the job without having to wait for walls to dry out, resulting in faster payment.

Although the sand:cement renders typically installed as part of a rising damp treatment are very effective at holding back damp and ground salts, they have a number of disadvantages. These include an incompatibility with the soft bricks and mortars encountered in older buildings and a lack of insulation properties compared with more traditional plasters, resulting in an increased risk of condensation. Replastering is also one of the most expensive parts of a rising damp treatment.

Porous renders to German WTA specification 2-2-91 can be used as an alternative to dense sand-cement renders. These have a minimum porosity of 40per cent of total volume. Salts crystallise in these pores rather than on the plaster surface, avoiding decorative spoiling. Such plasters offer a better solution than dense sand-cement renders when used on moderately salt-contaminated walls as their porous nature gives them insulation properties, resulting in a warmer surface temperature and making condensation problems less likely to occur. However, when used on heavily salt contaminated walls they may need to be replaced frequently as they lose effectiveness once all the pores have become filled with crystallised salt.

Replastering may not be necessary where salt contamination is not severe. BS6576:2005 states that: *Where the plaster appears to be in sound condition, the extent of plaster to be removed may be minimised by delaying any decision to replaster until the drying period is complete.* Avoiding the need to replaster in this way can reduce disruption and mess and has the advantage of allowing the original lime or gypsum-based plaster to be maintained. However it should be noted that the deficiencies of any remedial damp-proof course will be more apparent if the wall is not covered with a waterproof render. For this reason it is important to check the BBA certificate of the damp-proofing system to ensure that it is valid for use where replastering is not being carried out.

5.0 CONCLUSION

Damp proofing in any building is very important for the longevity of the physical structure, the health of the occupants, the quality of the material kept in the house. The ability of moisture to raise and penetrate floors and affect the structure, ability of moisture to penetrate the walls of the house or moisture to infiltrate from the roof to the inner part of the house has a damaging effect to the house. It distorts the aesthetics of the house; create a poor impression of maintenance in the house to people. The effect is creating an enabling environment disease conditions such as cold, rheumatism etc including providing opportunity for vectors and vermin to procreate. It is assuring for all sanitarians to know that remedies exist and is necessary for all to use appropriate materials during the construction of the DPC, the quality and quantity of the DPC materials must be safe guided.

6.0 SUMMARY

In this unit we have discussed damp proofing in building, its importance, how it is constructed, the various materials that can be used for it and its uses. The types of dampness i.e. Condensation, infiltration and capillary attractions were discussed and the various remedies also discussed. The health effects of each was mentioned and discussed. The treatment of the effects of dampness depends on the causes and the materials used in the construction of the DPC. The first step in assessing damp is to check for standing water or moisture. Removing water with good drainage will remove any form of dampness. Once done, and dampness remains, the next step is to look for the presence of a damp-proof course in the building as enumerated in the unit. It is needless to say that any building without a standard and appropriate DPC renders the foundation liable to moisture or water settling down on or from it. Replastering, improved drainage, cutting down of hanging tree branches etc. are some of the remedies to dampness.

7.0 TUTOR-MARKED ASSIGNMENT

1. Define the following:
   a) damp proofing
   b) damp proof course
   c) damp-proof membrane
   d) rising damp
   e) structural dampness
2. List the health effects of dampness.
3. Explain the prevention and treatment of dampness.

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UNIT 3 BUILDING PLAN PROCESSING, APPROVAL AND CERTIFICATION OF OCCUPANCY

CONTENTS

1.0 INTRODUCTION

In the previous unit we have discussed damp proofing in building, its importance, how it is constructed, the various materials that can be used for it and its uses. The types of dampness i.e. condensation, infiltration and capillary attractions were discussed and the various remedies also discussed. We have also seen some of the remedial actions that can be done in case damp proofing failed such as replastering in case of the wall, improved drainage in case of dampness by attraction and cutting down of hanging tree branches in case the roofing problem etc. In this unit we will discuss approval of building plan and issuance of certificate of occupancy to owners of building to enable them move into their newly or renovated structure.

2.0 OBJECTIVES

At the end of the unit, you should be able to:

- describe the requirement in the building plan
- explain approaches to plan approvals
- list methods of approvals
- define certificate of occupancy
- discuss criteria for issuance of certificate of occupancy.

3.0 MAIN CONTENT

3.1 Requirements in Building Plan

You have seen what a building plan is in the previous units. It was described to you as a basic requirement for all new buildings to ensure that they conform to regulations of the environmental sanitation laws or codes and regulations as to suitability of the site and for human habitation. It is important to emphasie that the plan is a drawing of the structure of a proposal, building made to scale on a piece of paper showing the site elevations and cross section of the building. This is submitted to the Sanitation Authority in charge of the area for approval before the construction of the building can go on, this could be in the Local Government, Environmental Protection bodies or Planning authorities as the case may be. The Environmental Health Officer (EHO) working in any of these offices visits the building site to check whether what is on the plan conform to what is on site. It is also the duty of the health officer to visit the site during the construction; it is also the duty of the health officer to see that the available building regulations enacted at either the local government or state level are not contravened by the builders (WAHEB, 1991).

3.2 Approaches to Plan Approvals

The EHO should pick the plan move out of his office to the site to determine the approach of the structure. It is advisable for the EHO to invite other relevant professionals to accompany him/her during the visit for proper interpretation of the plan.

The approach here refers to the access to the building site and includes the setback, building line and drainage systems.

- Setback this is the distance between the building line and frontage fence wall which should not be less than six (6) meters.
- Building Line is the distance between the building and the sides (right and left lane) and back (rear) of the building or the adjoining plot which shall be equal to at least three (3) metres.
- Drainage The distance between any public drainage (external drainage) and the house is to be thoroughly checked during the vetting of the building plan by the health officer.

Area built upon

This is the area of the plot which the building occupies (including out houses) and which should not exceed 50per cent of the total area of the

site for residential building and 75per cent for non-residential houses (commercial or industrial).

Type and structure of the building

The type of buildings and materials used for construction, as well as the facilities to provide, are also important requirements, which the EHO must examine during plan vetting. Such materials should be durable to withstand adverse environmental conditions and health hazards.

Room dimensions

Living rooms shall be at least 1 2m2 of the total floor area, an average height of not less than 2.7 metres and a minimum width of 2.4 metres, which should be well lit.

The position and areas of windows and doors should be adequate to ensure the house is properly wired and ventilated. At least each room should have a window on one wall opening directly to the outside, plus a second window or large ventilator in one of the outer dimension or area of the windows, excluding the frames should not be less one-eighth (1/8) of the total floor space.

The availability and adequacy of sanitary facilities within the building should be checked in the plan to ensure they conform to regulatory standards, e.g., kitchen, toilet, bathroom and store. The position of these, especially toilets, in relation to the living room, bedrooms and dimensions of the facilities are aspects that require serious security.

Water supply

The position of water supply for the occupants in the town in quality and quantity must be made available. The source should be located at least 30 metres away from possible contamination especially if it is a hand dug well or stream.

Excreta disposal

Every house or building whether for residential or other purposes should have sanitary conveniences to serve the occupants and visitors. The minimum number, according to the regulation, should be as follows:

1 toilet for 1 – persons
2 toilets for 11 - 20 persons
3 toilets for 21 - 40 persons
4 toilets for 50 - 75persons

5 toilets for 100 persons.

One additional toilet for 30 persons extra when the number of occupants exceeds 100 persons (FMENV, 2005; WAHEB, 1991).

It is important to note that owners of property can now use mobile toilets structures in case of events that are temporary in premises to reduce pressure on the facilities in the structure which may not necessarily be reflected in the plan.

Refuse (solid waste) disposal

The provision of a sanitary waste bin with tight filling lid for collection and storage of household waste, including sheltered shed is a prerequisite and necessary condition during plan vetting and building appraisal (FMENV, 2005; WAHEB, 1991).

The above is not exhaustive in the course of the inspection some issues unique to the structure or the environment may be noticed and act upon in consultation with other relevant professionals.

xi. Drainage and waste disposal

Requirement for adequate drainage systems must be available and also deals with pollution prevention, sewage infrastructure issues, and maintenance and adoption regimes for sewers. Technical design standards included in this covers the following: internal sanitary pipe work, foul drainage, rainwater drainage and final disposal, wastewater treatment and discharges, cesspools, building over or close to 'public' and 'private' sewers and refuse storage. Consider provision and adequacy for foul water drainage, waste water treatment systems and cesspools, rainwater drainage, building over sewers (public & private), separate systems of drainage (Foul water and Surface water), solid waste storage ("Bins" & "Recycling").

Special Consideration

According to the International Building occupancy classifications there some requirement that must be looked into depending on the uniqueness of the buildings, the Code book itself (2000 edition) totals over 700 pages and chapters include:

- Building heights and areas
- Interior finishes
- Foundation, wall, and roof construction

- Fire protection systems (sprinkler system requirements and design)
- Materials used in construction
- Elevators and escalators
- Already existing structures
- Means of egress see below.

Means of Egress

The phrase "means of egress" refers to the ability to exit the structure, primarily in the event of an emergency, such as a fire. Specifically, a means of egress is broken into three parts: the path of travel to an exit, the exit itself, and the exit discharge (the path to a safe area outside). The code also address the number of exits required for a structure based on its intended occupancy use and the number of people who could be in the place at one time as well as their relative locations. It also deals with special needs, such as hospitals, nursing homes, and prisons where evacuating people may have special requirements. In some instances, requirements are made based on possible hazards (such as in industries) where flammable or toxic chemicals will be in use.

3.3 Methods of Approvals

Depending on the country of your location, to comply with the building Act in the UK and the subsequent statutory instruments known as the building regulations, its approval can usually be obtained in 1 of 3 ways:-

1. By the **full plans** method where drawings are deposited with a Building Control Body such as an Approved Inspector or the Local Authority and are subsequently checked for compliance with the Building Regulations.
   The various stages of the work are also inspected and checked for compliance with the relevant technical requirements of the Building Regulations; by a Building Control Surveyor employed by either the Building Control Body (BCB).
   Unlike planning permission, work may start before approval has been granted. It is also quite usual for the final building to differ in some respects to that which received full plans approval, in which case amended "as built" plans are often required to be submitted to the appropriate Building Control Body.
2. By the **building notice** method where notice of commencement of (minor) building work is given to the Local Authority at least 2 days prior to the commencement of work. The various stages of the work are then inspected and approved by the L.A but no plans

are checked. Note that this method may not be used if the premises contain a workplace, or creates new flats.

3. Approved inspectors must issue their Initial Notice (stating that that particular approved inspector is the building control body for the specified work project, at a specific address and/or building site) to the relevant local authority before any controlled building work starts on site.

Generally **Fees** are paid to the building control body, with each application, will vary depending on the size and value of the project and between different Local authorities across the country and each approved inspector is free to set their own levels of charges. Some types of work may be exempt fees, e.g. adaptations or alterations for disabled persons.

Some work such as Electrical and Heating installations can be carried out by persons who can certify work as being Building Regulation compliant, without further inspection by either the Local Authority or an Approved Inspector. Any work certified in this way must however be registered with the Local Authority in the geographical area in which the work has been carried out.

A Building Control Body should issue a "Completion Certificate" or "Final Certificate" upon the practical completion of each building project, to state that the work meets the technical requirements of the building regulations.

If an Approved Inspector cannot do this due to omissions and/or known failures of the building work to show compliance with the relevant technical requirements of the Building Regulations, then the relevant local authority should investigate and consider the need to take appropriate enforcement action.

Building Regulation 'Enforcement Action' and/or 'incomplete work status' is normally recorded in the Local Lands Charges Register, held as a 'public record' by the relevant local authority. Solicitors must search these records prior to any purchase of any building.

In case your local authority or agency does not have a well developed regulation like the one described above, you may wish to use the above approach to do your work.

3.4 Criteria for Building Approval

For the purpose of appraisal, human settlements (housing) are classified into four (4) types:

Type 1- Housing - Areas in which buildings are in all round satisfactory conditions, but still requires protection.

Type 2 Housing -Areas that show incipient blight or are prone to adverse effects from **external** forces or environmental conditions or having in-built defects predisposing to blight and, therefore, require protection or corrective actions.

Type 3- Housing (substandard Housing)-Areas with structures at moderately advanced stages of deterioration that requires remedial action to bring them to an acceptable standard.

Type 4 Housing -Areas in which their present conditions are unsuitable for countries use and cannot be upgraded to an acceptable standard owing to the poor state of deterioration or disrepair, their poor sanitary neighbourhood environment beyond restoration or correction, which requires demolition or development.

3.5 Certificate of Occupancy

In describing Certificate of occupancy you need to know that each Local Authority might have some little variations in its description, methods and requirements but generally A certificate of occupancy is a document issued by a local government agency or building department certifying a building's compliance with applicable building codes and other laws, and indicating it to be in a condition suitable for occupancy.

The procedure and requirements for the certificate vary widely from jurisdiction to jurisdiction and on the type of structure. In the United States, obtaining a certificate is generally required whenever:

- a new building is constructed
- a building built for one use is to be used for another (e.g. an industrial building converted for residential use)
- occupancy of a commercial or industrial building changes, or ownership of a commercial, industrial, or multiple-family residential building changes

The purpose of obtaining a certificate of occupancy is to prove that, according to the law, the house or building is in livable condition. Generally, such a certificate is necessary to be able to occupy the structure for everyday use, as well as to be able to sign a contract to sell the space and close on a mortgage for the space.

A certificate of occupancy is evidence that the building complies substantially with the plans and specifications that have been submitted

to, and approved by, the local authority. It complements a building permit—a document that must be filed by the applicant with the local authority before construction to indicate that the proposed construction will adhere to ordinances, codes and laws.

To share our experiences with the international communities, In New York City, in order for a building to obtain a certificate of occupancy, the structure must pass a series of inspections, as well as a walk-through from the Department of Buildings. In most cases, the inspections include, but are not limited to, plumbing inspections, sprinkler inspections, fire alarm inspections, electrical inspections, fire pump pressure tests, architectural inspections (where inspector checks if building was built in accordance with an architect's stamped and approved drawings), elevator inspections, completion of lobby, and an inspection to see if the building complies with the proper number of entrances required for its size. After all inspections are passed, the last step is generally to have a walk-through by a member of the Department of Buildings, who sees that there is no major construction remaining on the job site, that there are no obstructions to the entrances, that there are no safety hazards in the building, and that everything in the building was built according to plan. If the inspector approves his walk-through, a Certificate of Occupancy is usually granted.

3.5.1 Temporary Certificate of Occupancy (TCO)

A *temporary* certificate of occupancy grants residents and building owners all of the same rights as a certificate of occupancy, however it is only for a temporary period of time. In New York City, TCOs are usually active for 90 days from the date of issue, after which they expire. It is perfectly legal, and not uncommon in the given situation, for a building owner to re-apply for a TCO, following all the steps and inspections required originally, in order to hypothetically extend their TCO for another period of time. Temporary certificate of occupancies are generally sought after and acquired when a building is still under minor construction, but there is certain section or number of floors that are deemed to be habitable and, upon issuance of TCO, can legally be occupied or sold. This is not impossible also in our situation and circumstances.

4.0 CONCLUSION

The reason for building plan approval is to ensure that developers of property do not over build or build according to specifications but congest the structure during utilisation. The use of approved building materials and choice of land that support a healthy structure that can withstand the agents of denudations to a reasonable extent is important.

EHO must ensure that their approvals of building plans is for them to confirm that the health and sanitary requirements in the building conform with the health regulations and the issuance of certificate of occupancy to confirm to the owner and all relevant stakeholders that the building is safe for human habitation. These must be done with the highest professional skills and respect to all people that might be interested in the exercise.

5.0 SUMMARY

In this unit the health requirements in building plan were enumerated as that relating to water supply, sanitary conveniences, ventilation openings either natural or the use of artificial ones, drainages, source and adequacy of light etc. The criteria for approvals of the building plan must take cognisance of the culture of the people therefore when enacting local regulations in buildings many cultural issues that are very sensitive must be addressed to avoid a clash between communities and the regulating bodies. While certificate of occupancy is giving assurance to occupants that the premises are safe, it is free from any nuisance that is of public health concern. While issuing this certificate care must be taken to ensure the right people allowed to occupy the premises are the only ones legally occupy it. Means of escape in case of hazards is a consideration that should not be compromised.

6.0 TUTOR-MARKED ASSIGNMENT

Explain the following:

1. Health requirement in building plan
2. The approaches to plan approvals
3. Discuss criteria for issuance of certificate of occupancy.

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MODULE 4

UNIT 1 INTRODUCTION TO HOUSING (BUILDING) CODES, EDICTS OR ORDINANCES, LAWS AND REGULATIONS OF LOCAL, STATE, FEDERAL GOVERNMENT AND INTERNATIONAL LEVELS

CONTENTS

1.0 INTRODUCTION

In the previous module (Module 3) we have discussed issues relating to preliminaries involved in the construction of various types of building, general principle of selecting and preparing sites to receive various types of foundations, the principles of damp-proofing in building, Criteria for building approval and certification for occupancy and health, safety and sanitary requirements in buildings. In this unit we will discuss the various codes, laws and regulation in forms of edicts or ordinances that will provide an enabling environment for professionals to discharge the above listed functions effectively. There will be no enforcement of any law if the profession do not have the relevant instruments that will provide the professionals with the authority to act. Therefore there is the need for you to understand the various laws and its provisions in handling building and housing issues at all levels.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- define Ordinance
- state the brief history of housing codes or ordinances
- explain Housing laws and regulations of federal, state and local government
- discuss briefly the Nigeria Urban and Regional Planning Decree No**.** 18, 1999
- list some International building codes.

3.0 MAIN CONTENT

3.1 Definitions of Ordinance

Ordinances: laws passed by the Nigerian Central Legislature before October 1, 1954.

a). Ordinances is defined as laws passed by the Nigerian Central Legislature before October 1, 1954. (Rotimi, A MCEP, 2011). Or "Decree or law promulgated by a state or national government without the consent of the legislature, such as for raising revenue through new taxes or mobilisation of resources during an emergency or threat" or "Local law such as a zoning ordinance enacted by the governing body of a city or municipality which applies only within its boundaries. To have full force and effect of law, an ordinance must not be in conflict with any higher law such as state or national law or constitutional provisions"

b). This is a list of Ordinances and Acts of the Parliament of England from 1642 to 1660, during the English Civil War and the Interregnum. As King Charles I of England would not assent to Bills from a Parliament at war with him, decrees of Parliament before the Third English Civil War were styled ordinances. The Rump Parliament reverted to using the term "Act" on 6 January 1649 when it passed the Act erecting a High Court of Justice for the trial of the King (when any possibility of reconciliation between King and Parliament was over). All but one subsequent decree were termed Acts through to the end of the interregnum. All of these Ordinances and Acts were considered void after the English Restoration due to their lack of Royal Assent. The Ordinances of 1311 were a series of regulations imposed upon King Edward II by the peerage and clergy of the Kingdom of England to restrict the power of the king. The twenty-one signatories of the Ordinances are referred to as the Lords Ordainers, or simply the Ordainers. Acts: an enactment made by the Federal Legislature before January 16, 1966 and at the onset of this current democratic dispensation effective 29th May 1999.

c. Laws: any enactment made by the Legislature of a region or of a State House of Assembly having effect as if made by that Legislature, or any subordinate legislation.
d. Decrees: an enactment made by the Federal Military Government.
e. Edicts: enactment made by a military governor, or by the administrator of a state.
f. Bye-laws: any enactment made by the Councillors or the Legislature of a Local Government in Nigeria having effect as if made by that Legislature with a jurisdictional scope limited to the Local Government enacting the bye-law.
g. Subsidiary Legislation: laws enacted in the exercise of powers given by a statute. It consists of words (spoken or published) or acts outside the court which are intended or likely to interfere with or obstruct the fair administration of justice. (Rotimi A, MCEP, 2011)

3.2 History of Housing Codes and Ordinances

The history of housing codes or ordinances dates back to the era of British Colonial Government in Nigeria when public health laws, as well as town and country planning law were introduced. The system of housing development control or town and country planning then were based on health improvement to safe guard the health of the residents in the Lagos colony only. Later, these health improvement measures were

changed due to changing situations and circumstances. Wikipedia, the free encyclopedia describe the code for sustainable homes as "an environmental impact rating system for housing in England and Wales, setting new standards for energy efficiency (above those in current building regulations) and sustainability which are not mandatory under current building regulations but represent important developments towards limiting the environmental impact of housing" In Nigeria, we are yet to develop these types of codes due to many factors including challenges in institutionalisation of the housing laws.

The development of these ordinances was as follows:

1. Town Improvement Ordinance of 1863
2. Township Ordinance of 1917
3. Town Planning Ordinance of 1929
4. Town and Country Planning Ordinance of 1946.
5. Public Health Laws cap 103, Laws of Eastern Nigeria, Vol.6, 1963.

Apart from the Town Improvement Ordinance of 1863 that was made for the colony of Lagos, the other laws were applicable to the whole country.

(i) The Township Ordinance of 1917;
(ii) The Town and Country Planning Ordinance of 1946;
(iii) Public Health Laws cap 103, Laws of Eastern Nigeria 1963 (Nnah, 2002)

3.2.1 The Township Ordinance of 1917

The aim of township ordinances 1917, during pre-independence, was to create a broad principle of municipal authority for effective service delivery. The objectives include:

- Classification of townships;
- Controls of offensive trades;
- Regulation of the construction of buildings streets and bridges.

3.2.2 The Town and Country Planning Ordinance of 1946

This was one of the laws enacted by the British Government to re-plan, improve and develop various parts of Nigeria. Planning authorities were, therefore, established throughout the country for the preparation and execution of planning schemes or layout.

The objectives of the town and country planning ordinance were:

(i) To control the development and use of land;
(ii) To ensure proper sanitation and provision of sanitary conveniences, including amenity;
(iii) To preserve buildings and other architectural, historical, artistic objects and places of natural interest or beauty;
(iv) To protect existing amenities in both urban and rural settlements within the planning area.

Furthermore, following the establishment of the Federal System of government in 1950 each of the 4 regions of Nigeria adapted and modified the Town and Country Planning Ordinance of 1946. Consequently, the following ordinances were created:

1. The Federal Capital, Lagos Town and Country Planning Ordinance of 1958;
2. The Western Region Town Planning Ordinance 1959;
3. The Eastern Region Ordinance 1963;
4. The Northern Region Ordinance 1963.

The Eastern Region ordinance was known as the Town and Country Planning Law cap. 1/26 of 1963.

3.2.3 Public Health Laws, Rep.103, 1963

This law was made specifically for eastern Nigeria, while the western and northern regions had similar laws or ordinances to protect public health (Nnah, 2002; Ogu, 1996; FRG). It was derived from the Township Ordinance Cap. 183 of the Laws of Nigeria, 1948. This law is still in force in the states in the country to date.

3.2.4 Public Land Acquisition Ordinance, 1917

Under this law, the Governor is empowered to acquire land compulsorily for public purposes or by agreement for public use. The law later became the land use Act Cap. 202 in 1978 and today it is known as the land use Decree of 1999, as amended (Nnah, 2002; Ogu, 1996).

These activities are being carried out by the Environmental Health and Sanitation Officers, Works Departments of the local government councils in Nigeria, under the present dispensation. Besides, the state ministries of Land (urban and regional planning), housing and urban development and the city development authorities are also involved in the promotion of adequate housing standard. In most states, the practice has resulted to duplication of functions and role conflicts, among the various departments or ministries, thus paralysing the implementation

and enforcement of housing regulation of the laws (Arokoyo & Adeyemo, 2002).

3.3 Housing Laws and Regulations of Federal, State and Local Government

The functions of housing and building regulations and control are shared by the three tiers of the government, viz Federal, State and Local Government. The legal instruments put in place for the regulation and control housing sanitation includes:

i. The Nigeria Urban and Regional planning decree No. 18, 1999 as amended;
ii. Public Health Law Cap. 103, Laws of Eastern Nigeria, vol. 6, 1963;
iii. National Environmental Health Practice Regulations, 2007;
iv. National Policy guidelines on sanitary inspection of premises, 2005;
v. National, Environmental Sanitation policy, 2005;
vi. State Environmental Sanitation Edicts;
vii. Local Government Laws and Bye Laws, etc.

3.4 The Nigeria Urban and Regional Planning Decree No. 18, 1999 as Amended (NURPL)

This law was promulgated by General Ibrahim Babangida on 15 December1992, as Decree No. 18 and later amended as Decree No. 16 on 23rd March 1999 by General Abdusalami Abubakar.

It is the most comprehensive physical planning law in Nigeria which clearly defines the roles of Federal, State and Local Governments. The law is divided into six parts, but the most important part to this subject matter concerns part 1 on plan preparation and part 2, on development control.

Part **I Plan Preparation:** The law states as follows:

- The Federal Government shall be responsible for preparation of national physical development plan, regional plan, sub-regional plans, urban plans, subject plans;
- The States are to prepare regional plans, sub-regional plans, urban plans, local plans and subject plans;
- The Local Governments are to prepare town plans, area plans, local plans and subject plans.

Part II Development Control

In section' 27 of this law, development is defined as the carrying out of any building, engineering, mining, or other operations in, on, over, or under any land, other making of any environmentally significant changes in the use of any land. It also includes demolition of buildings, the falling of trees and placing of the free standing erection used for the display of advertisement on the land. The regulation of these activities constitutes development controls and it is carried out by the development control department (DCD). Its major responsibility is to grant planning permits to prospective land developers (both private and public), in accordance with sections 30 subsection 1,2 and 3 of the urban and Regional Planning Law. The issuance of permits to land developers is based on an application which is normally accompanied with plans, designs, drawing or any other information, as prescribed in the regulation. The law further states in section 30 (2) that no government or its agencies shall carry out any development activity without prior approval by the relevant development control department, (Commission, Board, or Authority).

All proposed development building plans shall be prepared by a registered architect or town planner or engineer.

However, it is sad to note that this law has not been fully implemented, since its inception, as there is no established commission at the national level. So far, Lagos, Sokoto, Oyo, Ekiti, Edo, Enugu, Rivers and Abia states have adopted the law, but yet to implement it. In the meantime, Lagos and Sokoto are the only states in the country that have successfully implemented the law (Nnah, 2002). However, from the time this assessment was made to this point in time (in 2012), it seems all states of the federation have development control boards or agencies in place. Perhaps it is functionality or otherwise remained a different matter.

3.5 Public Health Laws Cap. 109 and 103, Laws of Northern and Eastern Nigeria Respectively

These laws are still being used at national, state, and local government levels to enforce sanitary standards in housing. The following provisions are particularly relevant:

Section 7 (an) contains housing characteristics that constitute hazards to human health and well-being (dampness, poor -ventilation, dilapidated structures, etc.). However various state edicts have been enacted by the various state assemblies to work in parallel with the national or regional ones.

Part III (Urban Subsidiary Legislation)

Sections 42 52 stipulates the basic requirement for building approval. For example, section 48 (1-2) and 51 states that proposed plans for residential and nonresidential buildings should be approved by Medical Officers of Health (MOH) or the Environmental Health Officers (EHOs) The plan should have facilities for adequate ventilation and lighting, toilets, water supply, washing and general cleaning, etc

(iii) The National Environmental Health Practice Regulation J07

This is the most recent legislation on housing and sanitation in Nigeria. It defines some of the basic requirements of healthy residential environment (housing), which include plan approval, certificate of fitness of new buildings and other aspects of housing and sanitation are to be dealt with by Environmental Health Practitioners.

(iv) National Policy Guidelines on Sanitary Inspection of Premises, 2005

The guidelines on sanitary inspection of premises are made for the proper conduct of inspection and appraisal of housing conditions. For this to be achieved, standards and procedures are provided for inspectors use. Also, the roles of various government institutions, (Federal and State Ministries of environment, health and the Local Government) have been included (FMENV, 2005).

(v) State Sanitation Laws and Edicts

Various states have enacted sanitation law and edicts which are modified from the Public Health Laws and other legislations to suit their local circumstances. Like the Public Health Laws and National Environmental Health Practice Regulations, they are all used to enforce sanitary standards in housing, including building regulation. The Bayelsa State Public Health Laws Cap. P16, 2006, Rivers State Environmental Sanitation Authority Edict 2004, among other state laws and guidelines are typical examples.

vi) Local Government Laws and By-Laws

The Local Government Law, 1950, empowers Local Government Councils or authorities to carry out public health functions such as housing sanitation, including building regulation (building approval) in their domain. These laws or by-laws are enforced by the environmental health officers who are professionally trained for such assignments. Furthermore, the local councils carry out town planning and

development under the Town Planning By-laws adapted from the National Urban and Regional planning law No.18 1999 (as amended), (Nnah, 2002; FMENV, 2005).

Institutional roles on building regulations

3.5.1 Roles of the Federal Government

- Development, periodic review and updating of policy guidelines, regulations and laws on housing sanitation and sanitary inspection of premises;
- Provision of technical assistance to state on housing sanitation and building regulation;
- Promotion of research on modern appraisal techniques or strategies;
- Provision of logistic support for effective implementation of housing and sanitation programmes;
- Encourage states to ensure compliance with policy guidelines and standards on housing and sanitation;
- Co-ordination of reports on sanitary inspection and building regulation from the states;
- Collaboration with relevant stakeholders and government agencies on effective implementation of planning, housing development and regulations (e.g., town planners, architects, engineers).

3.5.2 Roles of State Government

- Support the implementation of policy guidelines on sanitary inspection of premises and sanitation policy;
- Provide technical and logistic support to Local Governments;
- Enforce house-to-house inspection by environmental health officers;
- Promote public education and enlightenment on sanitary inspection of premises;
- Monitor the Local Governments to ensure compliance with the policy guidelines and regulatory standards;
- Co-ordinate reports on sanitary inspection of premises from the LGAs;
- Submit quarterly repairs on sanitary inspection of premises to the Federal Ministry of Environment.

3.5.3 Roles of Local Government

- implement the sanitary inspection of premises programmes in the area of jurisdiction;
- Provide logistic support for implementation of house-to-house inspection by EHOs;
- Assist in training environmental health practitioners and retraining of serving officers to update their knowledge;
- Enforce the building regulations, (building by-laws) and sanitation laws;
- Carry out public education and enlightenment to create awareness on housing sanitation and re-introduction of sanitary inspection of premises in the communities;
- Submit monthly reports on sanitary inspection of premises to the state (FMENV, 2005).

3.6 International Housing Regulations

At the global level, there are several governmental agencies that have shown considerable interest in the problem of housing in relation to health. The United Nation Bureau of Social Affair, Housing, Building and Planning have done so much work on housing and planning through research and seminars, with a view to improving living conditions. Others include the WHO, LO, FAQ, the American Public Health Association, etc.

But despite these efforts, the states of housing have continued to deteriorate, resulting in increased disease burden, poverty and low productivity. However, the world community, under the auspices of the United Nations, has realised the need for promoting healthy housing to reduce the suffering of millions without adequate shelter through the Millennium Development Goals (MDGs), target 11, a significant improvement in housing conditions, especially for slum dwellers by 2020. Also, the United Nations Human Settlements Programme (UN-HABITAT,2005) has developed standards or criteria for healthy housing. These have been modified by most countries for use, while others do not have any regulatory framework. Even in countries where minimum standards exist, they are not enforced.

To deal with the problems of living conditions in the human settlements, the office of the United Nations High Commissioner for Human Rights (1996 -2007) established International Standards on adequate housing as a component of the human right consistent with adequate standards of living.

The following are some of the relevant provisions of the International Human rights for member nations to enforce or implement.

1. Universal Article 25.1 states that everyone has right to adequate housing for the protection and maintenance of health and well-being, including security of life and property, International Covenant on Economic Social and Cultural Rights (1966). Article 5(e)
2. also affirms the right of everyone to adequate housing, stating that state parties have the obligation to ensure the realisation of this right;
3. Convention on the Rights of Persons with disabilities. Article 2 provides that persons with disabilities should have right to "Reasonable Accommodation" that is adapted to the conditions and needs of the individual without imposing a disproportionate or undue burden in a particular case. hou1d ensure to the person enjoyment or exercise on e Ja1bs Articles5.3, 9.1(a); 19(a), 22.1,28.1, &28. (a) Are also related to the above;
4. Declaration on the Rights of Indigenous peoples (2007). Article 21.1 states that indigenous peoples have the right to improved economic and social conditions of living which include inter alia adequate, housing and sanitation, health, education, security, employment, etc.
5. ILO convention No.161 on Standards of Social Policy (1962). Article 2 states that improvements of living standards shall be the principal objectives in economic planning and development; Article 2 of this convention further provides that in ensuring the attainment of minimum standards of living, consideration should be given to essential family needs of the workers such as adequate food supply, housing, clothing, healthcare and education;
6. ILO convention No. 110, on conditions of Employment of Plantation Workers (1958). Articles 88.1 states that the housing standards for plantation workers entitled to occupancy should be adequate in line with the national standards or national legislation of the country concerned;
7. Geneva Convention Relative to the protection of Civilian Persons in time of war (1949) Article 85 of this provision states that it is the statutory responsibility of the "Detaining Power" or country to ensure protected persons from the outset of their interment are given adequate accommodation or shelter against adverse climate conditions, health hazards and other hostile forces. The pressure should be protected from dampness, properly ventilated and illuminated with adequate sleeping room sanitary toilets, water supply, washing facilities for personal and domestic hygiene.

Separate sleeping rooms or apartments should be provided for women.

In addition to the above regulations, the general conference of the International Labour Organisation (ILO) at its 45th meeting further adopted proposals on workers' Housing, which is contained in ILO Recommendations No. 115 concerning Workers' Housing (1961). The ILO committee on Economic, Social and Cultural Rights interpreted the content of human rights under this provision to mean the "Right to adequate housing" (see general comment in article 11 [I]). Aside from these International Conventions of the United Nations, the WHO has been in the forefront of the struggle for the promotion of hygienic housing over the decades. Through the effort of various expert committee on housing basic requirements or criteria for human needs in the residential environment were produced based on epidemiological studies. They are internationally accepted standards used in housing appraisal include the followings:

(1) Safe and structurally sound adequate dwelling unit for each household consisting of:

- adequate living and sleeping rooms with sufficient space for the family and individual that are not overcrowded;
- a minimum degree of privacy for separate sexes within the household;
- separate rooms for adolescent and adult persons of opposite sex, except husband and wife;
- separate accommodation for domestic animals;
- adequate supply of potable water;
- adequate latrine/toilet within the dwelling unit;
- adequate facilities for preparation and storage of food and separate storage for personal belonging;
- adequate ventilation and lighting.

(2) A neighbourhood (allowed district) around the dwelling that conforms to good town, country and regional planning practice comprising: Community source of water supply, sewage treatment plant, solid waste management services and drainage of surface water:

- police security and fire services;
- availability of industrial, commercial, cultural, education, religious, recreational health and other social services and facilities;

- facilities for prevention/control of natural hazards (flooding,
  earthquakes, landslides, cyclones, etc.) (WHO, 1961;**V)**

3.7 Some ICC Building or Housing Codes

A large portion of the International Building Code deals with fire prevention. It differs from the related International Fire Code in that the IBC addresses fire prevention in regard to *construction and design* and the fire code addresses fire prevention in regard to the operation of a completed and occupied building. For example, the building code sets criteria for the number, size and location of exits in the design of a building while the fire code requires the exits of a completed and occupied building to be unblocked. The building code also deals with access for the disabled and structural stability (including earthquakes). The International Building Code applies to all structures in areas where it is adopted, except for one and two family dwellings (see International Residential Code).

Parts of the code reference other codes including the International Plumbing Code, the International Mechanical Code, the National Electric Code, and various National Fire Protection Association standards. Therefore, if a municipality adopts the International Building Code, it also adopts those parts of other codes referenced by the IBC. Often, the plumbing, mechanical, and electric codes are adopted along with the building code.

Some of the codes are:

- International Building Code
- International Residential Code
- International Fire Code
- International Plumbing Code
- International Mechanical Code
- International Fuel Gas Code
- International Energy Conservation Code
- ICC Performance Code
- International Wild land Urban Interface Code
- International Existing Building Code
- International Property Maintenance Code
- International Private Sewage Disposal Code
- International Zoning Code
- International Green Construction Code

4.0 CONCLUSION

The development and availability of the various laws and regulations at both local and national level is a positive development to the building and housing sector not only in the country but the citizenry**.** It is also anticipated that the development of building and housing regulations as well as the development of some minimum mandatory Code level at local, State and national level will definitely improve the nation's quality of buildings, with improved education and awareness the nation should target 'net zero CO_2 emissions' per annum standard. Relevant guidance should be made available via the code through adequate publicity. Simply explained published document by relevant agencies and authorities will definitely demystify the difficult technical requirements. Some codes have been listed here to enable you have idea on its nature and form.

5.0 SUMMARY

In this unit you were made to realized that we inherited the word ordinances from our British colonial masters and it means series of regulations imposed upon King Edward II by the peerage and clergy of the Kingdom of England to restrict the power of the king. The twenty-one signatories of the Ordinances are referred to as the Lords Ordainers, or simply the Ordainers. We continued to use the word or phrase in Nigeria before and after independence in building and housing laws. Until in the 60s and after independence we started using laws, edicts and acts. The contents of these ordinances and later laws provided an opportunity for the nation to use its indigenous instruments to manage its building and housing issues.

The laws are available at local, state and national levels and each is very specific in its expectations and provisions. The major issues covered by these laws relates to considerations of availability, adequacy or otherwise of water, drainage, ventilation, light, appropriate use of land, air and any available space in the environment. Adequate measures to prevent disease spread at state and national, including international level. The law that has to do with the international community was attended to at forum where conventions and protocols were developed for the good of all stakeholders.

6.0 TUTOR-MARKED ASSIGNMENT

1. State the brief history of housing codes or ordinances.
2. Explain the developments of:
    a) The Town Improvement Ordinance of 1863
    b) Township Ordinance of 1917

c) Town Planning Ordinance of 1929
d) Town and Country Planning Ordinance of 1946.
e) Public Health Laws cap 103, Laws of Eastern Nigeria, Vol.6, 1963.

3. Explain Housing laws and regulations of federal, state and local government.
4. Discuss briefly the Nigeria Urban and Regional Planning Decree No**.** 18, 1999.

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UNIT 2 ENFORCEMENT OF BUILDING AND HOUSING LAWS AND REGULATIONS

CONTENTS

1.0 INTRODUCTION

In the previous unit we have seen how we inherited the word ordinances from our British colonial masters and it means series of regulations imposed upon King Edward II by the peerage and clergy of the Kingdom of England to restrict the power of the king. The twenty-one signatories of the Ordinances are referred to as the Lords Ordainers, or simply the Ordainers. We have also seen that the major issues covered by these laws relates to considerations of availability, adequacy or

otherwise of water, drainage, ventilation, light, appropriate use of land, air and any available space in the environment. This unit will concentrate on the enforcement of the Building and housing laws and regulations. Providing the laws is one thing that can easily be done and its application is another. Any law that cannot be enforced has rendered itself useless.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- define enforcement
- state the purpose of enforcement of codes and regulations
- state the historical over view and enforcement status of laws and regulations
- enumerate the enforcement process.

3.0 MAIN CONTENT

3.1 Meaning of Enforcement

Enforcement has been defined as the application of a set of legal tools both formal and informal, designed to impose legal sanctions or penalties to ensure that a defined set of requirement is complied with. Compliance is therefore the ultimate goal of any enforcement programme.

Every Town or regional planning department, Local government works and health departments or any environmental protection board or agency should have a strong and well equipped enforcement section that will be responsible for administering all available building regulations, housing and building maintenance standards and other relevant regulations that might be enacted from time to time. These codes and regulations must define how properties are to be maintained in the local government, state or country.

3.2 Purposes of Enforcement of Building and Housing Codes are:

- to improve the quality of life for Montgomery County citizens;
- to stabilise neighbourhoods;
- to provide safe, decent, and clean dwelling units;
- to maintain and enhance property values; and
- to prevent blight.

We accomplish these goals by investigating complaints, performing legally required incidental and non incidental inspections and educating citizens regarding their rights and responsibilities in the area of property maintenance. The education and awareness messages must be addressed to all stakeholders including property owners, managers, landlords, tenants, and civic associations, private estate owners and managers as together we strive to realise our mutual goal of maintaining the high quality of life in the local government, state or country at large.

3.3 Historical Overview of Enforcement Status of Laws and Regulations

Every law or regulation has a history. It must have being enacted formally or informally out of necessities or guided by international or national convention, protocols and policies. We are taking Kaduna State as an example to look at its historical perspectives or sequence of authorities responsible for enforcement of regulations on buildings and housing. The enforcement of environmental laws, including that of housing and building regulations, in Kaduna state is as old as the state itself. Shortly after independence, the Ministry of health and the defunct Kaduna Capital Development Board were responsible for enforcing public health laws and the boards' edicts.

After the Dasuki reforms of the local government service in 1976, the Nigerian constitution vested the responsibility of refuse collections and sanitation with the local government, hence, they began to enforce the public health laws of northern Nigeria cap 107 of 1963 through the health departments.

From 1984-1985 Environmental Sanitation Task Force was established to enforce edict No.4 of 1984.

Environmental sanitation edict No.5 of 1991 was enacted to repeal the above.

From 1994 to date, the following organisations are involved in the enforcement of the existing environmental laws in the state, though some were reviewed along the line.

i. Kaduna State Ministry of Health.
ii. Kaduna State Urban Planning and Development Authority (KASUPDA)
iii. Kaduna State Environmental Protection Authority (KEPA)
iv. Local Government Health and works Departments
v. Kaduna State Ministries of Works and Environment And Natural Resources

vi. Development Area Health and Works Departments.
vii. Kaduna State Primary Health Care Agency.

3.4 The Code Enforcement Process

An inspection is triggered by a complaint, referral, required inspection, or as part of an overall departmental strategy in particular neighborhoods (target neighborhoods). If violations are observed, a violation notice is prepared and the owner has a stated period of time to correct the violations. After the stated time period has elapsed, the property will be re-inspected. In some countries (e.g. USA) if the owner has made the required repairs, the case is closed. Environmental health inspectors can grant for good cause an extension of time to correct violations. If the owner is not responsive, the inspector takes legal action by issuing civil citations to the owner. These citations carry fines of varying amount depending on the severity of the violation. In addition to the fine, the inspector requests an order from the court requiring that the violations be corrected (an Abatement Order). If the owner fails to correct the problem within the timeframe set by the Judge, this order allows the department to enter the property, make the repairs and charge the owner. If the owner fails to pay for the repairs, the department places a lien against the property and initiates legal actions to collect this lien.

3.5 Authority to Conduct Inspections

The relevant authority, using the appropriate Environmental Health Officer may inspect dwellings, non-residential structures and premises in order to safeguard the health and safety of the occupants and the general public. The Environmental Health regulations have stated that the relevant officer may apply for a warrant if an owner, owner's agent or occupant refuses to consent to an inspection.

Occupants must give the owner access to a dwelling or premises at all reasonable times to make repairs, conduct inspections, or to comply with the available regulations.

3.5.1 Abatement Notices of Violation

Any violation of the regulation that is observed or reported there must be communication to notify the owner of the violation and order that corrective action be taken. The notice must:

- be in writing;
- describe the corrective action that needs to be taken;
- provide reasonable time for performance of action;
- be served on or mailed to the owner/agent; or

- be posted on or near the property affected by the notice. See the sample of abatement notice.

What is Abate notice?

Abatement is the act of eliminating or nullifying, and when applied to nuisances, abatement signifies removal of the cause. A notice regarding abatement of a nuisance is a form of communication to a person whose act, default or sufferance has caused the existence of the nuisance giving him warning or notification for the removal of the nuisance usually within a specified time.

3.5.2 Procedure Under Section 7 of the Public Health Law

In Ondo State, public health laws of 2006 states that. 'A health officer shall, if, satisfied of the existence of a nuisance, serve a notice, hereinafter called the abatement notice, on the person by whose act, default or sufferance the nuisance arises or continues, or if, such person cannot be found, on the occupier or owner of the premises on which the nuisance arises, requiring him to abate the same within the time specified in the notice, and to execute such works, and to do such things as may be necessary for that purpose, and, if the health officer thinks it desirable (but not otherwise), specifying any works to be executed. The health officer may also by the same or another notice served on such person, occupier or owner require him to do what is necessary for preventing the recurrence of the nuisance, and, if he thinks it desirable, specify any works to be executed for that purpose, and may serve that notice notwithstanding that the nuisance may for the time being have been abated if the health officer considers that it is likely to recur on the same premises. Where the nuisance arises from any want or defect of a structural character, or where the premises are unoccupied, the notice shall be served on the owner.

3.5.3 Procedure under Section 70 Public Health Law

A notice, order or document required or authorised by this law to be served on the owner or occupier of any premises shall be deemed to be properly addressed if addressed by the description of the "Owner" or "Occupier" of such premises without further description, and shall be deemed to be properly served if it is delivered to some adult person on the premises to whom the same can with reasonable diligence be delivered, or by fixing the notice on some conspicuous part of the premises. A notice, order or document required on authorised by this law to be served on any person (including an owner or occupier) may be served:

(a) By delivering the same to such person;
(b) By delivering the same, at the usual or last known place of abode of such person, to some adult member or servant of his family.

3.5.4 Abatement of Nuisance under Section 92 of the Practice Regulations

There is a similarity in what obtains under Section 92 of the Regulation and Section 7 of the Public Health Law. Both have the same goal – abatement of nuisances. However, there is a slight difference in the procedure to be adopted with regards to sealing up of premises either found unfit for human habitation or poses great danger to the public health.

- By the provision of Section 92 (1), an Environmental Health Officer shall if satisfied of the existence of a nuisance, serve a notice, hereinafter called an abatement notice. (Schedule xv)

  (a) On the person who causes or continues to cause the nuisance or,
  (b) If such person cannot be found on the premises, occupier or owner or developer of the premises on which the nuisance was caused shall be served with notice requiring him to abate the nuisance within the time specified in the notice and to execute such works, and to do such things as may be necessary for that purpose and if the Environmental Health Officer thinks it desirable, may specify any work to be executed.

3.5.5 Failure to Comply with Abatement Notice under Public Health Law, Section 8

- The health officer shall cause him to be arraigned before a Magistrate's court for prosecution and if found guilty the court has the power to punish the offender according to law.
- Punishment of the offender according to law by the court may be by way of sentencing the offender to a prison term or by the imposition of a fine
- The court may also make a *Nuisance Order* which may be (i) an abatement order or (ii) a prohibition order or (iii) a closing order or a combination of such orders

  (1) Where an abatement notice has been served on a premises or industry and action is not taken within twenty four hours or as stated in such notice and if the Environmental Health Officer believes such a premises poses great danger

to the public health, then, the industry or the premises shall be sealed;

(2) A notice to seal any premises shall be signed by either the Head of the Local Government Environmental Authority, the head of the State Environmental Authority or the representative of the Minister and posted in a conspicuous place in the premises. The notice to seal the premises shall be issued in the appropriate form as contained in schedule XIII to this Regulation;

3) A notice to seal premises shall be deemed to have been served properly if it is served on an adult person in the premises, fixed in a conspicuous place in the premises or at the registered office of the company;

(4) A premises sealed under this section shall remain sealed until such a time when the reason for sealing of the premises has been rectified and the premises or any part thereof is no more a threat to public health or public safety.

3.5.6 Emergency and Corrective Actions

If at any time, the code enforcement staff determines that a situation requires immediate action to protect the public health and safety, the staff may order the owner, agent or operator to take action to correct the condition immediately. If possible, the order is to be hand delivered to the owner, agent or operator. If the order cannot be hand delivered, the order must be posted on the property in a conspicuous location. If the owner does not take action to correct the condition within 24 hours after the posting or delivery of the order, the staff may enter into a contract to have corrective action taken. The owner is liable to the county for all reasonable and necessary costs that are incurred. These costs constitute a debt owed by the owner to the county and may be placed upon the tax bill as a lien on the property and be collected in the manner in which ordinary taxes are collected.

3.6 Condemnation

Any dwelling, dwelling unit, or non-residential structure may be condemned as unfit for human habitation or unsafe for human occupancy if it:

1. lacks electricity, water supply, sanitation facilities, adequate light, ventilation, or a heating system;
2. is entirely or in part, so damaged, decayed, dilapidated, unsanitary, unsafe, or vermin-infested that it creates a serious hazard to the health or safety of the occupants or the public.

3. one which, because of its general condition, is entirely or in part, unsanitary or otherwise dangerous to the health or safety of the occupants or public;
4. contains unsafe equipment, including any boiler, heating equipment, elevator, moving stairway, electrical wiring or device, flammable liquid containers or other equipment, on the premises or in the structure that presents a hazard to the life, health, property or safety of the occupants or the public;
5. is vacant and unoccupied for the purpose for which it was built; has remained substantially in that condition for at least one year; and has been cited for five (5) or more violations of chapter 26, none of which has resulted in a "not guilty" finding by a court; or
6. is a public nuisance.

If any of these conditions are found, the Code Enforcement Staff notifies the owner of the condemned property and posts a Condemnation sign on the property. This sign must not be removed until the Code Enforcement Staff authorises its removal.

The owner of the property must notify any occupants that they must vacate the property. The owner then must secure all windows and doors that are accessible from the ground or by the reasonably foreseeable use of a ladder, and must keep all doors and windows secure from unauthorised entry.

Repair or Removal of Condemned Structures: When a property is condemned, the owner must repair or remove the condemned structure within the time period allowed by the Inspector. If the owner does not comply with the Inspector's order, the structure will be demolished after giving the owner a 30-day written notice. The cost of the demolition will be charged to the property owner. If the owner fails to reimburse the County for the demolition cost, the County will collect it as taxes on real property. Any such charge is a lien on the property.

3.7 The Effects of Violating Environmental Laws and Regulations

The environment plays more import role on man's health than all type of diseases one can think of. One doesn't need to be a philosopher to agree with this view, bearing in mind that apart from the direct effects the physical environment has on health, there are several diseases and other conditions which are largely determined by the nature of the environment. Laws and regulations are made to checkmate human manipulations of the environment which are detrimental to health and the ecosystem. Whenever such laws are poorly enforced or

rather violated all or some of the following health consequences will manifest.

3.8 The Court as an Instrument of Enforcing Housing and Building Laws

The Nigerian legal system consist of practical and dawn to the earth sets of procedures and rules designed to provide resolution to ordinary problems, further the course of trades and commerce, and for the regulation of conduct in the society. The court is the custodian of the law and the wheel on which the rule of law resolves.

The court will continue to serve as the last hope of citizens due to the following reasons:

1. The independence and impartiality of the judges ensure that proceedings are free from bias and extraneous consideration.
2. The openness of court procedure and proceedings ensure that decision will be as fair as possible.
3. There is certainly in the court process, as justice is done according to the law.
4. Court decisions are based on material facts, which are clearly stated.
5. No person can be punished by court except according to a written law of the land.
6. Rule of fair hearing and natural justice are employed by court in it adjudication of matters.
7. Court system ensures the supremacy of the rule and balance of power is therefore achieved.
8. Court engaged in review of the act of administrative and legislative bodies.

3.8.1 Categories of Courts in Nigeria

1. Supreme Court
2. Court of Appeal
3. Federal High Court
4. High Court of the Federal Capital Territory
5. High Court of a State
6. Sharia and Customary Court of Appeal of the Federal Capital Territory
7. Sharia and Customary Court of Appeal of a State

3.9 Factors Militating against Effective Enforcement of Laws and Regulations

Non-compliance with environmental including housing and building regulations is a common phenomenon in the world and the presence of this problem in Nigeria cannot be over emphasised. Some of the factors associated with this are:

1. general ignorance
2. inadequate qualified personal to enforce the laws
3. corruption and bribery
4. lack of political will from the government in power
5. poor enforcement mechanism
6. lack of effective monitoring and supervision
7. economic considerations on the part of the people and government
8. death of environmental pressure groups
9. cultural beliefs
10. inconsistent policies on environmental management due to political instability, therefore there should be some steps that will help in changing the situation, these steps are:

    i. Standards, regulations and guidelines should be flexible in order to stand the taste of time.
    ii. Education of the citizens through a powerful public enlightenment strategy is important.
    iii. Modern equipment should be made available for environmental monitoring and nuisance detection.
    iv. Increase research funding on environmental management issues.
    v. Competence based services delivery should be advocated, adopted and emphasised at all times and levels. Such that people with technical knowledge and competence only will be allowed to handle legal issues commensurate to their backgrounds.
    vi. Inter-sectoral collaboration. All stake holder agencies operating in the state should work in partnership with one another, and or team up to enforce the existing legislations.
    vii. Community empowerment and education should be invigorated to equip people with knowledge, skills and the means of complying with the provisions of environmental regulations.
    viii. Involvement of NG^{s}, CBO^{s} etc. in law enforcement. Example, formation of environmental sanitation

"marshals", "vanguards" as they may be called should be encouraged at both state and LGA[s] levels.

ix. Establishment of environmental courts/mobile courts to invoke relevant sections of the law as may be needed.

x. Adequate funding and equipping of establishments saddled with the responsibility of enforcing environmental legislations in the state.

4.0 CONCLUSION

In order to make the enforcement of sanitary standards and regulations of buildings more effective and result oriented, the Federal Ministry of Environment should encourage and support states and local governments to implement the national policy guidelines on sanitary inspection of premises and housing and building maintenance, there is the need for the states to enforce the implementation of national policy guidelines on sanitary inspection of premises. Government should encourage Environmental Health Practitioners to carry out research on the promotion of housing standard. The Government should create a common platform for effective collaboration and cross fertilisation of ideas on ways of improving housing sanitation, especially in the area of building approval. This will prevent role conflict and duplication of functions and further help check the proliferation of building collapse in the country.

5.0 SUMMARY

This unit has looked at some environmental standards, regulations and guidelines that govern the maintenance of the housing. It is clear that enforcement of environmental standards, regulations and guidelines are meant to direct and guide people and organisations on how to perform environmentally friendly activities, production processes and general development, with the aim of protecting, preserving and conserving the environment for the present and future generations. Some recommendations have been offered for the development of good mechanism for implementing such policies through co-operation and collaboration. The need for education and public enlightenment amongst the citizens has been highlighted. This is crucial because the average man on the street may not know the impact of his/her actions on the environment, and is probably not aware of the existence of regulations and guidelines.

6.0 TUTOR-MARKED ASSIGNMENT

1. What is the purpose of enforcement of codes and regulations?
2. Enumerate the enforcement process.

3. How would you file a complaint in court?
4. What are the effects of violating environmental laws and regulations?
5. What factors are known to militate against effective enforcement of environmental laws?

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QUESTIONS
CASE 1

Adebanke Ajiloro, a food vendor at No 14, Ilelabola Street, Oke Town in Ondo State was selling food in her canteen at the above named address. She had in her possession rice and stew together with goat meat. The goat meat was already decaying and not suitable for human consumption. She was selling the food to her patrons on 06/02/2008.
You as a public officer in charge of the area visited the canteen at 2.00 p.m and found these facts. You confiscated the food items and interrogated her. Draft a charge under section 34 of Ondo State Public Health Law Cap 124 Laws of Ondo State of Nigeria. Before a Magistrate's having jurisdiction in the area.

Schedule xv (Abatement Notice)

ABATEMENT NOTICE
To……
Of……
You are required to abate within……..days the nuisance at…….Consisting of..……
……
And for that purpose to …..……
……
……
and to prevent the recurrence of the nuisance.

DATED this…….day of……20…… Time……a.m./p.m.

……
Environmental Health Officer
I hereby certify that a copy of the above notice was served by me on the…….day of……20…....at……a.m/p.m by being (State how served)……..…… In the presence of (Mr/Mrs/Chief/Miss)……..as witness
Environmental Health Officer

Name of Witness

National Environmental Health Practice Regulation, 2007

ANSWER TO CASE 1
SPECIMEN DRAFT – CASE 1

IN THE MAGISTRATE COURT OF …… STATE
IN THE …….. MAGISTERIAL DIVISION
HOLDEN/HOLDING AT …….

CHARGE NO……..

BETWEEN
THE STATE
……COMPLANINAT/APPLACANT
AND
ADEBANKE AJILORO
……ACCUSED/DEFENDANT

COUNT 1
That you, Adebanke Ajiro on 6th day of Febuary 2008 at about 2.00pm at No 14, Ilelabola Street, in the Oke Magisterial Division has in your possession cooked rice and stew and decaying goat meat that was unfit for human consumption, selling same for consumption and thereby committed an offence, contrary to Section 34, subsection 1 and punishable under Section 34, subsection 2 of Public Health law cap 124 of Ondo State of Nigeria.

…..……..
Environmental Health Officer

Date of Arraignment: ……
Plea:……
Date of Adjournment: ……..
Sentence:…….
Name of Prosecutor:……
Name of Magistrate:……

CASE 2

Ade Bajide and Olu Kiloku on 26/06/2009 at about 6:30am jointly prevented a Public Health Officer, Tade Bayide from inspecting the abattoir at No. 4 Ileileri Street in Odede town within the Odede Magisterial District of Ondo state. Tade had gone to the abattoir upon receiving information that some cows that were unfit for human consumption had been slaughtered there and were being sold to members of the public by Samiu Odole, a cow dealer. The incident happened at about 6.30 am.

ANSWER to Case 2
SPECIMEN DRAFT – CASE 2

IN THE MAGISTRATE COURT OF …… STATE
IN THE …….. MAGISTERIAL DIVISION
HOLDEN/HOLDING AT …….

CHARGE NO……..

BETWEEN
THE STATE
……COMPLANINAT/APPLACANT
AND
1. ADE BAJIDE
……ACCUSED/DEFENDANT
2. OLU KILOKU

COUNT 1

That you, Adebanke Ajiro on 26th day of June 2009 at about 6.30am at No 4, Ileileri Street, in the Odede Magisterial Division of Ondo state jointly prevented Environmental health Officer by name Tade Bayide from inspecting the abattoir where cows that were unfit for human consumption were being slaughtered for human consumption and thereby committed an offence, contrary to Section 68 and punishable under Section 68 of Public Health law cap 124 of Ondo State of Nigeria.

……..
Environmental Health Officer

Date of Arraignment: ……
Plea:……
Date of Adjournment: ……..
Sentence:…….
Name of Prosecutor:……
Name of Magistrate:……..

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UNIT 3 ROLES OF ENVIRONMENTAL HEALTH PRACTITIONERS IN BUILDING APPROVAL AND REGISTRATION

CONTENTS

1.0 INTRODUCTION

In the previous unit you have learnt the various enforcement mechanisms necessary for the building and housing sector to be supervised and monitored. In other previous Units you have also learnt the various professional groups involved in one function or the other in the building and housing industry. You may also refer back to Unit 5 and see the most important stakeholders in maintaining standards in building and housing including an EHO. You have learnt that all of them work as a team to ensure that our buildings during construction and our houses are properly and sanitarily maintained. This unit will specifically discuss the unique role of an Environmental health Officer as a stakeholder in the processing of building documents, ensure that the house when newly completed is fit for human habitation and/or during his/her course of routine inspection, he/she ensure that the house is sanitarily maintained for the health benefit of its dwellers and their neighbours.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- describe an environmental health practitioner (ehp)
- discuss the roles of an eh practitioner in new building project and housing maintenance
- list general guide for inspection of existing premises.
- state the importance of sub professionals in new building project and housing maintenance.

3.0 MAIN CONTENT

3.1 Environmental Health Officer or Practitioner (EHO) according to the specification in the Environmental Health Officers Registration Council Act, 2002. Section 10 (5) in the third schedule specify who is qualified to be registered in the register of the Council and perform the functions of an EHO. The person must have attended a course of training in a recognised and approved health training institution and passed any of the following exterminations as follows:

Royal Society of Health Diploma for Environmental Health Officers in West Africa or West African Health Examinations Board Diploma for Environmental Health Officers; or

B.Sc. Environmental Health Science plus West African Health Examinations Board Diploma for Environmental Health Officers or Royal Society of Health Diploma for Environmental Health Officers in West Africa ; or

HND Environmental Health Science plus West African Health Examination Board Diploma for Environmental Health Officers or Royal Society of Health Diploma for Environmental Health Officers ; or

Master of Public Health (MPH) plus West Africa Health Examination Board Diploma for Environmental Health Officers or Royal Society of Health Diploma for Environmental Health Officers in West Africa.

Fig.3.1: Trained EHO in his complete uniform ready to perform his duties

3.2 Roles of Environmental Health Practitioners in Building Approval

The WHO Expert Committee on the Public Health Aspects of Housing (1961) states clearly that Environmental Health Practitioners have a leading role to play among the key actors in building regulations and town planning. The reason is that, as part of their statutory duties in the field of preventive medicine, they have a legal and moral obligation to ensure clean environment consistent with national health objectives. Therefore, they must focus attention on problems of housing deficiencies that pose the greatest health risks to majority of the human populations. Firstly, they must assess the sanitary quality of housing; secondly, they establish abatement programme to remove hazards; and thirdly, they evaluate or measure the effectiveness of the remedial actions.

Based on the above and in line with the National Environmental Health Practice Regulations (2007) and National Policy Guidelines on house-to-house inspection (2005), an Environmental Health practitioners perform the following functions:

1. Sanitary inspection of building and other premises to detect and abate nuisances (hazardous conditions) that may endanger the health and lives of the residents;
2. Enforcement of sanitary (environmental health) standards in buildings (not new and existing buildings), as provided in the laws and regulations;
3. The vetting of building plans for proposed buildings for necessary approval, including the continuous checks visit to buildings under construction to ensure compliance with stipulated standards;
4. Assistance in physical planning/development of plans for new buildings or existing building;
5. Ensuring that housing after construction is adequately, safely and hygienically maintained and used by the occupants in accordance with the legal requirements;
6. Education and enlightenment of both private and public land developers on the importance of hygienic housing and the need to adhere strictly to regulatory standards;
7. Advice to government agencies and policy makers on their role in enforcing housing laws, building regulations and standards;
8. Organise seminars and workshop for stakeholders on ways to promote housing and building sanitation;
9. Collaborate with town planners, architects, engineers, builders, land developers and other relevant stakeholders on ways of promoting better housing standards and building practices;

10. Conducting research on modern methods of housing appraisal and education of the public in the promotion and maintenance of healthy housing standards (WHO, 1961; WHO, 1967, Nnah, 2002; Zacchaeus, 2008; WHO, 1991; WAHEB, 1991).

3.3 General Guide for Inspection of Existing Premises

i. Carry out formal introduction
ii. Explain purpose of inspection visit
iii. Demand for owner, representative or occupier
iv. Consider the approach to the building
v. Confirm whether there are unauthorised attachment to the house
vi. Demand for approved plan of the premises or building
vii. Consider the distance between of the building to the main road
viii. Consider whether the building is located in a swampy, waterlogged area or an area prone to flooding
ix. Walk through the inside and consider the conditions of floors, wall and ceilings
x. Consider whether the building conforms with the approved building plan
xi. Confirm cases of overcrowding in some or all the rooms opened as at the time of inspection
xii. Consider whether an offensive trade is being practised in the premises
xiii. Consider the source of water supply and condition of the kitchen
xiv. Consider availability and conditions of sanitary conveniences
xv. Consider the methods of temporary disposal of waste

Fig.3. 2: Trained EHO in her complete uniform ready to perform her duties

3.4 Importance of Sub Professionals

The above listed functions cannot be performed as at when due by the qualified EHP under any circumstance due to many factors such as fast growing population in both urban and rural areas hence many people need to develop and build their house, unavailability of skilled personnel at all levels, other equally demanding services either in the office or within the community etc. Therefore, there is the need for the skilled personnel to utilise the availability of the environmental health technicians and assistants in one way or the other. This will enable you build their capacity to do some of the functions and duties that they are doing without over stepping their bounds.

4.0 CONCLUSION

The EHP should ensure that this responsibility of ensuring that all sanitary equipments are properly designed in the building plan and fixed during construction accordingly. Quality materials must be procured and be put in place. Many domestic accidents that occurred at homes especially in the toilet or fire outbreak etc. were traced to use of substandard sanitary and other equipments**.**

5.0 SUMMARY

In today Nigeria Environmental Health Practitioners have an important role to play among the key stakeholders in enforcing sanitary building regulations and town planning provision. The reason is that, as part of their statutory duties in the field of preventive medicine, they have a legal and moral obligation to ensure clean environment consistent with national health objectives. Therefore, they must focus attention on problems of poor housing practices, poor maintenance of premises through indiscriminate building of structures, building above the permissible plot area, deficiencies in lightening and ventilating sources that pose the greatest health risks to majority of the dwellers and users of premises. Many employers of labour including governments at federal, state and local levels, private organisations, uniform and non-uniform institutions are massively employing EHP to help them maintain the required standard in building and housing requirement. Therefore, EHP must be up and doing in discharging this important responsibility. The quality of the services to be rendered by EHP depends solely on their competence, seriousness, attitude and level of training. Due to ever increasing emerging challenges in our environment there is the need for increasing continuing education programme that will keep the practitioners abreast of developments.

6.0 TUTOR-MARKED ASSIGNMENT

1. Describe an Environmental Health Practitioner (EHP).
2. List the roles expected of an environmental health practitioner in the process of approving a building plan.

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