STATUTORY INSTRUMENTS
SUPPLEMENT No. 18 **26th July, 2019**

STATUTORY INSTRUMENTS SUPPLEMENT

to The Uganda Gazette No. 35, Volume CXII, dated 26th July, 2019

Printed by UPPC, Entebbe, by Order of the Government.

S T A T U T O R Y I N S T R U M E N T S

2019 No. 51

THE NATIONAL BUILDING (BUILDING STANDARDS) CODE, 2019

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S T A T U T O R Y I N S T R U M E N T S

2019 No. 51

The National Building (Building Standards) Code, 2019
(Under section 46 of the Building Control Act, 2013, Act No.10 of 2013)

In Exercise of the powers conferred on the Minister responsible for building works by section 46 of the Building Control Act, 2013 and in consultation with the National Building Review Board, this Code is made this 2nd day of October, 2018.

Part I—Preliminary

1. Title.
This Code may be cited as the National Building (Building Standards) Code, 2019.

2. Application.
This Code apply to all public and private building operations in Uganda.

3. Interpretation.
In this Code, unless the context otherwise requires—

"access door"means an entrance to an emergency route;

"Act" means the Building Control Act, 2013;

"artificial ventilation system" means a system in which air is caused to circulate through a room by means of mechanical apparatus which forces air into or extracts air from such room;

''automatic" means fitted with an approved device which is activated by a predetermined amount of heat, smoke, combustion gases or flame for any manual operation;

"balustrade" means a row of posts helping to support a rail or coping as an ornamental parapet to a staircase, terrace or balcony;

″basement″ means any storey of a building, which is under the first storey and any portion, which is below the level of the adjoining pavement or the surrounding ground;

“Board” means the National Review Board established under section 3 of the Act;

″block″ means a walling unit, which exceeds the size of a brick in overall dimensions;

″brick″ means common or standard basic building unit that supports vertical loads made from wet clay, hardened by heat, either sun baked or fire baked;

″brickwork″ means an assemblage of bricks solidly bonded together with mortar or grout or by any other approved methods, which are structurally acceptable to form a wall, pier or column;

″Building Committee″ means a Building Committee established under section 28 of the Act;

″canopy″ means a covering over a street at or below first floor level, which extends beyond plot boundary covering supported off a building structure within the plot boundary other than a roof eave;

″cesspool″ means a covered watertight tank used for receiving and storing sewage from premises which cannot be connected to a public sewer and where ground conditions prevent the use of an on site treatment works including a septic tank;

″chimney″ means that part of a building, which forms part of a flue other than a flue pipe;

“column” means a vertical member of a structure carrying axial loads and moments and whose width is not more than four times its thickness;

“concrete” means a material formed from a mixture of cement, aggregates and water;

“competent person” means a person who is qualified by virtue of experience and training and registered with the appropriate professional body;

"dead load" means the gravitational force caused by the static mass of all permanent parts of a building;

"division" means a portion of a building separated from the remainder of the building by one or more separating elements;

"domestic building" means any building, which consists of two or more dwelling units or a detached dwelling house;

"drain" means a conduit channel used for the drainage of a building or premises within the same curtilage;

"drainage work" means the construction or installation, laying, connecting, fixing, repair or removal of any pipe, drain, gully, cesspool, septic tank, soil pipe, trap, urinal, water closet, waste pipe or any other item connected with sewerage work;

"dwelling house" means a building designed for use exclusively as one self-contained dwelling unit by a single family, together with the out-buildings;

"dwelling unit" means a unit containing one or more habitable rooms and provided with adequate sanitary and cooking facilities and is lawfully used or constructed, adapted or designed to be used as a residence for one family;

"emergency route" means the entire path of travel from the farthest point in any room in a building to the nearest escape door;

"escape door" means a door in an escape route, which leads directly to a street or to any approved open space leading to a street or public place;

"escape route" means the entire path of travel from the farthest point in any room in a building to the nearest escape door and may include an emergency route;

"exit door" means any door that is a component of an escape route from any room in a building;

"external wall" means an outer wall of a building, but does not include a party wall or separating wall;

"feeder route" means that part of an escape route, which allows travel in two different directions to the access doors of not less than two emergency outlets;

"fire shutter" means an automatic or self-closing door, or shutter assembly especially constructed to prevent the passage of fire for a specified duration;

"fire resistance" means the shortest period for which a building element or component shall comply with the requirements for stability, integrity and insulation when tested to the fire requirements in ISO 834-1:1999 and BS 476;

"fire-stop" means a draught tight barrier or seal constructed of non-combustible material and placed within or between building, elements in shafts, voids and other concealed spaces to retard the spread of flame, heat or smoke;

"flat roof" means a roof with a pitch that does not exceed 10°;

"flight" means that part of a stairway, which consists of consecutive steps;

"floor area" means the net area measured on a plan enclosed within the internal surfaces of external walls without finishes;

"flue" means a passage for conveying the discharge of a heat generating appliance to the external air;

"flue pipe" means a pipe forming flue but does not include a pipe built as a lining to a chimney;

"foul water" means soiled or wastewater;

"foundation" means member of the structure the function of which is to distribute loads directly to the ground; or that part of a building, which is in direct contact with and is intended to transmit loads to the ground;

"foundation wall" means that portion of a wall between the foundation and the lowest floor above the foundation;

"garage" means an enclosed area, which is used or intended to be used for the parking, storing, servicing or repairing of motor vehicles;

"habitable room" means a room constructed or adapted to be used as a living or sleeping room or as a place for habitual employment of any person;

"hoarding" means a temporary fence made of light approved material erected around a building site;

"imposed load" means any force assumed in the design of any building, caused by the intended occupancy or earth pressure, hail, ground water or the ponding of rainwater;

"incremental house" means any dwelling house that, for reasons of affordability, is to be constructed in stages in such a manner that in its intermediate stages the house can be occupied by its owner for a specified period of time necessary to complete it;

"industrial effluent" means any liquid whether or not containing matter in solution or suspension which is given off in the course of or as a result of any industrial, trade, manufacturing, mining or chemical process or any laboratory, research or agriculture activity and includes any liquid other than soil water or storm water;

"inspection chamber" means a subterranean chamber not deeper than 750mm and with a removable cover at ground level usually located outside a building to provide open access for inspection and maintenance of a drainage or sewerage;

"kitchen" means a room designed, adopted or used solely for the purpose of preparing or cooking food and washing utensils;

"landing" means a platform between two consecutive flights of a stairway;

"lateral boundary" means a boundary of a site other than a boundary between the site and any street or public space with a width in excess of six meters measured at right angles to the boundary;

"latrine" means place or receptacle for the decomposition of the human excrement and includes pit privy, urinal, chemical or water closet;

"load" means any force to which a building is or may be subjected and includes dead, imposed, wind, seismic and other loads and forces caused by dimensional changes of materials;

"load bearing" means a wall primarily designed to carry an imposed vertical load in addition to its own weight;

"manhole" means a chamber of a depth greater than 750mm and of such dimensions that allow entry of a person into the chamber for the purpose of inspection of a drain or sewer;

"member" means a structural component such as a beam, joist, column, slab or foundation;

"Minister" means Minister responsible for building works;

"minor building work" shall have the meaning assigned to it in the Act;

"non-combustible" means not burning or adding fuel to a fire and classified as not combustible when tested in accordance with ASTM E136 Test;

"nosing" means the front edge of a tread of a stairway and includes the front edge of the top surface of any landing, which is situated at the top of a flight;

"obstruction" means any building or other object which partially or completely intersects any space serving a window but does not include a slender object such as a pole or railing which does not materially obstruct the entry of light or air to the opening concerned;

"occupancy" means the particular use or the type of use to which a building or portion of a building is normally put or intended to be put;

"partition" means a non-structural interior construction not more than one storey in height and generally of light materials, and may or may not be demountable;

"partition wall" means a non-structural internal wall extending to the ceiling and constructed for the purpose of subdividing a space;

"party wall or separating wall" means a wall forming part of a building and used or constructed to be used for the separation of adjoining buildings belonging to different owners or constructed or adapted to be occupied by different tenants; or a wall forming part of a building and standing on land of different owners;

"pit latrine" means a pit together with a superstructure housing a seat or squat plate, for deposition of human excrement;

"pitch line" means a notional line, which connects the nosing of all the treads in a flight of stairs;

"plot" means a parcel of land demarcated by definite boundaries and includes all land within the curtilage of the building, out-buildings, yards, courts, open spaces and gardens-attached or intended to be occupied, other than the land used, allotted or set apart for any street, lane, passage or pathway;

"pressurization" means the creating of a positive air pressure differential between one area of any building and the remainder of the building;

"public building" means a building to which the public have a right of access during all reasonable times for reasons which the building is used in accordance with its prescribed occupancy;

"public place" means any square, park, recreation ground or open space which is vested in the Government or local government, the public has the right to use or is designated and shown as a public place on any development or general plan of any area;

"public sewer" means any sewer vested in the control of a public body;

"reinforced concrete" means concrete containing at least the specified minimum quantities of steel reinforcement;

"repairs" means operations on a building to restore it to an identical condition as to appearance, structure and occupancy which existed before the operations became necessary whether caused by fair wear and tear or by accident; except that repairs shall not include the complete replacement of a building previously destroyed;

"retaining wall" means a wall intended to resist the lateral displacement of materials;

"roof assembly" means a building cover and its supporting structure including any ceiling attached to the structure;

"scaffolding" means a temporary frame constructed to provide means of access to high level working areas as well as providing a safe platform from which to work;

"separating element" means a wall or floor, with specific fire resistance, used between division occupancies or tenancies in a building;

"septic tank" means a watertight tank designed to receive sewage and to retain it for such a period as to secure adequate decomposition of sewage;

"sewage" means waste water, soil water, industrial effluent and other liquid waste flowing in separate or combined sewer but shall not include storm water;

"sewer" means a pipe, conduit or drain, used for the conveyance of sewage;

"sprinkler system" means approved system of piping and sprinkler connected to a water supply which when actuated by the effect of fire automatically releases water;

"stability" means resistance of a structure or part of a structure to overturning or overall failure;

"stairway" means any part of a building, which provides ascending or descending route of travel formed by a single flight or by a combination of two or more flights and one or more intervening landings;

"storey" means part of a building which is situated between the floor level next below it and the floor of the level above it or, if there is no floor above it, the ceiling;

"storm water drain" means a pipe, conduit or surface channel, used solely to convey storm water;

"storm water" means water resulting from natural precipitation and includes rainwater, surface water, sub-soil water or spring water;

"street" means any highway, road or service lane or any land reserved for a highway, road or service lane, and includes any bridge, footway, square, court, alley or passage, whether a thoroughfare intended for use by the public or not;

"strength" means, in relation to a member of a structure, resistance to failure by yielding or buckling;

"structural system" means the system of constructional elements and components of any building, provided to resist the loads acting upon it and to transfer the loads to the ground upon which the building is founded;

"temporary building"means any building, not being a builder's shed designated by the owner for a specific purpose and for a specified period of time not exceeding 3 years but renewable upon application for further period not exceeding one year;

"tile field" means a system of short butted pipes laid underground surrounded with broken stone or gravel or other similar material, into which effluent from the septic tank is discharged;

"travel distance" means the distance in any building where emergency routes are required, from the farthest point in any room in the building to an access door; or where no emergency routes are required, the distance from the farthest point in any room in a building to an escape door;

"tread" means the upper surface of a step;

"type plans" means a drawing of a simple single storey residential building of not more than 100m^2 prepared by an architect;

"ventilated improved pit latrine" means a pit latrine fitted with a vent pipe, screened to prevent both ingress and egress of insects;

"wall" means a vertical load-bearing or non-load-bearing member of a structure whose length exceeds four times its thickness;

"water closet" means latrine accommodation used with water borne system of excreta disposal;

"width" means the distance between opposite plot boundaries, measured at right angles to the direction of the street;

"wind load" means the force excreted by the action of wind, whether pressure or suction.

4. Siting of buildings.

(1) A building shall not be sited otherwise than as approved by the Building Committee.

(2) All new buildings and all additions to existing buildings and particularly all outbuildings, latrines, and all drains and sanitary apparatus of any kind pertaining to the buildings shall be situated on plots or any other piece of land on which they may be built, to ensure the best practicable sanitary conditions and to avoid as much as possible, any nuisance from the position and appearance of the latrines or outbuildings or from noise caused by the occupants of the outbuildings or from any other cause.

(3) The foundations of any new buildings shall not be constructed on any site which has been filled up by or has been used as a place for, the deposit of excremental matter or the carcasses of dead animals or other filthy or offensive matter until that matter has been properly removed or otherwise dealt with to the satisfaction of the Building Committee.

(4) The Building Committee may require the whole of the ground surface enclosed within the external walls of a building to be covered with an adequate layer of concrete, asphalt or other impermeable material where the soil is unsuitable either for the reasons stated in subparagraph (3) or on account of excessive dampness.

5. Drainage of site.

The area and subsoil of the site of a building shall, whenever the dampness or the position of the site renders the precaution necessary, be effectually drained to the satisfaction of the Building Committee.

6. Control of buildings in swampy sites.

(1) A habitable building which is served by a pit latrine shall not be sited in any place which is not ten feet above the maximum level of the subsoil water without the approval of the Building Committee.

(2) A pit latrine into which subsoil water rises within ten feet of its surface shall have its walls suitably reinforced.

7. Plot frontage.

A building shall not be erected on any plot which has no proper and sufficient access to a road or road reserve of not less than 10metres in width, the road or road reserve not being a sanitary lane or passage.

8. Building lines.

(1) The Building Committee may prescribe a building line for any street or part of a street.

(2) A person shall not erect a building near to the road than the prescribed building line, other than a boundary wall or other fence.

(3) The building line prescribed in subparagraph (1) shall be in accordance with the following specifications —

(a) where roads range between 6m-18m in width, the building line shall be 6m; and

(b) for any road above 18m in width, the building line shall be 9m.

9. Access lanes and passages.

The Building Committee shall have power to determine whether any road or road reserve is an access lane or passage in relation to a building and its decision shall be final; except that no road or road reserve measuring more than 10metres in width shall in any circumstances be deemed to be an access lane or passage.

10. Paving and gates to passages.

The Building Committee may, by written notice, require the owner of any plot on which there may be a passage between buildings or between buildings and plot boundaries, to surface and pave the passage or part of it to its satisfaction and if the entrance to the passage is from a street, to provide suitable gates or walls or suitable gates and walls at the entrance to its satisfaction within the period of time specified in the notice.

11. Paving and draining of yards.

The Building Committee may, by written notice, require the owner of any plot to pave and drain any open space in the plot with stone or cement concrete or other impervious material to the satisfaction of the Committee.

12. Plot coverage.

(1) In any area where no provision has been made under the Physical Planning Act, 2010, a building used or adapted or designed to be used whether wholly or partly as a dwelling, shall not be erected, added to, or altered that more than 30 percent of the plot on which it stands or is to stand shall be built over, except that—

(a) in the case of buildings constructed, adapted or designed to be used primarily as hotels, blocks of offices or shops, or to be used partly for human habitation and partly as shops, offices or for business or storage, the maximum permitted site coverages in Table 1 of Schedule 1 shall apply;

(b) the addition of any floor above the first floor shall be subject to the approval of the Building Committee, which in giving the approval, shall specify the maximum permitted floor area or areas which shall in no case exceed the percentages specified in Table 1 of Schedule 1;

(c) any open space on the first or higher storeys shall be free for a distance of at least three meters from the rearmost wall of that storey from any erection above the level of the floor of the storey, account not being taken of any parapets, ventilators, lantern lights or skylights not exceeding a mean one meter in height or any chimney stacks; and

(d) the space to be left free of buildings in accordance with this paragraph shall be in such position and of such shape as the Building Committee may require.

(2) For the purposes of this paragraph, such portions of the plot as may be covered by the staircases, balconies or other projections shall be deemed to be built over; except that boundary or division walls shall not be included as portions of the plot deemed to be built over.

13. Space around residential buildings.

(1) Every residential building shall have within the site, an open space at the rear, or partly at the rear and partly at the side, at a level of not less than 150mm below the floor of the lowermost storey; provided that where the Building Committee considers it necessary for proper and equitable development or re-development of an adjacent site, it may require the provision of more open space.

(2) The open space referred to under subparagraph (1) shall be such that no part of the building which bounds on such open space at any level shall be within 1.5metres from the boundary of the open space immediately opposite that building.

(3) A part of any residential building shall not be erected within 1.5metres of the rear boundary of the site and the open space provided shall be counted as part of the open space required under this paragraph.

(4) An existing residential building which has an open space of equal or less area than that required by this paragraph shall not be altered in such a manner as to reduce the existing amount of open space.

(5) An existing residential building which has a greater area of open space than that required by this paragraph shall not be altered in such a manner as to reduce the area of open space to less than that required by this paragraph.

(6) Where any open space or area is at a level more than 600mm below an adjoining open space, safe parapet walls, railings or fences shall be provided by the person creating the difference in levels.

(7) Access shall be provided to every open space.

14. Space in front of buildings.

(1) A residential building shall be so sited as to leave an open

space immediately in front of the building which extends along the whole width of the front of the building of not less than 6metres wide measured at right angles from the building.

(2) Notwithstanding subparagraph (1), where the building fronts on a street of a less width than 6metres, the width of such open space may be not less than the width of the street plus one half of the difference between that width and 6metres.

(3) Any part of the open space referred to in subparagraph (1), which lies within the plot, shall be free from any building above the level of the ground, except a fence, wall or gate not exceeding 1.5m in height or a portico, porch, step or other like projection from the building.

15. Side spaces.

(1) A building which is designed either wholly or in part for residential purposes shall be provided on at least one side with an open space of 1.5m or more in width measured from the boundary of the nearest plot facing that side at right angles to the nearest point of the building.

(2) The open space required by subparagraph (1), shall extend along the entire length of the building for 1.5m in width.

16. Areas of plots for residential purposes.

Subject to the Physical Planning Act, 2010, a person shall not erect or alter any building for use as a dwelling, or add to any building for the purpose of using it as a dwelling, or use any building as a dwelling on any plot having an area of less than 300 square meters or having a road frontage of less than 12 meters; except that—

(a) a smaller road frontage may be permitted by the Building Committee in its discretion to enable the development of terraced housing; and

(b) any building being one single structure which, in the

opinion of the Building Committee, is constructed, adapted or designed to be used as a hotel, block of flats or residential apartments shall be deemed to be one dwelling, except that this paragraph shall not apply unless the accommodation provided and all stairways, passages, corridors, closets, latrines, urinal, sculleries, bathrooms, laundry rooms, common rooms and all other parts of the premise whether used or designed to be used in common or otherwise are constructed, adapted or designed in the opinion of the Building Committee to avoid overcrowding, secure adequate space, light and ventilation and generally to ensure decent and healthy conditions of living for the inhabitants of the premises.

17. Car parking.

(1) A car parking area shall be provided on all residential plots.

(2) The surfaces of the parking area shall be adequately drained to the nearby drainage channel or soak–away pit or as advised by the relevant Building Committee.

18. Access to utilities.

(1) All buildings shall be served by piped water supply or any other suitable water supply as approved by the National Water and Sewerage Cooperation.

(2) Surface water run-off from buildings and other surfaces shall drain into the nearby drainage channel as approved by the Building Committee.

(3) A Building shall not block the natural flow of surface water run-off and a property owner shall take reasonable action to ensure that drainage channels through his or her property channel accumulated surface flow to the lowest point of the property.

(4) In urban areas, a permanent building shall have water–borne

toilet facilities drained to a septic tank and soak pit within the plot, or connected to a sewage lagoon or a central sewer line system, as approved by the Building Committee in consultation with the National Water and Sewerage Cooperation.

(5) Septic tanks shall be positioned to ensure accessibility for emptying by a cesspool emptier and the locations in Table 2 of Schedule I shall apply.

(6) Any refuse shall be stored in refuse containers for separated waste, approved by the local authority, with a combined capacity of not less than 0.25cubic metres per dwelling and the containers shall be located in easily accessible locations for collection.

(7) Electricity shall be supplied to all permanent developments in all areas by the electricity distribution entity.

(8) Generators, solar or wind system shall be permitted in residences subject to conditions set by the Building Committee issued in consultation with the Electricity Regulatory Authority.

19. Boundary fencing.

Unless the Building Committee otherwise directs, the development of any plot shall include the provision of boundary walls, screen walls, fences or other means of enclosure of approved materials, construction and design.

20. Height of boundary walls.

(1) Boundary walls, screen walls, fences or other means of enclosure of residential plots shall not be erected to a height greater than 1.8metres and shall allow at least 50% transparency where abutting on to a street or in front of the building line of the main building.

(2) Where the ground on the line of a boundary wall or fence has such a slope or, in the opinion of the Building Committee, on the grounds of privacy, amenity, safety or control, it is necessary, a person

may deviate from the heights prescribed in this paragraph.

(3) All other external boundary walls, screen walls and fences shall be of such a height as the Building Committee may require and shall use materials that allow at least 50% transparency.

(4) Razor wire, where permitted shall only be fixed at a minimum of 2meteres above ground level.

(5) Broken glass shall not be permitted on any building for use as a fence.

(6) Electric fencing shall comply with the BS 1722-17: 2017.

21. Existing mature trees.

Existing mature trees shall be retained wherever possible and where they need to be cut, planting shall be carried out to replace each tree.

Part Iii — Design And Planning of Buildings

General

22. Building operations by ministries, departments and agencies of Government.

Every ministry, department or agency of Government shall consult the Ministry responsible for works in planning, designing, construction, supervision and maintenance of Government of Uganda buildings in accordance with applicable law and the Public Service Standing Orders , 2010 Section N-a.

23. Design requirement.

(1) A building design shall be functional, sustainable and economical.

(2) A building design shall meet performance requirements and shall be safe to use.

(3) A building design shall be deemed to be functional where—

(a) it meets the needs of the people intended to use it and the technical requirements of the activities it is intended for;

(b) it translates the developers spatial and service requirements of a building;

(c) it functions as an integrated system and is composed of building systems, materials and technology that support each other to meet functional goals.

(4) A building design shall be deemed to be sustainable where—

(a) it balances environmental responsibility, cost and people's needs while meeting the function of the building; and

(b) it is designed to be resilient, able to survive and maintain operations in extreme conditions such as natural disasters.

(5) A building design shall be deemed to be economical where—

(a) it takes into consideration the whole life-cycle cost of the building including initial design and construction cost, operation and maintenance over the life of the building, other non-monetary benefits, such as the benefits, aesthetics, historic conservations and safety which may override quantitative cost comparisons;

(b) the developers goals and interests in the project and future of the building are taken into consideration including lower operation and maintenance cost, longest life span or best return on investment.

(6) A building design shall be deemed to perform when it integrates and optimises performance building attributes including energy efficiency, durability, life-cycle performance, occupant comfort and safety.

(7) The building design shall be deemed to be safe and secure where—

(a) there is a proactive approach to foresee risk and protect against it; and

(b) it integrates health, safety and security measures for structural and non-structural building components, fire protection, risk reduction from natural hazards, occupant health and safety, providing security for occupants.

24. Height of rooms.

A habitable room shall, taken over its entire area, be of a mean average height of at least 2.7 metres from the floor to the underside of each additional storey or the underside of the ceiling or roof, and no part of a habitable room other than a part not exceeding in all 15 percent of the whole in extent shall be less than 2.4 metres in height from the floor to the ceiling or underside of the roof except that—

(a) in rooms designed to be used as workrooms or places of habitual employment of any person, and in any place where in the opinion of the Building Committee climatic considerations so require, the height specified in this paragraph shall be not less than 3.0 metres; and

(b) if the Building Committee is satisfied that owing to the special conditions under which work is carried on in any workroom the application of the provisions of this paragraph to that workroom would be inappropriate or unnecessary, the Committee may by certificate in writing exempt the workroom from these provisions subject to any conditions specified in the certificate.

25. Projections beyond plot boundaries.

(1) A part of a building or projection of any description from a building shall not be permitted beyond the street boundary of a plot below a height of three metres from the ground; except where—

(a) the Building Committee permits a single storey arcade of approved design where this is in keeping with the general character of a street or where the frontage length in question is sufficient to warrant its being considered as an individual unit on its own merit; and

(b) a canopy projecting over the pavement of a street at the first floor level is permitted.

(2) A canopy or arcade permitted under subparagraph (1) shall conform to the requirements of paragraphs 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36 and 37 of this Code.

26. Projections from buildings.

(1) The following parts of a building or projections from a building may be permitted at a height above 3metres from the ground provided that in no case, except that of canopies under paragraph 27 of this Code, may the projection exceed 750 mm—

(a) roof eaves and down pipes for the discharge of storm water from the eaves;

(b) shades, string courses, cornices, lettering, clocks, plaques and sculptural features; and

(c) unenclosed balconies and bay or oriel windows conforming to the requirements of paragraph 38 of this Code.

(2) A projection from a building shall be constructed to provide drainage to the satisfaction of the Building Committee.

27. Canopies.

Where it is considered desirable that a canopy should be erected in front of a new building in order to conform with neighbouring buildings, the Building Committee may require the canopy to be included in the design submitted to it for approval and to be erected at the owner's expense.

28. Height of canopies and arcades.

A part of an arcade or canopy shall not be less than 3metres from the pavements over which it is constructed except the piers or columns supporting the arcade.

29. Pavement under canopies and arcades.

When a canopy or arcade is erected, the owner shall pave the full width of the pavement opposite the building with such materials and in such manner as shall be approved by the Building Committee, or the Building Committee may in its discretion cause the work to be carried out at the owner's expense.

30. Width of canopies and arcades.
A canopy or arcade shall not extend near the vertical plane of the pavement curb than 750mm, and in no case shall the width be greater than three metres measured at right angles to the building to which the canopy is attached.

31. Condition of canopies.
The owner of a canopy, balcony or other projection shall maintain it in good repair and sightly condition and shall be responsible for any accident or damage arising from it.

32. Canopies to conform with existing canopies.
A canopy over the pavement of a street shall conform as nearly as practicable in line, height and detail, with existing canopies adjoining unless there is shown to the satisfaction of the Building Committee good reason to the contrary.

33. Canopies to be drained.
The upper surface of every canopy and floors of all balconies shall be watertight, waterproof and effectively drained, and rain water downpipes shall be recessed into the wall of the building for a clear height of 2.4 m above the level of the pavement.

34. Discharge of water.
The owner of any canopy, balcony or other projection shall prevent the discharge of water from it on to any pavement.

35. Soffit of canopies and balconies.
The soffit of a new canopy or balcony over a pavement shall be neatly plastered or sealed with cement, steel sheeting or other hard material.

36. Loads on canopies prohibited.
(1) A canopy over a street shall not be used in conjunction with, or as a means of access to, any room or apartment.

(2) A person shall not place or permit or cause to be placed any article upon any canopy over a street without the approval of the Building Committee.

37. Fireproofing of canopies.
A canopy or arcade constructed in any part of non-fire-resisting materials shall be designed so as to prevent the spread of fire to adjoining buildings, canopies or arcades.

38. Balconies and bay windows overhanging streets.
(1) A balcony and a bay window shall be constructed of fire resisting materials and shall be supported by reinforced concrete, masonry or steel cantilevers statically secure and designed to resist the maximum overturning load which may be placed on it.

(2) The bay window having a sill height of less than 750mm from the floor level shall not have an aggregate length at any one floor level of more than one-third of the building frontage.

(3) A balcony shall not be the sole means of access to any room or apartment.

(4) No erection of any kind shall be placed upon a balcony except balustrades or ornamental railings of a design approved by the Building Committee for the safety of persons using the balcony.

(5) A balcony or bay window shall not project over a road reserve.

39. Doors and windows not to open outwards.
Within a minimum height of 2.4m above the level of any street, footway or pavement, any door, gate, bar, window or any other hinged or movable part of a building shall not open outwards so as to project into any street or land reserved, planned or required for the improvement of any street, beyond the street boundary.

40. Division of a large multipurpose building.
(1) A building containing separate rooms, sets of chambers or offices and occupied by different persons shall not extend to more than 9300sqm in area at any level or floor unless separated from all

other parts of the same building by fire-resisting floors and walls without openings throughout, except at corridors where the openings shall be protected by self-closing fire-resisting doors.

(2) In every building constructed or adapted to be used in part for trade or manufacture and in part as a dwelling house, the portion used for trade or manufacture shall be separated from the dwelling portion vertically by walls or partitions and horizontally by floors made of fire-resisting materials.

(3) Doorways communicating between the two parts of a building referred to under this paragraph shall be fitted with close-fitting doors and frames of fire-resisting materials.

(4) The doors shall be fitted with fastening approved by the Building Committee.

41. Stairs.

(1) Every building which exceeds 1 storey in height shall be provided with a staircase to give access to the upper floors except where there is a separate access to the upper floors.

(2) The main staircase of every building which exceeds 4 storeys in height shall be continued to the roof of the building except where a secondary staircase of fire escape is provided.

(3) Stairs shall be constructed so as to have a constant and uniform rise and tread and shall be to the following minimum and maximum dimensions—

(a) stairs in dwelling houses or stairs providing access to a single dwelling house shall have a—

(i) minimum width of 900mm;

(ii) maximum rise of steps of 175mm;

(iii) minimum tread of steps of 230mm;

(iv) minimum head room of 2.1m;

(b) stairs in residential buildings other than those provided for in subparagraph (a) and buildings of the warehouse class where not more than ten people are employed on any floor above the ground floor shall have a—

(i) minimum width of 1.2m;
(ii) maximum rise of steps of 165mm;
(iii) minimum tread of steps of 250mm;
(iv) minimum head room of 2.1m;

(c) stairs in buildings of the warehouse class where more than ten people are employed on any floor above the ground floor shall have a—

(i) minimum width of 1.2m;
(ii) maximum rise of steps of 150mm;
(iii) minimum tread of steps of 300mm;
(iv) minimum head room of 2.1m.

(4) A flight of stairs shall not exceed fourteen steps in any flight; any intervening landings shall have a minimum length of 675mm except for stairs provided for in subparagraph (1)(c), where the landing shall extend for a length of not less than 1.2m.

(5) A stairway shall not exceed two flights without a turning.

(6) Except for stairways provided for in subparagraph (3) (a) and unless the Building Committee otherwise directs, winders or similar steps shall not be permitted in any stairway.

(7) For the purposes of subparagraphs (3),(4),(5) and (6), the following modes of measurements shall be used—

(a) treads shall be measured horizontally from nose of tread to a point vertically beneath the nose of the tread immediately above;

(b) treads of winder steps shall be measured at centre of step or if over 1.1m in width at a point 450mm from the newel or turning point;

(c) widths shall be measured from the inside of the handrails; and

(d) head room shall be measured vertically above the line of nosings, except that the Building Committee may permit a deviation from subparagraphs (a), (b), (c) and (d) in any special case.

42. Dimensional requirements in stairways.

(1) The headroom at any point on any stairway shall be not less than 2.1m measured vertically from the pitch line, and the width of the stairway, measured to any enclosing wall or balustrade, shall be not less than 900mm.

(2) No door shall open onto a stairway unless the door opens onto a landing and the width of the landing shall be not less than that of the door.

(3) The variation in the dimensions of the risers and the going of the treads in any one flight shall be not more than 6mm provided that this requirement shall not be construed as prohibiting the use of tapered treads in the same flight as treads that are not tapered.

(4) Any tapered tread not being a winder and not forming part of a spiral stairway shall—

(a) be designed in such a way that, in respect of that part of the tread is 400mm from the narrower end of the tread,

(b) have a minimum going of 230mm;

(c) be constructed in a way that the angle between successive risers, measured in the horizontal plane, shall be constant; and

(d) comply with the requirement for variation in going contained in sub regulation (3), where the variation is in each case measured at the same distance from the narrower end of each tread.

(5) Stairways incorporating winders shall be permitted only in dwelling houses and within individual dwelling units, and at any point on the stairway—

(a) there shall be not more than three successive winders; and

(b) the winders shall not turn through more than 90°.

(6) Any spiral stairway shall have a width of not less than 800mm and that stairway shall be used as part of any emergency route.

43. Bannisters of balconies and stairways.

(1) A stairway shall be provided with at least one hand rail, and stairways of the categories provided for in paragraph 41(3)(b) and (c) shall have a handrail on each side, and the outer handrail shall be continuous throughout the stairway.

(2) Handrails shall not project more than 75mm.

(3) Bannisters of stairways and balconies shall not be spaced more than 125mm apart.

(4) Where other forms of railings or protection are used for stairs and balconies, the infilling below the handrails shall provide for the safety of the persons using the stairway or balcony to the satisfaction of the Building Committee.

(5) A balustrade, railing or parapet intended for the protection of human life shall not be less than 840mm in vertical height above the nosing at the rake of the stairway, nor less than 900mm in height at landings or where constructed on the level and such protection shall be of adequate strength.

(6) In addition to the requirements of subparagraphs (1), (2) and (3), where a stairway exceeds 2.4m in width, a centre handrail shall be provided.

(7) A common stairway and passageway shall be adequately ventilated and sufficient natural and artificial lighting shall be provided.

(8) A stairway constructed in accordance with paragraph 41(3) (b) and (c) of this Code shall be of fire-resisting materials throughout.

44. Pedestrian guarding for siting.

(1) Guarding shall be provided for safety to guard the edges of any part of a floor gallery or balcony and any basement area or similar sunken area next to a building.

(2) Guarding shall be provided in vehicle parks, but not on any ramps used only for vehicle access.

(3) Guarding need not be provided to such places as loading bays where it would obstruct normal use.

45. Vehicle barriers.

Where vehicles have access to a floor, roof or ramp which forms part of a building, a barrier shall be provided to any edges which are level with or above the floor or ground or any other route for vehicles.

46. Ramps.

In any building not being a domestic dwelling house or any site on which a building is situated, any—

(a) ramp or driveway used by motor vehicles shall have a gradient of not more than 1 in 25 within a distance of 5m from any street boundary crossed by the ramp or driveway;

(b) ramp or driveway used by pedestrians shall have a gradient of not more than 1 in 12; and

(c) ramp designed for use by both vehicles and pedestrians shall have a walkway not less than 1.2m wide which shall be provided with a kerb not less than 150mm high.

47. Staircases in buildings intended for separate occupation.
In any building intended for separate occupation by more than two tenants, the staircase intended for common use shall be provided with adequate natural lighting at each storey above the ground floor and be ventilated at least at its highest point.

48. Escalators to be in addition to staircases.

(1) Where an escalator is installed in any building, it shall be in addition to any staircase required under this Code and the means of escape in case of emergency.

(2) For the avoidance of doubt, an escalator shall not be a staircase, passage or other normal means of egress for the purposes of this Code.

49. Means of escape.

(1) Every building shall be provided with such means of escape in case of emergency as may be required by the intended use of the building.

(2) Without prejudice to subparagraph (1), every building which exceeds 6 storeys in height or in which the level of the floor of the uppermost storey is more than 17m above the level of the ground at the point of discharge of the main staircase, shall, in addition to the main staircase, be provided with a second staircase as means of escape in case of emergency.

50. Enclosure and position of lifts and motor rooms.

(1) The enclosure and position of lifts in new buildings, shall comply with this Code.

(2) The motor room shall be impervious to moisture and fully enclosed with incombustible materials and separated from the lift shaft, except, for openings necessary for the passage of the requisite wires and cables.

(3) In enclosed lift shafts, a smoke outlet to the open air shall be provided, at or near the head of the shaft.

(4) The smoke outlet shall be not less than 0.04 m^2 in area and fitted with an openwork metal grill or widely spaced louvers that are water and vermin proof.

(5) The motor room, shall be cross-ventilated with an approved window space, which shall open directly into the external air having a chamber of sufficient size to permit an unobstructed circulating passage between the lift motor equipment and the external walls.

(6) In domestic and public buildings, where any floor is more than 14 meters above the adjacent ground level, and there is only one staircase enclosure, the lift shaft shall be wholly enclosed in fire-resisting materials having a notional fire resistance equal to that of the walls of the building in which the lift is installed and not of less thickness than 100mm, and doors to the opening shall be of solid timber doors, steel shielded gates or any other materials with a resistance to fire of not less than half of that required for the walls enclosing the lift shaft.

(7) In buildings not exceeding 14 meters in height, if the motor chamber is situated at the bottom of the shaft, the lift shaft shall be within the staircase enclosure if protected by solid fire-resisting enclosures and solid timber type doors or steel shielded gates; and if the motor room is situate at the head of the shaft, the enclosure to the lift, shall consist of metal grilles with collapsible lattice gates at openings.

51. Lifts.

(1) The construction of all lifts and lift ways shall comply in every respect with this Code and the requirements of section 69 of the Occupational Safety and Health Act, 2006.

(2) In addition to the requirements under paragraph (1), the following shall apply—

(a) a clear space of not less than 900mm shall be provided between the bottom of the lift shaft and the lowest point of the cage floor or fittings when the cage is at the lowest landing, and between the top of the lift shaft and the crosshead of the cage when the cage is at the top landing; except that for a lift of greater speed than 1.8m per second the clearance space in each case shall be increased to 1.5m;

(b) the bottom pits of lift shafts shall be soundly constructed in order to be kept dry;

(c) the floor of a pit shall be level and, where necessary, provision shall be made for permanent drainage of the pit;

(d) at the bottom of the lift shaft, a screen of adequate strength and construction shall be fixed round the path of the counterbalance weight extending at least 2.1m above the floor of the lift shaft to protect persons working under the counterbalance weight from accident through contact with it.

(3) Every lift shall be inspected in accordance with section 69 of the Occupational Safety and Health Act, 2006 and a report of inspection issued.

(4) A copy of the inspection report shall be submitted to the Building Committee or Building Control Officer by the owner of the building upon request.

52. Precautions against fire.

(1) Any building in which more than ten persons reside or are employed at any one time shall—

(a) be constructed of fire-resisting materials;

(b) be provided with a sufficient number of fire escapes;

(c) be provided with a secondary means of access;

(d) have fire-resisting floors, stairs, staircases and passages; and

(e) be provided with suitable and convenient sites for the placing of refuse receptacles and the removal of the receptacles and the sites shall have an impervious floor surrounded by a curb or dwarf wall.

(2) If required by the Building Committee, the sites shall be roofed or drained or both roofed and drained.

Temporary Buildings

53. Temporary buildings.

(1) For any application to erect a building, which qualifies to be classified as a temporary building, the Building Committee may grant authorisation to a person to proceed with the erection of the building subject to compliance with any conditions or directions specified in the authorization.

(2) The Building Committee shall, before granting, the authorization in subparagraph (1), require the owner of the temporary building to state the period for which the authorisation is required.

(3) The applicant shall submit to the Building Comittee a site plan together with the application to erect a temporary building.

(4) The application shall be accompanied by layout drawings in sufficient detail to enable the Building Committee to determine the general size, form, materials of construction and use of the proposed temporary building.

(5) The owner of a temporary building shall, in addition, submit

for approval, the structural details as may be necessary for the Building Committee to determine the structural safety of the proposed building where it is intended that the public shall have access to the building.

(6) The Building Committee shall grant authorisation for a limited period not exceeding one year having regard to the use of a temporary building.

(7) The Building Committee may at the request of the owner grant approval for extension of the period of authorisation.

(8) Where it is intended that the public shall have access to the building, the request shall be accompanied by a certificate signed by an engineer, indicating that the condition of the structural system is satisfactory for the period of extension.

54. Scaffolding.

(1) Scaffolds shall be provided for all work that cannot safely be done on or from the ground or from a ladder.

(2) The working platforms and gangways scaffolding shall not be less than 500 mm wide and when over 2.0 m in height, shall be provided with toe board and guard rails on any open side.

(3) The Building Committee may prohibit the erection, use or employment of any scaffolding, staging, shoring, crane or other lifting apparatus, which may cause damage to persons or property.

(4) In the case of a building operation more than 6.0 m above the ground, scaffolding shall be constructed in approved steel.

55. Hoardings to be erected during building operations.

A person who erects or makes any alteration to a building shall erect and maintain during the execution of the work such hoardings as are necessary in the opinion of the Building Committee for the protection of the public, but no hoardings shall be erected in any

street except with the written permission of the Building Committee.

56. Special hoardings.

(1) The Building Committee may grant the use of a part of a street or public way in connection with the erection, alteration or taking down or securing of any building and may require that such part be enclosed with a barricade or hoarding to its satisfaction.

(2) The hoarding or barricade shall-

(a) be properly lighted by red lamps from sunset to sunrise;

(b) conform to all requirements of the Building Committee which may from time to time be notified; and

(c) be removed at any time the Building Committee requires.

(3) No building shall be erected, added to or altered so that any portion of it, or any scaffolding, hoarding, barricade, staging, shoring or crane or other lifting apparatus constructed or used in connection to the building, is nearer than seven feet to any overhead electric supply line, unless the consent of the Ministry responsible for electricity or the Uganda Electricity Transmission Company Limited has first been obtained.

57. Repair of damage.

Any damage done to any street or property by or in connection with the erection or removal of hoardings or barricades or scaffolding or otherwise shall be made good by the owner interested in, or the person authorising, the operations, or may, at the option of the Building Committee, be made good at the expense of that person or owner.

58. Advertisements on hoardings.

A person other than the owner or builder of the premises at which the hoardings are erected shall not use them for advertising purposes without the permission of the Building Committee, and the owner or builder shall only advertise with reference to his or her own business in a manner approved by the Building Committee.

Assembly

59. Arrangements.

(1) The arrangement of assembly buildings shall be such as to secure the safety of the public to the fullest extent.

(2) Buildings of occupancy classification 1,2,4,5,9 and 10 classification as shown in Table 3 set out in Schedule I, shall have the main or lowest floor provided for the accommodation of the public as near as possible to the level of the exit street.

60. Sites to be safe.

(1) Whenever large numbers of persons are likely to assemble on the occasion of any public procession, open-air meeting or other like occasion, every building, platform, balcony or other structure or part of it let or used, or intended to be let or used, for the purpose of affording sitting or standing accommodation for a number of persons, shall be safely secured and constructed to the satisfaction of the Building Committee; but this Code shall not relieve the owners of responsibility in respect of any accident which may occur by reason of the use of those structures.

(2) The Building Committee shall have power to refuse to approve the plans of any proposed building of occupancy classification 1,2,4,5,9 and 10 classification which does not provide for sufficient protection against fire from adjacent premises.

(3) The Building Committee may object to and may prohibit the use of any defective structure.

61. Area per person.

The area in assembly buildings shall be allotted according to the design population prescribed in Table 4 set out in Schedule 1.

62. Floors, walls, stairs and ceilings to be fire resistant.

(1) The whole of the floors, walls, stairs and ceilings of assembly buildings shall be of approved fire resistance rating and construction.

(2) Where a portion only of a building is used as an assembly building, that portion shall be entirely cut off from the remainder of the building by solid fireproof walls and floors; refreshment bars and tearooms shall be deemed as parts of the assembly building if under the same management as assembly building.

63. Floors and slope of floors.
A floor or division shall be constructed at a slope to permit steps in the passages or aisles being not more than 150mm risers nor less than 280mm treads measured in the direction of going.

64. Height of galleries.
(1) Where the first floor or balcony of any public building extends over any part of the pit, stalls or area, the clear height above the first floor or balcony shall not be at any part less than 2.7m.

(2) The height between the floor of the highest part of the gallery and the lowest part of the ceiling over the part shall not be less than 3m.

65. Width of aisles.
(1) The aisles or passages within the auditorium shall at no point be less than 1.1m in width and where required by the Building Committee shall be increased in width towards the exit in the ratio of 40mm to every 1.5m.

(2) Where the aisle or passage is of a width less than an exit door communicating with it, the isle or passage shall be widened to that opposite the door and for a distance of 1.8m from its width shall not be less than the clear opening of the exit door.

66. Gangway around auditorium.
Where required by the Building Committee, a clear passage or gangway not less than 1.1m wide shall be reserved around every portion of the auditorium.

67. Pit floor.

(1) In all public buildings the floors of the highest part of the pit shall be accessible from the street at the principal entrance to the pit or stalls by a gradient not exceeding 1 in 15; and the lowest part of the floor of the pit or stalls shall not be more than 1.85m below the level of the street at the principal entrance to the pit.

(2) In any case the lowest floor shall not be placed at such a level as will render it liable to flooding, and it shall be efficiently and properly drained to the satisfaction of the Building Committee.

68. Stairs in assembly buildings.

(1) The treads of each flight of stairs intended for the use by the public shall be of uniform width not less than 285mm wide and with risers of uniform height not more than 155mm high.

(2) A flight of stairs for public use shall not consist of more than fifteen nor less than three risers and each flight shall have a landing of adequate area.

(3) Winder steps shall not be permitted and there shall not be more than two successive flights without a turn.

69. Planning of lobbies.

(1) Where stairs, passages and doorways lead into a lobby, the width of the lobby measured at right angles to the lines of egress shall be at least one-third greater than the combined width of all the doorways, passages and stairs leading into the lobby from the auditorium.

(2) The doorways from the lobby to a street shall aggregate at least one-quarter more in width than the aggregate of the widths of all doorways, passages and stairs leading from the interior into the lobbies.

(3) Where stairs discharge into any such lobby, they shall discharge towards the street by direct lines of egress which will in no way interfere with lines of egress from the main hall, passages or

other exits, and external exit doors shall be provided on all the lines of egress.

70. Stage space.
The space above the stage shall be of sufficient height to allow all scenery and the fire-resisting screen, being raised above the top of the stage opening in one piece and without rolling if the Building Committee so directs.

71. Ventilation.
The assembly building shall be ventilated to the satisfaction of the Building Committee.

72. Swinging of doors.
(1) All outer and inner doors of assembly buildings which are used as the ordinary and usual means of public ingress and egress, shall open outwards, but may open inwards as well.

(2) The doors, where not provided with satisfactory spring hinges, shall be provided with proper and adequate means of holding them back in an open position to afford the full width of the doorway as a means of ingress and egress, and they shall be kept unlocked and fully open or in the case of those with spring hinges, fully and immediately available during the time the building is in use.

(3) All doors for use by the public including emergency exits and gates in open lanes or passages outside the building, whether connected directly with the means provided for leaving the building or not, shall be made to open outwards in the direction of exit traffic.

(4) No door shall open immediately on to stairs or steps, but on to a landing at least 1.25m in width, which width shall be provided between the doors and stairs or steps.

73. Panic bolts and locks on doors.
(1) External exit doors or gates, including those to open passages

outside the building, shall not have any locks or fastenings other than satisfactory panic bolts fixed on the inside in such manner that they are easily and immediately opened by pressure from the inside on a horizontal bar or panel; except that main external entrance doors may be fitted on the inside face with long barrel or tower bolts.

(2) If in two leaves, an ordinary lock may be used; and if in one leaf and a lock is required, it shall be a draw lock without any catch pin to keep the door locked capable of being opened from the inside without a key.

74. Door fastening prohibited.
Internal doors for use by the public shall have no locks, bolts or other fastenings, except such as are necessary to hold them in an open position, but may be fitted with spring hinges.

75. Outlet doors.
In any public building, outlet doorways or exit doors and all means of egress shall be so situated and arranged and shall be of a number and capacity for each floor, tier or level or part of the building as in the opinion of the Building Committee shall enable all the persons whom the floor, tier, level or part can seat or accommodate, to vacate the building in a space of time not exceeding three minutes when proceeding at a walking pace of 4.8 kilometres per hour.

76. Notice on exit doors.
All exit doors shall be indicated on the inside by an adequately illuminated notice in block letters at least 155mm in height, to the satisfaction of the Building Committee, which notice shall consist of the word "EXIT", and the letters shall, during the time that the building is open to the public, be kept uncovered and unconcealed by any obstruction.

77. Separate exits for each level.
(1) Where different floors, tiers or levels are provided for the accommodation of the public, each floor, tier, level or subdivision of it shall have its own separate and independent staircase, corridors and

passages, and at least two exits discharging directly into a street or open passage or lane.

(2) All exits shall be sited to afford the greatest degree of public safety and shall be to the satisfaction of the Building Committee.

(3) The width of every stair, corridor or passage outside the auditorium provided for the use of the public shall be not less than 1.1meters for every hundred persons using it, but no stair, corridor or passage shall be less than 1.4m wide; where a greater width is necessary under this Code, the width shall be in units as prescribed in subparagraph (4).

(4) All public staircases over 1.85m in width shall be properly divided down the centre by one or more strong handrails with adequate and substantial supports.

78. Width of exits.

(1) The total aggregate width of exit doors required for a public building or any part of it shall not be less than 1.15m for every hundred persons.

(2) The width of any exit door shall be measured between the leaves when wide open and shall not in any case be less than 1.1m; passages, stairs and corridors shall be at least 1.25m wide.

79. Number of exits.

(1) The exits for the ground floor shall not be less in number according to the number of persons accommodated than shown in Table 5 set out in Schedule 1.

(2) The exits for galleries shall not be less in number than shown in Table 6 set out in Schedule 1.

(3) There shall be provided at least two separate staircases in connection with each gallery.

80. Exits to be spaced apart.

(1) At least two of the exits from any floor or level shall be arranged as far apart as practicable on opposite sides or ends of the floor or level.

(2) If any floor or level is divided into two or more distinct parts, each part shall be regarded and treated as a separate floor or level.

81. Separate and independent exits.

If a public building is incorporated in a building and a portion of which is used for other purposes, all exits, courts, alleys, passages, gangways, corridors and staircases required for the public building shall be separate and independent from those required for the use of the rest of the building.

82. Lighting.

All entrance halls, passages, staircases, gangways or other means of approach to a public room in any public building shall be efficiently lighted during the whole time the public building is being used.

83. Artificial lighting.

(1) When artificial light is used in any public building, provision shall be made so that the public may not be left in darkness through any breakdown or accident.

(2) Two complete systems of electric lighting from two separate sources of supply shall be provided.

(3) All exit lamps shall be kept lit during the whole of the time the public are in the building.

84. Means of warning and escape.

A building shall be designed and constructed with appropriate provisions for early warning of fire and appropriate means of escape in case of fire from the building to the place of safety outside the building capable of being safely and effectively used at all material times.

85. Internal fire spread.

(1) To inhibit the spread of fire within the building, the internal lining shall—

(a) adequately resist the spread of flames over their surfaces; and

(b) have, if ignited, a rate of heat release or a rate of fire growth which is reasonable in the circumstances.

(2) In this paragraph, "internal linings" means the materials or products used in lining any partition, wall, ceiling or any other internal structure.

86. Temporary proscenia.

In the case of premises in respect of which permission is desired for the occasional performance of stage plays by nonprofessional performers and where a permanent proscenium, safety curtain, or any of the other requirements of this Code regarding the stage or seating is not in existence, the Building Committee may grant permission for the occasional performances upon such conditions as it may deem necessary for ensuring the safety of the performers and audience including the treatment of scenery, curtain and temporary proscenium to render them fire resisting.

87. Cinematograph chambers.

The siting, construction and management of cinematograph apparatus and cinematograph operating chambers shall be in accordance with this Part.

88. Owner to cover costs.

For the avoidance of doubt, the owner of any assembly building shall cover the expenses of carrying out any alterations of the building, or additions to it, which shall be required by a notice issued under this Code.

Business or Industrial Buildings

89. Offices in shops.

A part of a shop used as an office shall be lighted in accordance with paragraph 111 and 117 of this Code, except the Building Committee may exempt any part of the shop used as an office located on two sides the head of any screen or partition from the shop at least 900mm below any ceiling or beam immediately above and the screen or partition is glazed from a height of 1.1m above floor level to the head on two sides of the office.

90. Offices in industrial buildings.

A part of a factory or workshop used as an office shall be lighted in accordance with paragraphs 82 and 83 of this Code; except that the Building Committee may exempt any part which is only screened or partitioned off and which the Building Committee considers to be adequately lighted and ventilated.

91. Size of rooms in industrial buildings.

In any building used or intended to be used as a factory or workshop, other than a store, the floor area of any room of the building or portion of a room enclosed by a partition whether temporary or permanent shall be not less than is required by the design population standards prescribed in Table 4 of Schedule 1.

92. Further requirements.

Paragraphs 59, 60,63,64,65 and 66 of this Code for the design and planning of public buildings and places of assembly shall apply to the design and planning of shops and offices to which the term "public building" shall be deemed to apply for this purpose, and the word "public" shall be deemed to cover all persons normally present or employed in the buildings, provided that the total sum of such persons is greater than twenty at any one time.

Design of Buildings for Schools

93. Classrooms.

(1) Every classroom in a place of instruction shall be of such dimensions as to ensure suitable accommodation for the number of learners intended to use the room.

(2) In every case, the minimum measurements of a classroom shall be —

(a) in accordance with the design population standards prescribed in Table 4 of Schedule 1;

(b) 1.1m aisle width; and

(c) 3metres mean height.

94. Halls.

Where, in any school, a hall is provided for the occasional assembly of the learners, the minimum amount of floor space per learner shall be 0.5 square metres.

95. Lighting and ventilation.

Every classroom shall—

(a) be lighted in accordance with paragraphs 111 and 112 of this code; and

(b) be provided with ventilation in accordance with paragraph 115 and 116 of this code.

96. Accommodation for boarders.

In every boarding establishment—

(a) suitable and sufficient sleeping accommodation in the form of dormitories shall be provided for the boarders in addition to the school classrooms;

(b) separate dormitory accommodation shall be provided for learners for each sex;

(c) the minimum floor space per learner in every dormitory shall be as per design population standards prescribed in table 4 of Schedule 1 and in accordance with the following—

(i) 2.78 square metres for each learner under twelve years of age; and

(ii) 3.70 square metres for each learner where two-tier beds are used.

(d) in respect of beds—

(i) the side of any bed shall not be placed within 300millimetres of any wall of a dormitory;
(ii) the distance between adjacent beds shall in no case be less than 1100millimetres;
(iii) where there are two or more lines of beds in a dormitory, an unobstructed passage at least 1100milllimetres in width shall be maintained at all times between each line of beds;
(iv) all beds shall be so constructed as to permit easy and regular disinfestation;
(v) the requirements for lighting of dormitories shall be in accordance with paragraphs 111 and 112 of this code; and
(vi) every dormitory shall have secure, sufficient and accessible latrine and bathing accommodation.

97. Accommodation for meals.
In every boarding establishment, separate accommodation shall be provided where the pupils shall take their meals, and that accommodation shall not communicate with any dormitory except by a properly ventilated passage and shall be constructed to ensure a minimum floor space of 0.75square metres for each learner using the room.

98. Kitchens and water supply.
In every boarding establishment, there shall be provided to the satisfaction of the Building Committee—

(a) kitchen accommodation of suitable size, type and construction;
(b) a water supply sufficient for all purposes and proper washing and bathing accommodation for the users;
(c) every school shall be provided at all times with a sufficient supply of wholesome drinking water; and
(d) where there is no piped supply, the water shall be provided in a clean receptacle and arrangements shall be made to ensure that the water is accessible without danger of contaminating the supply.

99. Latrine accommodation.

(1) Every school, whether a boarding establishment or not, shall be provided with proper and sufficient latrine accommodation conforming to the National Building (Standards for Mechanical Installations in Buildings) Code, 2019.

(2) In estimating the latrine accommodation, the following shall be the minimum requirements, but in any particular case the Building Committee may require special arrangements to be made—

(a) for water closets or pit or septic tank latrine stances—

(i) schools which are boarding establishments: one for every fifteen persons or fraction of that number which the school can ordinarily accommodate for purposes of residence;

(ii) schools which are not boarding establishments: one for every twenty-five persons or fraction of that number up to one hundred persons which the school can ordinarily accommodate; above one hundred, one for every forty persons or fraction of that number;

(b) for pail closets—

(i) schools which are boarding establishments: one for every twelve persons or fraction of that number which the school can ordinarily accommodate for purposes of residence;

(ii) schools which are not boarding establishments: one for every twelve persons or fraction of that number up to forty-eight persons which the school can ordinarily accommodate; above forty-eight, one for every twenty-four persons or fraction of that number;

(c) for urinals—a reduction of 50 percent in the number of latrines required for males under this paragraph may be made where latrine accommodation is provided, if urinal accommodation in the ratio of one stall or basin or at least 560millimetres of channel length for every twenty-five males or fraction of that number is provided.

(3) In schools used or intended to be used for the accommodation of both boarders and non-boarders, latrine accommodation for the boarders and non-boarders shall be computed in accordance with the requirements of this Code for schools which are boarding establishments or non-boarding establishments, respectively.

(4) In every school in which males and females are, or are intended to be accommodated—

(a) separate latrine accommodation shall be provided for learners of each sex;

(b) separate latrine accommodation shall in all cases be provided for teachers, and if teachers of different sexes are employed, separate latrine accommodation shall be provided for each sex; and

(c) the latrine accommodation shall be constructed to ensure privacy, with the entrances to female accommodation effectively screened from those for males.

(5) So far as is practicable, no dormitory in any school shall be situated more than 18metres from a latrine and no school building used or intended to be used by learners shall be situated more than 45metres from latrine accommodation.

(6) Where the level of the contents of any pit latrine is within 1metre of the surrounding ground level, the pit latrine shall be closed for use and the pit completely filled up with earth.

100. Floors.

All floors shall be impervious and shall be so constructed as to enable every part of them to be regularly cleaned.

101. Playgrounds.

There shall be provided for every school and, where possible, adjacent to the school, an open space of sufficient size for the use of the learners as a playground.

102. Size of rooms intended to be used as dwellings.

In a domestic building every habitable room shall have a superficial area of 9sqm at the least with an allowance of 3.7sqm per person for each person sleeping or intending to sleep in it; except that—

(a) if more than one habitable room is provided, all those in addition to the first habitable room may have a superficial area of not less than 7.4sqm; and

(b) the minimum superficial area of any ironing room where there is provision for an electric iron shall be 3.7sqm.

103. Provision of kitchens, stores and bathrooms.

(1) A dwelling shall be provided with sufficient and suitable accommodation for cooking, storing food, bathing and washing to the satisfaction of the Building Committee.

(2) A dwelling referred to under subparagraph (1) shall comply with the following minimum requirements—

(a) shall be provided with at least one kitchen which shall have a floor area of not less than 7.4square metres and a mean height of at least 2.6metres with a minimum height of 2.3m in any part except where the total area of the dwelling unit is less than 74 square metres in which case the kitchen floor area shall not be less than 10 percent of the total area and in no case shall be less than 4.6 square metres;

(b) a hotel, institution or communal building where food is, or is intended to be provided for the inmates, shall have a kitchen which shall have a mean height of at least 2.6metres and a minimum height of 2.3metres in any part; the floor area of the kitchen shall not be less than the scale laid down in Table 7 set out in Schedule 1.

(c) where in addition to a kitchen complying with the provisions of subparagraphs (a) and (b) of this paragraph a second kitchen designed solely for the personal use of household servants is erected, the second kitchen may

have a minimum floor area of at least 2.3square metres and a minimum height of 2.6metres in any part measured from floor level to the wall head;

(d) a kitchen erected under this paragraph shall have an approved means of removing smoke and fumes and, unless exempted by the Building Committee shall—

(i) be lighted in accordance with paragraphs 111 and 113 of this Code;

(ii) have a floor constructed of concrete brought to smooth surface or of other approved incombustible material; and

(iii) be provided with adequate water supply and sink or splash basin;

(e) the Building Committee may require special provision for the disposal of kitchen refuse and for drainage before permission is given for the use as a kitchen of a room or rooms not on the ground floor;

(f) dwelling shall be provided with a cupboard or compartment for storing food and if this is of a cubic capacity of more than 2.8 cubic metres it shall be lighted in accordance with paragraphs 111 and 112 of this Code;

(g) a dwelling shall be provided with a bathroom or cubicle having an area of not less than 1.5sqm and a mean height of at least 2.4m with a minimum of 2.1m in any part measured from floor level to the wall head.

(3) The bathroom or cubicle shall be lighted in accordance with paragraphs 111 and 113 of this Code.

104. Position of blocks of flats and hotels.

(1) Where no provision has been made under the Physical Planning Act, 2010, hotels, special blocks of flats, blocks of flats and residential buildings may be erected only on plots approved by the Building Committee.

(2) The Building Committee may restrict the number of blocks of flats to be permitted on any particular plot and shall permit residential buildings to be erected only on suitable plots where the development will not unduly affect adjoining residential plots.

105. Construction of buildings of more than two storeys.

(1) A building consisting of more than two storeys for residential or any other purpose shall—

(a) be provided with a sufficient number of approved fire escapes;

(b) be so designed that satisfactory means of access to the building for public services is provided;

(c) be provided with satisfactory means of drainage for waste, foul and storm water in accordance with the requirements of this Code;

(d) in addition to the main stairways providing access to each storey, be provided either with adequate means of fire escape and disposal of refuse from each floor or with a secondary stairway so sited that in no case shall entrance to any habitable room be more than 27.4m from a stairway; and

(e) be provided with one or more central sites for the placing of refuse containers.

(2) The sites shall be constructed to the satisfaction of the Building Committee.

(3) The sites shall have an impervious floor surrounded by a curb or dwarf wall and shall be sufficient in size to accommodate the number of refuse containers to be used at the building or buildings on the plot.

(4) The sites shall, if the Building Committee so directs, be roofed, drained and fly-proofed.

106. Kitchens in flats.

Where provision is made for communal dining and catering, paragraph 103 (2)(a) and (e) of this Code shall not apply.

107. Facilities to be provided for residential rental premises.

(1) Every landlord shall provide for the use of all persons renting in his or her premises such number of latrines as are required by the National Building (Standards for Mechanical Installations in Buildings) Code, 2019.

(2) Every landlord shall provide for the use of all tenants in his or her premises—

(a) lighting in all common circulation areas;

(b) a supply of water;

(c) accommodation for the storage of food;

(d) kitchen and ablution facilities; and

(e) waste and foul water drainage.

108. Duties of landlord.

Every landlord shall—

(a) maintain his or her premises and its appurtenances in good repair;

(b) keep his or her premises free of vermin;

(c) disinfect his or her premises when required so to do by the Building Committee, in the manner prescribed by the Building Committee;

(d) provide every staircase with a handrail securely fixed;

(e) provide every passage and staircase with adequate ventilation and lighting in accordance with this Code;

(f) keep clean and in good repair—

(i) every common receptacle for the storage of water;
(ii) all drainage;
(iii) every latrine;

(iv) every bath;
(v) every receptacle for refuse;
(vi) every common staircase and passage; and
(vii) every other place in his or her premises which is used in common;

(g) after the termination of any letting of any accommodation and before the accommodation is occupied by any succeeding tenant, thoroughly clean the accommodation and any fittings, furniture or appliances in it; and

(h) in the month of November in every year thoroughly clean every part of his or her premises and redecorate the premises by washing or painting and make good any damage or decay.

109. Duties of the tenant.

Every tenant shall—

(a) remove all refuse from the accommodation which has been let to him or her and clean every receptacle used for the refuse;

(b) keep clean and in good condition his or her accommodation and any fittings or appliances in the accommodation; and

(c) report any arising matters in regards to the premises to the landlord for action.

110. General provisions relating to residential rental premises.

A landlord or tenant shall not—

(a) keep or permit to be kept any animal so as to cause any part of the premises to be filthy, unwholesome or smelly;

(b) cause or allow any obstruction whatsoever in any passage, staircase or doorway;

(c) cause or allow more persons to be accommodated than will allow 3.7square metres of floor space for each person, or, if the average height of any room or part is

less than 2.4metres, 4.6square metres of floor space for each person; and

(d) prevent entry or access to any part of the premises by any person duly authorised by law to inspect the premises while in the exercise of his or her duty, or delay or obstruct that person in the exercise of his or her duty.

Lighting and Ventilation.

111. Provision of windows.

In all buildings, every habitable room and every bathroom, lavatory, pantry, larder, scullery and staircase shall have provided for it in the wall of the building which immediately fronts or abuts on such open spaces as are provided this Code, a sufficient number of suitable windows, in such a manner and in such a position that each of the windows shall afford effectual means of ventilation and light by direct communication with the external air; except that—

(a) a staircase may be lighted by an overhead skylight of sufficient area if ample means of ventilation are otherwise provided;

(b) the lighting of bathrooms and larders may be by overhead skylight or artificial light or borrowed light if effective means of ventilation are provided; and

(c) water closets shall be lighted in accordance with this Code.

112. Warehouse lighting and ventilation.

Every building of the warehouse class shall be provided with proper and efficient lighting and with proper, adequate and efficient means of ventilation, to the satisfaction of the Building Committee.

113. Area of windows.

(1) Every window of a habitable room which opens directly into the external air shall, except in factories and workshops or unless otherwise approved by the Building Committee, be glazed, and the

total area of the window, or if there are more than one, of the several windows, clear of the frames shall be equal at the least to 1/10th of the floor area of the room, and in the event of a window or windows occurring in a wall or walls abutting on to a verandah or beneath a balcony or canopy the area shall be increased by 5 percent for each 300 mm over 900 mm by which the verandah, balcony or canopy extends outwards from the wall in which the window is placed.

(2) Windows shall be constructed so that an area thereof equal at the least to 1/20th of the floor area of the room shall be made to open; but—

(a) in calculating the area of windows required to open, any area of permanent ventilation in excess of the requirements of subparagraph (1) of this Code may be deducted, but in no case shall the total area of windows provided be less than that required by this paragraph;

(b) in any factory or workshop in which any special trade or process is carried on, additional light shall be provided for the requirements of the trade or process, to the satisfaction of the Building Committee; and

(c) if a window is protected by means of rods or by a grille or similar device, the Building Committee may deem the effective area thereby reduced by 10 percent.

(3) A shop having one or more display windows shall be exempt from the requirements of this paragraph in regard to the provision of an opening portion in the window or windows, and may further be exempt from the requirements in regard to the lighting area of the windows if the Building Committee is satisfied that the shop is adequately lighted by other means.

114. Space opposite windows.

A window of a habitable room shall not be deemed to open directly into the external air if there is opposite such a window a wall which is less than 1500 mm away from the window or, where the height of the

opposing wall measured from the level of the head of the window to the level of the eaves or top of the parapet, is greater than 1½ times the distance from the window to the wall; except that—

(a) if the window opens on to an internal open space, the distance from the window to the wall opposite shall not be less than 3660 mm;

(b) if any window opens on to a court or passage, open at one end, and of a width of not less than 1500 mm, that window shall be deemed to open directly into the external air if it is situated—

(i) opposite the open end; or

(ii) on either of the other two sides within a distance from an open end not exceeding twice the distance across the court or passage; and

(c) for the purpose of this paragraph, in calculating the effective distance between opposing walls, a reduction shall be made of the amount by which any eaves, balcony, canopy or other projection extends outwards from either wall except that a projection of not more than 380 mm may be disregarded.

115. Window and ventilation requirements for soil-water fitting apartments.

Every person who constructs a soil-water fitting in connection with a building shall provide the apartment in which the soil-water fitting is situated with—

(a) a window of an area not less than 0.186 square metres exclusive of the frame, in an external wall and constructed in a way that at the least 0.186 square metres shall open; except that in any building other than one used or intended to be used as a dwelling house where a water closet is provided with sufficient means of lighting by artificial or borrowed light, it shall not be necessary to provide a window opening directly into the external air;

(b) constant ventilation by means of—

(i) a ventilator having a minimum area of 0.93 square metres and no material other than wire gauze or other equally suitable material approved by the Building Committee shall be inserted in the ventilator, which shall open into the external air and be adequately protected from the entry of rain; or

(ii) an approved air shaft or some other similar effectual method, but where a closet other than a squatting or oriental closet is provided, ventilation may be by means of an opening fanlight.

116. Ventilation of rooms.

(1) Every person who erects a new building other than a public building or building of the warehouse class, shall cause every room, passage, hall and stairwell to have permanent ventilation openings, in addition to those required by paragraphs 113,114 and 115 of this Code, to ensure effective cross or through ventilation; except that—

(a) a chimney or flue may be deemed to be a ventilation opening as required by this paragraph;

(b) in the case of bathrooms and food storage compartments of over 2.8 cubic metres, ventilation shall be directly to the external air;

(c) ventilation of water closets shall be in accordance with this Code; and

(d) in any domestic building or workshop, the requirements of this subparagraph shall be deemed to be satisfied if—

(i) in respect of each room, passage, hall or stairwell, the aggregate superficial area of ventilation openings free from obstructions except wire gauze amounts to not less than 14, 200 square millimetres per 2.8 cubic metres of air space;

(ii) in the case of rooms, at least half the required ventilation comes directly from the external air,

and, where on account of the design of the building it is not practicable for all required ventilation to come directly from the external air, not more than half shall come from a passage which is itself effectively ventilated with independent ventilation openings sufficient to satisfy the requirements of subparagraph (i) and at least half the area of which opens to the external air;

(iii) the ventilation openings are so designed as to ensure the free passage of air at all times but are effectively protected from the weather;

(iv) the minimum ventilation openings required by subparagraph (i) are sited so that the upper limit of each opening is not more than 900 mm below the top of the wall in which it is situated.

(2) In addition to the requirements of subparagraph (1), every boiler house, engine room and every room in any factory or workshop in which a substantial quantity of heat is used or produced, and which is situated immediately under the roof of the factory or workshop, shall be provided with permanent roof ventilators of an aggregate area of not less than 1/50th of the floor area; except that the Building Committee may exempt any work room from the requirements of this subparagraph where it is satisfied that such provision is inappropriate or unnecessary.

(3) Every room in which a fireplace is provided shall have a properly constructed flue communicating directly with the external air.

(4) In any factory or workshop in which any special trade or process is carried on, additional ventilation with or without air conditioning sufficient for the requirements of that trade or process may be required to the satisfaction of the Building Committee.

(5) Where a mechanical system of ventilation is installed, the requirements of this paragraph may be modified to the satisfaction of the Building Committee.

117. Ventilation of public buildings.

(1) Every person who erects a new public building shall cause the building to be efficiently ventilated through or cross ventilation by means of windows, fanlights, air bricks or tubes distributed around the building in such positions and in such manner as to secure effective change of air, and arranged so as to communicate directly with the external air.

(2) The openings required under this paragraph shall be arranged to provide an aggregate area for each person accommodated in the building—

(a) of not less than 15,500 square millimetres, the area of the openings being in every case measured with a reduction on account of any grating or other diminution or contraction placed across or in the opening;

(b) of the 15,500 square millimetres per person provided, not less than 3900 square millimetres shall be situated at a height not exceeding 1500 millimetres above the floor, and 12,000 square millimetres at a height of not less than 2.7 metres above the floor; and

(c) where a mechanical system of ventilation is installed, the requirements of this subparagraph may be modified to the satisfaction of the Building Committee.

Part IV — Building Materials

118. General requirements.

(1) Materials other than those specified in this Code may be used provided that the Building Committee is satisfied that they are of a suitable nature and quality for the purpose for which they are used and when properly mixed or prepared.

(2) Damaged, insanitary or unsightly materials such as bent or disfigured corrugated iron or metal, reused portions of packing cases or containers, timber which is decayed, damaged or infected are prohibited from use.

(3) No materials of a temporary nature such as cloth, canvas, grass or mats, may be used for any external wall unless under special circumstances approved by the Building Committee.

(4) The use of locally produced building materials that do not compromise the natural ecosystem and that use the least energy for their production and transport shall be emphasized in accordance with this Code.

119. Testing.

(1) Where the Building Committee is not satisfied as to the fitness of any building material for the purpose for which it is proposed as regards strength, durability, fire resistance, porosity or other structural quality, it may require evidence of its soundness to be produced.

(2) A satisfactory certificate of test issued by the Uganda National Bureau of Standards or any other recognised laboratory, building or industrial research centre shall be accepted as proof.

120. Second-hand material.

Subject to paragraph 119, no second-hand material shall be used for building operations to which this Code applies.

121. Other standards.

The decision of the Building Committee shall be final regardless of any intended use of any proposed method of construction which is not specifically covered by this Code or any other Standard or Code of Practice approved by the Uganda National Bureau of Standards.

122. Water.

Water shall be clean and free from deleterious matter either in suspension or solution.

123. Sand or fine aggregate.

(1) Sand used for mortar or concrete shall be clean, well graded, and substantially free from pebbles and large particles.

(2) The sand referred to under subparagraph (1) shall be of such size that can pass through a sieve of 5millimetres mesh and not more than 3 percent shall pass through a No . 100 British Standard sieve and shall consist of—

(a) hard natural sand; or

(b) crushed hard igneous rock free from decomposed or weathered portions and from which the dust has been removed after crushing.

124. Coarse aggregate.

Coarse aggregate or "stone" shall be of sound and durable quality and of a size that can pass through a ring not exceeding 50millimetres in diameter and be retained on a mesh of 5millimetres measured in the clear.

125. Cement.

Cement shall comply with the relevant standards issued by Uganda National Bureau of Standards.

126. Bricks and blocks.

(1) A stone, brick or block in a structural wall including a pier or chimney forming part of a wall shall be composed of hard, durable, incombustible material and shall be of such size, shape and surface as to permit proper bonding and jointing.

(2) A block shall be suitably matured before use.

(3) A block shall possess resistance to crushing as follows—

(a) brick, squared stone and other building blocks in load-bearing parts of a building shall possess such resistance to crushing that when saturated with water and loaded

under conditions corresponding with those of their functions in the actual work with a load of 10.3N/mm2 of gross horizontal area, they shall not crack or break;

(b) brick, squared stone and other building blocks in non-loadbearing parts of a building other than in partition walls referred to in subparagraph (c) shall possess such resistance to crushing under the circumstances prescribed in subparagraph (a), that when loaded with a load of 6.9N/mm2 of the horizontal area, they shall not crack or break; and

(c) brick, squared stone and other building blocks in a non-loadbearing partition wall which is adequately restrained laterally at top and bottom and at each end and is not of less thickness than when three times its height is added to its length the total does not exceed two hundred times its thickness shall possess such resistance to crushing that after having been saturated with water and dried to the normal condition of the partition wall, and when loaded, under conditions corresponding with those of their functions in the actual work, with a load of 1.4N/mm2 of their gross horizontal area, they shall not crack or break.

127. Stresses in brick and block walling.

(1) Subject to the modifications prescribed in this paragraph in respect of the slenderness ratio, the bearing pressures on load-bearing brickwork, masonry of squared stones and block work shall not exceed the values given in Table 8 set out in Schedule 1, and subparagraph (2).

(2) For the class of materials designated "special" in Table 8 of Schedule 1, the maximum permissible (stress) pressure in kilo Newtons per mm2 shall not exceed the value produced when the number of kilo Newton per square millimetre of the resistance of the bricks, stone or blocks to crushing is divided by 500 and 10 is added to the quotient, but not in any case to exceed 4.3kN/mm^2 .

128. Mortar.

(1) All mortar shall be of a strength consistent with the stability of the structure in which it is used, and the proportions of the ingredients shall be in accordance with the requirements of Table 8 set out in Schedule 1, unless a variation of those requirements is as specified by the professionals and approved by the Building Committee.

(2) Cement mortar shall be composed of cement and clean washed sand or grit or other suitable material thoroughly mixed with clean water.

129. Concrete.

(1) Load-bearing concrete other than reinforced concrete shall be composed of cement, fine aggregate, coarse aggregate and water as defined in Table 9 set out in Schedule 1, and the grading of the aggregates between the limits specified in that Table shall be such as to produce a dense concrete with no voids.

(2) Concrete containing more than twelve parts of combined aggregate of sand and stone measured separately to one part of cement shall not be used for any purpose in the construction of a building.

(3) Concrete containing any ashes, slag, clinker or similar material shall not be used in contact with any steel or other metal used in the structure of any building.

(4) Coke breeze shall not form an ingredient of any concrete or concrete blocks used in the construction of walls, floors, stairs or other parts of any structure which under any requirements of this Code should be of incombustible or fire-resisting materials.

(5) The bearing pressures on load-bearing concrete shall not exceed the values given in Table 9 set out in Schedule 1, in which the first proportional part indicates the volume of cement, the second proportional part the volume of sand or fine aggregate and the third

proportional part the volume of stone or coarse aggregate.

130. Slenderness ratio of pier.

(1) For isolated bearing walls and unreinforced isolated piers of concrete, brickwork, blockwork or masonry, the walls and piers being without proper lateral support, the permissible pressures specified in this Code shall be reduced where the slenderness ratio in accordance with Table 10 set out in Schedule 1, intermediate values being interpolated.

(2) In no case shall an unreinforced isolated pier or bearing wall have a slenderness ratio higher than twelve or a least horizontal dimension less than 230millimetres.

131. Stresses in wrought and cast iron.

The working stresses in cast iron and wrought iron shall not exceed the values in Table 11 set out in Schedule 1.

132. Timber.

Timber shall be of a quality and strength sufficient for its purpose and shall be well seasoned, sound, free from and suitably protected against termites, rot, beetle and vermin; and shall not contain large, loose or dead knots, splits or other defects to such an extent and so situated in the piece as to render it insufficient in strength and stiffness.

133. Stresses on timber.

Subject to paragraph 134 of this Code, the unit stresses on deal, podocarpus, cedar, mvuli and timbers of similar strength and characteristics in N/mm^2 shall not exceed the values in Table 12 set out in Schedule 1.

134. Stresses on timber columns.

(1) Subject to paragraph 135 of this Code, the unit compressive stresses in N/mm2 on axially loaded columns, posts, or struts of deal, podocarpus, cedar, mvuli and timber of similar strength and

characteristics shall not exceed the values in Tables 13 and 14 set out in Schedule 1 corresponding with the slenderness ratio of the column post or strut, that slenderness ratio being the figure arrived at by dividing the length by the diameter or least transverse dimension if the same units of measurement are employed.

(2) The stresses specified in this paragraph are for columns, posts or struts which are unrestrained from bulging from end to end without contra flexure, but other stresses may be permitted for special methods of end fixing.

(3) The stresses for intermediate values of the slenderness ratio shall be by interpolation and where these structural members are eccentrically loaded the stresses due to that loading shall be calculated and safely provided for.

135. Special timber.

Greater stresses than those specified in paragraphs 133 and 134 of this Code may be permitted on the production of authoritative and certified tests on an ample number of specimens of any particular variety of timber which will warrant the use of the greater stresses.

136. Timber column lengths.

A column or post of timber shall not have an unsupported length of more than thirty times its diameter or least transverse dimension.

137. Damp-proof and ant proof courses.

(1) Materials used for a damp-proof and ant proof course shall be durable and impervious to moisture, and when placed in a wall, shall be capable of withstanding the dead load of the wall and all superimposed loads on the wall and all horizontal and inclined forces in such a manner as will not impair the efficiency of the damp-proof and ant-proof course and will not allow such movement of the wall as may lead to instability of any part of the structure.

(2) The requirements of this paragraph shall be deemed to be satisfied by—

(a) a layer of sheet lead weighing not less than 0.19KN/ mm2 and coated on each side with bitumen, any joint being overlapped to the extent of not less than 75millimetres;

(b) a layer of soft-tempered sheet copper weighing not less than 36N/m2 bedded in cement mortar, any joint being overlapped to an extent of not less than 7millimetres, or alternatively a welted joint shall be used;

(c) a continuous layer of mastic asphalt not less in thickness than 10millimetres;

(d) a layer of bituminous damp-proof course sheeting with fibre base weighing not less than 32N/m2 laid on a level bed of good mortar, any joint being overlapped to an extent of not less than 75millimetres;

(e) a layer of bituminous damp-proof course sheeting with lead core and fibre base weighing not less than 42.6N/ m2 laid on a level bed of good mortar, any joint being overlapped to an extent of not less than 75milimetres;

(f) a layer not less than 25millimertres thick of well consolidated cement mortar or granolithic not weaker than one part of cement to three parts of sand; or

(g) such other suitable material as specified by the professionals and approved by the Building Committee.

Part V — Environmental Protection And Energy Efficiency Standards

138. Object of Part.

The object of this Part is-

(a) to achieve a rational use of the energy and natural resources required for the construction, operation and demolition of buildings whilst providing indoor comfort ensuring that occupants can achieve adequate levels of lighting, thermal and acoustic comfort, reducing their

consumption to sustainable limits, conserving natural resources and getting a portion of this consumption from renewable energy sources during their design, construction, use and maintenance;

(b) to guarantee the right to sustainable cities and safeguard a healthy and comfortable urban environment while adapting and providing valid solutions according to the local climate, social needs and transformations, local cultural identity and cultural practices and conservation of natural resources;

(c) to offer orientation to built environment professionals in Uganda a standard with which to deliver energy and resource efficient solutions in buildings to ensure a healthy urban and building environment whilst ensuring environment conversation and the recovery of the huge energy saving potential in buildings;

(d) to provide technical tools that take account of the various climatic conditions in Uganda with the aim to encourage the design of healthy and comfortable buildings and urban environments that require a minimum amount of non-renewable energy;

(e) to promote quality of the built environment through parameters and requirements that ensure solid, secure, healthy and sustainable building and urban environment; and

(f) to incorporate criteria to reduce energy consumption and promotion of energy and resource efficiency in building indicating building technologies, resources management and processes oriented towards sustainable use of natural resources.

139. Scope of Part.

(1) This Part shall apply to-

(a) new buildings;

(b) additions to existing buildings;

(c) alterations to existing buildings (restoration works or alteration of equipment, electrical appliances or sewer system;
(d) buildings or parts of buildings that, due to their use, are permanently open and conditioned;
(e) mechanical systems and equipment, including cooling, heating, ventilating and air conditioning;
(f) service hot water heating;
(g) interior and exterior lighting;
(h) electrical power and motors;
(i) water facilities;
(j) sewer systems;
(k) solid waste management;
(l) land, vegetation and landscaping;
(m) drainage systems; and
(n) urban planning design.

(2) The following are exempted from the application of this Part—
(a) temporary buildings with a planned use at or below two years;
(b) unconditioned storage spaces and warehouses;
(c) workshops and rooms or spaces for defence activities, industrial and agricultural processes of defence and agricultural buildings.

(3) Subject to subparagraph (1), this Part shall apply to the climatic zones and relief zones of Uganda illustrated in Schedule 2.

140. Climatic zone 01: hot-arid.

The hot-arid zone—
(a) is found in more or less large spots, between the semiarid and desert climates;
(b) includes the parts far from the sea, with altitudes ranging from 0 m to 500 m;

(c) maximum temperatures are high, higher than those of the hot-humid climate and high is the daily temperature variation;
(d) humidity, especially in the hottest hours, is very low;
(e) breezes are generally light with no strong predominant direction;
(f) for the hottest month, the mean maximum air temperature is about 36 °C, mean minimum air temperature 23 °C, mean temperature swing about 12 °C and mean relative humidity about 40%; and
(g) global solar radiation over horizontal surface is 7 kWh/ m2 day.

141. Climatic zone 02: hot-semiarid or savannah.

(1) The hot-semi arid or low savannah and savannah zones substantially differ from the hot-arid for the higher humidity values and higher peak temperatures.

(2) The daily temperature swing for the hot-semiarid or savannah is comparable to the hot semi-arid.

(3) In hot-semiarid or savannah, for the hottest month, the mean maximum air temperature is about 33 °C, mean minimum air temperature 22 °C, mean temperature swing about 11 °C and mean relative humidity about 65%.

(4) The global solar radiation over horizontal surface is 4.2-6.3 kWh/m2 day.

142. Climatic zone 03: lake region.

The climatic zone 03: lake region—
(a) includes a strip 0-25 km wide along the shore of lake Victoria;
(b) has temperature slightly lower than the savannah zones, but daily variations are comparable;

(c) has humidity slightly higher than in savannah zone, even if in the same altitude range, due to the lakes;
(d) in the hottest month, the mean maximum air temperature is about 28-29 °C, mean minimum air temperature 16-17 °C, mean temperature swing about 12 °C and mean relative humidity about 60-70%;
(e) the global solar radiation over horizontal surface is 5.5 kWh/m2 day.

143. Climatic zone 04: high upland.

Upland and high upland zones are areas-

(a) for which some heating degree-days are recorded;
(b) at altitudes between about 1500 to 2000m and above;
(c) generally cool where some heating is welcome in the coolest days of the year and at over 2000m heating is necessary for most part of the year;
(d) with fairly high humidity similar to that of semi-humid zone;
(e) for the hottest month, whose mean maximum air temperature is about 26-27 °C, mean minimum air temperature 14-16 °C, mean temperature swing about 10-12 °C and mean relative humidity about 60-65%;
(f) for the coldest month, whose mean maximum air temperature is about 20-24 °C, mean minimum air temperature 14-15 °C or around 12ºC above 2000m, mean temperature swing about 6-10 °C and mean relative humidity about 60-75% and up to 80% in high lands;
(g) whose global solar radiation over horizontal surface 5.3-7 kWh/m2 day.

144. Design of buildings.

A building shall be designed and built to ensure a good indoor environment quality with a minimum use of non-renewable energy as follows-

(a) the thermal comfort shall be provided as far as possible

through passive building measures and without artificial cooling or heating;

(b) indoor air quality shall be ensured by the quality of construction materials and source control and proper ventilation;

(c) ventilation referred to in subparagraph (b) shall use natural means such as wind and stack effect, as far as possible, and mechanical ventilation shall be used only where and when necessary;

(d) day lighting shall be used as far as possible, and buildings shall be designed to promote natural lighting; and

(e) all appliances using non-renewable energy shall present the best energy efficiency.

145. General requirements.

(1) The buildings shall be designed and built to ensure that the energy performance of the building is such as to limit the amount of energy required for the operation of the building whilst ensuring a good indoor environment quality with a minimum use of non-renewable energy and in particular-

(a) the thermal comfort shall be provided without artificial cooling or heating except in hot humid area and premises where the internal thermal load cumulated over 24hour is larger than160 Wh/m² net floor area;
(b) indoor air quality shall be ensured by the quality of construction materials, contaminant source control and natural ventilation in the whole building and with special focus on kitchens: mechanical ventilation may be authorized in some cases;
(c) for each building, a ventilation principle shall be

established which may include the following ventilation modes—

(i) natural ventilation with automatic or manual control;
(ii) mechanical extraction with air supply through on purpose openings;
(iii) double flow mechanical ventilation with heat recovery if the air is conditioned; or
(iv) a combination of subparagraph (i) to (iii).

(d) the description of the ventilation principle shall include the localization of air inlets and outlets, and airflow rates at all possible regimes, and it shall allow users to get the necessary airflow by an appropriate use of the mechanical ventilation or ventilation openings;
(e) the location, shape and size of lighting openings shall allow adequate natural lighting of the premises during the day;
(f) acoustic comfort shall be ensured by appropriate acoustic protection against the noise from outside and, especially for large premises, by suitable internal acoustics; and
(g) fire resistance, waterproofing, stability, accessibility and security in all the buildings shall be ensured in accordance with this Code.

(2) Comfort requirement for indoor air quality, thermal, visual and acoustical comfort shall be adapted to the users, their activity and clothing, as well as to user's habits.

146. Building design prescriptions related to energy efficiency.

Notes(i) Passive design strategies. Applied to Architecture, the term "passive design" or "bioclimatic design" refers to a building whose architectural features take advantage of local climatic resources to provide indoor environment as comfortable as possible, thus

reducing the energy consumption due to the need for mechanical heating or cooling.

(ii) A bioclimatic building is completely integrated into the cycles of nature and is able to use them without causing damage. This way comfort can be achieved through passive means and architectural features before the introduction of mechanical systems if the building design is properly addressed.

(iii) In passive architecture, the means that the architect can use for creating thermally and visually comfortable indoor environment are: solar radiation, wind, orientation and shape of the building, walls and roof thermal mass, thermal transmittance and colour, size of openings and type of glazing.

(1) In tropical climate, with the exception of highlands, where some heating may be necessary, solar radiation shall be kept out of the building as much as possible, because solar gains produce a temperature increase as described in Figure 1 set out in Schedule 3.

(2) Passive building design measures shall take precedence to mechanical means in order to achieve thermal and visual comfort in any building and avoid unnecessary energy consumption through-

(a) proper orientation;
(b) proper configuration;
(c) adequate building materials according to the climatic zone;
(d) adequate opening sizes;
(e) adequate solar devices to avoid overheating;
(f) proper natural ventilation;
(g) proper access to natural lighting; and
(h) natural cooling and passive heating.

147. Building orientation.

(1) To avoid overheating in buildings, the main facades shall be oriented taking into account the sun path, the prevailing winds, the slope of the ground and external obstacles.

(2) In hot climates, living and working rooms shall be protected against solar radiation, making use of canopies, awnings, overhangs and fins or trees, plants, foliage or hedges to provide shade.

(3) In Uganda, the South and North facades are almost not exposed to the sun and the solar protection of these facades is much easier and more efficient than that for the East or West facades that are hit by the direct sun in the morning or afternoon and for this reason, the main facades are preferred facing North and South, avoiding as far as possible openings towards the East and West.

(4) Where the main facades with openings might end up on the East and West, the use of shading systems shall be employed in the most intelligent ways to promote thermal comfort.

(5) In places with strong winds, the building and its occupied surroundings shall be protected from the impact of wind on the facade by trees, plants, foliage or hedges or embankments, or adapting the shape of the building and in places with weak winds, placing the ventilation openings upwind and downwind improves the natural ventilation as prescribed in Figure 2 set out in Schedule 3.

(6) The orientation of the building and of it lighting and ventilation openings shall contribute to improve thermal comfort, ventilation and daylight.

(7) The facades with the largest windows area shall be oriented towards the North or the South, with ± 30° tolerance.

(8) The less occupied spaces such as corridors and service

rooms shall be adjacent to the façade that is most exposed to nuisance, while frequently occupied spaces shall be adjacent to the facades best protected against nuisances and most exposed to sight in accordance with Figure 3 set out in Schedule 3.

148. Building shape and configuration.

Note

The capability of a building to store or release heat is connected to its volume and shape and to its mass, since losses or gains take place through its surfaces. Thus, the ratio of surface to volume determines the heating rate during the day and the cooling rate during the night.

(1) Optimum shape depends upon the type of tropical climate as follows-

(a) in hot arid zones, where daily temperature swing is high between hot days and cool nights, the best is a compact shape (low surface to volume ratio), to minimise the envelope area exposed to the sun;

(b) in hot humid zones, where daily temperature swing is small and the humidity is high, the shape shall be as open as possible in order to allow natural ventilation and all the precautions shall be taken to ensure sun protection;

(c) in climates in between hot arid and hot humid, the choice between compactness and openness shall depend upon the prevailing climatic conditions, that is, if closer to hot dry or to hot humid, and on the availability of wind.

(2) The building's depth or the distance between the opposing facades, is another determinant as follows-

(a) in hot humid climate, in order to favour air circulation, the depth shall be limited, and the dwelling rooms shall be arranged in a row and provided with large openings on the opposite exterior walls;

(b) in hot dry climate, natural ventilation shall be avoided during the day, but night ventilation shall be favoured for cooling the building in accordance with Figure 4 set out in Schedule 3.

149. Building materials.

Notes

Local climate plays a role in the standard requirements for the material selection and techniques used to construct the building envelope. Standard requirements specify the insulation levels in the floor, ceiling, and walls and are intended to seal the building against air leakage and moisture migration. The defined energy-efficiency levels of envelope's components take into consideration heat gain and daylighting.

(1) Building designers and contractors shall ensure that the building materials specified for the building are used in accordance with this Code.

(2) Building materials shall be, as far as possible, selected from materials extracted or manufactured locally.

(3) Embodied energy of building materials shall be as little as possible in accordance with Figure 5 set out in Schedule 3.

(4) Where selection is beyond what is available locally, justified reasons that present the popular choice shall be presented and the environmental gains identified.

(5) For purposes of subparagraph (3), "embodied energy or the energy content of a building material" comprises all the energy consumed in acquiring and transforming the raw materials into finished products, and transporting them to the place of installation or the building site.

(6) Building materials shall—

(a) not be harmful to health through releasing gases or aerosols in quantities that can be harmful to health or production of natural or induced radiation;
(b) be resilient and able to be repaired with local means;
(c) be abundant and come from a source and manufacturing process with minimal effect on the environment;
(d) have good thermal and acoustic properties; or
(e) generate little waste and be, as far as possible, reusable or recyclable.

(7) Green cements and recycled concrete aggregates shall be encouraged.

(8) The finishes materials used shall be resistant to aggressive agents of the environment and contribute to the reduction of maintenance costs.

(9) Building materials shall be selected according to the local climate as described in Figure 6 set out in Schedule 3.

150. Building envelope.

Notes. (i) The building envelope design is a very important part of the design process. The building envelope should be considered as the first characteristic of the building which can be modified based on the climate and immediate environment, in order to control the indoor climate.

(ii) It is essential to adapt the envelope design to the climate where the building is located. Uganda is subject to a predominantly hot and humid climate throughout the year. It is important, therefore, to design the building envelope such that it minimizes solar heat gains and risks of overheating.

(iii) It is usually effective to use solar shading to attenuate heat gains, and to use insulation only where it is found to positively reduce solar gains without causing internal gains to be "trapped" inside the building (for example using insulation in roofs rather than walls, since the roof is the element through which most of the solar gains enter a building).

(1) The building envelope includes all walls, roofs, floors and openings (fenestrations and doors) separating the occupied spaces from outdoor space and the roof shall be protected from solar gains either by horizontal ventilated shading or use of insulation as illustrated in Figure 7 set out in Schedule 3.

(2) The building envelope shall protect the occupants from external nuisance, including rain, noise, and wind; contribute to thermal comfort and minimise heat gain to reduce the overall cooling load when required.

(3) To allow flexibility, a person may use any of the following in designing a building envelope—

(a) the prescriptive path which is based on the use of fixed U-values for each component of the building envelope in relation to the Window to Wall Ration (WWR) and the maximum Solar Heat Gain Coefficient (SHGC) of glazing which requires relatively less effort to demonstrate compliance but allows less design flexibility;

(b) the overall building-envelope trade-off option which is based on the use of equations and tabulated reference values, and involves the demonstration of compliance with two separate requirements:—

(i) the thermal transmittance values of the whole envelope (walls, windows and roofs) and the equivalent window to wall ratio (proportion of window that remains unshaded to wall ratio); and

(ii) the overall envelope approach which permits trade-off

between building envelope components, and as such provides more building design flexibility;

(c) the performance path which is based on the general energy performance of the building and any strict use of this method requires an energy simulation software, and involves the demonstration that the annual thermal heating and cooling energy requirements of the proposed building are less than or equal to the annual thermal heating and cooling energy requirements (kWh/m2.year) for similar category of buildings in the appropriate climatic zone: the performance path requires relatively more effort to demonstrate compliance but allows greater design flexibility than the others.

Note: *The prescriptive and building-envelope trade-off path cannot be used when the proposed building has a window to gross wall ratio greater than 45%, or when the proposed building has a skylight to gross roof ratio (the gross roof area is inclusive of the skylight area) greater than 5%. The performance path should be used in these cases. The performance path may be used when innovative design concepts are being considered.*

(4) The envelope's requirements in this paragraph are established according to the climate zones defined in this Code.

(5) The heat transfer coefficient of the facades shall be less than-

(a) the U-values given in Table 15 set out in Schedule 1 if the prescriptive option is chosen; or

(b) the U-values given in Table 16 or 17 set out in Schedule 1 for the Trade-Off option.

Notes.

(a) Heat transfer: U-values

(i) The heat transfer of the building envelope or U-value depends on the characteristics of the materials of the

building envelope components and the airtighting of the openings. Each building material has a different U-value that depends on its capacity to transmit heat and the thickness of the layer. The sum of the U-values of each component in relation to its area will determine the heat transmittance of the envelope.

(ii) Every specific climate will require a specific envelope heat transfer in order to maintain thermal comfort indoors.

(b) Window to wall ratio

The building component with lower resistance to the heat transfer are usually the windows. For this reason, the area of windows shall be limited as per climatic zone. The "Window to Wall ratio" WWR, is the Window area (measured to the outside of the frame) to gross exterior wall area ratio (including all areas in the walls that let in light).

(6) The envelope of buildings with mechanical ventilation or air conditioning shall be as airtight as reasonably possible when the doors, windows and other openings are closed.

(7) Opaque construction of walls shall follow—

(a) prescriptive or trade-off requirements prescribed in subparagraph 5 according to the local climatic zone;

(b) walls shall have a reflective external surface or reflective insulation and it is recommended to use light-color and reflective finishes to building surfaces as this can help reduce the solar heat load: if insulation is used, it is recommended to use insulation which contains reflective foil on one side, and that it is placed so that the reflective side of the insulation is on the external side of the roof or wall;

(c) appropriate building components as per climatic zone

shall be adapted which shall use materials available locally in accordance with Figure 8 set out in Schedule 3.

(8) Roofs shall comply with the following-

(a) roofs in any climatic zone shall be waterproofed;

(b) prescriptive or trade-off requirements shall comply with subparagraph 5(b) according to the local climatic zone;

(c) ventilated roofs shall have a space between the roof and the ceiling, the smallest thickness of which is larger than a hundredth of the distance between the cornice and the ridge; ventilation openings with an area exceeding one hundredth of the area of the roof shall be practiced at the cornice and the ridge;

(d) the reflection coefficient for solar radiation of roofs shall be as large as possible, preferably greater than 70%;

(e) cool roofs: roofs with slopes less than 20 degrees shall have an initial solar reflectance of no less than 70% and an initial emittance no less than 75%;

(f) the dynamic thermal transmittance of not ventilated roofs shall not exceed 0.20 w/(m² k); roofs which thermal transmission coefficient equal to or less than 0.20 w/(m²k) meet this requirement;

(g) where the climate is adequate, unventilated roofs may be covered with vegetation (green roofs);

(h) appropriate roof building components as per climatic zone shall be used which shall be adapted to the materials available locally as prescribed in Figure 9 set out in Schedule 3.

Notes

The roof is the part of the building receiving most of the solar radiation. The outer surface absorbs radiation and heats up; the roof then transmits this heat to its inner surface, which increases the air temperature. Thus roof thermal performance is critical for thermal comfort. The thermal performance depends to a great extent on the shape of the roof, its construction and the materials used.

(9) Fenestration may take the following options-

Notes
Roughly 40% of the unwanted heat that builds up in a building comes in through the windows. For this reason direct sunlight in hot climates must be excluded from the windows through proper orientation and adequate solar devices.

(a) vertical fenestration and skylight assemblies installed or replaced in the building external envelope shall meet either of the following requirements according to the local climatic zone-
   (i) prescriptive option:—
      (aa) U-Values and Solar Heat Gain Coefficients (SHGC) of the glazing shall not exceed the maximum SHGC and U-Values requirement according to the WWR shown in Table 15 set out in Schedule 1 for the prescriptive method; or
      (bb) Architectural Shading Factor (ASF) must not be less than the minimum ASF requirement according to the orientation shown in Table 19 set out in Schedule 1.
      (cc) the adjusted SHGC of the glazing, as modified by the ASF from external shading devices, using the Table 17 set out in Schedule 1.

(b) Trade-Off option:—
   (i) U-Values of the glazing shall not exceed the maximum shown in Table 16 set out in Schedule 1 for the Trade-Off method;
   (ii) U-Values of the glazing shall be appropriate to comply with the U-Value requirements for the Overall Envelope shown in Table 17 set out in Schedule 1;

(c) vertical fenestration area is limited to a maximum of 60% of the gross wall area for the prescriptive requirement;

(d) skylight area is limited to a maximum of 5% of the gross roof area for the prescriptive requirement; and

(e) unintentional air leakage in doors and windows shall be controlled, especially when artificial conditioning is in place as prescribed in Figure 10 set out in Schedule 3.

Movable and Fixed Solar Protections

151. Solar protections.

Notes

In a space, either passively ventilated or where unavoidable, air-conditioned, the goal is to control the direct solar radiation to ensure thermal comfort, adequate lighting and minimization of energy consumption.

Shading of east windows and especially west should be prioritized in a tropical climate like Uganda's. Exterior devices are more effective than interior devices. They are optimal in climatic zones where 100% sun protection is necessary. Mobile systems allow more flexible control of lighting and ventilation, when needed. High thermal resistant solar devices should be put in place to avoid overheating and thus heat transmission.

(1) Every window shall be protected by movable or fixed solar protections from direct solar radiation according to the needs in each climatic zone in order to avoid overheating of the building.

(2) Any window orientated more than 15 degrees off of true north or south requires careful assessment to avoid unwanted sun penetration as shown in Table 19 which demonstrates the Architectural Shading Factor (ASF or the proportion of the window that remains unshaded) according to the Projection Factor (PF) of the shading devices (overhangs and fins) and the orientation of the window* for a latitudes of ±23°.

(3) Solar protections shall allow natural lighting suitable to the activities of the occupants.

152. Movable solar protections.

(1) External movable solar protections installed shall be wind-resistant.

(2) The overall solar energy transmission factor of the window (glazing and solar protection) shall not exceed 0.15.

(3) Transparent or translucent roof lights shall be equipped with mobile solar protection and have an area of not less than 5% of the net floor area of the lit premises.

(4) The requirements on mobile sunscreens may be reduced in the presence of fixed solar protection, as long as the external heat load on a sunny day does not exceed the external heat load with an overall energy transmission factor of the window equals to 0.10 and verification shall be performed for each room.

153. Fixed solar protections.

Notes.

Fixed solar protections must be used in hot climates when mobile solar protections can not be implemented. In this case, the solar devices must be carefully designed in order to protect the window from direct solar radiation. Once the fixed solar protections are in place, the ***equivalent Window to Wall Ratio (WWR-eq)*** *is the proportion of the windows that remains unshaded.*

(1) In order to avoid overheating of any room due to solar radiation the equivalent window to wall ratio (WWR-eq) of buildings not equipped with mobile solar protections shall not exceed the limits given in Table 18 set out in Schedule 1.

(2) The WWR-eq and the impact of the solar load in a building depends on the ratio of windows to gross wall areas, the ratio of skylight to roof area, the glass Solar Heat Gain Coefficient (provided by the supplier), the Architectural Shading Factor that depends on the permanent solar protections of the building (overhangs, fins and verandas), the orientation of opening and latitude as calculated in the

following formula in accordance with Figure 11 set out in Schedule 3.

WWR-eq = ∑(Awi x SHGCwi x ASFwi) / Av + 2 x∑(Asi x SHGCsi) / Ah

Awi = Area of the individual window (m^2)

SHGCwi = Solar Heat Gain Coefficient of the individual window (provided by supplier)

ASFwi = Architectural shading factor of the individual window (look at the PF tables at the end of the document)

Av = Area of all vertical surfaces (opaque walls + windows) (m^2)

Asi = Area of the individual skylight (m^2)

SHGCsi = Solar Heat Gain Coefficient of the individual skylight (provided by supplier)

Ah = Area of all horizontal surfaces (roofs + skylights) (m^2)

The projection factor of overhangs and fins will determine the proportion of the window that remains unshaded, (ASF), and it is equal to the proportion of A with respect to B:

Pf=A/B

e.g. PF=15 and ASF=0.88 means that A is a 15% of B and shades 22% of the window (100%-88%)

(3) Solar devices shall be adequate to the local climate and meet the requirements shown in Table 19 set out in Schedule 1 according to the latitude and orientation of the window.

154. Minimum visible transmittance of glazing.

In order to permit the use of available daylighting instead of electric lighting, glazing products used in offices, banks, libraries, classrooms and other building typologies with predominant daytime

usage, shall have the minimum visual transmittance (VT), defined as function of WWR, equal to or greater than the Minimum VT requirements of Table 20 set out in Schedule 1 and Figure 12 set out in Schedule 3.

155. Building envelope sealing in cases where AC is used.

(1) Site-constructed windows and doors, exterior joints, seams or penetrations in the building envelope, that are sources of infiltration or air leakage, shall be sealed with durable caulking materials, closed with gasketing systems, taped or covered with moisture vapor-permeable house-wrap, and heat resistant.

(2) Sealing materials spanning joints between dissimilar construction materials shall allow for differential expansion and contraction of the construction materials including sealing around recessed lights and around all plumbing and electric penetrations: these being the openings located in the building envelope between conditioned space and unconditioned space, or between the conditioned space and the outside.

(3) In air-conditioned buildings, the building envelope shall act as a barrier to prevent uncontrolled entry of outside air into an air-conditioned space.

(4) The following areas of the enclosed building envelope shall be sealed, caulked or weather-stripped to minimize air leakage—

(a) joints around fenestration and door frames;
(b) openings between walls and foundations and between walls and roof and wall panels;
(c) openings at penetrations of utility services through roofs, walls, and floors;
(d) site-built fenestrations and doors;
(e) building assemblies used as ducts or plenums; and
(f) all other openings in the building envelope.

156. Natural ventilation.

Notes

Natural ventilation is a passive measure to maintain a healthy indoor environment. It is required to supply fresh air for respiration of occupants, to dilute inside air and prevent vitiation by body odours and to remove any products of combustion or other contaminants in air. It is also a way to provide thermal comfort, since it assists in the maintenance of heat balance and body cooling specially in hot and humid climates. A certain minimum desirable wind speed is needed for achieving thermal comfort at different temperatures and relative humidities.

A proper design of the building layout shall utilize prevailing wind conditions to achieve adequate cross ventilation

(1) In order to promote natural ventilation, the following may be adopted—

(a) orient building at any convenient angle between 0º-30º from the perpendicular winds of the hot season and orient roofs towards the prevailing breeze;

(b) windows and doors located diagonally opposite each other perform better for ventilation;

(c) the location of an outlet opening higher than the inlet and of equal area maximizes ventilation;

(d) if openings cannot be provided in two walls, room width should be limited up to 6.5m, otherwise a depth up to 3 times the ceiling height may be naturally ventilated according to Figure 13 set out in Schedule 3.

(2) Natural ventilation shall take precedence over artificial ventilation.

(3) In every occupied space, openings for natural ventilation shall be provided and in rooms without mechanical ventilation, two openings shall be provided, one of which shall be as close as possible to the ceiling.

(4) In each residential room, the ventilation openings shall have—

(a) an area equal at least to 5% of the net floor area, or 0.2m^2, whichever is the greater;

(b) 10% if the opening opens onto a veranda, roofed and enclosed balcony or gallery;

(c) 15% in schools, offices, meeting rooms, restaurants and other spaces with high occupancy, and these openings must be opened and closed at will.

(5) Natural ventilation shall not be under 0.35 ACH (Air Changes per Hour) since the normal rates are between 0.5 and 1 ACH: if infiltration is reduced below 0.35 ACH, it is recommended that mechanical ventilation be implemented.

(6) Where openings are covered with louvers or otherwise obstructed, openable area shall be based on the free unobstructed area through the opening.

(7) Air vents shall be placed at a height above the floor of not less than two-thirds of the average height of the room.

(8) New or renovated premises with natural ventilation shall be equipped with a ceiling fan from or an electrical socket for such a fan for every 20 m² of floor.

(9) Solar chimneys for natural ventilation in places where passive ventilation is difficult shall take precedence over mechanical ventilation as prescribed in Figure 14 set out in Schedule 3,

157. Natural ventilation in kitchens and bathrooms.

(1) Kitchens, both residential and industrial shall be provided with operable openings for natural ventilation in a proportion of 15% of the floor area.

(2) Ventilation exhaust fans shall be installed in non-residential kitchens and bathrooms to be able to maintain a minimum ventilation rate of 50 m3/hour/person when such spaces are occupied as prescribed in Figure 15 set out in Schedule 3,

158. Natural lighting.

(1) To obtain a good day lighting system, the following means shall be considered in the early design stage-

(a) orientation and space organization;
(b) shape and size of glazing;
(c) internal surface properties;
(d) protection from solar gain or glare, external and internal shading devices;
(e) solar and thermal properties of windows.

(2) All buildings shall have adequate natural lighting and lighting facilities according to the needs of the users while being energy efficient in their operation.

(3) In every occupied room, staircase or corridor, openings to provide daylight in buildings shall be required.

(4) Windows shall be made, located and, where appropriate, screened such that sunlight through them does not cause overheating in the rooms, and to avoid nuisance from direct solar heat gain.

(5) The effective area of daylit openings, their transparent area multiplied by their light transmission coefficient without mobile solar protections shall be between 20% and30%of the net floor area of the room.

Note: 25% of Wall to Window Ratio (WWR) is the optimum rate for natural lighting. Beyond this value a sort of saturation is reached, while consumption for cooling continues to grow uniformly.

(6) Buildings whose floor area exceeds 500m2 shall provide a control system to adjust the ignition to the actual occupation of the area as well as a control system that optimizes the use of natural light in areas that fulfil certain conditions as the Building Committee may determine.

(7) The distance between the work or stay places and the openings shall not exceed 3 times the height of the openings above the working place.

(8) The illuminance (in Lux) shall be adapted to the use and activity or applications as shown in Table 21 set out in Schedule 1.

Notes

(i) Encourage design that optimizes the use of effective daylighting to reduce energy use for artificial lighting.

(ii) Adding small openings gives better daylighting performance than increasing window size. Larger windows cause more glare and require more shading.

(iii) Daylight penetration depends on the obstructions and shading elements applied. With no obstructions and shading elements the natural light penetrates 2 times the window head height. Beyond that artificial lighting should be used during the day. If obstructions are located in front of the building natural lighting will be reduced, and other type of calculations should be applied to find out the daylight autonomy area.

(iv) Clear colours of interior walls and ceiling enhance natural and artificial lighting due to their higher reflectance.

(9) The daylight autonomy for general activities is established at an illuminance of 300 lux.

(10) In working areas, the variation of luminance of the surfaces and sources of light in the visual field shall be limited to a factor 3 in the ergorama (60° aperture field around the centre of attention) and a factor 10 in the panorama, 120 ° aperture field as prescribed in Figure 16 set out in Schedule 3.

159. Natural cooling.

Notes.

(i) Passive cooling is a comfortable, cheap, and energy-efficient way to keep the indoor environment within a comfortable temperature range. In well adapted buildings, it can ensure a comfortable indoor climate in the hot season without artificial cooling, provided that internal heat load is not too large.

(ii) To cool the air without making use of any mechanical means, some "natural" technical solutions are available. These techniques may be proposed either as the only cooling system or in conjunction with an air conditioning system which intervenes as an alternative to the first when the external or internal conditions are such as to not allow reasonable comfort conditions.

(1) Passive cooling shall take precedence over artificial cooling.

(2) As a precaution, passive cooling shall not be used in areas where the water vapour content of outdoor air exceeds that corresponding to 75% RH indoors for more than a week.

(3) For the cases in subparagraph (2), indirect evaporative cooling and maximization of ventilation shall be applied to cool the environment and reduce the feeling of heat.

Cooling Provision in Different Climatic Zones.

160. Cooling provision in hot-arid climatic zone.

(1) The passive ventilation cooling strategy shall be applied in residential buildings and, as far as possible in other buildings.

(2) Water bodies and vegetation both in the patios and around the building shall be put in place, when possible, in order to promote evaporative cooling.

(3) Obstruction of prevailing winds shall be avoided when possible.

(4) When prevailing winds cannot be captured or vegetation and water bodies cannot be put in place, evaporative cooling towers may be implemented in order to enhance passive cooling prescribed in Figure 17 set out in Schedule 3.

(5) Systems of natural cooling through underground water stores and cool stones, may be implemented to enhance natural cooling.

161. Cooling provision in hot semi-arid or savannah.

(1) The passive ventilation cooling strategy shall be applied in residential buildings and, as far as possible, in other buildings.

(2) Where the minimum relative humidity throughout the year is over 75%, hot and humid cooling measures shall be applied.

(3) Where minimum relative humidity throughout the year is under 75% hot and dry measures shall be applied as prescribed in Figure 18 set out in Schedule 3.

162. Cooling provision in Great lakes.

(1) The passive ventilation cooling strategy shall be applied in residential buildings and, as far as possible in other buildings.

(2) The strategy referred to in subparagraph (1) consists in evacuating during the night, by natural ventilation, the heat accumulated in the mass of the building during the day.

(3) The building design elements to apply to the strategy referred to in subparagraph (1) are as follows—

(a) the outdoor dew point must be lower by 6°C to the upper comfort temperature limit;

(b) in occupied spaces, the thermal capacity per unit net floor area,CR/Anetf, shall be atleast 180 kJ/m2K or 45 Wh/(m2·K): a ground floor, a concrete slab with or without tiles, or adobe, concrete or solid masonry walls that are

apparent on an area corresponding to at least 80% of the floor area of the room shall meet these requirements;

(c) openings that can remain open overnight shall be provided at suitable places to secure strong aeration of premises even in the absence of wind; facade and roof windows can be used for this purpose;

(d) a large opening shall be located as high as possible in the considered volume, to evacuate all hot air (stack effect); and

(e) the total area of the openings shall be at least 5% of the floor area: single sided ventilation is suitable for the premises of less than 3m deep and in the other premises, openings shall be provided on two opposite walls.

163. Cooling provision in High Upland.

The passive ventilation cooling strategy shall be applied in residential buildings and, as far as possible, in other buildings in order to maintain indoor comfort in the hot season.

164. Passive heating.

Notes

Passive heating consists in heating the building by allowing solar radiation to enter, in most cases through the windows. The building is then heated during the day, and thermal insulation and inertia are sufficient to maintain a comfortable temperature overnight.

In tropical climates where temperatures do not reach under 10°C heat load needs can be covered though passive heating, so artificial heating should not be necessary. Under this temperature, artificial heating may be used.

(1) Passive heating shall take precedence over artificial heating.

(2) In climate zones where the daily mean temperature may fall below the comfort range of between18 to 20°C, every new or renovated building shall be designed to allow for using the passive solar heating strategy.

(3) The building design elements to apply the strategy in this paragraph are as follows-

(a) premises to be heated in the morning are oriented to the East, and to the West for heating in the afternoon;

(b) the thermal insulation of the building envelope shall be enough to reduce the heating energy demand to less than 10 kWh/m² floor area;

(c) in occupied spaces, the thermal capacity per unit net floor area,C_R/A_{netf}, shall be atleast 180 kJ/m^2K or 45 Wh/(m^2·K);

Note: A ground floor, a concrete slab with or without tiles, or adobe, concrete or solid masonry walls that are apparent on an area corresponding to at least 80% of the floor area of the room shall meet these requirements.

(d) the windows of the premises to be heated shall have a transparent area between 20% and 30% of the net floor area and the windows shall be equipped with clear glass and mobile sunscreens.

Passive Heating Provision in Different Climatic Zones

Note:
Passive heating should only be necessary in high upland climate throughout the day in the colder season and in lake region climate during the night.

165. Passive heating requirements in high upland.

(1) The requirements of passive heating for this climate shall comply with paragraph 164 (3).

(2) Windows and solar devices shall be carefully designed to allow solar radiation to enter into the building in the colder season and prevent direct solar radiation in the hot season.

166. Passive heating requirements in Great lakes.

(1) Passive heating in Great lakes region is only required during the night, so walls with high thermal mass shall be put in place in order to provide the necessary heating during the night.

(2) The requirements of passive heating for this climate shall comply with paragraph 160 (1)

167. Compartments: rooms, staircases, accesses and circulation.

(1) Specific requirements contained in Table 22 set out in Schedule 1 shall apply to compartments ventilation, lighting, conditioning and orientation.

(2) The minimum recommended area and distance roof ceiling are contained in Table 23 set out in Schedule 1.

168. Acoustic comfort.

(1) Any building shall be isolated from external noise in order to preserve indoors comfort conditions and health.

(2) The background noise level in the occupied premises shall not exceed the levels of Table 24 set out in Schedule 1 and shall in no case exceed 85 dB (on 10 seconds average) as indicated in the table.

(3) The outdoor noise produced by human activities shall not exceed the levels of Table 25 set out in Schedule 1, when measured at 10m from the source.

(4) The acoustic insulation of the building envelope shall be adapted to external noise, so that the levels mentioned in Table 25 set out in Schedule 1 are not exceeded.

(5) The reverberation time in the premises shall be adapted to occupants' activities and for good speech intelligibility, it shall be between 0.5 and 1 second.

169. Moisture control.

Notes

(i) Moisture ingress through the building envelope can cause a number of problems including mold and mildew, corrosion, rot, insects, staining, adhesion loss and loss of thermal resistance.

(ii) Moisture can also affect the building's comfort to its occupants and health; therefore, it is recommended that vapor retarders or moisture shields are used on the exterior surface of the building envelope where moisture ingress is likely to be a problem (roof, basement walls, etc.)

(1) Accumulation of water in cracks, pores and voids of building components in quantities that may cause damage or promote mould growth is not allowed.

(2) The thermal resistance of a construction element shall not decrease under the influence of moisture: a minor and reversible variation may be tolerated.

(3) Irreversible changes caused by humidity shall be excluded.

(4) In order to remove moisture—

(a) spaces with important sources of humidity including kitchens, bathrooms or laundries shall be sufficiently ventilated (passively or active-passively), so as to quickly evacuate the water vapour produced;

(b) air drying is necessary if the water vapour content of outdoor air exceeds that corresponding to 75% RH indoors.

(5) To control condensation or mould growth risk—

(a) the building shall be designed and built so that, in occupied spaces-

(i) there is no risk of surface condensation of water vapour occuring anywhere; or

(ii) there is no risk of mould growth;

(b) the momentary appearance of surface condensation may be tolerated if it causes no damage;
(c) to avoid the mould growth risk, the relative humidity of the air near the surface layer shall not exceed 80% for a period of more than two consecutive weeks;
(d) special operating measures including stopping ventilation, reducing airing, dehumidification or heating depending on the use of the space shall be taken in the premises with locations whose surface temperature is kept permanently at or below the dew point of the outdoor air.

(6) To control moisture in building components, a person shall ensure—

(a) no harmful build-up of moisture appears in building components;
(b) the risk assessment is done and takes into account the transport of moisture by-
  (i) convective air flows;
  (ii) capillarity; and
  (iii) the diffusion of water vapour;

(c) calculations according to the standard ISO 13788[20] allow assessing the transport of moisture by vapour diffusion and specific assessments may be necessary to take into account the three modes of transport referred to in subparagraph (b).

170. Efficient water management and use.

Notes

(i) The Ministry of Water and Environment and other relevant agencies shall provide national outreach and technical assistance as needed regarding water efficiency, which shall include the development of best management practices for community water efficiency and conservation.

(ii) More than 30% of water used in cities is wasted due to leakages in the distribution system

These best management practices for community water efficiency and conservation shall address as a minimum, the following practices-

(a) integrating water efficiency and conservation into water supply plans;
(b) conducting regular water audits to identify revenue and nonrevenue water and water losses;
(c) adopting water loss abatement programs;
(d) metering and submetering of existing multiunit residential, commercial, and industrial complexes;
(e) retrofitting fixtures, equipment, and irrigation systems to make them more water efficient;
(f) landscaping in a manner that conserves water use and is regionally appropriate;
(g) employing water reuse practices that include harvesting rainwater and using recycled greywater; and
(h) performing regular checks on plumbing systems to check for leakages, wastages, and system degradation.

171. Water efficient fittings.

(1) Low consumption sanitary fixtures that need less amount of water than conventional ones shall be installed in all buildings including-

(a) low-volume flush toilets;
(b) dual- flush toilets;
(c) vacuum toilets;
(d) composting toilets;
(e) low-consumption urinals;
(f) urinals with on-demand sensor;
(g) waterless urinals;
(h) water efficient faucets and tap adaptors;
(i) faucets with on-demand sensors and faucets with automatic shut-off systems;
(j) controlling water flow and timers on showers;

(k) water efficient shower heads;
(l) showers with automatic shut-off systems;
(m) low-flow kitchen sink;
(n) basin taps and mixers;
(o) shower taps, mixers or showerheads;
(p) sink or taps and mixers; and
(q) all other water fittings.

(2) Use of water efficient fittings that are certified by the Uganda National Bureau of Standards shall be preferred.

(3) Provision of private water meters to monitor high water usage activities feature such as irrigation, swimming pools, fountains, ponds among other water features may be applied.

172. Solar water heating.

(1) This paragraph applies to newly constructed or renovated buildings, irrespective of their use, in which there is a demand for domestic hot water or the conditioning of a covered swimming pool over 50 litres per day.

(2) The minimum solar contribution determined by virtue of the basic requirement developed in this paragraph, could be justifiably diminished in the following cases-

(a) when the energy contribution to domestic hot water is covered by the use of renewable sources of energy, co-generation processes, or residual sources of energy from the installation of heat recovery units which are external to the buildings' own heat generation;
(b) when the location of the building does not afford sufficient exposure to the sun, owing to external barriers;
(c) in the rehabilitation of buildings, when there are irremediable limitations derived from the prior configuration of the existing building or provided under the Physical Planning Act, 2010;
(d) in newly constructed buildings, when there are irremediable limitations derived from the Physical

Planning Act, 2010, which clearly make it impossible to obtain the necessary collection surface;

(e) when so stipulated by the competent body that has to give an opinion on historical and artistic protection.

(3) In buildings where the cases in subparagraph (2)(b), (c) and (d) are encountered in the plan, the inclusion of alternative measures or elements that save thermal energy or reduce carbon dioxide emissions equivalent to the energy saving and emission reduction levels that would be obtained by the corresponding thermal solar system, shall be justified, by obtaining extra improvements in the thermal comfort and energy efficiency of the equipment or system.

Note

A thermal solar system consists of a set of components designed to collect solar radiation, transform it directly into thermal energy by transferring it to a working fluid, and finally using said thermal energy efficiently, either in the same working fluid of the collectors, or transferring it to another, so as to use it afterwards in the points of consumption. This system is supplemented with thermal energy production by a conventional back-up system which may, but need not be, integrated in the same installation.

(4) The constituent systems of the solar thermal installation for hot water are as follows—

(a) a collection system composed of solar collectors designed to transform the incident solar radiation into thermal energy to heat the working fluid that circulates through them;

(b) an accumulation system composed of one or more tanks in which the hot water is stored until its use is specified;

(c) a hydraulic system composed of pipes, circulators, valves, which establishes the movement of the hot fluid to the accumulation system;

(d) an exchange system that transfers the thermal energy

collected from the circuit of the collectors, or primary circuit, to the hot water that is consumed;

(e) a control system that ensures that the equipment functions correctly to supply the maximum thermal solar energy possible, while providing protection against many factors such as the overheating of the system, freezing risks; and

(f) a conventional back-up energy unit used to supplement the solar contribution by providing the energy necessary to cover the anticipated demand, thereby guaranteeing the continuity of hot water supply in cases of scarce solar radiation or higher demand than anticipated.

(5) The basic aim of a thermal solar system is to provide the user with a solar installation that—

(a) optimises the global energy supply of the installation in combination with the rest of the building's thermal equipment;

(b) guarantees sufficient durability and quality; and

(c) guarantees a safe use of the installation.

(6) Installations shall comprise a primary circuit and a secondary system independent of each other, avoiding any type of mixture of the different fluids that may operate in the installation.

(7) In installations with more than 10 m^2 of collection surface corresponding to a single primary circuit, the circuit shall be with forced circulation.

(8) For safety and energy efficiency reasons, a thermostatic mixing valve limiting the temperature of the distributed hot water at 60 ° C maximum shall be installed on the boiler.

(9) If the installation allows the water to attain a temperature of 60 ºC, galvanised steel components shall be excluded.

(10) To protect against electric discharges, the installation shall comply with the National Building (Standards for Electrical Installations in Buildings) Code, 2019.

(11) Electrolytic couplings shall be installed between elements of different materials to avoid a galvanic couple.

(12) If a hot water circulation system is provided, it shall be equipped with a clock interrupting the circulation when hot water is not necessary.

173. Working fluid.

(1) The carrier fluid shall be selected according to the specifications of the manufacturer of the collectors.

(2) Tap water, demineralised water or water with additives may be used as fluid in the primary circuit, depending on the prevailing climatological characteristics where the system is located and the quality of the water used.

(3) If other thermal fluids are used, their composition and thermal capacity shall be indicated in the plan.

(4) The working fluid shall have a pH of between 5 and 9 at 20 °C, and a salt content that shall be adjusted as indicated below—

(a) the salinity of the primary circuit water shall not exceed 500 mg/l of total soluble salt concentration, if it does not have this value, the conductivity value shall be taken as a limiting variable, not to exceed 650 µS/cm;

(b) the calcium salt content shall not exceed 200 mg/l, expressed as calcium carbonate content;

(c) the maximum free carbon contained in water shall not exceed 50 mg/l.

(5) Outside the values in subparagraph (4), the water shall be treated.

174. Overheating.

(1) To protect against overheating—

(a) the solar installations shall be fitted with manual or automatic control mechanisms that protect the system from overheating, as this can damage the materials or equipment and affect the quality of the power supply: automatic mechanisms will prevent overheating control through excessive waste of tap water and particular care shall be required for seasonally used systems by taking measures to avoid overheating that may be caused during the period that installations are not used;

(b) where the system can be drained to protect it from overheating, the construction shall be such that the hot water or vapour from the drainage do not pose any danger for the inhabitants and do not cause damage to the system or any other material in the building or dwelling;

(c) where the waters are hard, i.e. with a calcium salt concentration between 100 and 200 mg/l, the requisite forecasts shall be made so that the operating temperature does not exceed 60° C at any point in the consumption circuit, without prejudice to the application of the necessary measures against legionnaire's disease and in any event, the necessary means shall be taken to help keep the circuits clean; and

(d) the system shall be calculated in a way that the maximum admissible temperature for all materials and components is never exceeded.

(2) Protection against burns in domestic hot water systems where the hot water temperature at the points of consumption can exceed 60 °C, an automatic mixing or other system shall be installed to limit the supply temperature to 60 °C, although a higher temperature can be attained in the solar part to compensate for losses.

175. Resistance to pressure.

(1) The circuits shall be subjected to a pressure test 1.5 times the value of the maximum service pressure and the system shall be tested with this pressure for at least one hour without any permanent damage

or leaks produced in the installations and its interconnections: after this period, the hydraulic pressure shall not drop by more than 10% of the average value measured at the start of the test.

(2) The consumption circuit shall be able to support the maximum pressure required by the standards on potable water for open and closed consumption water installations.

(3) In case of open consumption systems with connection to the distribution network, the maximum pressure shall be taken into account to ensure that all the components of the consumption circuit can support this pressure.

176. Backflow prevention.

(1) The installation of the solar water heating system shall ensure that no relevant energy losses are produced by unintentional backflows in any hydraulic circuit of the system.

(2) The natural circulation that produces the backflow may be abetted when the accumulator is situated below the collector, and appropriate precautions shall be taken in such a case to prevent this from happening.

(3) Non-return valves are recommended for preventing backflows, except in the case of natural circulation equipment.

177. Minimum solar contribution.

(1) The annual minimum solar contribution is the fraction between the annual values of the contributed solar energy required and the annual energy demand obtained from the monthly values as demonstrated in the paragraphs (a) and (b)—

(a) Table 26 set out in Schedule 1 prescribes the minimum annual solar contribution for each climatic zone and different levels of domestic hot water demand (DHWD), at a reference temperature of 60 ºC; and

(b) Table 27 set out in Schedule 1 prescribes the annual minimum solar contribution for the application with covered swimming pool conditioning for each climatic zone.

(2) The continuously collected solar contributions are minimum levels that can be increased at the developer's discretion or with approval of the Building Committee.

(3) Irrespective of the intended use of the system, if the actual solar contribution exceeds 110% of the energy demand in a given month of the year, or 100% of said demand for more than three consecutive months, one of the following measures shall be taken—

(a) fit the system with the capacity of dissipating such excess energy with specific equipment or by means of night-time circulation of the primary circuit;
(b) partially cover the field of collectors: in this case, the collector is insulated from the heat generated by solar radiation, and in turn discharges any residual excess heat through the primary circuit fluid which continues to pass through the collector;
(c) partially empty the field of collectors and this prevents overheating, but as the loss from the primary circuit fluid has to be replaced by a fluid with similar characteristics, this operation shall, in this case, be included in the tasks covered by the maintenance plan; or
(d) divert excess energy to other existing applications.

(4) The system shall be monitored throughout the year to prevent any damage caused by possible overheating.

(5) Three conditions shall be met in all cases—

(a) losses by orientation and tilt;
(b) losses by shading; and
(c) total losses shall be lower than the limits stipulated in Table

28 set out in Schedule 1, in respect of the values obtained with optimal orientation and tilt and without any shade.

178. Calculation of the demand and sizing according to the requirements.

(1) For the calculation of the annual solar contribution, the monthly demands shall be estimated by taking into consideration the number of units (persons, beds, services, etc.) corresponding to full occupancy, except systems for tourist residential use, for which a specific demand profile based on partial occupancy is justified.

(2) The sum of the domestic hot water demands of various buildings in the same area, including all the services, shall be taken as pertaining to a single building and similarly, in buildings with various dwellings or users of DHWD, the sum of the demands of all of them shall be taken into consideration for the purposes of this requirement.

(3) Where a DHWD level with differences of more than 50% between the days of the week is justified, the corresponding daily average for the week shall be taken into consideration, and the accumulation capacity shall be equal to that of the day of the week with the highest demand.

(4) The unit values given in Table 29 set out in Schedule 1 shall be taken to assess the demand referenced at 60 ºC.

(5) The calculation of the number of people per residential dwelling shall be carried out using the average figures prescribed in this Code.

(6) If a temperature other than 60°C is selected in the final accumulator, the minimum solar contribution that corresponds to the demand obtained with the reference demands at 60°C will have to be obtained and, the demand to be considered for the calculation, according to the temperature selected, shall be that obtained using the following equation—

$D(T) = \sum D_i(T)$ (sum 12 months per year)

$D_i(T) = D_i\ (60° C) \times (60 - T_i) / T - T_i$

where

D(T) Annual domestic hot water demand at the selected temperature T

$D_i(T)$ Domestic hot water demand for the month 1 at the selected temperature T

$D_i(60\ ºC)$ Domestic hot water demand for the month i at 60 °C

T Temperature of the final accumulator

Ti Average temperature of cold water for the month i

(7) Heat losses in water distribution or recirculation at points of consumption shall also be taken into account.

(8) The limits of homogeneous zones for the purposes of the requirement and the zones have been defined by taking into account the annual daily average global solar radiation over a horizontal surface area (H), at intervals for each of the zones as indicated in Table 30 set out in Schedule 1.

179. Supplementary water heating system.

Supplementary water heating system shall be designed to maximize the energy efficiency of the system and shall incorporate the following design features in that order-

(a) maximum heat recovery from hot discharge system like condensers of air conditioning units;

(b) use of gas fired heaters wherever gas is available; and

(c) electric heater as last resort.

180. Piping insulation.

(1) The entire hot water system including the storage tanks, pipelines shall be insulated conforming to the relevant requirements of this Code.

(2) Supply and return pipes shall be insulated with at least 4 cm thick of insulating material, whose thermal conductivity is not larger than 0.04 W/(m·K).

181. Heat traps.

Vertical pipe risers serving storage water heaters and storage tanks not having integral heat traps and serving a non-recirculating system shall have heat traps on both the inlet and outlet piping as close as practical to the storage tank.

182. Swimming pools.

(1) Heated pools shall be provided with a vapor retardant pool cover on or at the water surface.

(2) Pools heated to more than 32°C (90°F) shall have a pool cover with a minimum insulation value of R-2.1 (R-12).

183. Maintenance.

(1) Without prejudice to the maintenance requirements prescribed in any other law, to ensure efficiency, operability, increase reliability and prolong the duration of an installation, an owner shall develop—

(a) a surveillance plan; and

(b) a preventive maintenance plan.

(2) The surveillance plan shall provide for-

(a) the operations intended to ensure that the operational values of the installation are correct; and

(b) an observation plan of the main functional parameters, to ensure that the installation is functioning properly as described in Table 31 set out in Schedule 1.

(3) The maintenance plan shall—

(a) comprise operations entailing visual inspection, verification of actions and other operations, which applied to the installation;

(b) make it possible to maintain the conditions for the operation, performance, protection and durability of the installation within acceptable limits;

(c) as a minimum, an annual verification of the installation for installations with a collection surface under 20m², and

a verification every six months for installations with a collection surface of over 20 m²;

(d) be carried out by competent technical staff familiar with thermal solar technology and mechanical installations in general and the installation shall have a maintenance record where all the operations carried out as well as the preventive maintenance shall be entered;

(e) include all the maintenance operations and replacement of consumable or worn elements, necessary to ensure that the system functions properly during its useful life; and

(f) include maintenance operations that must be carried out on the thermal solar energy installations for the production of hot water, the minimum frequency in months, and comments on preventive actions as described in Table 32 set out in Schedule 1.

184. Greywater reuse and recycling.

Notes

(i) Greywater represents 40% to 60% of water usage in residential buildings such as houses and apartment blocks, hotels and resorts, remote mining camps and military facilities. It is the used water from showers, baths, hand basins and the laundry and, with the right technology, it can be captured, treated and safely reused for irrigation, laundry, flushing toilets, among others. This simple but important initiative can substantially cut water bills, reduce the use of "new" water and vastly improve water sustainability.

Therefore, greywater treatment systems—

(aa) play an important role in reducing per capita consumption of water;

(ab) enable significantly greater efficiencies in the use of water; and

(ac) have the potential to reduce water and wastewater treatment costs and energy consumption.

(ii) Any gray water recycling practices must guard against risks to public health, include safety, and protect the environment. Different qualities of gray water may require different levels of treatment and processes depending on the potential risks. Gray water must be treated to remove substances that compromise human health, the environment, and performance of plumbing fixtures. The appropriate treatment method depends upon the desired end use.

(1) Authorization of greywater facilities shall be done in consultation with the National Environment Management Authority and National Water and Sewerage Cooperation.

(2) Suitable systems that utilise recycled greywater shall be encouraged for no human consumption purposes like flushing toilets, washing, gardening, landscaping, among others, in order to reduce potable water consumption.

(3) Greywater shall be collected in a manner that minimises household wastes, human excreta, animal or vegetable matter, and chemicals that are hazardous or toxic, as determined by the National Environment Management Authority.

(4) Permitted sources of greywater include, bathroom and laundry sinks, dishwashers, bathtubs, showers and laundry machines.

(5) Greywater shall not be collected from toilets, urinals, kitchen sinks or non-laundry utility sinks.

(6) Greywater treatment and reuse shall be mandatory when water consumption exceeds xxxm3 per month.

(7) Automatic water irrigation system with rain sensor shall be mandatory for landscaping exceeding xxxm^2

185. Rainwater harvesting.

(1) For purposes of this paragraph—

(a) "rain water harvesting" means collection and storage of rainwater from roof top of a building or from a vacant land for use or for ground water recharge;

(b) "rainwater catchment system" means a system that utilizes the principal of collecting and using precipitation from a rooftop or other manmade above ground collection surface;

(c) "ground water recharge" means recharging of open well or the underground water as the case may be, by use of harvested rain water.

(2) The purpose of this paragraph is to assist engineers, designers, plumbers, builders, developers, local government, and end users in safely implementing a rainwater catchment system.

(3) This paragraph applies to new rainwater catchment installations, as well as alterations, additions, maintenance and repairs to existing installations.

(4) The standards mentioned in this paragraph are intended to be consistent with, and complimentary to, the requirements of the plumbing prescribed in any other law or the National Building (Standards for Mechanical Installations in Buildings) Code, 2019.

(5) This paragraph applies to the following applications—

(a) non-potable water;

(b) potable water;

(c) fire protection;

(d) agricultural; and

(e) industrial.

(6) Suitable systems that utilise rainwater harvesting shall be encouraged for no human consumption purposes like flushing toilets, washing, gardening, landscaping, among others, in order to reduce potable water consumption.

(7) Every owner or occupier of a building having sital area of not less than 200m^2 or every owner who propose to construct a building on a sital area of not less than 100m^2 shall provide rain water harvesting structure for storage, use or for ground water recharge.

(8) Rainwater shall only be collected from a roof and stored in a cistern.

(9) Rainwater runoff from parking areas and other outdoor surfaces contains harsh chemicals and other contaminants which are undesirable in a rainwater catchment system.

(10) Rainwater harvesting system shall be independent from drinking water facilities.

(11) Rainwater harvesting system shall be mandatory for roofs over 100m^2 and in residential buildings with over 10 households.

186. Materials for rainwater harvesting.
Although suitable locally available materials of non-corroding, non-rusting, non-absorbent nature are permissible, for longer life, materials indicated below are recommended-

(a) in the case of roofing—
  (i) use galvanized iron sheet, aluminimum sheet, deleterious glass fibre sheet, concrete or clay tiles, slates and other roofing materials;
  (ii) thatched roof may be used provided it is covered by water proof sheeting like food grade low density polyethlene films; and
  (iii) if the roof is painted, only non-toxic paints may be used for painting the roof.

Note: water collected from roofs painted with toxic paints shall not be used for drinking purposes.

(b) In the case of drain or gutter, use galvanized iron sheet, wood, bamboo or reinforced cement concrete gutters;

(c) in the case of down pipe, use galvanized mild steel pipe, cast iron pipe or high density polyethylene pipe; and

(d) in the case of storage tank, use underground masonry or reinforced cement concrete structure suitably lined with water proofing materials, high density polyethylene tanks or for over ground or surface, use galvanized iron sheet, reinforced cement concrete, plastic or high density polyethylene or ferro-cement sheet.

187. Design and installation requirements for rainwater harvesting equipment.

(1) All piping and plumbing component materials used in the installation of a rainwater harvesting system shall comply with the National Building (Standards for Mechanical Installations in Buildings) Code, 2019.

(2) Collection roofing, gutters, piping, fittings, valves, screens, down spouts, flushing devices, tanks, and liners, shall be approved by the Building Committee for the intended use.

(3) All tank interior surfaces and equipment shall be washed clean before they are put into service.

(4) For water storage volumes less than 1,363liters, or intended for minor utility, irrigation and garden use, no treatment is required.

(5) Water level control devices that control pumps or makeup water valves, in contact with the water supply, shall be mercury free devices.

(6) Overhanging vegetation and proximity to air borne pollution sources shall be avoided.

(7) Subparagraph (1) to (6) do not apply to the collection of rainwater from vehicular parking or other similar surfaces.

(8) For non-potable water applications—

(a) the collection surface may be constructed of any above-ground, hard surface, impervious material; and

(b) harvested rainwater shall be filtered or treated to an appropriate quality suitable for intended use and no treatment is required for sub surface irrigation, agricultural, or garden use but for above surface irrigation, a person shall consult the National Environment Management Authority or any other relevant agency regarding required water quality.

188. Conveyance system for rainwater harvesting

(1) In the case of roof drainage system, gutters and downspouts used to collect rainwater shall comply with the following-

(a) all piping, plumbing components, and material used shall be manufactured of material approved for the intended application, conforming to National Building (Standards for Mechanical Installations in Buildings) Code, 2019;

(b) gutter and down spout systems leading to the cistern shall be fitted with debris excluder or equivalent device.

(2) For washers and pre-filtration, all collected rainwater, for potable water application, shall pass through a roof washer or pre-filtration system before the water enters the cistern and the roof washer systems shall meet the following design requirements—

(a) a sufficient amount of rainwater shall be wasted, and not allowed to enter the cistern, to wash accumulated debris from collection surface and approximate amount of rainfall to be wasted shall be adjustable as necessary to minimise cistern water contamination;

(b) the inlet to the roof washer shall be provided with a debris screen that protects the roof washer from the intrusion of waste and vermin: the debris screen shall be corrosion resistant and shall have openings no larger than 0.5 inches and no smaller than 0.25 inches nominal;

(c) subparagraph (b) does not apply to pre-filters which

provide their own method of diverting the prescribed first flush;

(d) water drained from the first-flush diverter or pre-filter shall be piped away from the storage tank and terminate in a location which will not cause damage to property or cause erosion;

(e) if more than one cistern is used, a screen, roof washer or pre-filtration system shall be provided for each cistern;

(f) subparagraph (e) shall not apply where cisterns are interconnected to supply water in series, in which case a single pre-filter shall be permitted as follows-

(i) first flush diverters and pre-filters shall be provided with an automatic means of self-draining between rain events;

(ii) roof washers shall be readily accessible for regular maintenance; and

(iii) pre-filtration screens or filters shall be maintained consistent with manufacturer's specifications.

189. Cisterns or storage.

The following are the minimum requirements for cisterns—

(a) cisterns may be used as storm-water collection points to minimise flood damage, while providing a reservoir for later use and shall have access to allow inspection and cleaning;

(b) tanks sizing: the amount of rainwater that can be collected monthly can be calculated according to the equation-

Wry = Ac x e x hN x η

where:

Wry = monthly rainwater yield [l/month];

Ac = roof collecting area [m2]. The size of the roof collecting area is the calculated base area of the house (plus the roof overhang), independent of the roof shape and roof slope. The base area is the projection on a horizontal plane of the roof area;

e = yield coefficient. The position, slant, orientation and

composition of the collecting area are to be taken into consideration in the determination of the yield coefficient. The values in Table 33 set out in Schedule 1 can be used as a planning basis for the slant and composition of the collecting area;

hN = monthly precipitation [l/m month] or [mm/ month] (10 mm = 10 l/m2). Values of monthly precipitation should be provided locally;

η = hydraulic filter efficiency. The manufacturer information with regard to the usable rainwater volume flow is to be taken into consideration for hydraulic-action filter systems that are used in the reservoir supply line. The value of 0.8 can be used in absence of more precise information.

190. Installations of cisterns.

(1) Cisterns may be installed either above or below grade.

(2) Above grade plastic tanks shall be certified by the manufacturer for intended application.

(3) Above grade cisterns shall be protected from direct sunlight and shall—

(a) be constructed using opaque, UV resistant materials which are heavily tinted plastic, lined metal, concrete, wood or painted to prevent algae growth; or

(b) have specially constructed sun barriers such as installed in garages, crawlspaces or sheds.

(4) Below grade cisterns, located outside of the building, shall be provided with manhole risers at a minimum of 4 inches above surrounding grade or installed in such a way as to prevent surface or ground water from entering through the top of any fittings.

(5) Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the cistern weight when the cistern is full consistent with bearing capability of adjacent soil.

(6) All cisterns shall be installed in accordance with the manufacturer's installation instructions and-

(a) underground tanks shall comply with the standards relating to excavation and backfill technique or safety;

(b) above grade tanks shall be installed on a sturdy and level, foundation or platform, adequately secured with adequate drainage.

(7) In a situation where the soil can become saturated, underground tanks shall be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty.

(8) Cisterns shall be provided with a means for draining and cleaning.

(9) All cistern openings shall be protected from unintentional entry by humans or vermin and manhole covers shall be provided and secured to prevent tampering.

191. Inlets, outlets and openings to cisterns.

(1) Cistern inlets shall be provided to permit water to enter the tank with minimum turbulence.

(2) The overflow outlet or flap valve, shall be protected with a screen having openings no greater than 0.125 inches or as otherwise appropriate, for preventing entrance of insects or vermin into the cistern.

(3) Water from the cistern overflow shall be discharged.

192. Pump.

Where a pump is provided in conjunction with the rainwater harvesting system, the pump shall meet the following requirements-

(1) the pump and all other pump components shall be listed and approved for use with potable water systems;

(a) the pump shall be capable of delivering a minimum of 15

psig residual pressure at the highest or most remote outlet served; minimum pump pressure shall allow for friction and other pressure losses and the aximum pressures shall not exceed 80 psig; a pressure reducing valve shall be provided at water branch distribution piping if the pump is capable of exceeding 75 psig.

193. Filtration.

Filtration shall meet the following requirements-

(a) where rainwater is used for non-potable use and for non-critical operations, including irrigation or wash down, a final stage filtration system is not required;

(b) where rainwater is used for non-potable use, interior to an occupied facility, for makeup for laundry or toilets process; the water shall be filtered as a safeguard against sediment or discoloration, and for proper operation of valves or other devices.

194. Piping.

(1) There shall be no direct connection of any rainwater harvesting pipe system and a public utility provided to domestic potable water pipe system without an approved back flow device.

(2) Separation shall be maintained between potable and non-potable water systems at all times and cross connections, without proper protection in accordance with the National Building (Standards for Mechanical Installations in Buildings) Code, 2019, shall not be permitted.

195. Piping materials.

(1) Rainwater distribution water piping, fittings and other related system components shall be suitable for domestic water application as indicated in the National Building (Standards for Mechanical Installations in Buildings) Code, 2019.

(2) Plastic piping shall be protected from UV radiation.

(3) All rainwater supplied fixtures, not specifically treated for potable water use, shall be prominently labeled: "NON-POTABLE - DO NOT DRINK".

196. Potable rainwater applications.

(1) Collection surfaces for potable water applications shall be made of non-toxic material as follows—

(a) painted surfaces are only acceptable if paint has been certified to ensure the toxicity level of the paint is acceptable for drinking water contact; lead, chromium or zinc-based paints are not permitted;

(b) enameled steel may be used; and

(c) collection of water from vehicular parking surfaces is prohibited.

(2) The following shall not be used for potable water-

(a) wood or cedar shake roofing;

(b) copper roofing materials; and

(c) lead flashing.

(3) The following materials are not recommended for potable water or may be used with caution—

(a) bitumen or composition roofing; and

(b) galvanized zinc-coated metal.

(4) Cistern inlets shall comply with the following-

(a) methodology of water entering cistern shall maintain a quiet flow in the cistern by minimizing splashing and disturbance of sediment in bottom of cistern;

(b) for potable water applications, and recommended for maintaining good water quality, the pipe entering the cistern shall terminate in a return bend elbow pointed upward at the bottom of the tank, or equivalent calming device.

(5) Cistern outlets shall be provided with floating inlet to draw water from the cistern just below the water surface or a cistern outlet shall be located at least 4 inches above the bottom of the cistern.

(6) All particulate filtration shall be installed upstream of disinfection systems; carbon filtration may be provided for reduction of taste, odor and organic chemicals.

(7) The following water disinfection systems may be applied—

(a) chlorination shall enable adequate contact time and residual;

(b) ozone may be used with an approved ozone system ensuring adequate contact time with the ozone and provision shall be made to off- gas ozone to a safe environment; and

(c) ultra-violet disinfection may be used and shall be provided between final filtration (5-micron maximum) and final point of use.

197. Operation and maintenance of rainwater harvesting system.

(1) The property owner shall maintain the system components according to manufactures written recommendations.

(2) Filtration and disinfection systems shall be serviced in accordance with manufactures recommendations.

(3) After several cycles of rain harvesting, an initial sample of the resultant accumulated water shall be tested.

(4) For a private system, prior to placing the water system into service, water quality testing, at a minimum shall be performed for E. Coli, total coliform, and heterotrophic bacteria and subsequent periodic testing to assess the ongoing integrity of the system is recommended.

(5) For a public system (defined as a system where 25 different persons consume water from the system over a 60-day period)—

(a) in addition to the tests referred to in subparagraph (3) and (4), water shall be tested for cryptosporidium;
(b) subsequent annual tests shall be made for Total Coliform, E Coli, Heterotrophic bacteria and any chemicals of concern; and
(c) records of test results shall be maintained for at least two (2) years as indicated in Figures 19, 20 and 21 set out in Schedule 3.

(6) Rain water harvesting for non-potable water is suitable for lawn and plant irrigation or process water makeup and filters to remove particulate may be added to improve water quality in order to avoid problems with sprinkler or process devices; signage marking water outlets as "Non-Potable, Do Not Drink "are required in a public environment and highly recommended elsewhere.

*Drainage and Storm Water Management***.**

(i) The purpose of this section is to protect and promote the environment, public health, safety and welfare by preventing the introduction of potentially harmful materials into the storm sewer within the cities and towns; to protect property from potential stormwater damage; to maintain and enhance water quality; and to eliminate as much as possible the pollutants in stormwater discharges.

(ii) Urban storm water, when not properly controlled and treated, can cause pollution of the waters, threaten public health, and damage property by carrying pollutants from highways, streets, roads, parking lots, driveways, sidewalks, alleys, lawns, and other surfaces of low permeability into lakes, rivers, streams, and ponds.

(iii) Development can increase storm water runoff by increasing the size and number of paved and other

impervious surfaces within a watershed and decreasing the extent of vegetated and other permeable surface areas that control storm water runoff through natural infiltration and evapotranspiration and groundwater recharge.

(iv) Some studies show that preserving and expanding natural and built green infrastructure can minimize negative impacts and enhance the resilience of water infrastructure and water bodies.

198. Green stormwater infrastructure.

Notes

(i) Green stormwater infrastructure is an approach that communities can choose to maintain healthy waters, provide multiple environmental benefits and support sustainable communities.

(ii) Unlike single-purpose gray stormwater infrastructure, which uses pipes to dispose of rainwater, green infrastructure uses vegetation and soil to manage rainwater where it falls. By weaving natural processes into the built environment, it provides not only stormwater management, but also flood mitigation and air quality management. At a time when so much of our infrastructure is in need of replacement or repair and so few communities can foot the bill, green stormwater infrastructure resilient is an affordable solution that meet many objectives at once.

(1) Green infrastructure systems and practices use or mimic natural processes to infiltrate, evapotranspirate (the return of water to the atmosphere either through evaporation or by plants), or reuse stormwater or runoff on the site where it is generated.

(2) Green infrastructure can be used at a wide range of landscape scales in place of, or in addition to, more traditional stormwater control

elements to support the principles of low impact development.

199. Minimal impact design standards.

(1) The development of minimal impact design standards is based on low impact development which mimics a site's natural hydrology as the landscape is developed.

(2) Using the low impact development approach, storm water is managed on site and the rate and volume of predevelopment storm water reaching receiving waters is unchanged.

(3) The calculation of predevelopment hydrology is based on native soil and vegetation.

200. General provisions relating to drainage stormwater management.

(1) The storm water drainage system may be designed based on analysis of frequency of storms by rational method or some well proven method derived based on rainfall data analysis for a particular type of catchment.

(2) Incidences of mixing of sewage with storm water shall be avoided.

(3) Treatment of storm water run-off before discharge to public drains shall be encouraged.

(4) Attempts shall be made through sustainable drainage practices to restore the permeability index of the catchment to pre-development levels.

(5) The potential impact of new and existing developments with respect to surface water drainage discharges shall be faced through—

(a) source control;
(b) permeable paving such as pervious concrete;
(c) storm water detention;
(d) storm water infiltration; or

(e) evapo-transpiration including from a green roof.

(6) Comprehensive stormwater management with green stormwater infrastructure shall be given priority among other possibilities to protect and preserve the existing natural resources, avoid sewer overflowing during the raining seasons and reduce costs.

(7) Infiltration features or design features including the following shall be provided when possible—

(a) bio retention which involves dispersed small scale landscape features designed to attenuate and treat stormwater; which features are typically vegetation-filled areas, including rain gardens bioretention swales, constructed wetlands, cleasing biotipes or retention ponds with a drainage mechanism, often located in parking lots, median strips or streets;

(b) permeable pavement which allows rainfall to penetrate the pavement into a porous material that retains stormwater before it enters a combined sewer, limiting or removing the effects of the stormwater on the sewer system; *Note: permeable pavement is not suited for high traffic areas;* or

(c) roof disconnection which removes water that flows from a roof through a downspout to a combined sewer and redirects it to some other location and this is not considered a gsi technique, but may be combined with "green" features such as rain gardens.

(8) Drainage cleaning shall be done at least three times a year as follows—

(a) before the normal arrival of rainy season each year;

(b) the drains shall be thoroughly cleaned after the first heavy shower; and

(c) subsequently, after retreating of rain or after the raining season.

(9) A person shall use the services of trained person and ensure the availability of operations and maintainance manual for operating and maintaining the drainage system.

201. Prohibited discharges.

(1) A person shall not discharge or cause to be discharged into a public storm water drainage system or water courses any materials including pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards other than stormwater.

(2) Discharges from the following activities shall not be considered a source of pollutants to the storm drain system and to waters when properly managed to ensure that no potential pollutants are present—

(a) potable water line flushing;
(b) uncontaminated pumped groundwater and other discharges from potable water sources;
(c) landscape irrigation and lawn watering;
(d) diverted stream flows;
(e) rising groundwater;
(f) groundwater infiltration to the storm drain system;
(g) uncontaminated foundation and footing drains;
(h) uncontaminated water from crawl space pumps;
(i) air conditioning condensation;
(j) uncontaminated roof drains;
(k) springs;
(l) individual residential and occasional non-commercial car washing;
(m) flows from riparian habitats and wetlands;
(n) dechlorinated swimming pool discharges; or
(o) street wash waters and flows from firefighting.

(3) The construction, use, maintenance, or continued existence of illicit connections to the storm drain system is prohibited.

(4) A person shall not throw, deposit, leave, maintain, keep, or permit to be thrown, deposited, left, or maintained in or upon any public or private property, driveway, parking area, street, alley, sidewalk component of the storm drain system, or water any refuse, rubbish,

garbage, litter, or other discarded or abandoned objects, articles and accumulations that may cause or contribute to pollution.

(5) Wastes deposited in streets in proper waste receptacles for the purposes of collection are exempted from the prohibition in subparagraph (4).

(6) A person who is subject to an industrial or construction activity with stormwater discharge shall comply with this Code and other applicable laws.

202. Sewer systems.

(1) New buildings shall be located near existing infrastructure in order to increase the efficiency of the existing infrastructure and minimize urban sprawl.

(2) Separation of combined sewers shall be encouraged and implemented when possible.

(3) The use of non-mains foul drainage, such as wastewater treatment systems or cesspools, shall only be considered where connection to mains drainage is not practicable.

(4) In building and locations far from a main sewer line or with difficult access to the main sewer line, on-site sewage systems like biogas plants at any scale or reed beds combined with septic tanks shall be encouraged.

(5) The on-site sewage treatment system shall include primary and secondary treatment.

(6) A sewage treatment plant shall be placed at least 7m from a habitable property and the soak away shall be at least 10m away from a watercourse, 15m away from a building and 50m away from a borehole or spring.

203. Connection to the public sewer.

(1) The owner or occupier of a building has a right to connect to a public sewer subject to the following restrictions—

(a) where the public sewer is designated as either a foul sewer or a surface water sewer, the right is limited to connection of foul drains or surface water drains as appropriate;

(b) where the manner of the connection would not be prejudicial to the public sewer system; and

(c) appropriate notice is given to the National Water and Sewerage Cooperation of the intention to make the connection.

(2) Guidance on making connections to existing sewers shall be sought from the National Water and Sewerage Corporation.

204. Wastewater treatment systems.

(1) In order to protect public health and the natural environment, wastewater treatment systems shall comply with the following requirements —

(a) have sufficient capacity to enable breakdown and settlement of solid matter in the wastewater from the buildings; and

(b) are sited and constructed to prevent overloading of the receiving water.

(2) Cesspools shall have sufficient capacity to store the foul water from the building until they are emptied.

(3) Wastewater treatment systems and cesspools shall be sited and constructed so as not to—

(a) be prejudicial to health or be a nuisance;

(b) adversely affect water sources or resources;

(c) pollute controlled waters; or

(d) be in an area where there is a risk of flooding.

(4) Septic tanks and wastewater treatment systems and cesspools shall be constructed and sited so as to have adequate ventilation and prevent leakage of the contents and ingress of subsoil water.

(5) Having regard to water table levels at any time of the year and rising groundwater levels, drainage fields shall be sited and constructed —

(a) to avoid overloading of the soakage capacity; and

(b) to provide adequately for the availability of an aerated layer in the soil at all times.

(6) A notice giving information as to the nature and frequency of maintenance required for the cesspool or wastewater treatment system to continue to function satisfactorily shall be displayed within each of the buildings.

(7) A wastewater treatment system may be a septic tank, together with a drainage field or other means of secondary treatment or other wastewater treatment system.

(8) Any discharge from a wastewater treatment system shall require a consent from the National Environment Management Authority.

Note: Initial contact with the National Environment Management Authority is normally made as part of the planning procedures for non-mains drainage. Where there have not previously been such discussions with the National Environment Management Authority, those seeking building plans approval for non-mains drainage should contact the National Environment Management Authority in order to determine whether a consent to discharge is required and what parameters apply. This should be done before an application is made for building plans approval as it may have a direct bearing on the type of system that may be installed.

(9) Specialist knowledge is advisable in the detailed design and installation of small sewage treatment works.

205. Septic tanks.

Note: Septic tanks provide suitable conditions for the settlement, storage and partial decomposition of solids which need to be removed at regular intervals. The discharge can, however, still be harmful and will require further treatment from either a drainage field or mound or constructed wetland.

(1) Septic tanks shall only be used in conjunction with a form of secondary treatment such as a constructed wetland.

(2) Septic tanks with some form of secondary treatment shall normally be the most economic means of treating wastewater from small developments.

(3) Septic tanks shall be sited at least 7m from any habitable parts of buildings, and preferably downslope.

(4) Septic tanks may also be constructed in brickwork or concrete, roofed with heavy concrete slabs as follows-

(a) brickwork shall be of engineering bricks and at least 220mm thick;
(b) the mortar shall be a mix of 1:3 cement–sand ratio; and
(c) in situ concrete shall be at least 150mm thick.

(5) Septic tanks shall prevent leakage of the contents and ingress of subsoil water, shall be ventilated and the ventilation shall be kept away from buildings.

206. Constructed wetlands.

Notes:

(i) Constructed Reed Bed Systems, also known as artificial wetland systems, are the reconstruction of freshwater wetland ecosystems to treat wastewater. They can be used to provide secondary or tertiary treatment of effluent from septic tanks or packaged treatment works. The systems

purify wastewater as it moves through the gravel bed around the rhizomes and roots, by removing organic matter, oxidising ammonia, reducing nitrate and removing a little phosphorus. The mechanisms are complex and involve bacterial oxidation, filtration, sedimentation and chemical precipitation.

(ii) Reed beds generally use the common reed (phragmites australis); other types of plants used in constructed wetlands include the reed maces (typha latifolia), the rush (juncus effusus), the true bulrush (schoenoplectus lacustris) as well as members of the sedge family (carex) and the yellow flag (iris pseudacorus).

(iii) Most reed bed models are land-intensive, but they are highly energy-efficient (requiring no energy for treatment processes) inexpensive to build, low maintenance, productive, have minimal sludge generation, are aesthetically appealing, and create valuable habitat for wildlife.

(1) There are three basic types of wetland construction—

(a) horizontal flow: where wastewater is continually fed through an inlet or outlet gradient system;

(b) vertical flow: where wastewater is applied in batch and allowed to drain each time; and

(c) pond systems: where a series of shallow ponds are linked by a constructed wetland container.

(2) Constructed wetlands such as reed beds are man-made systems which exploit the natural treatment capacity of certain wetland plants.

(3) Constructed wetlands discharging to a suitable watercourse may be used to treat septic tank effluent where drainage fields are not practical and the consent of the National Environment Management Authority is required.

(4) Constructed wetlands shall not be constructed in the shade of trees or buildings to avoid poor or patchy growth.

(5) There are two main designs of constructed wetland system as follows—

(a) horizontal flow systems which—

(i) are continuously fed with wastewater from one end and the effluent flows horizontally through the gravel bed over the full width of the bed to the outlet end as illustrated in Figure 22 set out in Schedule 3;

(ii) tend to be oxygen limited and therefore tend not to be able to completely treat concentrated effluents, particularly those with high levels of ammonia;

(iii) require a level site;

(iv) only use a single bed and therefore less maintenance is required than with vertical flow systems;

(b) vertical flow systems—

(i) are intermittently fed with wastewater from the top flooding the surface followed by a period of rest and for this reason, two or more beds are normally provided for use in rotation;

(ii) the flow is predominantly downward to an outlet at the bottom as illustrated in Figure 23 set out in Schedule 3 and is collected by a drainage network at the base;

(iii) require a fall of between 1m and 2m;

(iv) can achieve much better oxygen transfer than horizontal flow systems and therefore achieve more complete treatment, particularly of ammonia;

(v) generally require more maintenance than horizontal systems.

207. Packaged treatment works.

Notes

(i) The term packaged treatment works is applied to a range of systems engineered to treat a given hydraulic and organic load using prefabricated components which can be installed with minimal site work. They use a number of processes which are different in detail, all treat effluent to a higher standard than

septic tank systems and this normally allows direct discharge to a watercourse.

(ii) Packaged treatment works discharging to a suitable watercourse will normally be more economic for larger developments than septic tanks. They should also be considered where space is limited or where other options are not possible.

(1) The discharge from the wastewater treatment plant shall be sited at least 10m away from watercourses and any other buildings.

(2) Packaged treatment works shall be type-tested.

(3) If the packaged treatment works requires power to operate, it shall be able to adequately function without power for up to 6 hours or have an uninterruptable power supply.

(4) A notice shall be fixed within the building describing the necessary maintenance.

208. Cesspools.

(1) A cesspool is a watertight tank, installed underground, for the storage of sewage and no treatment is involved.

(2) Where no other option is feasible, a cesspool may be acceptable.

(3) The site of the cesspool shall preferably be on ground sloping away from and sited lower than any existing building in the immediate vicinity.

(4) Cesspools shall be sited at least 7m from any habitable parts of buildings and preferably downslope.

(5) Cesspools shall be sited within 30m of a vehicle access and at such levels that they can be emptied and cleaned without hazard to the building occupants or the contents being taken through a dwelling

or place of work; access may be through a covered space which may be lockable.

(6) Cesspools shall have a capacity below the level of the inlet of at least 18,000 litres (18m³) for 2 users and this size shall be increased by 6800 litres (6.8m³) for each additional user.

(7) Cesspools shall have no openings except for the inlet, access for emptying and ventilation.

(8) Cesspools shall prevent leakage of the contents and ingress of subsoil water and shall be ventilated.

(9) Cesspools shall be provided with access for emptying and cleaning; and access covers shall be of durable quality having regard to the corrosive nature of the tank contents; the access shall be lockable or otherwise engineered to prevent personnel entry.

(10) Factory-made cesspools available in glass reinforced plastics, polyethylene or steel shall meet the relevant requirements of this Code and particular care is necessary in ensuring stability of the tanks.

(11) Cesspools may be constructed in brickwork or concrete, roofed with heavy concrete slabs—

(a) brickwork shall be of engineering bricks and at least 220mm thick;
(b) the mortar shall be a mix of 1:3 cement–sand ratio; and
(c) in situ concrete shall be at least 150mm thick of C/25/P mix.

(12) The inlet of a cesspool shall be provided with access for inspection.

209. Biogas plants.

Notes:

Biogas plants can be used as complete sewage systems or developed in combination with conventional sewage plants to capture gas from sludge and introduce it into the main gas pipeline. In a biogas plant, sewage is piped into a sealed container called a digester, where it ferments producing a mixture of methane and carbon dioxide along with slurry. The anaerobic conversion process destroys pathogens and renders the slurry harmless and odourless, so it can be used directly on the land as a fertiliser. The methane is piped directly out from the top of the digester.

(1) Biogas plants shall be encouraged especially when access to the main sewer line is difficult and when there is space shortage.

(2) Construction materials and appliances used in biogas plants or tanks shall comply with the quality standards to achieve a proper operation and durability of the biogas facilities.

(3) The size of the digester or the digester volume (Vd), shall be determined on the basis of the chosen retention time (RT) and the daily substrate input quantity (Sd) as follows—

$Vd = Sd \times RT$ [$m^3 = m^3/day \times$ number of days]
Where Vd is in m^3; Sd in m^3/day or L/day; RT in Days; Biomass/ Organic material in kg and; Water in L

(4) The selected site shall ensure easy operation and maintenance activities including feeding of the plant, use of the main gas valve, composting and use of slurry, checking of gas leakages and draining condensed water from the pipeline.

(5) The site selected shall guarantee plant safety.

(6) For proper functioning of the plant, the optimal temperature shall be maintained in the digester and as such, a sunny site shall be selected to keep the digester near 35 degrees Celsius (95 degrees Fahrenheit).

(7) The area to construct the plant shall have an even surface.

(8) The selected site shall be in a slightly higher elevation than the surrounding to avoid water logging and to ensure free flow of slurry from the outlet overflow to the composting pit.

(9) The site shall be at sufficient distance from trees to avoid damage of bio digester from roots and to make plant operation easier.

(10) To avoid wastage of raw feedstock, the plant shall be as close as possible to the feedstock supply such as toilet, animal pen or compost pits and water source.

(11) Gas pipe length shall be kept as short as possible to reduce risk of gas leaks due to increased number of joints and the cost.

(12) The plant shall be as close as possible to the point of use to facilitate proper operation.

(13) The edge of the foundation of the plant shall be at least three meters away from any other structures to avoid risk of damage during construction.

(14) The plant shall be at least 15 meters away from groundwater wells or surface water bodies to protect water from pollution in case of damage.

Solid Waste Management

210. Waste sorting and collection.

(1) Each multi-storey building or group of single dwellings (groups of 10 households) shall be equipped with containers for selective harvesting or sorted stream collection of the following waste—

(a) glass;

(b) paper and paper board;

(c) plastics and metals; and
(d) organic waste.

(2) In new multi-storey building or groups of single dwelling in the same compound, the waste containers shall be placed in a designated room called the 'bin room'.

(3) When planning a bin room, the dimensions of different containers shall be considered along with the appropriate number of containers for the population it will be catering for.

(4) When planning the room, any container shall be accessible for use and also maneuvering to other containers.

(5) The bin room shall be adequately big to cater for future increased demands of such containers.

(6) In existing buildings and areas of isolated single dwellings, the relevant local government shall provide a place for the containers in the urban space.

(7) The capacity of the waste containers shall be sufficient to store waste between two pickups.

(8) Every bin room in a building, shall be provided with a label explaining how waste separation shall be done.

(9) Every waste collection point shall be accessible for motorized transport.

211. Land, vegetation and landscaping.

(1) The following shall apply to vegetation near a building—
(a) use of local plants and trees adaptable to the local climate shall be encouraged for landscaping;
(b) use of drought tolerant plants that require minimal irrigation

shall be the first option for landscaping and urban vegetation;

(c) restoration, conservation or relocation of existing trees on site shall be encouraged;

(d) compost recycled from horticulture waste shall be encouraged as fertilizer in landscaping maintainance instead of chemical products;

(e) new buildings shall encourage the planning of bio-swales or rain gardens where applicable to reduce storm water run-off;

(f) new buildings and existing buildings shall employ water-wise garden techniques to conserve water and reduce waste;

(g) new buildings and existing buildings shall encourage the implementation of systems that use water from showers and sinks, known as gray water, for gardening irrigation or other no drinking purposes; and

(h) energy-efficient landscape design in the form of proper placement and selection of shade trees and creation of windbreaks shall be implemented in all building endeavors.

(2) Building endeavors shall incorporate permeable paving materials to reduce storm-water run-off and allow rainwater to infiltrate into the ground and replenish groundwater rather than run into surface water.

(3) Building endeavors shall invest in the use of renewable energy in landscaping such as solar-powered landscape lighting.

Building Appliances

212. Heating, mechanical ventilation and air conditioner.

(1) Mechanical ventilation facilities shall be subject to authorization by the Building Committee.

(2) The authorization referred to in subparagraph (1), may be granted only if it is impossible to properly ventilate the premises by natural ventilation, especially if the outside air is too polluted, if the external environment is too noisy, or if the premises are too large.

(3) Artificial ventilation systems shall be implemented only in cases where natural ventilation is insufficient.

(4) Minimum air requirements for artificial ventilation in buildings are prescribed in Table 34 set out in Schedule 1.

(5) The airtightness of the envelope of a building equipped with mechanical ventilation (ventilation openings being closed) shall be as tight as reasonably possible when the doors, windows and other openings are closed.

(6) The ductwork shall be airtight and sized to ensure that the discharge air velocity does not exceed 2 m/s.

(7) The specific energy use of every fan, namely the ratio of the used electrical power to the nominal airflow rate, shall not exceed 0.1 Wh/m3.

(8) Air flow adjustment shall be performed with a frequency inverter powering the fan, and not with registers.

(9) In offices, theatres, schools and similar premises, as well as in indoor car parks, the airflow rate shall be adapted according to occupancy using a CO sensor or any other occupancy-sensitive sensor.

(10) Mechanical ventilation of the toilet shall be activated according to their use.

(11) Mechanical ventilation shall be switched off when the premises are not occupied, but shall be restarted early enough to purge the space before the arrival of the occupants.

(12) If the mechanical ventilation facility is to be used for night cooling of the building, the specific airflow rate shall be at least 3 volumes per hour or at least 9 m net floor area and this airflow rate shall

be increased to 4 volumes per hour or 12 m net floor area if the glazing-to façade area ratio exceeds 30%.

(13) Mechanical ventilation facilities of heated or cooled premises shall have supply and return ducts with enthalpy recovery; unless it is proven that the energy recovery is not profitable.

(14) Every new ventilation system shall be commissioned after installation and the effective airflow rates, pressure differentials and energy efficiency of fans shall be measured and compared to the design values.

213. Ceiling fans.

(1) The minimum ceiling height for the use of fans shall be 2.7 m.

(2) The blades shall be about 30 cm (minimum 25 cm) from the ceiling and more than 2.4 m above the floor.

(3) The fan diameter shall comply with Table 35 set out in Schedule 1 in function of the space area in order to provide adequate ventilation.

(4) A mechanical means of ventilation shall be capable of supplying fresh air to all parts of a room at a rate of not less than 5 changes of air per hour.

214. Air conditioner.

(1) Mechanical cooling facilities are subject to authorization by the Building Committee.

(2) The authorization referred to in subparagraph (1), may be granted only in hot-humid areas or if the internal heat loads accumulated over 24 hours exceed 160 Wh/m2 net floor area.

(3) Mechanical cooling may not be justified by thermal loads due

to solar radiation or insufficient thermal insulation.

(4) The sizing of mechanical cooling system shall be based on the following conditions—

(a) airflow rate per person: between 10 and 30 m3/h, as fixed in the ventilation principle according to-
  (i) natural ventilation with automatic or manual control;
  (ii) mechanical extraction with air supply through on purpose openings;
  (iii) double flow mechanical ventilation with heat recovery if the air is conditioned;
  (iv) combination of subparagraphs (i), (ii) and (iii);
  (v) the localization of air inlets or outlets, and airflow rates at all possible regimes, and it shall allow users to get the necessary airflow by an appropriate use of the mechanical ventilation or ventilation openings;
(b) internal operative temperature of 25 °C;
(c) indoor relative humidity of 70%; and
(d) climatic condition according to Table 36 set out in Schedule 1.

(5) Where chillers are used and when the design load is greater than 1000 kW (or 3412000 Btu), a minimum of two chillers or a single multi compressor chillers shall be provided to meet the required load.

(6) Ground-cooled heat pumps shall be installed wherever it is possible instead of air cooled heat pumps for cooling buildings.

(7) Air conditioning systems shall have supply and return ducts with an enthalpy recovery and a droplet catcher shall be installed downwind the cooling coil.

(8) The design indoor operative temperature for cooling system shall be 25 °C and the cooling temperature set point shall not be below 25°C.

215. Equipment performance requirements.

(1) The overall annual coefficient of performance of cooling facilities shall not exceed the minimum energy performance standards as authorized by the Uganda National Bureau of Standards.

(2) Cooling equipment shall meet or exceed the minimum energy performance standards as authorized by the Uganda National Bureau of Standards or Ministry of energy.

(3) The defrosting of the evaporator and the frequency of starting at part load cycles shall be controlled by action on the main engine of the cold group, rather than by the use of bypass of hot gases or by paragraph of the pressure in the evaporator.

216. Space heating.

(1) A building shall be designed taking into account the best passive solar heating with the following requirements—

(a) passive heating shall precede artificial heating, when possible;

(b) in climate zones where the daily mean temperature may fall below the comfort range (18 to 20^{o} C), every new or renovated building shall be designed to allow using passive solar heating strategy.

(2) The heating design power of 20°C operative temperature can be obtained in premises when the outdoor air temperature is at the lowest 72 hours average.

(3) Solid, liquid and gaseous fuel stoves shall have a closed combustion room with adjustable air inlet and flue gas shall be evacuated by a flue gas duct outside the occupied space.

217. Piping and ductwork.

(1) Piping for heating systems with a design operating temperature of 60°C (140°F) or greater shall have at least R-0.70 (R-4) insulation.

(2) Piping for heating systems with a design operating temperature less than 60°C (140°F) but greater than 40°C (104°F), piping for cooling systems with a design operating temperature less than 15°C (59°F), and refrigerant suction piping on split systems shall have at least R0.35 (R-2) insulation.

(3) Insulation exposed to weather shall be protected by aluminum sheet metal, painted canvas or plastic cover.

(4) Cellular foam insulation shall be protected as prescribed in subparagraph (3), or be painted with water retardant paint.

(5) Ductwork shall be insulated in accordance with Table 37 set out in Schedule 1.

218. Controls for mechanical cooling and heating systems.

(1) All mechanical cooling and heating systems shall be controlled by a time clock or programming system that can start and stop the system under different schedules.

(2) All heating and cooling equipment shall be temperature controlled.

(3) Where a unit provides both heating and cooling, controls shall be capable of providing a temperature dead band of 3°C (5°F) within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

(4) Where separate heating and cooling equipment serve the same temperature zone, thermostats shall be interlocked to prevent simultaneous heating and cooling.

(5) All cooling towers and closed circuit fluid coolers shall have either two speed motors, pony motors or variable speed drives controlling the fans.

(6) Provision shall be made for an accessible manual switch or an automatic shut off system when the room is unoccupied, for rooms < 30m2 and for hotels, all hotel rooms shall provide for an accessible manual switch or an automatic shut off system when the room is unoccupied.

219. Balancing.

(1) Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards.

(2) Construction documents shall require that a written balance report be provided to the owner or the designated representative of the building owner for HVAC systems serving zones with a total conditioned area exceeding 500 m^2 (5,000 ft2).

(3) Air systems shall be balanced to first minimise throttling losses.

(4) For fans with fan system power greater than 0.75 kW (1.0 hp), fan speed shall be adjusted to meet design flow conditions.

(5) Hydronic systems shall be proportionately balanced to first minimise throttling losses; and the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions.

(6) Impellers need not be trimmed nor pump speed adjusted for pumps with pump motors of 7.5 kW (10 hp) or less.

(7) Impellers need not be trimmed when throttling results in no greater than 5% of the nameplate horsepower draw, or 2.2 kW (3 hp), whichever is greater.

220. Condensers.

(1) Care shall be exercised in locating the condensers in such a manner that heat sink is free of interference from heat discharge by

devices located in adjoining spaces and does not interfere with other systems installed nearby.

(2) All high-rise buildings using centralized cooling water system shall use soft water for the condenser and chilled water system.

221. Economizers.

(1) Each individual cooling fan system that has a design supply capacity over 1,200 l/s (2,500 cfm) and a total mechanical cooling capacity over 22 kW (6.3 tons) shall include either—

(a) an air economizer capable of modulating outside-air and return-air dampers to supply 100 percent of the design supply air quantity as outside-air;

(b) a water economizer capable of providing 100% of the expected system cooling load at outside air temperatures of 10°C (50°F) dry-bulb/7.2°C (45°F) wet-bulb and below;

(c) projects in the Hot-Dry and Warm-Humid climate zones are exempt from the requirements of this subparagraph; and

(d) individual ceiling mounted fan systems < 3,200 l/s (6,500 cfm) are exempt from the requirements of this subparagraph.

(2) Where required, economizers shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the cooling load.

222. Variable flow hydronic systems.

(1) Chilled or hot -water systems shall be designed for variable fluid flow and shall be capable of reducing pump flow rates to no more than the larger of—

(a) 50% of the design flow rate; or

(b) the minimum flow required by the equipment manufacturer for proper operation of the chillers or boilers.

(2) Water cooled air-conditioning or heat pump units with a circulation pump motor greater than or equal to 3.7 kW (5 hp) shall have two-way automatic isolation valves on each water cooled air-conditioning or heat pump unit that are interlocked with the compressor to shut off condenser water flow when the compressor is not operating.

(3) Chilled water or condenser water systems shall comply with either subparagraph (1) or (2) and that have pump motors greater than or equal to 3.7 kW (5 hp) shall be controlled by variable speed drives.

223. Electrical lighting.

(1) The lighting requirements in this paragraph shall apply to—

(a) interior spaces of buildings;

(b) exterior building features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks and illuminated canopies;

(c) exterior building grounds lighting that is provided through the building's electrical service.

(2) The lighting requirements in this paragraph shall not apply to—

(a) outdoor recreational facilities;

(b) exterior lighting for public monument;

(c) special lighting for research laboratories;

(d) lighting used solely for commercial greenhouse;

(e) high risk security areas;

(f) lighting power for theatrical productions, television broadcasting, audiovisual presentations and portion of entertainment facilities where lighting is essential technical element for the function performed; and

(g) emergency lighting.

(3) All sources of electrical lighting or set of sources close to each other shall be equipped with a switch.

(4) The electrical lighting of offices, meeting rooms, teaching rooms or hotel rooms shall be equipped with a system switching off the lighting in absence of occupants.

(5) In spaces of more than 60 m^2 floor area, the lights far off the windows and those close to the windows shall have separate switches.

224. Lighting control.

(1) All lighting systems except those required for emergency or exit lighting shall be provided with manual, automatic or programmable controls and for lighting loads exceeding 100 kW, automatic controls shall be provided.

(2) Interior lighting systems shall be fitted with an automatic control device and in meeting rooms, classrooms, hotel rooms and storage spaces, automatic occupancy sensors shall be fitted for offices < $30m^2$.

(3) For other spaces, the automatic control device shall function on either—

(a) scheduled basis at specific programmed times; an independent program schedule shall be provided for areas of no more than 2,500 m^2 and not more than one floor; or,

(b) occupancy sensors that shall turn the lighting off within 30 minutes of an occupant leaving the space: light fixtures controlled by occupancy sensors shall have a wall-mounted, manual switch capable of turning off lights when the space is not occupied.

(4) Lighting control requirements are specified to ensure that lights can be switched off when not needed, and to allow daylight energy saving strategies to be implemented.

(5) Each space enclosed by ceiling-height partitions shall have at least one control device to independently control the general lighting within the space.

(6) Each control device shall be activated either manually by an occupant or automatically by sensing an occupant and shall cover a maximum of 250m^2.

225. Lighting power: interior and exterior.

(1) For domestic buildings, lighting fittings that only take lamps having a luminous efficacy greater than 40 lumens/Watt shall be provided.

(2) For office, industrial and storage areas in all building types, the average initial efficacy shall be no less than 45 lumens/Watt.

(3) For any other non-domestic buildings, an average initial lamp plus ballast efficacy of not less than 50 lamp lumens/circuit-Watt is required.

(4) All exterior building grounds luminaries that operate at greater than 100 W shall contain lamps having a minimum efficacy of 60 lumens per Watt.

Note:
This eliminates the incandescent lamps (including quartz iodine lamps) and the worse compact fluorescent lamps. Candles and gas lamps, much less effective, are not prohibited by this paragraph which refers only to the electric lamps.

226. Exit signs.

Internally illuminated exit signs shall not exceed 5W per face.

227. Kitchen equipment.

(1) Cooking wood stoves shall have a closed combustion room with adjustable air inlet.

(2) Flue gas shall be directly evacuated outside the occupied space with a duct.

(3) Hoods evacuating gases and aerosols shall be installed above every fuel stove.

(4) The evacuation of the gases may be natural (stack effect) or mechanical and in the case of mechanical, the requirements of each compartment including rooms, staircases, accesses and circulation prescribed in Table 38 set out in Schedule 3, shall apply to the installation.

228. Lifts and escalators.

(1) The installation of lifts and escalators shall be in accordance with the Occupational Health and Safety Act, 2006 and this Code.

(2) The lifts shall be equipped with an energy recovery system.

(3) The standby energy use of the lifts and escalators shall be negligible.

Electrical Power

229. Minimum photovoltaic contribution to electric power.

(1) Buildings with uses specified in Table 39 set out in Schedule 1 shall incorporate photovoltaic solar energy systems for capturing and transforming solar energy into electricity for own use or supply to the network where approved by the Ministry responsible for electricity.

(2) The values derived from this paragraph shall be considered minimum values without prejudice to stricter values that may be established by the Ministry responsible for electricity which contribute to sustainability, in compliance with the specific characteristics of their location.

(3) Buildings with uses specified in Table 39 set out in Schedule 1 shall incorporate capture and conversion photovoltaic systems of solar energy into electricity as follows—

(a) new buildings and existing buildings that are fully retrofitted or which characteristic use has been changed, for uses listed in Table 39 set out in Schedule 1 when exceeding 5,000 m^2 of floor area;

(b) enlargement of existing buildings, when the extension corresponds to one of the uses set in Table 39 of Schedule 1 and exceeds 5,000m^2 of floor area.

(4) The minimum electric power determined in this paragraph may be justifiably reduced or removed in the following cases-

(a) in protected historic buildings when determined by the competent body in charge of Historical-artistic heritage protection;

(b) when the estimated electricity production corresponding to the minimum power is covered by other renewable energies.

230. Minimum electric power produced by solar photovoltaic.

(1) The minimum rated power to be installed shall be calculated according to—

(a) the solar radiation in each particular climatic zone; and

(b) the building floor area.

(2) The floor area shall be deemed to include the underground parking area, if any and exclude the common outdoor areas.

(3) The floor area considered for buildings with uses listed in Table 39 set out in Schedule 1 and constructed within the same parcel shall be the sum of all the buildings in the same parcel.

(4) In all cases, the minimum peak power of the generator shall be at least equal to the rated power of the inverter and the maximum rated power required to install in all cases shall be 100Kw.

(5) The minimum required electrical power of solar PV may be either partially or completely replaced when the estimated electricity production corresponding to the minimum power is covered with other renewable energies.

(6) The minimum power required shall be calculated with the formula below—

P = C ·(0,002 · A - 5)
P- mínimum power required [kW];
C- coefficient defined in Table 40 set out in Schedule 1 according to the solar radiation zones. The highest solar radiation has the biggest coefficient
A - built area

(7) To estimate the production of the PV system the following production ratios by climatic zones shown in Table 41 set out in Schedule 1 shall be considered, kWh / kW-

231. Energy losses due to orientation, inclination and shadows.

(1) The layout of the modules shall ensure that the losses due to orientation and tilt of the system and the shadows projected over it are less than the limits in Table 41 set out in Schedule 1.

(2) The losses are expressed as a percentage of solar radiation that would fall on the collection surface facing the adequate orientation with an optimal tilt without shadows.

(3) In all cases three conditions shall be met—
(a) losses due to orientation and inclination;
(b) shadows and total losses shall be less than the limits specified in the Table 42 set out in Schedule 1, compared to the energy values obtained by considering the optimal orientation; and
(c) inclination and no shade.

(4) When, due to exceptional architectural reasons, all the power required to fulfill the requirements listed in Table 41 set out in Schedule 1 cannot be installed, this impossibility shall be justified by analyzing the various options of building configuration and location of the modules, taking the solution closer to the conditions of maximum production.

232. Verification and justification of the compliance of requirements.

(1) Verification procedure shall follow the following sequence—

(a) obtaining the minimum high peak power to be installed;

(b) design and sizing of the PV system; and

(c) obtaining limit losses due to orientation, inclination and shades specified in Table 42 set out in Schedule 1.

(2) To provide justification of compliance with the requirements of this Code, the project documentation shall include—

(a) climatic zone of the location of the building;

(b) minimum peak power to be installed;

(c) characteristics and dimensions of the proposed PV systems;

(d) peak power reached; and

(e) monitoring and maintenance plan for the facility.

233. Energy efficient motors.

(1) Large buildings of five stories or more, that install potable water pump motors or lift motors, shall install motors that comply with the minimum energy performance standards prescribed by the National Building (Standards for Electrical Installations in Buildings) Code, 2019.

(2) Motor nameplates shall list the nominal full-load motor efficiencies and the full-load power factor.

(3) Motor users shall insist on proper rewinding practices for any rewound motors; if the proper rewinding practices cannot be assured, the damaged motor shall be replaced with a new, efficient one rather than suffer the significant efficiency penalty associated with typical rewind practices.

(4) Whenever a motor is rewound, appropriate measures shall be taken so that the core characteristics of the motor is not lost due to thermal and mechanical stress during removal of damaged parts and after rewinding, a new efficiency test shall be performed by the Uganda National Bureau of Standards and a similar record shall be maintained.

234. Power factor correction.

The total power factor for all circuits shall comply with that provided by the Electricity Regulatory Authority, at duty point, except buildings with electricity supplies less than 100 A.

Part VI — Inspection, Surveys, Investigations And Maintenance

235. Requirements for inspection.

(1) The Building Control Officer shall in accordance with sections 33(d), (e) and 43(2) of the Act carry out inspection of building operations and regular inspection of completed buildings to ensure compliance with the requirements of the Act, regulations made under the Act and this Code.

(2) The Building Committee may, in accordance with section 41 of the Act and after undertaking an inspection, determine remedial action required to be done by owner of a defective building.

236. Manner of inspection of buildings.

(1) The inspection of a building shall consist of one or more of the following—

(a) visual inspection;
(b) full structural or civil investigation;
(c) full building condition survey;
(d) full building services (electrical and mechanical) investigation; or
(e) special building investigation.

(2) In all inspections under this paragraph, the Building Control Officer shall carry out the visual inspection as the first stage and the necessity of the full structural or civil investigation, full building condition survey or full building services investigation shall depend on the type, extent and seriousness of the defects, deformation and deterioration in the structure found by the Building Control Officer in the visual inspection.

(3) The Building Control Officer carrying out an inspection shall take into consideration the following—

(f) a visual inspection of the building, including a visual survey of the condition of the building, its structural elements and any addition or alteration to the building and its structural elements;

(g) a visual inspection of the surrounding areas including the slopes and drainage system and any alteration to the slope structures;

(h) the preparation and submission to the Building Committee of a report of the result of the visual inspection;

(i) if, having regard to the results of the visual inspection, the Building Committee reasonably suspects or is of the opinion that there are defects, deformations or deterioration in the building and its structural elements that will or are likely to endanger or reduce the structural stability or integrity of any part of the building, he or she shall inform the Building Committee of the need to carry out a full structural or civil investigation, full building condition survey or full building services investigation, including investigation in respect of its structural elements;

(j) the Building Committee may after considering the report of the Building Control Officer, authorise the Building Control Officer to arrange for a full structural or civil investigation, full building condition survey or full building services investigation which shall include—

(i) taking all reasonable steps in obtaining information relating to the design, construction, maintenance and history of the building;
(ii) with reasonable diligence checking the structural plans of the building and the calculation or if the plans are not available, reconstruct the structural plans where the Building Committee so requires, with a view to determining any inadequacy in the structural elements of the building;
(iii) carrying out or causing to be carried out tests on the structural elements of the building with reasonable care so as not to damage any part of the building;
(iv) carrying out or causing to be carried out tests on the material used in the construction of the buildings; and
(v) carrying out or causing to be carried out tests on such part of the building as the Building Committee considers necessary;

(k) the Building Control Officer shall prepare and submit to the Building Committee a report of the results of the full structural or civil investigation, full building condition survey or full building services investigation carried out under this paragraph together with his or her recommendations.

237. Report of the results of inspection.

(1) A report of the results of an inspection shall comprise—
(a) detailed description of the visual inspection and any full structural or civil investigation, full building condition survey or full building services investigation of the building conducted by the Building Control Officer;
(b) analysis of observations and tests conducted in the course of any full structural or civil investigation, full building condition survey or full building services investigation; and

(c) recommendations by the Building Control Officer as to the remedial works as are necessary to ensure the structural or civil, building services, condition, stability or integrity of the building.

(2) The Building Committee shall, if it is satisfied after evaluating the visual inspection report submitted under paragraph 230 (3)(c) or full structural or civil investigation, full building condition survey or full building services investigation report and recommendations of the Building Control Officer submitted under paragraph 230 (3)(f) as the case may be—

(a) accept it in full;
(b) reject it;
(c) accept part of it; or
(d) obtain a second opinion on it.

(3) The Building Committee shall thereafter-

(a) issue a compliance certificate to the owner of the building;
(b) issue an order to the owner of the building to take the appropriate measures to rectify or remedy any defect, deformation or deterioration as recommended by the Building Control Officer within such period as the Building Committee shall specify; or
(c) upon an inquiry, issue closure or demolition order to the owner of the building if the Building Committee is satisfied that the building cannot be repaired to a safe condition for either the occupier or the surroundings.

238. Guidelines on visual inspection and submission of report.

Notes:

(i) *The guidelines in this paragraph are only a general guidance on the scope of the visual inspection as well as the content of the report to be submitted to the Building Committee. It is only for consistency in approach and reporting. The Building Control Officer should therefore*

exercise his or her own professional judgment and diligence in the conduct of the inspection and reporting of his or her findings appropriate to the particular building inspected.

(ii) *Visual inspection is of architectural, structural and services elements of the buildings and the surrounding so that any misuse, abuse, defect, sign of structural distress, deformation and deterioration can be identified. The owner will get the professional advice to initiate further investigations or to take appropriate remedial action.*

(1) The Building Control Officer shall carry out, with reasonable diligence, visual inspection of—

(a) compliance with the space usage in the approved plan;

(b) the condition of the structure of the building to identify-

(i) the type of structural defects;

(ii) any sign of structural distress and deformation; and

(iii) any sign of material deterioration;

(c) the loading on the structure of the building to identify any misuse, abuse and change of use which can result in overloading;

(d) any addition or alteration affecting the structure of the building which can result in overloading or adverse effect on the structure;

(e) other conditions that may affect the safety of the occupant including—

(i) the assessment of the stability of the surrounding areas;

(ii) the condition of slopes and drainages within the same catchment area which has stability effect on the buildings checked against overall stability and functionality; and

(iii) earth and water retaining structures, water and soil retaining structures, stabilization within the building plot and immediately outside the boundary inspected against possible failure.

(2) Regarding the extent of inspection—

(a) the Building Control Officer shall identify critical areas of the building and pay special attention to them;

(b) in a building where the loading is light, the usage fairly uniform and where it is unlikely to be subject to overloading, a reasonable sampling of a certain percentage of inspection shall suffice and if the Building Control Officer detects the possibility of abuse, overloading or signs of structural or other defects and possible deterioration, he or she shall consider inspection of the structure or a particular aspect, in full;

(c) in a building where loading is high, the usage varied and where it is subject to likely abuse and overloading, the Building Control Officer shall carry out an inspection of all units or parts of the building;

(d) all exposed common areas in any building shall be inspected fully;

(e) all parts of a building with special and critical structural elements shall be inspected fully;

(f) all drain components shall be inspected fully;

(g) all slopes shall be inspected for signs of lateral movement and instability if there are any changes in the condition of the slope;

(h) all retaining structures shall be checked against stability, alteration of loading pattern and possibility of weakening of the toe due to other construction activities.

(3) A report on the results of a visual inspection of a building shall comprise—

(a) a detailed record and description of the visual inspection;

(b) assessment of the observations in regard to the condition of the building in general, the structure of the building, the loading

on the structure of the building, any addition or alteration affecting the structure of the building and the seriousness of any structural or other problems detected; and

(c) recommendation by the Building Control Officer on the remedial actions or full structural or civil investigation, full building condition survey or full building services investigation to ensure safety and health.

(4) The main contents of the visual inspection report shall include—

(a) general information on the building including—
  (i) name and address of the building;
  (ii) ownership details;
  (iii) land title number;
  (iv) location of the building;
  (v) sketch site plan showing the number of blocks of buildings at the site indicating clearly the block inspected;
  (vi) number of storeys and units in each block of the building;
  (vii) description of main usage of building, indicating approximately the percentage of areas for each usage;
  (viii) date of completion of construction;
  (ix) plan approval and occupation permit numbers;
  (x) maintenance history of the building;
  (xi) name of Architect, Engineer and other professionals retained;

(b) structural system of the building including—
  (i) description of the structural forms, systems and materials used in the different parts of the building;
  (ii) description of the soil condition and the foundation system, if known;
  (iii) identification of the key structural elements and the critical areas for special investigation;

(c) conditions of surrounding areas including—
  (i) description of the condition of the drainage system of the surrounding areas;
  (ii) description of the condition of the slope protection system;
  (iii) description of earth retaining and liquid containing structures;
  (iv) description of any other hazards; and
  (v) usage of surrounding areas;

(d) extent of inspection including—
  (i) the extent of inspection carried out, indicating clearly the number of and percentage of areas inspected as well as the areas not inspected and the reasons for not inspecting them;
  (ii) the conditions of the drains and the slope protection system of the surrounding areas inspected as well as the areas not inspected and the reasons for not inspecting them;
  (iii) limitation of access for inspection;

(e) diary of the inspection including—
  (i) record of observation indicating clearly the locations, the extent and seriousness of any observations in respect of loading conditions, addition or alteration and sign of structural or other defects and possible deterioration;
  (ii) record of observations of the drains, indicating clearly the cracks, infiltration and adequacy of capacity, blockages and the condition of the concrete surface;
  (iii) record of observation of the slope protection system, indicating clearly any tilt or lateral movement, cracks of the wails, tension, cracks of the soils, sink holes, condition of ground anchors and minor slip;

(iv) record of observation of building services;

(f) inspection of loadings on the building structure including—
(i) records and comments on the observations on the loading conditions, indicating the usage at different parts of the building and identifying any misuse, abuse or change of use;
(ii) statement of whether the existing usage and loading condition is compatible with the intended purpose of the structure;
(iii) statement of whether any misuse, abuse or change of use has given rise to excessive loading which can adversely affect the building structure;

(g) inspection of addition or alteration to the building structure and the surroundings including—
(i) statement of whether any addition or alterations have given rise to excessive loading or other adverse effects on the building structure;
(ii) statement of whether any addition or alterations have given rise to excessive loading or other adverse effects on the slope protection system;
(iii) statement of whether any addition and alterations have affected building services;
(iv) statement of whether any addition and alterations have affected infrastructural services and other land uses;

(h) inspection of signs of structural defects, damage, distress, deformation or deterioration including—
(i) records of observations of any signs of structural defects, damage, distress, deformation or deterioration;
(ii) comments on the extent, possible causes and assessment of the seriousness of the problems identified;

(iii) report on whether the identified problems are—
(aa) defects of no structural significance;
(ab) defects requiring monitoring and remedial action;
(ac) suspected defects of structural significance requiring full structural investigation and immediate action;
(ad) recommendations on any monitoring or remedial actions necessary to ensure the structural stability and integrity of the building or for a further full structural investigation;

(i) other inspections or checks carried out including—
(i) report and comment on any previous rectification carried out on the building structure;
(ii) report and comment on any construction work on adjacent site which shall affect the building under inspection;
(iii) report and comment on any other surveys or checks carried out on the conditions of the water retaining structures and other building services;

(j) conclusions including—
(i) conclusions on the condition on loading, additions and alteration, structural defects, damage, distress, deformation, deterioration, overall structural integrity and stability;
(ii) conclusion on the condition of the surrounding areas;
(iii) conclusions on the flow capacity, structural integrity and extent of maintenance of the drains;
(iv) conclusions on loading, additions and alteration, structural defects, damage, distress, deformation, deterioration, overall structural integrity and stability of the slope protection system;
(v) whether any addition and alterations have affected infrastructural services and other land uses;

(k) recommendations for follow-up actions such as, measures on restriction of loading; action on additions or alterations affecting the building structure and slope protection system; monitoring; repair; strengthening and the need for a full structural or civil investigation, full building services investigation or full building condition survey, where necessary;

(l) sketches, plans and photographs inspected, including-

(i) sketches, plans and photographs giving an idea of the building under inspection and its environs;

(ii) sketches, plans and photographs clearly illustrating the structural system of the building, the usage, loading addition or alterations in various parts of the building, as well as a record of all major problems and condition of key structural elements;

(iii) sketches, plans and photographs clearly illustrating the drainage system of the areas addition or alterations in various parts of the surrounding areas, as well as a record of all major problems and condition of slope protection system;

(iv) all sketches, plans and photographs with proper title, explanations, legend and cross-reference to the main report and attached as appendices;

(m) the report shall be signed and endorsed by the Building Control Officer.

239. Guidelines on submission of full structural or civil investigation report.

Note:

The guidelines listed in this paragraph contain a standard list of check items to be carried out by the Building Control Officer in a full structural inspection. The Building Control Officer shall exercise his or her own professional judgment and diligence in the conduct of the inspection and shall include further details to support his or her findings.

(1) The main contents of the civil or structural report shall include—

(a) general information on the building including—
  (i) name and address of the building;
  (ii) ownership details;
  (iii) land registration number;
  (iv) location of the building;
  (v) sketch site plan showing the number of blocks of buildings at the site indicating clearly the block inspected;
  (vi) number of storeys and units in each block of the building;
  (vii) description of main usage of building, indicating approximately the percentage of areas for each usage;
  (viii) date of completion of construction;
  (ix) plan approval and occupation permit numbers;
  (x) maintenance history of the building;
  (xi) name of original architect, professional engineer and other professional retained;

(b) the report shall indicate the source of information on design, construction and maintenance including—
  (i) the original calculations and drawings available for checking purposes;
  (ii) soil investigation report, including records on the foundation system used;
  (iii) any construction records; and
  (iv) routine maintenance information, including previous visual inspection report;

(c) design check or reconstruction of structural plans where structural plans are not available including—
  (i) conduct the necessary survey, investigations and test to ascertain type, sizes and reinforcement detail of key structural elements, including foundation system;

(ii) reconstruct the structural plans, where possible, including tests done on structural appraisal;
(iii) prepare a set of drawings showing structural layouts and details for each floor including member sizes and reinforcement details of key elements;

(d) design check or reconstruction of structural plans where structural plans and calculations are available including—
(i) a summary of report stating the conclusion and overall evaluation;
(ii) evaluation and detailed comments on the design and comments based on the following criteria—
(aa) codes of practice adopted in the design;
(ab) design loading including wind load, if applicable;
(ac) standard and specification of materials;
(ad) structural design concept and identification of key structural elements to evaluate the structural, design concept and whether any simplified design process takes into account the actual behavior of the structural system and identification and classification of key structural elements;
(ae) structural analysis of all key structural elements, including foundation systems; to evaluate designers' analysis and design of key structural elements and compare with own independent calculations;
(af) stability of structural frame; stability under various load combinations including wind and other dynamic loads in relation to height/ width ratio;
(ag) structural detailing; to be consistent with design concept in accordance with recommendation in codes of practice;
(ah) other design aspects; which are peculiar to the

building and essential to structural integrity and stability of the slope protection works under current condition.

(e) tests carried out including—
  (i) laboratory tests on mechanical and chemical properties of materials including-
    (aa) in-situ testing by non-destructive methods;
    (ab) test for presence and causes of deteriorated or deleterious materials;
    (ac) description of test methods and their limitations; and
    (ad) interpretation of test results;

  (ii) loading test including—
    (aa) load testing of the relevant parts or the whole of the structure if deemed necessary by the Building Control Officer;
    (ab) description of test procedure and its limitation; and
    (ac) interpretation of load test results;

(f) inspection of the condition and assessment of the load carrying capacity of the existing structure including—
  (i) identification of areas of existing potential defects and structural deficiencies and ascertain the extent, nature, causes and seriousness of these defects and deficiencies;
  (ii) survey of dimensions of existing structural elements and survey of type, size and number of steel reinforcement comparison with as built drawings shall be made;
  (iii) assessment of actual loading and load carrying capacity of the existing structure such as—
    (aa) assessment of actual loads and their distribution;
    (ab) assessment of in-situ strength of materials;

(ac) assessment of the effect due to deterioration and damage;
(ad) assessment of the load carrying capacity of the structure;

(g) recommendation for remedial works to be undertaken, including—
(i) when remedial work is required subsequently to the full structural investigation, the Building Control Officer shall recommend the appropriate remedial measure, including suitable strengthening, rectification, and modification or replacement measures;
(ii) the Building Control Officer shall make conclusion on his or her inspection and recommend any monitoring, repairs, limitation on usage and loadings and shall categorize the remedial works to be undertaken as major or minor.

(h) the report shall be accompanied by sketches, plans and photos to illustrate the findings of the inspection; and
(i) the report shall be signed by the Building Control Officer and submitted to the Building Committee.

240. Guidelines on submission of full building condition survey.
Note:

The guidelines listed in this paragraph contain a standard list of check items to be carried out by the Building Control Officer in a full building condition survey. The Building Control Officer shall exercise his or her own professional judgment and diligence in the conduct of the inspection and shall include further details to support his or her findings.

(1) The main contents of the building condition survey report shall include-
(a) general information on the building including—

(i) name and address of the building;
(ii) ownership details;
(iii) land registration number;
(iv) location of the building;
(v) sketch site plan showing the number of blocks of buildings at the site indicating clearly the block inspected;
(vi) number of storeys and units in each block of the building;
(vii) description of main usage of building, indicating approximately the percentage of areas for each usage;
(viii) date of completion of construction;
(ix) plan approval and occupation permit numbers;
(x) maintenance history of the building;
(xi) name of original architect, professional engineer and other professional retained;

(b) identification of the maintenance needs or requirements according to information collected or assimilated from the following—
(i) regular conditional surveys of the building stock: determining the condition of existing buildings, identifying and analyzing defects, including proposals for repair or further investigation;
(ii) existing planned maintenance programme or profile;
(iii) faults and repairs notified by the building users;
(iv) feedback from works of servicing, repairs and improvements in progress;
(v) relevant legal requirements; and
(vi) existing building and service records.

(2) The Building Control Officer shall present the maintenance requirements to the owner or occupier of building and the presentation shall be in a simple format which can be understood by non-technical persons.

(3) The Building Control Officer shall use his or her expertise to generate clear and accurate information when carrying out identification of resources and prioritization and presentation of findings to the owner of a building in issue on the issues that affect safety and comfort of buildings and users.

(4) The owner of any building or common property shall ensure that the ground is kept in a clean and tidy condition at all times, and shall in particular ensure that—

(a) the garden, whether paved or turfed, is regularly swept and kept reasonably clean;
(b) the grass is not overgrown and is cut regularly;
(c) the trees, shrubs and hedges are well maintained, by regular pruning, trimming, fertilizing and application of insecticides and dead plants are replaced;
(d) access and exit to the properties should be smooth, the courtyard, driveway and car park are kept in good order and in a proper state of repair and all potholes and ruts are filled and resurfaced, if necessary;
(e) parking lots are properly demarcated in white lines to and repainted, when necessary) to ensure the parking of vehicles in an orderly manner and vehicles are not parked otherwise than in the parking lots;
(f) the drains, cover slabs and culverts are kept in a proper state of repair and are swept regularly and are free from odour, litter, debris and stagnant water;
(g) a proper and adequate refuse bin centre is provided which is kept clean, free from odour, flies and vermin, and in a proper state of repair, and arrangement is made with the responsible authorities to empty the refuse regularly and to replace any refuse bins when damaged;
(h) the recreational area and playground, pergolas, benches, play equipment and all recreational facilities are kept in a clean condition and good order;
(i) gates and fences including wall fences and railings are repaired when damaged and are painted to the

satisfaction of the Building Committee;

(j) the external walls of the building are neat and tidy in appearance and exterior painting is done at least once in 5 years to the satisfaction of the Building Committee or such shorter period as the Building Committee shall require;

(k) the windows and doors including panels, grilles, louvers panes, ventilators and awnings are regularly painted and are kept in good order and repair;

(l) all fixtures, fittings and services including sewers, septic tanks, lights, gas, hot and cold water, air conditioning, lifts, escalators, tanks, pumps, generators, motor fans, compressors, incinerators, ducts, cables, wires, pipes, switches, meters, gauges and all apparatus and installation existing for common use are kept in a proper working condition and serviced regularly;

(m) roofing and gutters including rain water pipes when damaged are repaired as soon as possible;

(n) the corridors, passages, landings, staircases, escalators, air wells, walls, ceilings, fire escapes, entrances and exits of buildings, basements, car parks, roof and roof gardens, recreational or community facilities, refuse chutes, common storage spaces, common toilets and latrines are kept clean and properly maintained, repaired, redecorated and if necessary renewed;

(o) adequate ventilation and lighting, whether natural or artificial, are provided to the entire building in general and in particular all passages, landings, staircases, lifts and hallways and any blown fuses, bulbs or defective wires and switches are immediately replaced;

(p) boxes, bottles and any other articles are not stacked along any passage of the building or in any part of the ground or on the roof of the building; and

(q) the building is kept clean and free from mutilation, scribbling or drawing on walls, floor and ceilings.

(5) The Building Control Officer shall carry out a full building condition survey and make recommendations to the Building Committee for any remedial measures to be undertaken or issuance of certificate of occupation.

(6) The Building Control Officer shall prepare a report of the full building condition survey and submit a copy to the Building Committee and shall, where necessary, include comments and consultations from any other relevant professional.

241. Guidelines on full building services (electrical and mechanical) investigations.

(1) The electrical services that require periodic inspection include—

(a) electrical installations;
(b) fire detection and alarm systems;
(c) hoists and escalators; and
(d) access control systems.

(2) The frequency of the periodic inspection and testing shall be determined by the type of installation, its use and operation, the frequency of maintenance and to the external influences to which it is subjected to.

(3) The Building Committee shall by notice in writing to the owner of the building require inspection of the electrical installations of the building.

(4) In the case of initial inspection—

(a) every installation shall, during erection or on completion but before being put into service, be inspected and tested to verify, so far as reasonably practicable, that the requirements of the National Building (Standards for Electrical Installations in Buildings) Code, 2019 have been met;
(b) the method of test shall be such that no danger to persons, livestock or property or damage to equipment can occur even if the circuit tested is defective;

(c) the initial inspection on the electrical installation before occupation shall be carried out by a Building Control Officer and the inspection report filed for reference during subsequent inspections;

(d) detailed inspection shall precede testing and shall normally be done with part of the installation under inspection disconnected from the supply;

(e) the detailed inspection during erection shall include at least the checking of the following, as appropriate—

(i) connection of conductors;

(ii) identification of conductors;

(iii) routing of cables in safe zones or mechanical protection;

(iv) selection of conductors for current carrying capacity and the voltage drop, in accordance with the design;

(v) connection of single pole devices for protection or switching in phase conductors only;

(vi) correct connection of socket outlets and lamp holders;

(vii) presence of fire barriers and protection against thermal effects;

(viii) methods of protection against direct contact;

(ix) methods of protection against indirect contact;

(x) prevention of mutual detriment influence;

(xi) presence of the appropriate devices for isolation and switching;

(xii) presence of under voltage protective devices;

(xiii) choice and setting of protective and monitoring devices;

(xiv) labeling of circuits, fuses, switches and terminals;

(xv) selection of equipment and protective measures appropriate to external influences;

(xvi) adequacy of access to switch gear and equipment;

(xvii) presence of danger notices and other warning devices;

(xviii) presence of diagrams, instructions and similar information;

(xix) erection methods; and

(xx) environmental soak test.

(5) If, in regard to the results of the visual inspection in subparagraph (4), the Building Control Officer reasonably suspects or is of the opinion that there are defects, deformations or deteriorations in the installation and that the questionable aspects of the installation are likely to endanger or reduce the electrical integrity of the installation, he or she shall inform the Building Committee for the need to carry out full electrical installation tests.

(6) The building committee shall after considering the report of the Building Control Officer, arrange for full and detailed tests and investigations on the electrical installations in the building.

(7) The test and investigations referred to in subparagraph (6) shall include—

(a) continuity of protective conductors;
(b) continuity of ring final circuit conductors;
(c) insulation resistance;
(d) site applied insulation;
(e) protection of separation of circuits;
(f) protection against direct contact by a barrier or enclosure provided during erection;
(g) insulation of non-conducting floors;
(h) polarity;
(i) earth fault loop impedance;
(j) earth electrode resistance; and
(k) operation of residual current operated devices.

(8) The Building Control Officer shall prepare a report of the findings of the inspection and the tests on the electrical installation which shall include—

(a) detailed description of the visual inspection and full presentation of the test results conducted;
(b) analysis of the observations and test results; and
(c) recommendations as to the remedial measures to be undertaken to ensure soundness of the electrical integrity of the installation.

(9) The Building Control Officer shall submit to the Building

Committee a report of the results of the full building services investigation carried out under this paragraph together with his recommendations.

(10) The owner of any lift in a building shall ensure that the lift is kept in a clean and proper working condition at all times and the lift is under periodic maintenance and examination in accordance with the Occupational Safety and Health Act, 2006.

(11) The owner of every lift or hoist shall cause the lift, all machinery and equipment connected to the lift or hoist and the safety equipment provided by the manufacturer to be serviced by a lift contractor at intervals prescribed by the manufacturer.

(12) Subject to subparagraph (11) and the Occupational Safety and Health Act, 2006, the owner of every lift or hoist shall carry out periodic examination, test and inspection as follows—

(a) at intervals not exceeding one year, cause the lift to be thoroughly examined and inspected in order to determine whether the lift and all machinery and equipment connected to the lift or hoist is in safe working order;

(b) at intervals not exceeding one year, cause the safety equipment to be tested without any load in the lift;

(c) at intervals not exceeding five years, cause the safety equipment provided with the lift to be tested with full rated load in the car;

(d) where the examination, test and inspection show any lift to be defective, the lift shall not be permitted to be operated until proper repairs have been carried out; and

(e) a proper record of all notices, certificates of inspection, permits and documents issued in connection with any lift shall be kept and produced to the Building Control Officer when required.

(13) The owner of the building shall ensure that the boiler installation is periodically inspected in accordance with the Occupational Safety and Health Act, 2006.

242. Implementation of repair work.

(1) Buildings shall be maintained according to a maintenance manual approved by the Building Committee.

(2) Major repair and strengthening work, where necessary, shall be treated as building operations as defined in the Act and all relevant requirements for plan approval and issuance of building permit to carry out building operations shall apply.

(3) Minor repairs that fall within the definition of minor building works shall require the building permit issued by the Building Control Officer under section 39 of the Act.

243. Guidelines on submission of plans for repair works.

Plans for repair works shall include—

(a) relevant drawings indicating the type of the repair works and where the repairs are to be carried out;

(b) analysis of methods of repair work including—

(i) materials to be used, including catalogues, where appropriate;

(ii) recommendations from specialist contractors;

(iii) analysis and design of the strengthening and replacement works;

(iv) any defects on existing structure requiring further analysis;

(v) recommended testing of materials;

(vi) recommended quality control of the repair work; and

(vii) recommended tests to determine the effectiveness of remedial works;

(c) additional consideration and comments depending on actual building conditions;

(d) plans shall be submitted to the Building Committee or Building Control Officer, as appropriate, for approval and issuance of a building permit.

244. Guidelines on submission of report after completion of remedial works.

(1) After completion of the remedial work, the owner of the building shall submit to the Building Committee or Building Control Officer, as the case may be, a report indicating—

(a) diary of remedial works;

(b) type and location of remedial works, indicating, on the drawings and sketches the locations and type of remedial works carried out at these locations;

(c) methods of remedial works commenting—

(i) on any deviations in the extent of remedial work;

(ii) on any changes in the methods used;

(iii) on any changes in the material used;

(d) assessment of remedial works carried out stating-

(i) reports of tests on materials carried out during the work;

(ii) reports of tests on completed structure;

(iii) reports of any other test; and

(e) the report shall be signed and endorsed by the engineer retained to carry out the remedial works.

SCHEDULES

SCHEDULE 1

Paragraph 12(1)

TABLE 1: MAXIMUM PERMITTED SITE COVERAGE.

	Ground and first floor		Second floor and above	
	Accommodation to be used solely for hotel, office or shopping purposes	Accommodation to be used wholly or partly for habitation	Accommodation to be used solely for hotel, office or shopping purposes	Accommodation to be used wholly or partly for habitation
	%	%	%	%
Hotels	50	50	50	50
Offices	60	50	60	50
Shops	70	50	70	50

TABLE 2: LOCATION OF SEPTIC TANKS AND THEIR SOAK AWAY PITS

Paragraph 18(5)

Minimum distance	**Septic tank (m)**	**Soak away pit (m)**
Buildings	1.5	1.5
Property	1.5	3
Wells	30	30
Streams	7.5	30
Cuts/embankments	7.5	30
Pools	3	7.5
Water pipes	3	3
Paths	1.5	1.5
Large trees	3	3

TABLE 3: OCCUPANCY CLASSIFICATION

Paragraph 50(2)

Occupancy			
Class	**Sub-class**	**Use Group**	**Description**
Assembly	oc1	Entertainment & public assembly	Occupancy where persons gather to eat, drink, dance or participate in other recreation activates.
	oc2	Theatrical and Indoor sports	Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral, cinematographic or sports performances.
	oc4	Worship	Occupancy where persons assemble for the purpose of worshipping.
	oc5	Outdoor sports	Occupancy where persons view outdoor sports events
	oc9	Exhibition Hall	Occupancy where goods are displayed primarily for viewing by the public.
	oc10	Museum	Occupancy comprising a museum, art gallery or library.
Business	oc18	Large shop	Occupancy where merchandise is displayed and offered.
	oc19	Small shop	Occupancy where merchandise is displayed and offered for sale to the public and the floor area does not exceed 250 $m^{2.}$
	oc21	Offices	Occupancy comprising offices, banks, consulting rooms and other similar usage.

Occupancy			Description
Class	**Sub-class**	**Use Group**	
Educational	oc3	Places of Instruction	Occupancy where school children, students or other persons assemble for the purpose of tuition or learning.
Industrial	oc11	High risk Industrial	Occupancy where an industrial process is carried out and where either the material handled or the process carried out is liable in the event of fire, to cause combustion with extreme rapidity, or give rise to poisonous fumes, or cause explosions.
	oc 12	Moderate risk industrial	Occupancy where an industrial process is carried out and where either the material handled or the process carried out is liable in the event of fire, to cause combustion with moderate rapidity, or give rise to poisonous fumes, or cause explosions.
	oc 13	Low risk industrial	Occupancy where an industrial process is carried out and where either the material handled or the process carried out does not fall into the high or moderate risk category.
	oc 14	Plant room	Occupancy Comprising usually unattended mechanical or electrical services necessary for the running of building services.

Occupancy			Description
Class	**Sub-class**	**Use Group**	
Institutional	oc 15	Place of detention	Occupancy where people are detained for punitive or corrective reasons or because of their mental condition.
	oc16	Hospital	Occupancy where people are cared for or treated because of physical or mental condition.
	oc 17	Other institution	Occupancy where groups of people who either are not fully fit, or who are restricted in their movements or their ability to make decisions, reside or are cared for.
Mercantile	oc 6	High risk commercial service	Occupancy where a non- industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with extreme rapidity, or give rise to poisonous fumes, or cause explosions.
	oc 7	Moderate risk commercial service	Occupancy where a non- industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with moderate rapidity, or give rise to poisonous fumes, or cause explosions.

Occupancy			Description
Class	**Sub-class**	**Use Group**	
Mercantile	oc 8	Low risk commercial service	Occupancy where a non- industrial process is carried out and where either the material handled or the process carried out does not fall into the high or moderate risk category.
	oc 20	Wholesale store	Occupancy where goods are displayed and stored and where only a limited selected group of persons is present at any one time.
	oc 29	Parking garage	Occupancy used for storing or parking more than 10 motor vehicles.
Residential	oc 22	Hotel	Occupancy where person rent furnished rooms, not being dwelling units.
	oc 23	Dormitory	Occupancy where groups of people are accommodated in one room.
	oc 24	Domestic residence	Occupancy consisting of one or more dwelling units.
	oc 25	Detached dwelling house	Occupancy consisting of a detached dwelling unit including a garage and other domestic out buildings.
STORAGE	oc 26	High risk storage	Occupancy where material is stored and where the stored material is liable, in the case of fire to cause combustion with extreme rapidity, or give rise to explosions.
	oc 27	Moderate risk storage	Occupancy where material is stored and where the stored material is liable, in the case of fire to cause combustion with moderate rapidity, or give rise to explosions.
	oc 28	Low risk storage	Occupancy where the material stored does not fall into the high or moderate risk category.

TABLE 4: DESIGN POPULATION

Paragraphs 61,91,93(2),96(c)

Sub-class of Occupancy	**Population**
OC 1, OC 2, OC 4, OC 5	Number of fixed seats or 1 person per m^2 where there are no fixed seats
OC 15, OC 17, OC 22, OC 24	2 persons per bedroom or actual number of persons, whichever is the greater (4.5 m^2 per person)
OC 21	1 person per 10 m^2
OC 20, OC 26, OC 27, OC 28	1 person per 30 m^2
OC 3, OC 9, OC 10, OC 19	1 person per 1.2 m^2
OC 18 (area less than 1,000 m^2)	1 person per 2.0 m^2
OC 18 (area more than 1,000 m^2)	1 person per 5.0 m^2
OC 6, OC 7, OC 8, OC 11, OC 12, OC13	1 person per 10 m^2 or actual number of persons, whichever is greater
OC 29	1 person per 40 m^2
OC 16, OC 23	1 person per 5.0 m^2

TABLE 5: NUMBER OF EXITS ON GROUND FLOOR

Paragraph 79(1)

Number of persons accommodated or normally present	Number of exits
Not exceeding 200	2
Over 200 and not exceeding 300	3
Over 300 and not exceeding 400	4
Over 400 and not exceeding 550	5
Over 550 and not exceeding 700	6
Over 700 and not exceeding 850	7
Over 850 and not exceeding 1,000	8
Over 1,000 and not exceeding 1,500	9
Over 1,500 and not exceeding 2,000	10
For each additional 500 persons over 2,000	at least one additional exit shall be provided

TABLE 6: EXITS FOR GALLERIES

Paragraph 79(2)

Number of persons accommodated or normally present	**Number of exits**
Not exceeding 200	2
Over 200 and not exceeding 300	3
Over 300 and not exceeding 400	4
Over 400 and not exceeding 500	5
For each additional 100 persons over 500	at least one additional exit shall be provided

TABLE 7: FLOOR AREA OF KITCHEN FOR HOTEL, INSTITUTION OR COMMUNAL BUILDING

Paragraph 103(2)(b)

No. of persons	**Floor area**
Not more than 10	9.3square meters
Not more than 30	18.6 square meters
Exceeding 30	4.65 square meters for every 10 persons up to a maximum of 46 square meters;

TABLE 8: STRESSES IN BRICKS

Paragraph 127(1),(2) and 128(1)

Class of block		Proportion of mixture of mortar (in volumes)			Maximum Permissible pressure Stress in kN/mm2
Grade	Crushing load borne under test given in paragraph	Cement	Lime	Sand	
Special	Over 45kN	1	—	2	see subparagraph (2) of paragraph (127)
First	45kN	1	—	2½	3.2
Second	34 kN	1	—	2½	2.5
Third	22.5 kN	1	—	3	1.7
Fourth	18 kN	1	—	3	1.5
Fifth	14 kN	1	—	4	1.2
Sixth	7 kN	1	—	4	1.0

TABLE 9: MAXIMUM PERMISSIBLE PRESSURE FOR CONCRETE.

Paragraph 129(1) and (5)

Concrete	Maximum permissible pressure
	Kilo Newton per Square Metre
1 : 1 : 2	3830
1 ;1½ : 3	3350
1: 2: 4	2870
1: 3: 6	1915
1: 4: 8	480

TABLE 10: SLENDERNESS RATION OF PIER.

Paragraph 130(1)

Value of	Percentage reduction in pressure from that given above
8	14
10	28
12	42

TABLE 11: WORKING STRESSES IN WROUGHT AND CAST IRON.

Paragraph 131

Nature of stress	Cast iron N/mm²	Wrought iron N/mm²
Compression	110	69
Tension	21	76
Shear	28	48
Bearing	117	97

TABLE 12: STRESSES IN TIMBER

Paragraph 133

Nature of stress	Deal	Podo and cedar	Mvuli
Tension with the grain	4.82	4.82	8.27
Compression with grain at end bearing	7.58	6.20	8.27
Compression across the grain	1.39	1.03	2.07
Transverse extreme fibre stress (value "f" joist and beam formulae)	4.82	6.08	8.27
Shearing with the grain	0.69	0.69	1.03
Shearing across the grain	3.45	1.72	3.45

TABLE 13: STRESSES ON TIMBER COLUMNS

Paragraph 134(1)

Slenderness ratio	Safe unit stress in N/mm²		
	Deal	Podo and cedar	Mvuli
10	4.21	3.44	4.59
15	2.71	2.21	2.95
20	1.81	1.47	1.96
25	1.26	1.03	1.38
30	0.92	0.76	1.01

TABLE 14: VALUES FOR SQUARE AND RECTANGULAR COLUMNS, POSTS AND STRUTS

Paragraph 134(1)

Slenderness ratio	Safe unit stress in N/mm²		
	Deal	Podo and cedar	Mvuli
10	4.73	3.87	5.17
15	3.22	2.64	3.51
20	2.23	1.82	2.43
25	1.59	1.30	1.74
30	1.18	0.96	1.29

Table 15: PERFORMANCE PATH. BUILDING ENVELOPE REQUIREMENTS FOR RESIDENTIAL BUILDINGS ACCORDING TO THE CLIMATE.

Paragraph 150(5)(a),(9)(a)(i)(aa)

Window to Wall Ratio WWR (%)	U-value Roof W/m^2.K		U-value Wall W/m^2.K		U-value Wind. W/m^2.K		SHGC*	
	Zones 1;3;4;5	Zone 2	Zones 1;3;4;5	Zone 2	Zones 1;3;4;5	Zone 2	Zones 1;3;4;5	Zone 2
≤ 15 %	0.63	0.71	0.77	1.60	4.0	5.8	NR	N0.4R
16 – 25 %	0.63	0.71	0.77	1.60	4.0	5.8	0.7	0.7
26 – 35 %	0.63	0.71	0.57	1.60	3.3	4.0	0.5	0.6
36 – 45 %	0.55	0.71	0.57	1.26	2.6	3.3	0.4	0.4
SRR Skylight					U-value Skylight W/m2.K		SHGC	
≤ 2 %					4.0	5.8	0.4	0.4
2.1- 5.0 %					3.3	5.8	0.2	0.2

*SHGC of glazing of proposed building can be multiplied by corresponding Architectural Shading Factor (ASF) for exterior permanent solar shading (overhangs and fins).

NR: Not required

SRR=Skylight Roof Ratio. It is the ratio of the total skylight area of the roof, measured to the outside of t he frame, to the gross exterior roof.

Table 16: TRADE-OFF PATH. MAXIMUM HEAT TRANSFER

COEFFICIENT OF THE FAÇADE COMPONENT

Paragraph 150(5)(b),(9)(b)(i)

	Climate zone	U_{Max} (W/m²K)		
		Opaque walls	Roofs	Doors and windows
1	Hot and Humid and semi humid (Coast / Coastal hinterland)	1	0.6	3
2	semiarid/ savannah (Central plateau)	2	0.7	6
3	Upland and Highland areas	1	0.6	3
4	High lake regions	1	0.6	3
5	Hot and arid	1	0.6	3

Table 17: TRADE-OFF PATH, OVERALL ENVELOPE APPROACH. REFERENCE U-VALUE OF FAÇADE OF BUILDINGS VS. CLIMATIC ZONE UFREF

Paragraphs 150(5)(b)(9)(a)(cc),(9)(b)(ii)

	Climate zone	U_{Fref} (W/m²K)
1	Hot and Humid and semi humid (Coast / Coastal hinterland)	2.1
2	semiarid/ savannah (Central plateau)	2.3
3	Hot and arid	2.1
4	Upland and Highland areas	2.1
5	High lake regions	2.1
6	Desert	2.1

Table 18: UPPER LIMITS FOR THE EQUIVALENT WINDOW TO WALL RATIO(WWR-EQ)

Paragraph 153(1)

Climate Zone	Maximum Reference Window to Wall Ratio. WWR-ref
Zone 1: Hot-arid	0.30** //0.22*
Zone 2: Hot-semi arid/savannah	0.25** //0.21*
Zone 3: Great Lakes	0.25** //0.21*
Zone 4: High Upland	0.30** //0.21*

Table 19: OVERHANGS AND FINS SIZES ACCORDING

TO ORIENTATION AND WINDOWS MEASURES IN LATITUDES +/-10º (CALCULATE FOR +-23?)

Paragraph 150 (9)(a)(bb),153(2)(3)

	Architectural Shading Factor (ASF)											
	N, NE, NW			E,EN,ES			W,WN,WS			S,SE,SW		
Protection Factor (PF) %	Over-hangs	Fins	Over-hangs +fins	Over -hangs	Fins	Over -hangs +fins	Over -hangs	Fins	Over -hangs +fins	Over -hangs	Fins	Over -hangs +fins
0-15	1	1	1	1	1	1	1	1	1	1	1	1
16-40	0.88	0.74	0.64	0.80	0.8	0.6	0.80	0.8	0.6	0.78	0.79	0.6
41-65	0.8	0.64	0.51	0.65	0.72	0.49	0.65	0.72	0.49	0.63	0.69	0.46
66-90	0.75	0.58	0.44	0.55	0.65	0.42	0.55	0.65	0.42	0.52	0.6	0.35
91-100	0.72	0.52	0.37	0.50	0.60	0.35	0.50	0.60	0.35	0.43	0.66	0.30

TABLE 20: MINIMUM VISUAL TRANSMITTANCE REQUIRED

Paragraph 154

WWR	Minimum VT
0 – 0.3	0.27
0.31 – 0.40	0.20
0.41 – 0.50	0.16
0.51 – 0.60	0.13
0.61 – 0.70	0.11

TABLE 21: ILLUMINANCE REQUIRED PER TYPE OF ACTIVITY

Paragraph 158 (8)

Use	**Activity/Applications**	**illuminance (Lux)**
Residential	Bedroom	100
	Toilet	100
	Stores and staircases	100
	Lounge	150
	Bathroom	150
	Kitchen	150 – 300

Use	Activity/Applications	illuminance (Lux)
Other uses	Minimum service illuminance	20
	Corridor, passageways, stairs	100
	Entrance hall, lobbies, waiting room	100
	Escalators, elevator	150
	Restaurant, canteen, cafeteria	200
	Museum and gallery	300
	General offices, shops and stores, reading and writing	300 – 400
	Drawing office	300 – 400
	Class room, library	300 – 500
	Shop/ supermarket/ department store	200 – 750
Localized lighting for exact task	Proof reading	500
	Exacting drawing	1000
	Detailer and precise work	2000

TABLE 22: OPTIMAL LOCATION OF THE ROOMS ACCORDING TO ORIENTATION.

Paragraph 167 (1)

ROOM	ORIENTATION
Bedrooms	North/South façade and location towards the eastern part of the building favours natural lighting in the morning. Avoid west orientation to protect from overheating in the evenings and thus at night.
Living room	North/South façade and location towards the western part of the building favours natural lighting in the afternoon-evening. Avoid east orientation to protect from overheating in the mornings.
Kitchen	North/South façade with no specific location as it is used the whole day. Avoid both east and west orientation to prevent overheating along the day
Bathroom	East or West receiving the biggest amount of heat (acting as buffer zones)

ROOM	ORIENTATION
Staircase*	East or West receiving the biggest amount of heat (buffer zones that can also work as ventilation chimney)
Stores and service rooms	East or West receiving the biggest amount of heat (acting as buffer zones). In hot and arid and upland climatic zones the stores, if possible, can also be placed underground to preserve the food in a fresh environment (cave effect) thus saving energy for refrigeration.

TABLE 23: RECOMMENDED MINIMUM AREA AND DISTANCE ROOF-CEILING

Paragraph 167 (2)

ROOM	MINIMUM RECOMMENDED AREA (m^2)	MINIMUM AREA (m^2)	MINIMUM DISTANCE ROOF-CEILING recommended (m)
Bedrooms	9	7.5	2.4
Living room	12	9	2.4
Kitchen	4	3.5	2.4
Bathroom	3.5	3	2.1
Staircase*	0.9m wide	0.9m wide	NA
Stores and service rooms		1	2.1

Note: Minimum measures should be adaptable for affordable housing

NA: Not applicable

**Private stair: Any rise between 155mm and 200mm used with any going between 225mm and 300mm*

TABLE 24: MAXIMUM BACKGROUND NOISE LEVELS IN PREMISES (DBA)

Paragraph 168 (2)

Type of use / Activity	Maximum background noise levels (DBA)
Residential	35 (night) – 45 (day)
Sleeping rooms	30 - 40
Small offices and meeting rooms	30 - 40
Large offices to open, busy offices	40 to 60
Intellectual work	50 - 70
Manual work (e.g. in factory buildings)	80
Noise from ventilation systems	30

TABLE 25: MAXIMUM NOISE LEVELS OUTDOOR (DBA, 10 SECONDS AVERAGE)

Paragraph 168 (3)(4)

Main land use	Day	Night
Activities that require a low noise level (hospitals, quiet areas)	55	45
Residential areas, hotels, schools	60	50
Agriculture, mixed residential and industrial areas	65	55
Industry	70	60

TABLE 26: MINIMUM SOLAR CONTRIBUTION IN PERCENTAGE

Paragraph 177 (1)(a)

Total Domestic Hot Water Demand of the building (I/d)	Solar radiation Zone				
	I	II	III	IV	V
50-1,000	60	70	80	80	80
1,000-3,000	65	70	80	80	80
3,000-5,000	70	70	80	80	80
5,000-7,000	70	70	80	80	80
7,000-10,000	70	70	80	80	80
10,000-15,000	70	70	80	80	80
15,000-20,000	70	70	80	80	80
> 20.000	70	70	80	80	80

Values to be elaborated locally according to the solar radiation and sunny days in each climatic zone

TABLE 27: MINIMUM SOLAR CONTRIBUTION IN PERCENTAGE. SWIMMING POOL CONDITIONING

Paragraph 177 (1)(b)

Total Domestic Hot Water Demand of the building (I/d)	Solar radiation Zone				
	I	II	III	IV	V
50-1,000	60	70	80	80	80

Values to be elaborated locally according to the solar radiation and sunny days in each climatic zone

TABLE 28: MAXIMUM LOSSES

Paragraph 177 (5)(c)

Case	**Orientation and tilt**	**Shade**	**Total**
General	10 %	10 %	15 %
Superposition	20 %	15 %	30 %
Architectural integration	40 %	20 %	50 %

Notes:

(i) The optimal orientation will be considered to be calculated according to the latitude of the location, south orientation if the location is in northern hemisphere and north orientation if the location is in southern hemisphere. Tilt will be calculated depending on the period of use and latitude. In tropical countries the appropriate tilt shall be the latitude of the location.

(ii) In buildings with hot water demand or temperature control of indoors swimming pool, a portion of the thermal energy needs shall be met by the incorporation of solar water heating systems for the capture, storage and distribution of hot water, adapted to solar radiation of the location and to the demand for hot water of the building or swimming pool.

TABLE 29: REFERENCE DEMAND AT 60ºC (1)

Paragraph 178 (4)

Demand criterion	Litres of DHWD/day at 60º C	
Single-family dwellings	30	per person
Multi-family dwellings	22	per person
Hospitals and clinics	55	per bed
Hotel ****	70	per bed
Hotel ***	55	per bed
Hotel/Hostel **	40	per bed
Hostel/Boarding house *	35	per bed
Homes for the elderly, student dormitories, etc.	55	per bed
Dressing rooms/collective showers	15	per service
Gyms	20 to 25	per user
Laundromats	3 to 5	per kilo of clothing
Restaurants	5 to 10	per meal
Cafeterias	1	per meal
Factories	60% of the hot wáter consumption	

Notes:

(i) The litres of DHWD/day at 60ºC in the table have been calculated from the average daily unit consumption of UNE 94002:2005 "Thermal solar systems for domestic hot water production: Calculation method for heat demand."Equation below was used for the calculation, with Ti = 12ºC (constant) and T = 45ºC.

(ii) Values checked by experience or obtained from reliable sources will be taken for other uses.

TABLE 30: GLOBAL SOLAR RADIATION ZONES

Paragraph 178 (8)

Zone	kWh/m2
Solar radiation 1	SGR ≤ 5
Solar radiation 2	5.1 ≤ SGR < -5.5
Solar radiation 3	5.6 ≤ SGR < 6
Solar radiation 4	6.1 ≤ SGR < 6.5
Solar radiation 5	SGR ≥ 6.5

TABLE 31: OPERATIONS OF THE SURVEILLANCE PLAN

Paragraph 183 (2)(b)

System element	Operation	Frequency (months)	Description
COLLECTORS	Cleanliness of panes	To be determined by owner	With water and appropriate products
	Panes	3	Visual inspection of condensation in the central hours of the day
	Joints	3	Visual inspection of cracks and deformations
	Absorber	3	Visual inspection of corrosion, deformation, leaks, etc.
	Connections	3	Visual inspection of leaks
	Structure	3	Visual inspection of deterioration, indications of corrosion
PRIMARY CIRCUIT	Piping, insulation and filling system	6	Visual inspection of Absence of humidity and leaks
	Manual drain valve	3	Bleed the air from the bottle
SECONDARY CIRCUIT	Thermometer	Dayly	Visual inspection of temperature
	Piping and insulation	6	Visual inspection of absence of humidity and leaks
	Solar accumulator	3	Accumulated mud in the bottom of the tank drained

TABLE 32: MAINTENANCE PLAN

Paragraph 183 (3)(f)

	EQUIPMENT	FREQUENCY (MONTHS)	DESCRIPTION
COLLECTION SYSTEM	Collectors	6	Visual inspection of the differences from the original and between collectors
	Panes	6	Visual inspection of the condensation and dirt
	Joints	6	Visual inspection of cracks, deformation
	Absorber	6	Visual inspection of corrosion, deformations
	Housing	6	Visual inspection of deformations, oscillations, ventilation windows
	Connections	6	Visual inspection of appearance of leaks
	Structure	6	Visual inspection of deterioration, indications of corrosion, and bolt torque
	Collectors*	12	Partial covering, uncovering or filling of the field of collectors
ACCUMULATION SYSTEM	Tank	12	Presence of mud at the bottom
	Sacrifice anodes	12	Check for wear
	Impressed current anodes	12	Check for proper operation
	Insulation	12	Check that there is no humidity

	EQUIPMENT	FREQUENCY (MONTHS)	DESCRIPTION
EXCHANGE SYSTEM	Plate exchanger	12	Operational control efficiency, performances and cleanliness
	Coil exchanger	12	Operational control efficiency, performances and cleanliness
	EQUIPMENT	FREQUENCY (MONTHS)	DESCRIPTION
HYDRAULIC CIRCUIT	Refrigerating fluid	12	Check its density and pH
	Tightness	24	Carry out pressure test
	Exterior insulation	6	Visual inspection deterioration of the protection of the connections and absence of humidity
	Interior insulation	12	Visual inspection connections and absence of humidity
	Automatic drain valve	12	Operational control and cleanliness
	Manual drain valve	6	Bleed the air from the bottle
	Circulator	12	Tightness
	Closed expansion vessel	6	Check the pressure
	Open expansion vessel	6	Check the level
	Filling system	6	Operational control action
	Shut-off valve	12	Operational control actions (open and close) to avoid seizing
	Safety valve	12	Operational control action

	EQUIPMENT	FREQUENCY (MONTHS)	DESCRIPTION
ELECTRIC AND CONTROL SYSTEM	Electrical switchboard	12	Make sure that this is always properly closed so that no dust can get in
	Differential control	12	Operational control action
	Thermostat	12	Operational control action
	Verification of themeasuring system	12	Operational control action
BACK-UP ENERGY SYSTEM	Back-up system	12	Operational control action
	Temperature probe	12	Operational control action

TABLE 33: YIELD COEFFICIENTS

Paragraph 189 (b)

Type of surface	e (yield coefficient)
Slanted hard roof	0.8
Flat roof, without gravel	0.8
Flat roof, with gravel	0.6
Green roof, intensive	0.3
Green roof, extensive	0.5
Paved surface/compound paved surface	0.5
Asphalt covering	0.8

TABLE 34: REQUIREMENTS FOR ARTIFICIAL VENTILATION

Paragraph 212 (4)

Occupancy	Minimum air required l/s
Kitchens	50.0 per local
Bedrooms	5.0 per occupant
Living rooms and dining rooms	3.0 per occupant
Bathrooms and shower-roams	15.0 per local
Storage rooms and common areas	0.7 per m^2 useful
Rooms containing WC pan or urinal	15.0 per local
Parkings and garages	120 per parking space

Note: This Table establishes the minimum l/s of fresh air required. However, 8litres/sec per person supply of fresh air is the recommended.

TABLE 35: FAN DIAMETER IN FUNCTION OF SPACE AREA

Paragraph 213 (3)

Room area (m2)	**Minimum fan diameter**
10	90
10 – 20	120
20 – 30	140
>30 – 40	160
>40	Two fans

TABLE 36: DESIGN TEMPERATURES FOR AIR CONDITIONING AND OTHER MECHANICAL COOLING SYSTEMS

Paragraph 214 (4)(d)

	Climate zone	Outdoors temperatures		
		Dry Bulb ºC	Roofs	Wet Bulb ºC
1	Hot and Humid	30-31		23-25
2	Semiarid/ savannah	30		18
3	Highland areas	29		23
4	High lake regions	28		20
5	Hot and arid	30		20

TABLE 37: DUCTWORK INSULATION

Paragraph 217 (5)

Duct Location	Required Insulation[a]	
	Supply Ducts	**Return Ducts**
Exterior	R-1.4 (R-8)	R- 0.6 (R-3.5
Ventilated Attic	R-1.4 (R-8)	R- 0.6 (R-3.5)
Unventilated Attic without Roof Insulation	R-1.4 (R-8)	R- 0.6 (R-3.5)
Unventilated Attic with Roof Insulation	R- 0.6 (R-3.5)	No Requirement
Unconditioned Space[b]	R- 0.6 (R-3.5)	No Requirement
Indirectly Conditioned Space[c]	No Requirement	No Requirement
Buried	R- 0.6 (R-3.5)	No Requirement

Notes:

(i) Insulation R-value is measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 24°C (75°F) at the installed thickness.

(ii) Includes crawlspaces, both ventilated and non-ventilated.

(iii) Includes return air plenums with or without exposed roofs above.

(iv) Insulation R-values, measured in (hft °F)/Btu, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation.

TABLE 38: OPTIMAL LOCATION OF ROOMS ACCORDING TO ORIENTATION

Paragraph 227 (4)

ROOM	ORIENTATION
Bedrooms	North/South façade and location towards the eastern part of the building favours natural lighting in the morning. Avoid west orientation to protect from overheating in the evenings and thus at night.
Living room	North/South façade and location towards the western part of the building favours natural lighting in the afternoon-evening. Avoid east orientation to protect from overheating in the mornings.
Kitchen	North/South façade with no specific location as it is used the whole day. Avoid both east and west orientation to prevent overheating along the day.
Bathroom	East or West receiving the biggest amount of heat (acting as buffer zones)
Staircase	East or West receiving the biggest amount of heat (buffer zones that can also work as ventilation chimney).
Stores and service rooms	East or West receiving the biggest amount of heat (acting as buffer zones). In hot and arid and upland climatic zones the stores, if possible, can also be placed underground to preserve the food in a fresh environment (cave effect) thus saving energy for refrigeration.

TABLE 39: SCOPE OF APPLICATION OF SOLAR PV SYSTEMS ACCORDING TO THE BUILDING USE

Paragraphs 229, 230 (3)

Type of Use
Hypermarket
Shopping mall and leisure center
Storage warehouse
Administration Building
Hotel and Hostel
Hospital and Clinic
Exhibition Center

TABLE 40: CLIMATIC CO-EFFICIENT

Paragraph 230 (6)

Solar Radiation Zone	**Climatic Coefficient**
Solar radiation 1	1.3
Solar radiation 2	1.4
Solar radiation 3	1.5
Solar radiation 4	1.6
Solar radiation 5	

TABLE 41: PRODUCTION RATIOS PER SOLAR RADIATION (SR) ZONE

Paragraphs 230 (7) and 231(1) , (4)

Zones	SR Zone 1	SR Zone 2	SR Zone 3	SR Zone 4	SR Zone 5
Annual equivalent hours of reference (kWh/kW)	1.632	1.753	1.892	1.950	2000

TABLE 42: LIMITED LOSSES

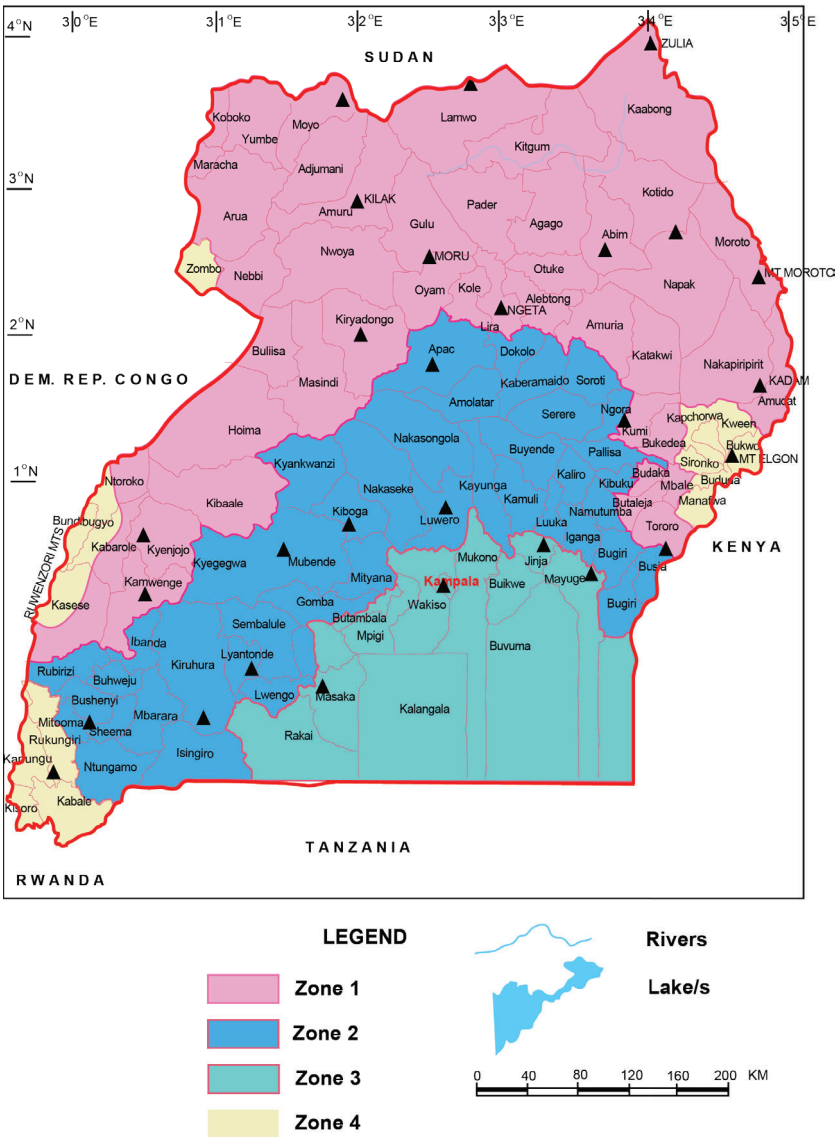
Paragraphs 231 (3) (b) and 232(1)(c)

	Orientation and inclination	Shadows	Total
General	10%	10%	15%
Super position of PV modules	20%	15%	30%
Architectural integration of PV modules	40%	20%	50%

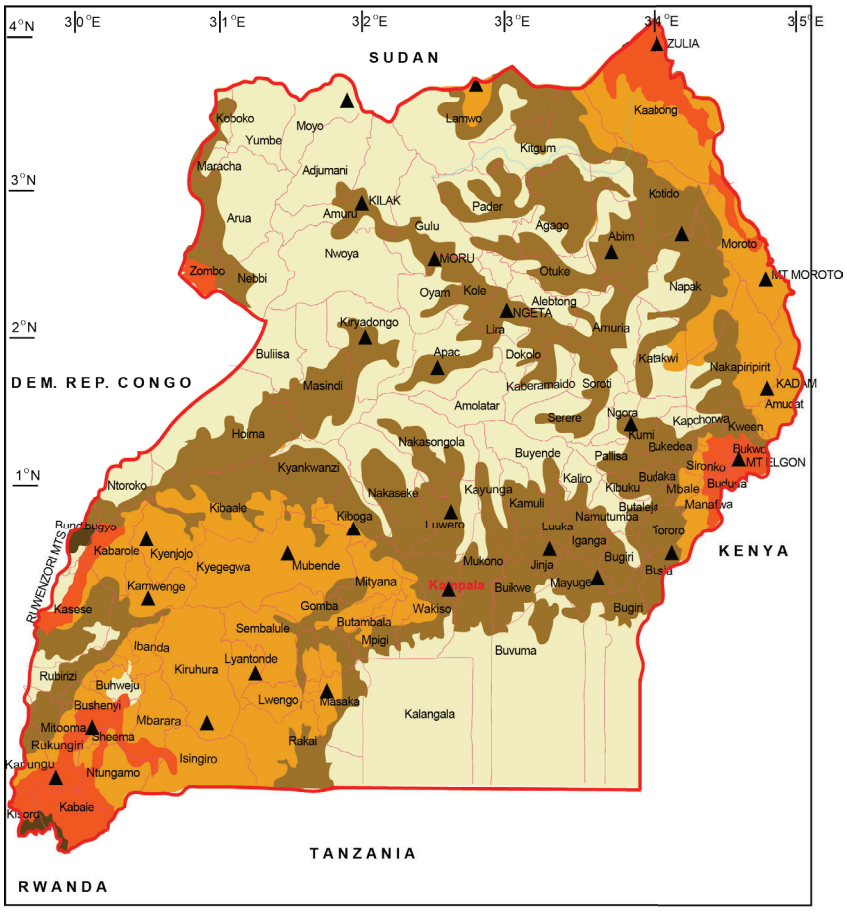
SCHEDULE 2

Paragraph 139(3)

CLIMATIC ZONES, UGANDA



RELIEF REGIONS, UGANDA



SCHEDULE 3

FIGURE 1: BIOCLIMATIC BUILDING DESIGN

Paragraph 146(1)

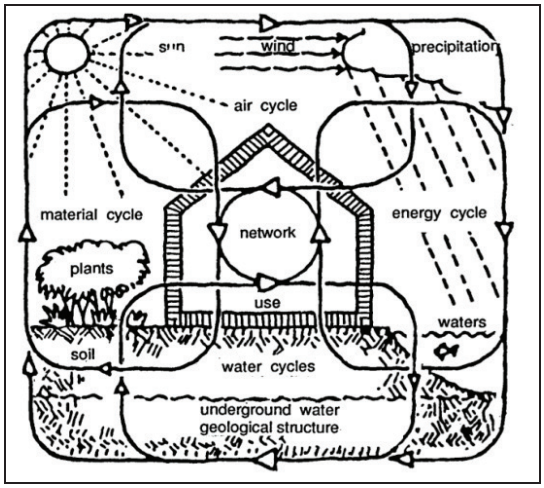


FIGURE 2: ORIENTATION ACCORDING TO THE SUN PATH AND PREVAILING WINDS

Paragraph 147(5)

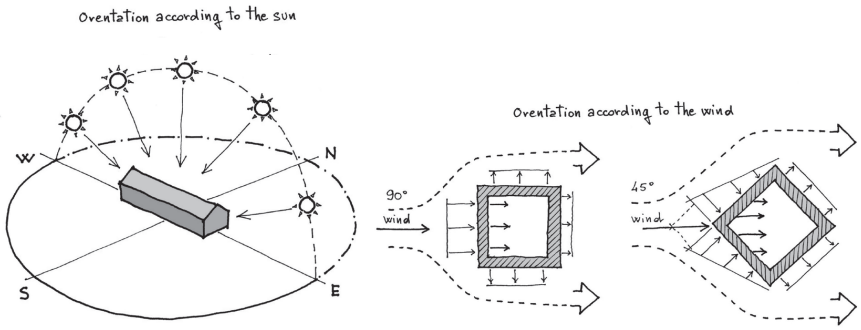


FIGURE 3: ORIENTATION BY CLIMATIC ZONE

Paragraph 147(8)

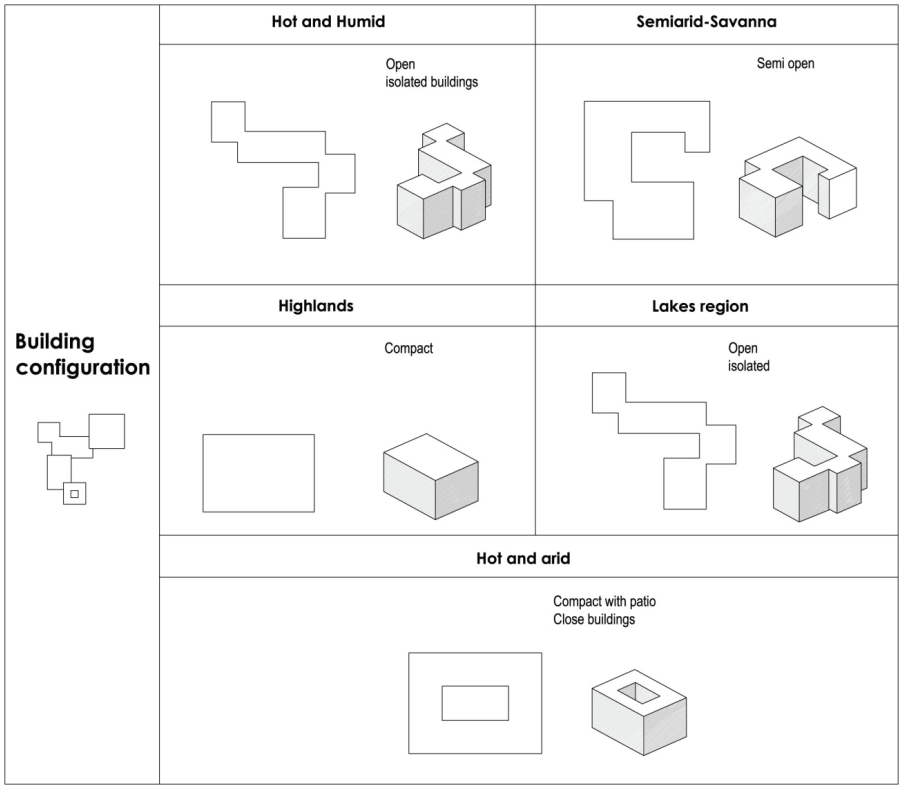


FIGURE 4: BUILDING CONFIGURATION BY CLIMATIC ZONE

Paragraph 148(2)(b)

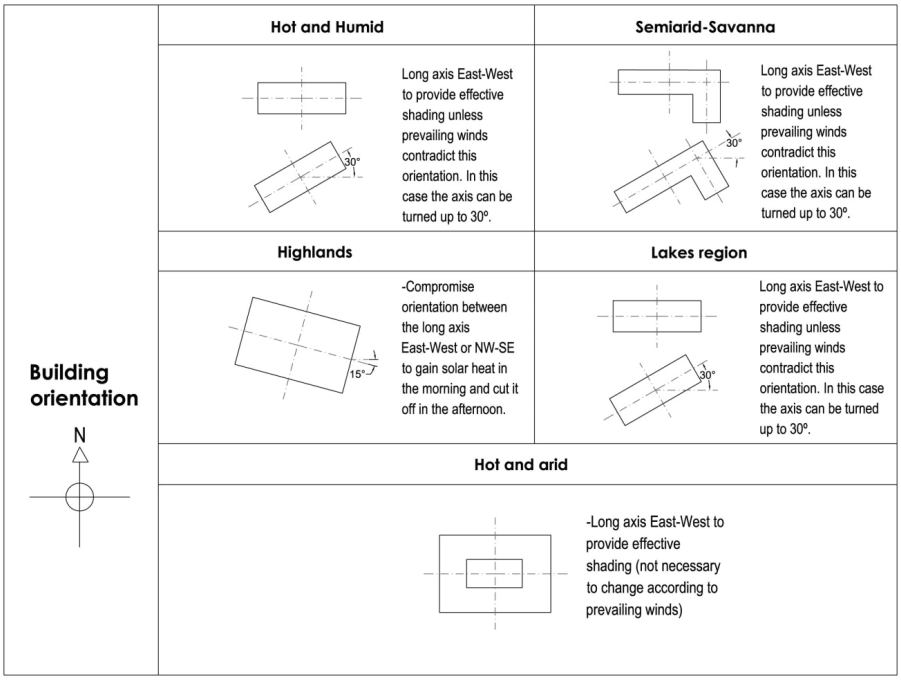


FIGURE 5: EMBODIED ENERGY OF BUILDING MATERIALS

Paragraph 149(3)

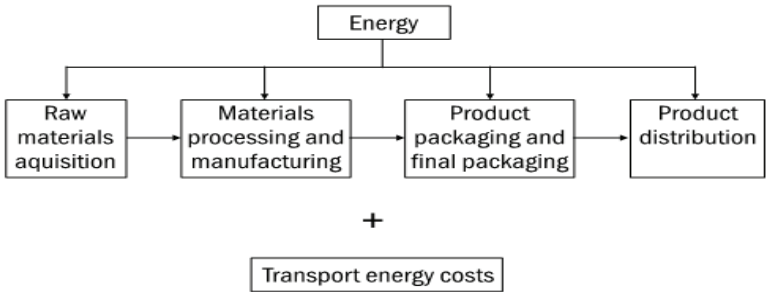


FIGURE 6: BUILDING MATERIALS CHARACTERISTICS BY CLIMATIC ZONE

Paragraph 149(9)

Building materials	Hot and Humid	Semiarid-Savanna
	- Lightweight building materials but with isolation properties in walls and roofs: - Light stone - Thin concrete blocks (10cm max) - Thin bricks (10cm max) - Wood or bamboo - Wattle and daub (10cm max) - Other local materials with similar characteristics - In case of Air conditioning: High Isolation factor in walls and roofs (isolation layer in the inner part of the wall) and tight openings	- Mediumweight building materials but with isolation properties in walls and roofs: - Medium weight stone - Concrete blocks (20cm max) - Bricks (20 cm max) - Wattle and daub, soil stabilized blocks (20 cm max) - Other local materials with similar characteristics - In case of Air conditioning: High Isolation factor in walls and roofs (isolation layer in the inner part of the wall) and tight openings
	Highlands	**Lakes region**
	-Mediumweight building materials but with isolation properties in walls and roofs - Medium weight stone - Concrete blocks (20cm and adobe) - Bricks (20 cm and adobe) - Wattle and daub, soil stabilized blocks, rammed earth, adobe. (20 and adobe) - Other local materials with similar characteristics -Air conditioner ar artificial heating should not be necessary with an appropriate building design. -In case of artificial heating (at very high altitudes), high weight building materials with high isolation factor should be provided.	-Medium to highweight building materials but with isolation properties in walls and roofs - Medium weight stone - Concrete blocks (20cm and adobe) - Bricks (20 cm and adobe) - Wattle and daub, soil stabilized blocks, rammed earth, adobe. (20 and adobe) - Other local materials with similar characteristics -In case of Air conditioning: High Isolation factor in walls and roofs and tight openings
	Hot and arid	
	-Highweight building materials in walls and roofs - Highweight stone (thick walls) - Concrete blocks (30 cm and above) - Bricks (30 cm and above) - Wattle and daub, rammed earth, adobe, soil stabilized blocks (30 and above) - Other local materials with similar characteristics -Air conditioner should not be necessary with an appropriate building design. However, for those cases that it is needed, high Isolation factor in walls and roofs and tight openings	

FIGURE 7: ENERGY BALANCE THROUGH BUILDING ENVELOPE IN HOT PERIOD

Paragraph 150(1)

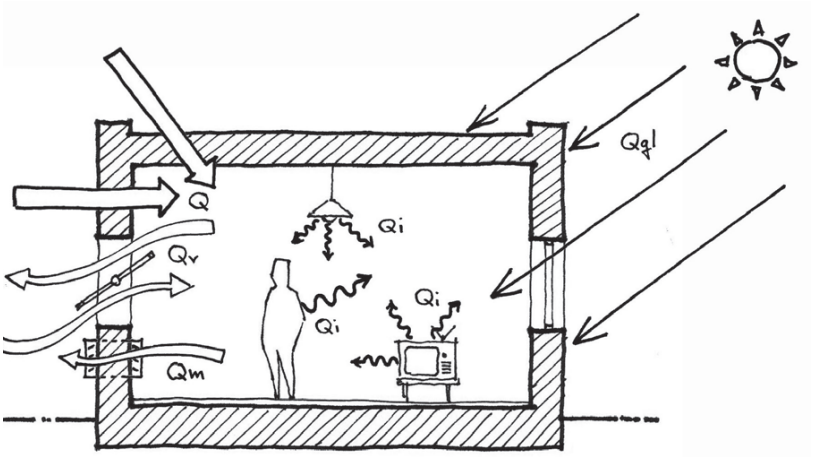


FIGURE 8: WALL PROPERTIES BY CLIMATIC ZONE

Paragraph150(7)(c)

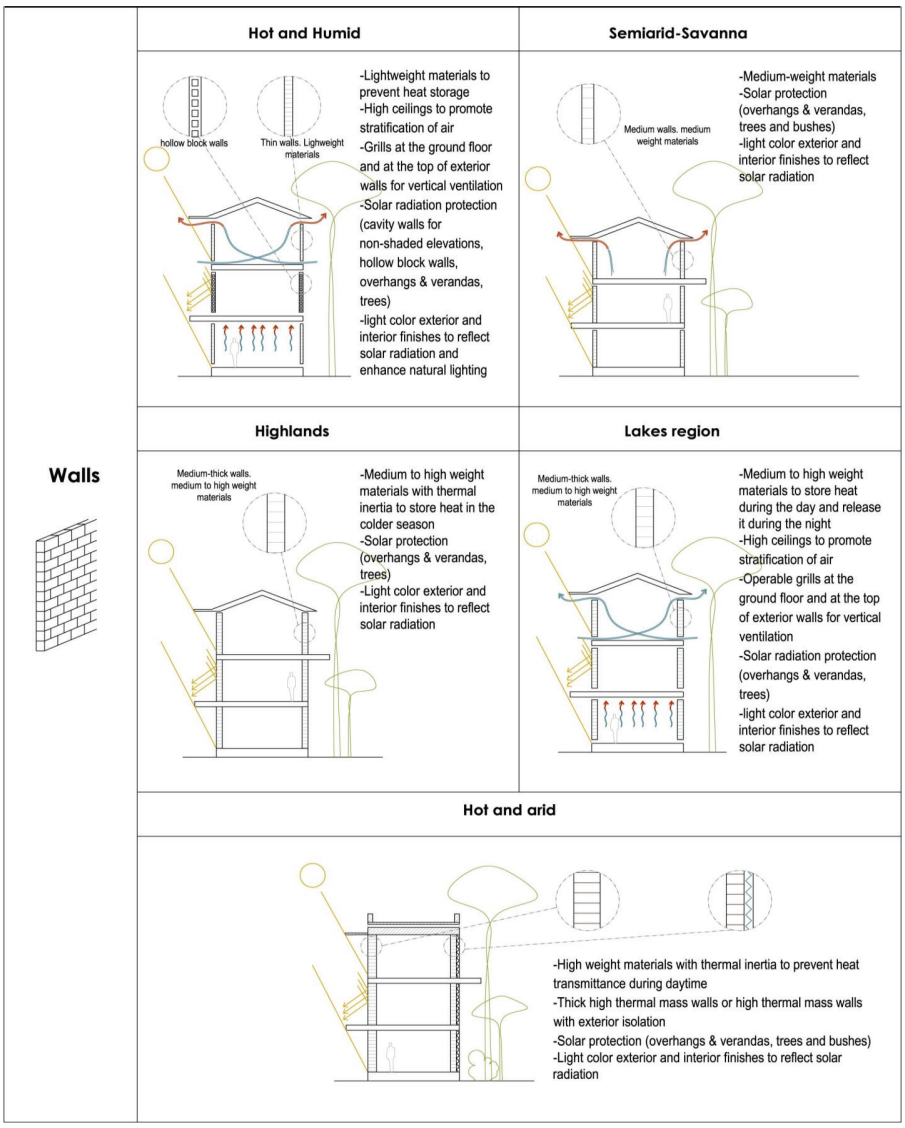


FIGURE 9: ROOFS CHARACTERISTICS BY CLIMATIC ZONE

Paragraph 150(8)(h)

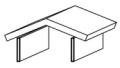
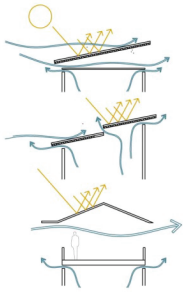
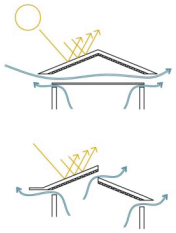
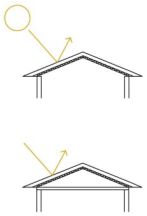
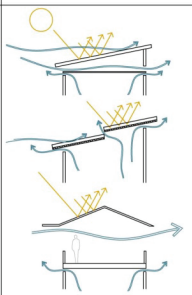
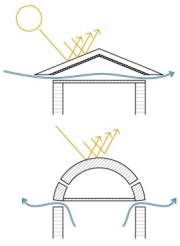
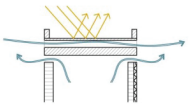
<table>
<tr><td rowspan="6">Roofs
  </td><td>Hot and Humid</td><td>Semiarid-Savanna</td></tr>
<tr><td> 
-Lightweight material
-High reflectivity
-Insulated roofs
-Separate roof-ceiling or open terrace to allow ventilation
-Vents just under the roof or on the roof to allow vertical ventilation
-minimum floor-to-ceiling height of 2.7 m
-Roofs orientated towards the prevailing breeze.</td><td> 
-Mid-weight material, -High reflectivity
-Provide with openings to allow vertical ventilation at night (vents just under the roof or on the roof).</td></tr>
<tr><td>Highlands</td><td>Lakes region</td></tr>
<tr><td> 
-Mid-weight material, mid-thermal capacity
-Medium reflectivity
-Insulated roofs or roofs with air chamber
-Medium weight ceilings for solar passive gains.</td><td> 
-Mid-weight material, mid-thermal capacity -High reflectivity
-Insulated roofs or roofs with ventilated air chamber
-Provide with vents just under the roof or on the roof allow vertical ventilation
--Roofs orientated towards the prevailing breeze.</td></tr>
<tr><td colspan="2">Hot and arid</td></tr>
<tr><td colspan="2"> 
 
-Heavyweight material,
-High reflectivity
-Provide with openings to allow vertical ventilation at night (vents just under the roof or on the roof).
-Ventilated roof, flat roof or dove are appropriate for this climate.</td></tr>
</table>

FIGURE 10: OPENINGS CHARACTERISTICS BY CLIMATIC ZONE

Paragraph 150(9)(e)

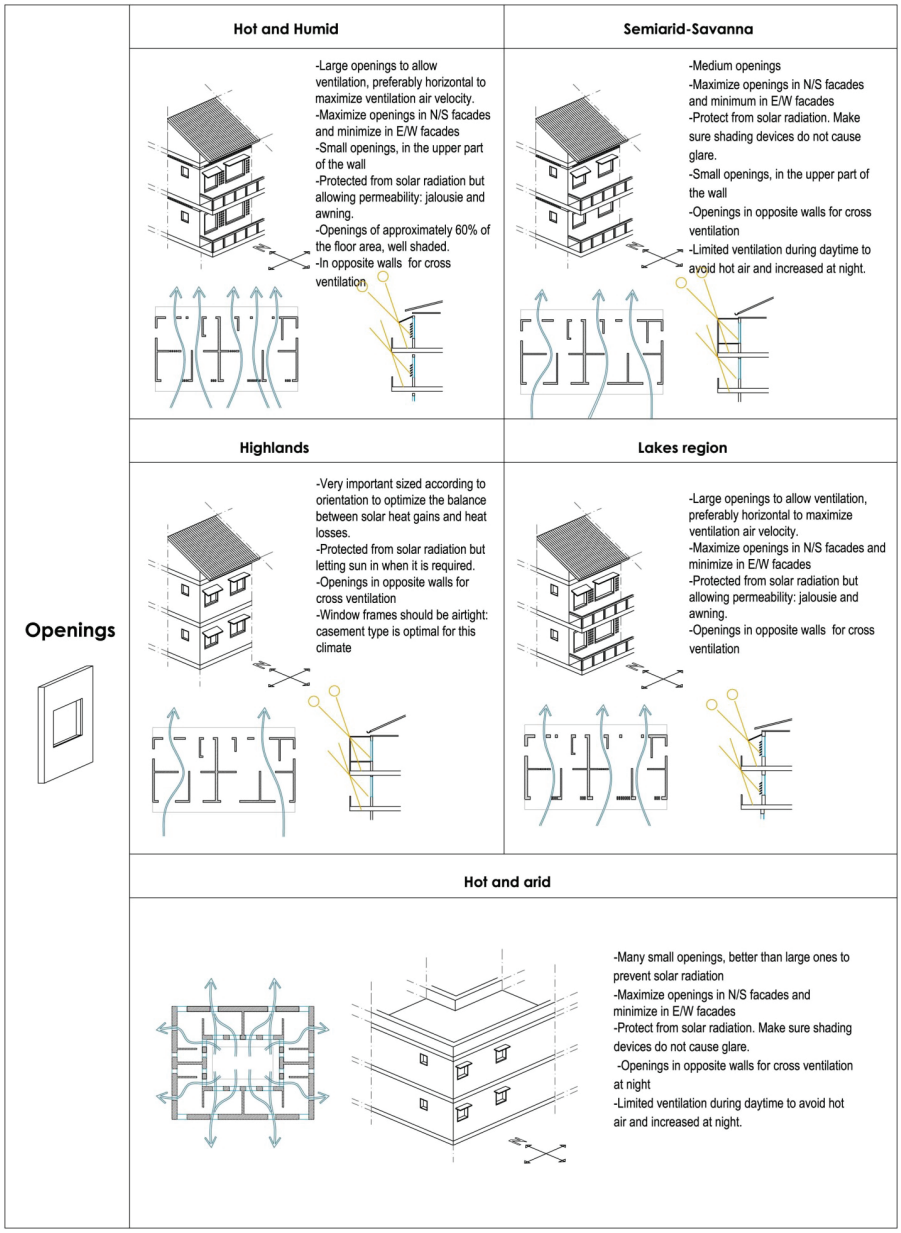


FIGURE 11: FIXED SOLAR PROTECTIONS

Paragraph 153(2)

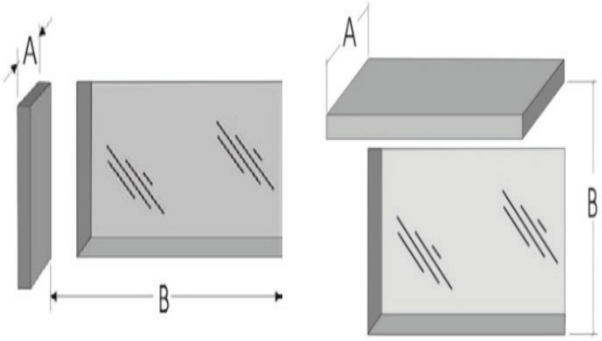


FIGURE 12: SOLAR DEVICES CHARACTERISTICS AS PER CLIMATIC ZONE

Paragraph 154

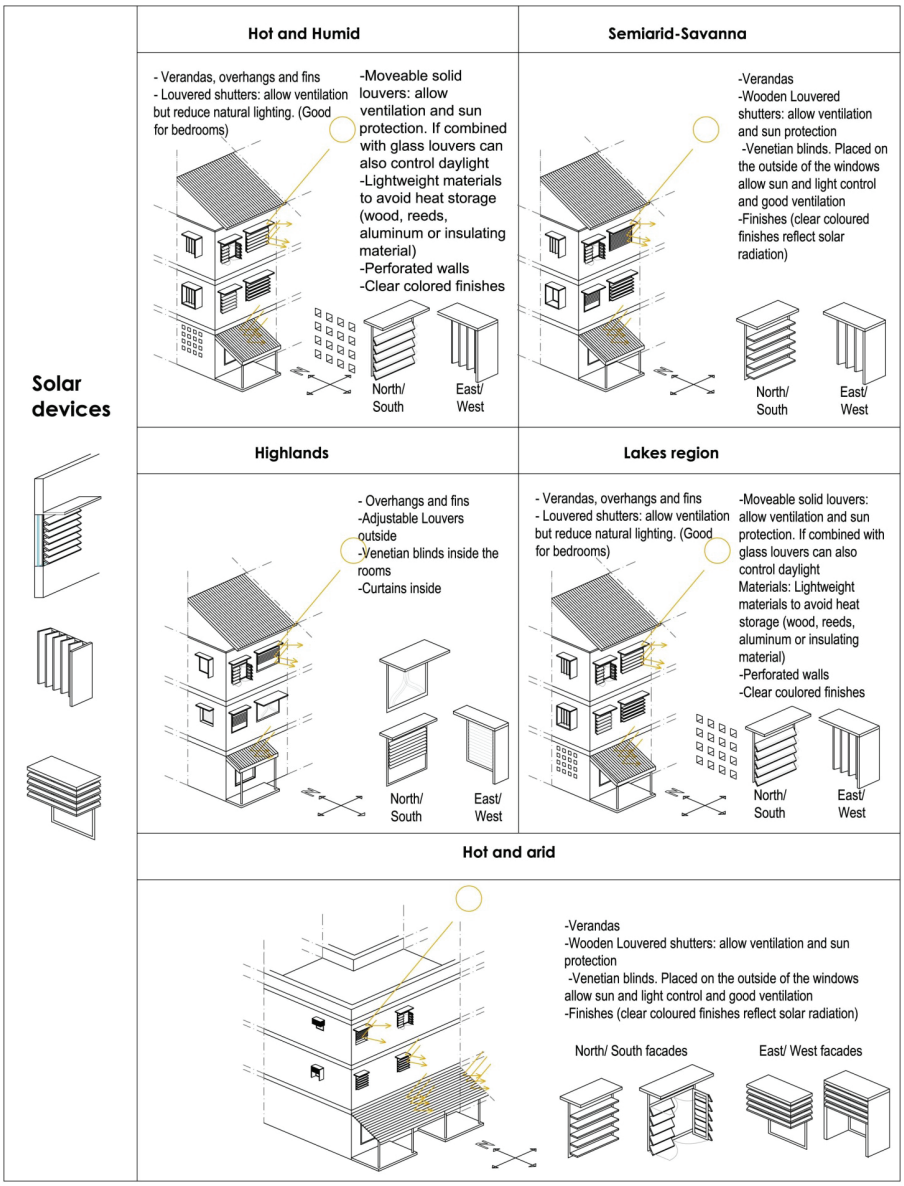


FIGURE 13: HORIZONTAL CROSSED VENTILATION AND VERTICAL VENTILATION BY STACK EFF

Paragraph 156(1)(d)

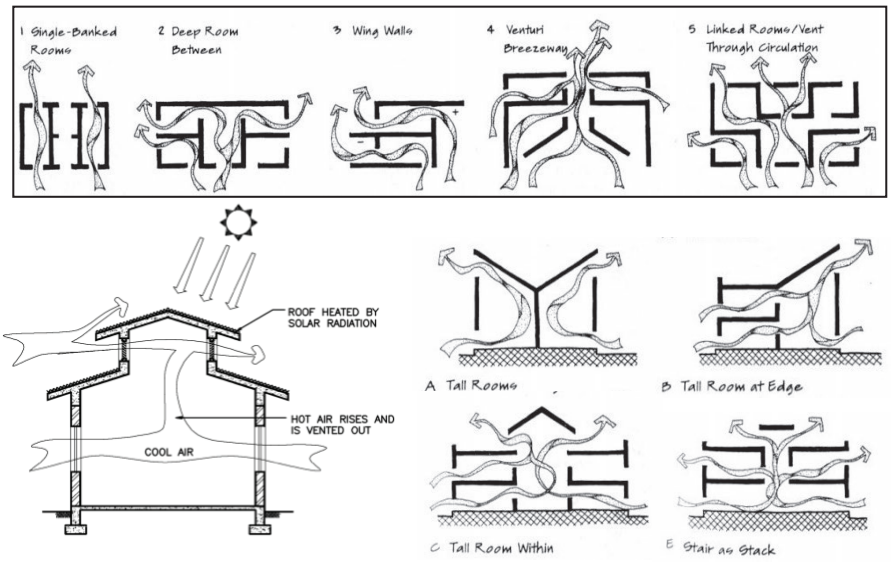


FIGURE 14. SOLAR CHIMNEYS

Paragraph 156(9)

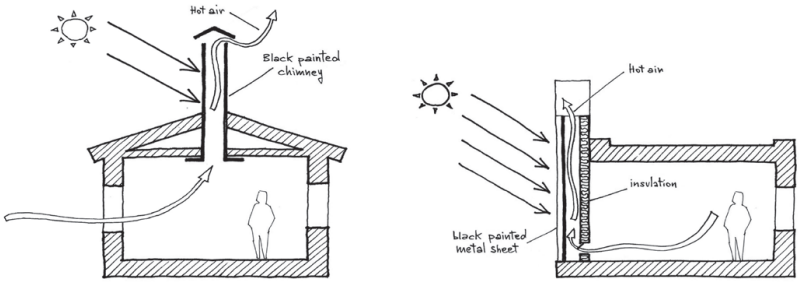


FIGURE 15: NATURAL VENTILATION AS PER CLIMATIC ZONE

Paragraph 157(2)

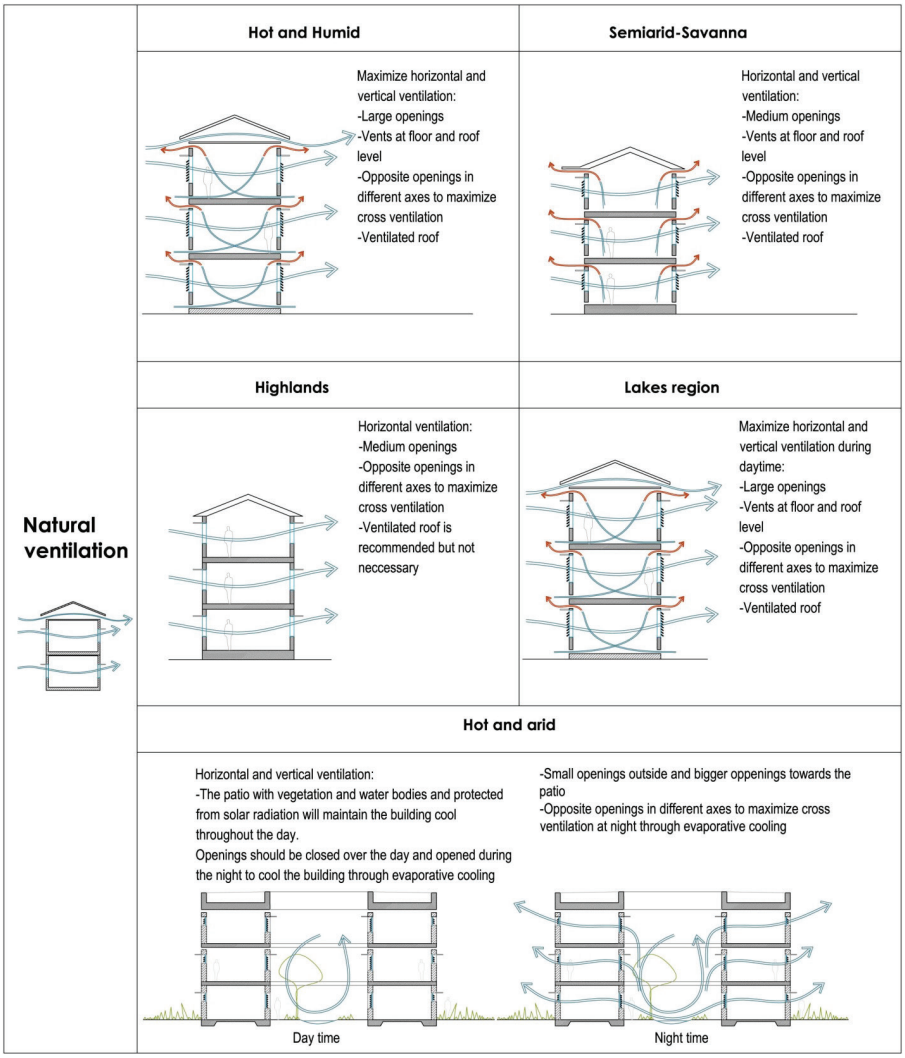


FIGURE 16: NATURAL LIGHTING PROVISION AS PER CLIMATIC ZONE

Paragraph158(10)

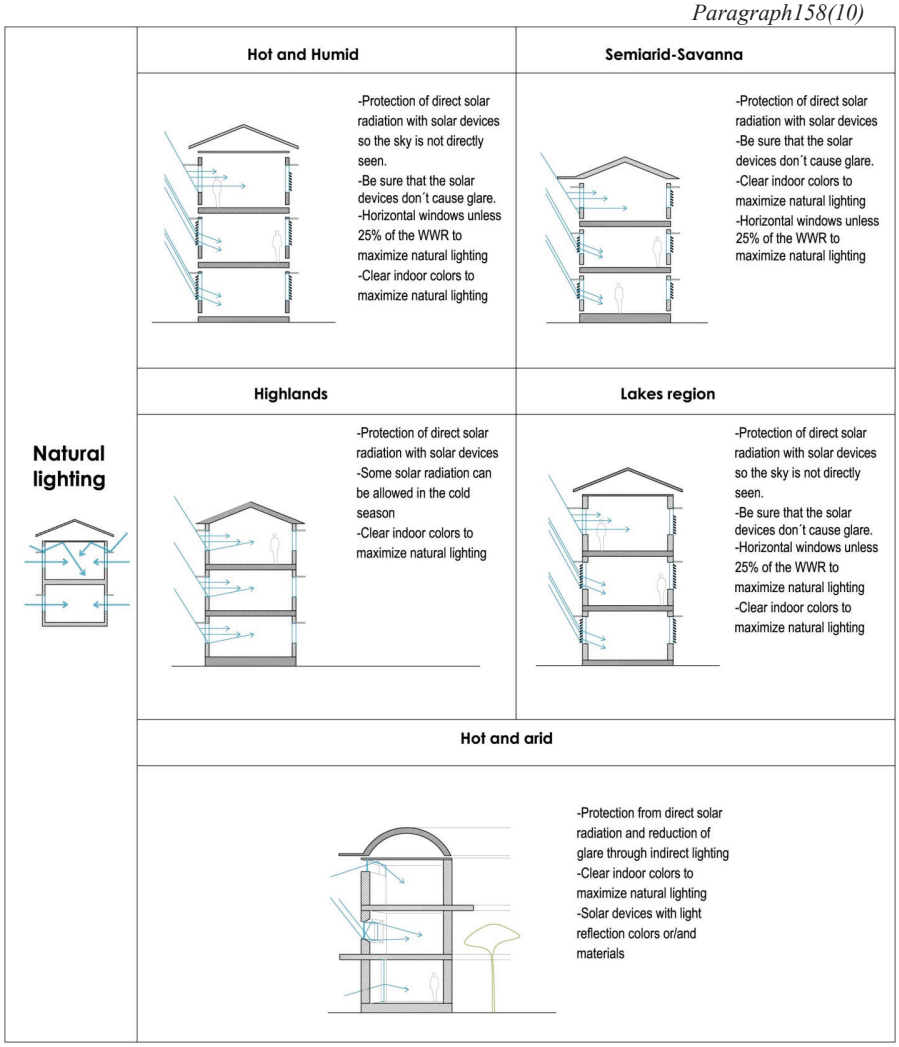
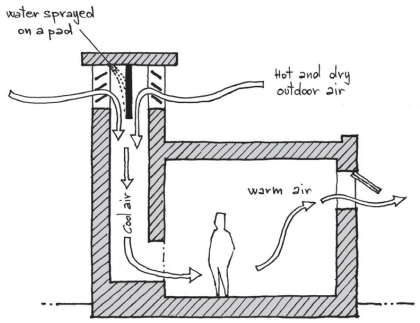


FIGURE 17: EVAPORATIVE COOLING SUITABLE TO HOT AND DRY CLIMATES

Paragraph160(4)



18: INDIRECT EVAPORATIVE COOLING; A) OPEN CIRCUIT; B) CLOSED CIRCUIT

Paragraph161(3)

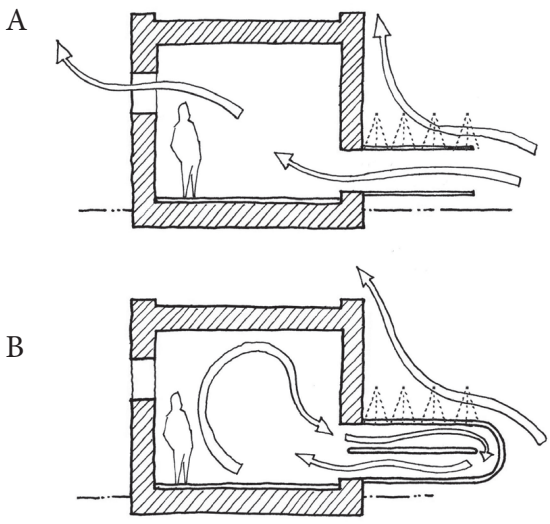


FIGURE 19: POTABLE AND NON-POTABLE WATER.

Paragraph 197(5)(c)

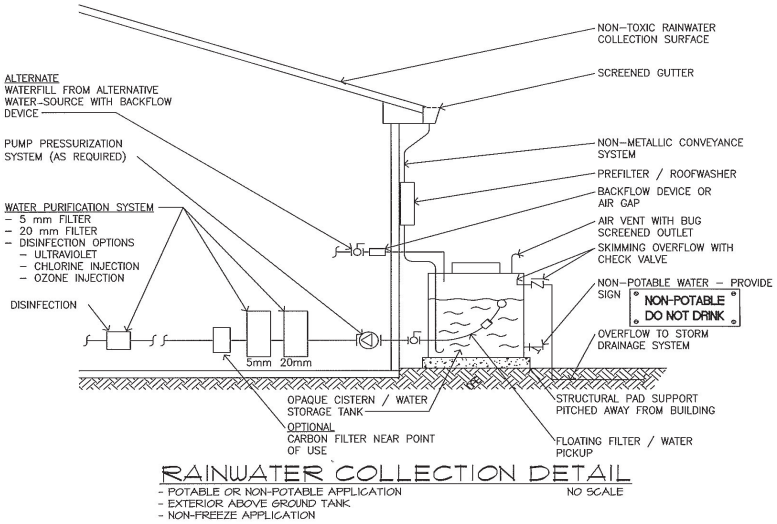


FIGURE 20:UNDERGROUND EXTERIOR CISTERN FOR POTABLE APPLICATION

Paragraph 197(5)(c)

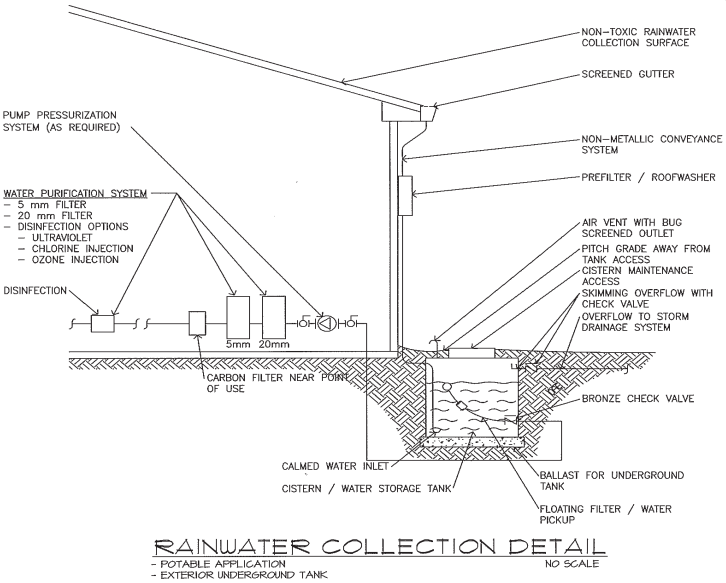


FIGURE 21: RAIN WATER HARVESTING FOR NON-POTABLE WATER

Paragraph 197(5)(c)

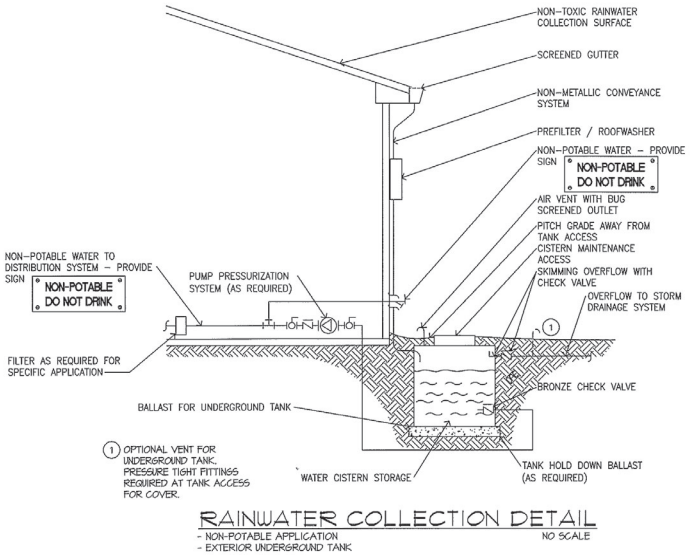


FIGURE 22: HORIZONTAL FLOW REEDBED

Paragraph 206(5)(a)(i)

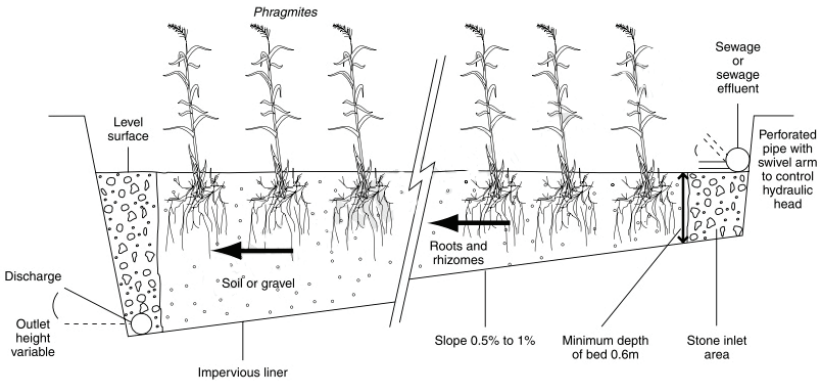
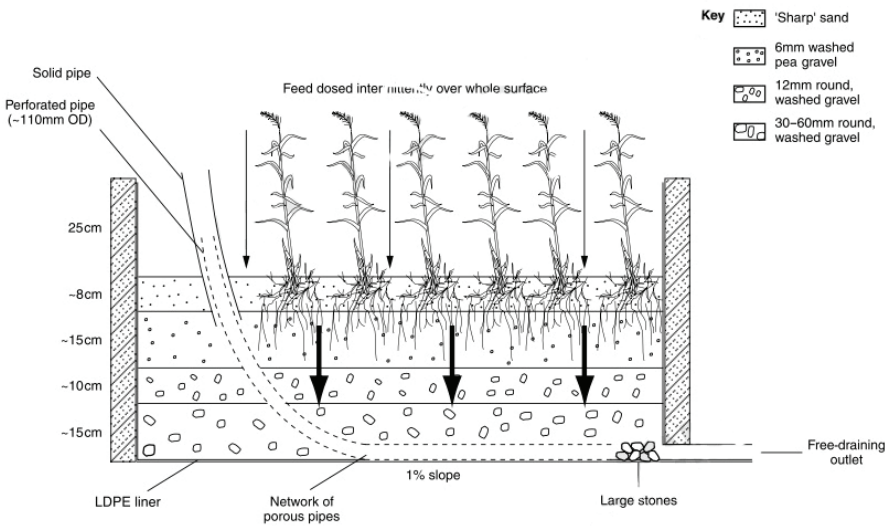


FIGURE 23: VERTICAL FLOW REEDBED

Paragraph 206(5)(b)(ii)



Cross Reference

National Building (Standards for Electrical Installations in Buildings) Code, 2018.
National Building (Standards for Mechanical Installations in Buildings) Code, 2018.

HON. AZUBA MONICA NTEGE
Minister of Works and Transport