**STATUTORY INSTRUMENTS**
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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. 60.

## THE NATIONAL BUILDING (STANDARDS FOR MECHANICAL INSTALLATIONS IN BUILDINGS) CODE, 2019.

### Part I—Preliminary

*Paragraph*

1. Title.
2. Application.
3. Interpretation.

### Part II— Domestic Water Supply And Distribution

4. Pipes and fittings.
5. Joints and connections of pipes.
6. Connections between different materials.
7. Jointing pipes to cisterns.
8. Quality of water supply.
9. Preservation of water quality.
10. Cold water supply.
11. Stopcocks and valves.
12. Pumps and equipment.
13. Air compressors.
14. Pump room.
15. Installation of pumps.
16. Water meters.
17. Hot water supply.
18. Pipe sizing.

19. Accessibility of pipes and water fittings.
20. Installation of pipework.
21. Cleaning and disinfection of the supply system.
22. Identifying and recording piping locations.
23. Inspection, testing and commissioning.

PART III — SANITARY FITMENTS, PLUMBING AND DRAINAGE WORKS.

24. Residential buildings.
25. Latrine fitments to be provided where soil fitments are prohibited.
26. Sanitary fitness for persons employed in a residential building.

*Plumbing - Soil Fitments and Waste Fitments*

27. Disposal of soil.
28. Waste pipe.
29. Materials for soil fitments.
30. Construction of watercloset fitments.
31. Construction of trough waterclosets.
32. Construction of urinal channels.
33. Flushing water supply.
34. Flushing rim.
35. Flushing cisterns.
36. Pressure valves.
37. Flushing pipes.
38. Storage tanks for flushing water.
39. Overflow pipes.
40. Traps for soil fitments.
41. Traps for waste fitments.

*Pipes and Eaves Gutters*

42. Soil pipes.
43. Waste pipes.
44. Bends in soil and waste pipes.
45. Access to soil and waste pipes.
46. Anti-syphonage pipes.

47. Ventilating pipes.
48. Rain water pipes.
49. Rain water pipes for verandas or balconies.
50. Materials for pipes.
51. Connections of pipes.
52. Fixing of pipes.
53. Pipes in ducts.
54. Eaves gutters.

*Drainage Works*

55. Drainage of buildings.
56. Disposal of foul water.
57. Disposal of surface water.
58. Pipes carrying surface water not to discharge across surface of footpath.
59. Disposal of sub-soil water.
60. Materials for drains.
61. Sub-soil water drains.
62. Size of drains.
63. Laying of drains and sewers.
64. Drains and sewers in gathering grounds to be watertight.
65. Falls of drains.
66. Junctions of drains.
67. Joints.
68. Inlets to drains.
69. Ventilation.
70. Traps not to be between ventilated points.
71. Drains and sewers under buildings.
72. Manholes and cleaning eyes to be provided.
73. Construction of manholes.
74. Disconnecting traps.
75. Gullies.
76. Cleaning eyes.
77. Filling in of drainage trenches.
78. Surface water channels.

*Septic Tanks*

79. Disposal of effluent.
80. Dip pipes.
81. Ventilation.

*Cesspools*

82. Situation of cesspools.
83. Disposal of contents.
84. Capacity.

*Testing of Drainage Works*

85. Procedure for application to test drainage works.
86. Power of National Water and Sewerage Corporation to require drainage trenches to be opened.

*Work to be carried out by the National Water and Sewerage Corporation and Recovery of Cost*

87. National Water and Sewerage Corporation to make connection of drain and private sewer to public sewer or nullah.
88. National Water and Sewerage Corporation to provide every disconnecting trap.

PART IV— HEATING VENTILATION AND AIR CONDITIONING

89. Air-conditioning and ventilation systems.
90. Materials in air duct systems.
91. Connections and openings in Air duct systems.
92. Duct coverings, linings, adhesives and insulation.
93. Underground ducts.
94. Fire dampers.
95. Smoke detector control.
96. Exhaust ducts and outlets.
97. Interconnection of systems.
98. Ducts in exits.

99. Make-up air.
100. Supply, return, intake and exhaust air openings.
101. Filters and odour removal equipment.
102. Air washers and evaporative cooling sections or towers.
103. Fans and associated air handling equipment.
104. Vibration isolation connectors.
105. Clearances of ducts and plenums.
106. Return-air system.
107. Air ducts for low capacity systems.
108. Construction and installation of ducts and plenums.
109. Warm-air supply outlets.
110. Adjustable dampers and balance stops.
111. Return-air system.
112. Coverings, linings and insulation.
113. Clearances of ducts and plenums.
114. Exhaust ducts and outlets.
115. Make-up air.
116. Supply, return, intake and exhaust air openings.

## Part V — Fire Safety

117 General requirement.
118. Design of fire installations.
119. Communication pipe.
120. Isolating valves
121. Approved fire installations.
122. Fire installations.

### *Fire Alarm System*

123. General design considerations.
124. Manual call points location, construction and requirements.
125. Selection of fire detectors.
126. Siting of detectors.

127. Audible and visual alarms.
128. No smoking signs.

*Fire Suppression*

129. Provision of fire-fighting equipment.
130. Water reticulation for fire-fighting purposes.
131. Hose reels.
132. Hydrants
133. Sprinkler systems
134. Portable fire extinguishers
135. Mobile unit fire extinguishers or trolley fire extinguishers.
136. Fire stopping of inaccessible concealed spaces.
137. Protection in service shafts
138. Services in structural or separating elements
139. Smoke control.
140. Evacuation procedures
141. Fire and evacuation plans.
142. Fire and evacuation instructions-buildings used for temporary events
143. Fire and evacuation instructions for high occupancy buildings
144. Maintenance of fire safety installations

## Part VI— Lifts

145. Provision of lifts
146. Installation and operation of lifts
147. Liftwell enclosure.
148. Liftwell inspection and emergency doors and inspection traps.
149. Ventilation of a liftwell.
150. Walls, floor and ceiling of a liftwell.
151. Lift pit.
152. Exclusive use of a liftwell.
153. Outside of a liftwell.
154. Machine and pulley rooms.

155. Machine and pulley room access.
156. Dimensions of machine and pulley rooms.
157. Doors and trap doors to machine and pulley rooms.
158. Machine rooms and enclosures.
159. Machine rooms and driving and return stations.
160. Steps and landings.
161. Obstructions.
162. Firefighting lifts.
163. Stretcher lifts.
164. Lift shafts.
165. Fire Safety of Lifts.
166. Enclosure and position of lifts and motor rooms.
167. Certificate of efficiency.

SCHEDULE 1— WATER REQUIREMENTS
SCHEDULE 2— WATER CLOSETS
SCHEDULE 3— SPECIFICATIONS OF DUCTS
SCHEDULE 4— TABLE 1 - TYPE OF OCCUPANCIES
TABLE 2 - PROVISION OF PORTABLE EXTINGUISHER
TABLE 3 - STABILITY OF STRUCTURAL ELEMENTS OF COMPONENT

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

**2019 No. 60.**

**The National Building (Standards for Mechanical Installations in Buildings) Code, 2019.**

*(Under sections 46(1) and (2) (c), (e) and (f) of the Building Control Act, 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 (Standards for Mechanical Installations in Buildings) Code, 2019.

**2. Application.**

This Code prescribe standards for—

(a) stairways, ramps, guards and lifts;
(b) lighting, ventilation and heating;
(c) fire safety; and
(d) plumbing, sanitary fitments and drainage works.

**3. Interpretation.**

In this Code, unless the context otherwise requires—

"air gap" means the unobstructed vertical distance between the outlet of any faucet or pipe and flood level rim of the water supply or receptacle;

"anti-flood valve" means the valve installed in a building drain or sewer to prevent sewage from flowing back into the building;

"appliance" means a receptacle with necessary appurtenances designed for a specific purpose the use or operation of which

results in a discharge into the sanitary drainage system;

"Authority" means any person or Agency authorised by the Government to enforce this Standard or part thereof;

"back-flow" means such flow of water from any source other than the public water supply system of potable water or any solid, liquid or gaseous substance, or any combination thereof, into potable water distribution pipe as may make the water in that pipe non-potable;

"branch" means that part of a pipe system which extends from a water distribution pipe, or from a main soil or waste pipe, to one or more fixtures, or the pipe connecting one or more individual vents with the main stack or stack vent;

"building drain" means that part of the lowest piping of a drainage system which receives the discharge from stacks and conveys it to the building sewer via a manhole located at not more than 2.0m away from the external building wall;

"building drainage" means a drainage system consisting of appliances, their traps and discharge pipes, a soil or waste stack, graded discharge branch pipes, a building drain and a building sewer with external drains, manholes and other appurtenances;

"building sewer" means that part of the horizontal piping of a drainage system which extends from the end of the building drain to a public sewer, a treatment unit or cesspool or septic tank;

"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 onsite treatment works including a septic tank;

"clean-out" means a device that has a removable cap or plug securely attached to it and in a pipe so that the cap or plug may be removed to permit pipe cleaning apparatus to be inserted into the pipe;

"collecting sewer" means the public sewer outside the cartilage of the individual plot or within a reserved way leave which crosses a part of the plot;

"crown weir" means the highest portion of the inside lower surface of the outlet end of a trap;

"cross vent" means a vent interconnecting a stack and its relief vent;

"dead end" means leading from drainage piping or vent pipe that ends in a cap, plug or other closed fittings;

"developed length" means the total length along the centreline of a pipe and fittings including all bends;

"discharge pipe" means a pipe for carrying sewage or waste water from any fixture or appliance to a stack, gully trap or drain;

"distribution pipe" means any pipe other than an overflow pipe or a flush pipe conveying water from a storage cistern or from any other pressure source apart from main's pressure to one or more fixtures or appliances;

"drainage trap" means a trap installed in the building to prevent circulation of air between the drainage system inside the building and the sewer;

"drain" means any drain, together with its appurtenances, used for the drainage of one building only, or of premises within the same curtilage and made for the purpose of communicating with a cesspool or other receptacle for drainage, or with a sewer into which drainage or two or more buildings or premises occupied by different person is conveyed and includes any pipe or channel, whether opened or closed used or intended to be used for drainage of land;

"drop pipe" means vertical section of drain joining the drains at different levels;

"duct" means an enclosure designed to accommodate water pipes and fittings and other services if required and constructed so that access to the interior can be obtained either through its length or at specified points by removal of a cover or covers;

"dwelling" means a building constructed and adopted or designed to be used as a residence;

"effective opening" means the cross-sectional area of a faucet, fitting or pipe, at the point of discharge;

"effluent" means liquid discharged from a wastewater treatment unit;

"firefighting water supply system" means the water service pipe, a storage cistern, pumps, distribution pipes, fittings and connecting pipes, control valves and devices intended for the purpose of firefighting;

"fire hose reel" means a length of firefighting hose which is connected to a valved water supply and is wound on a reel;

"fire hydrant" means a fitting installed in a water pipeline which provides a valved outlet, above or below ground made to permit a controlled supply of water to be taken from the pipeline for firefighting;

"fixture discharge unit" means a design factor by which the hydraulic load produced by fixtures may be expressed as multiples of that factor; and is usually regarded as the amount of water discharged in one minute from a lavatory basin with a standard 35mm waste, flowing full bore;

"flood level" means when used with reference to fixture, the level at which water begins to overflow the top or rim of the fixtures;

"floor drain" means a drain to receive water from a floor or section of a floor of a building, especially the water used for washing the floor;

"flushing cistern" means a cistern provided with a device for discharging the stored water rapidly into a water closet pan or urinal;

"flushing siphon" means a device, manual or automatic, actuated by siphonic action;

"flush valve" means a device located at the bottom of the tank for the purpose of flushing water closets and similar fixtures;

"foul drainage" means the drainage of foul water with a given gradient;

"foul water" means any water contaminated by soil or any domestic wastewater;

"gradient" means when used with reference to a pipe, its slope with reference to the true horizontal;

"grease trap" means a trap designed to intercept and prevent the passage of grease into the drainage piping;

"gully trap" means an assembly used in a wastewater system which provides a water seal to prevent odours and gases from external drain from escaping into a building or into the atmosphere in the proximity of the assembly;

"hydrant valve" means a valve controlling flow of water from the fire hydrant outlet with provision for attachment of a fire hose;

"indirect waste" means waste that is not discharged directly into drainage piping;

"indirect waste pipe" means a waste pipe that connects indirectly to drainage piping through a gully trap;

"industrial wastes" means liquid wastes resulting from the processes employed in industrial establishments and which are free from faecal matter;

"inspection chamber" means a covered chamber constructed on a drain or sewer so as to provide access, for inspecting, testing or clearance and removal of obstructions, and usually situated in areas subjected to light loading only;

"intercepting trap" means a devise designed and installed to separate and retain deleterious, hazardous or undesirable matter from normal sewage or liquid wastes to discharge into the disposal terminal by gravity;

"interceptor" means an appurtenance or device designed and installed to separate and retain deleterious, hazardous, or undesirable matter liquid or solid from normal wastewater and permit normal wastewater or liquid waste to discharge into the disposal terminal by gravity;

"junction" means a plumbing fitting used to connect a branch pipe or channel to a main pipe or channel;

"load factor" means a percentage of the total connected fixture unit flow rate which is likely to occur at any point in the drainage

system; and varies with the type of occupancy, the total flow unit above this point being considered and with the probability factor of simultaneous use;

"nominal size" means a numerical designation of the size of a pipe, bend or branch (DN) fitting, which is a convenient round number approximately equal to a manufactured dimension;

"offset" means when used with reference to piping, a pipe with double bends running parallel;

"peak flow" means the maximum rate of a fluctuating flow;

"pipework" means an installation of piping with its fittings;

"plumber" means a person who is qualified and certified by the appropriate authority to practice the plumbing works;

"plumbing inspector" means a person appointed by the appropriate Authority to enforce this Standard;

"plumbing system" means the arrangement of fixtures, pipes, drains and other appurtenances, including venting system, for conveying water, sewage, or other liquid wastes to, in or from a building and its associated premises; and does not include arrangements outside the property boundary;

"potable water" means water which is satisfactory for human consumption and meets the requirements of the Ministry responsible for public health;

"potable water system" means the plumbing system that conveys potable water;

"private sewerage disposal" means any approved privately owned and operated system of sewage disposal;

"relief vent" means a vent installed in a stack below the lowest fixture;

"riser" means a water supply pipe which extends vertically one full storey or more to convey water to branches and to sanitary fixtures if it is a direct system or to storage cisterns or tanks for distribution by gravity;

"roding" means a system of rods which are progressively joined to clear drainage lines;

"roughing work" means the installation of all parts of the plumbing system which is completed prior to the installation of fixtures;

"self-cleansing velocity" means the velocity of a flowing liquid in a pipe or channel necessary to prevent the deposition of solids in suspension;

"septic tank" means a water-tight receptacle which receives the discharge of a drainage system or part of the drainage system, designed and constructed to retain solids, digest organic matter through a period of retention and allow the effluents to be discharged to percolation trenches or soak away pits;

''service pipe" means so much of any pipe for supplying water from a main to any premises as is subject to water pressure from that main;

"sewage" means any liquid waste containing animal, vegetable, or mineral matter, in suspension or solution and includes household wastes and wastes from commercial and industrial establishments;

"sewer" means a conduit for the carriage of sewage;

"sewerage system" means drainage piping, main sewers and private or public sewage treatment plants and sewage-disposal plants;

"siphonage" means the siphoning away of water seals in fixture traps due to negative pressure;

"sleeve" means an enclosure of tubular or other section of suitable material so designed as to provide a space through an obstruction to accommodate a single water pipe and to which access to the interior can be obtained only from either end of the sleeve;

"soak away pit" means a pit dug into permeable ground, filled with broken stone, bricks or large granular material and usually covered, where liquid may seep away into the ground;

"soil pipe" means a pipe that conveys the discharge of soil from sanitary appliances other than from waste water sanitary appliances;

"soffit" means the highest point of the internal surface of a pipe at any cross section;

"sprinkler system" means an assembly of pipework graded in size, erected throughout a building with sprinkler heads are installed at prescribed intervals having pipe work is connected to a set of installation for the operation of the system;

"spud" means the threaded outlet connection from a water-closet or urinal tank or inlet to a water-closet bowl;

"stack" means the vertical main pipe of soil or waste stack or vent pipe;

"storage cistern" means any cistern or water tank other than a flushing cistern in which water is stored at atmospheric pressure, the water being normally received through a float control valve set at a predetermined level and incorporating an air gap;

"sub – drain" means a drain that is at a level lower than the building drain and the building sewer;

"sump" means a watertight tank or pit that receives the discharge from a sub-drain and from which the discharge flows or is ejected into drainage piping by pumping;

"supply pipe" means a service pipe that is not a communication pipe;

"surface water drain" means a drain installed to collect surface water from an open area and discharge it into a storm water sewer;

"trap" means a fitting or device designed and constructed to provide, when properly vented, a liquid seal that prevents the back passage of foul air without materially affecting the flow of sewage or waste water through it;

"trap seal" means the maximum vertical depth of' water that a trap retains to prevent the passage of foul air back into the building and it is measured between the crown weir and the top of the depth of the trap;

"trap-standard" means a service sink which has its trap integral with the support for the sink;

"trap weir" means the lowest point of the outlet leg of a trap;

"under drain" means a two pipe subsurface effluent disposal system with the pipes laid at different elevations, with fine gravel media in between;

"vent pipe" means a pipe installed to provide circulation of air within a plumbing or drainage system to exhaust foul gases and to protect trap seals from siphonage and back pressure;

"vertical" means not departing from the true vertical plane by more than 45 degrees;

"waste pipe" means a pipe which receives discharge from a waste water appliance and conveys it to the building drain through a gully trap;

"water distribution pipe" means when used with reference to premises, a pipe which receives either from a main or storage cistern or tank and conveys into sanitary appliances and it includes a control valve and fittings connected to it, but does not include a meter or control-valve;

"water main" means a water supply main pipe from the Authority meant for distribution of water to the public;

"water-outlet" means a water distributing opening;

"water seal" means the depth of water in a trap, an interceptor or other similar unit, between the point of overflow and the lower level of the division separating the inlet and outlet meant for prevention of foul air backflow into the system from either the drainage outside or the sewer;

"water supply system" means, the water service pipe, a storage cistern, distributing pipes, fittings and connecting pipes, fittings, control valves and devices adjacent to the building and under the control of the occupier;

"water service pipe" means any pipe supplying water from a main to a premises and is subjected to water pressure from the main or would be subjected to but for the closing of valves; and

"waste water unit" means a receptacle used for ablutionary purposes

only, including, bath, lavatory basin, kitchen sink, cleaners' sink, laundry trays, shower trays and any other similar fitting.

## Part II— Domestic Water Supply and Distribution

### 4. Pipes and fittings

(1) All pipes and fittings for the water supply system shall conform to the requirements of this Code.

(2) A pipe or other water-fittings or storage cistern made from lead or internally lined with lead shall not be used in new installation, not having lead services.

(3) Repairs to existing lead services shall be by replacement with materials.

(4) The repair or partial replacement of lead piping with copper piping shall be avoided unless galvanic action is prevented.

(5) Where supply waters are capable of dissolving an undue amount of copper such that either unacceptable green staining is produced, or deposition of copper into aluminium or zinc surfaces promotes galvanic attack, consideration shall be given to the use of alternative materials.

(6) Galvanized steel pipework shall not be used connected to and, especially, downstream from copper pipework.

(7) Galvanized steel pipe shall be jointed only by screwed connections, under no circumstances shall welded or brazed joints be used.

(8) Plastic pipes shall not be installed close to source of heat or indirect sunlight.

(9) Where pipes are installed above the ground, consideration shall be given to accommodate thermal movements.

(10) As unplasticized PVC pipes become increasingly brittle with reducing temperatures, particular care shall be taken in handling them in temperatures below $5^{O}C$

(11) A pipe, pipe fitting or storage cistern intended for conveying or storing water shall not be lined or coated internally with coal tar or any substance that includes coal tar.

**5. Joints and connections of pipes.**

(1) All joints shall be made in accordance with the manufacturer's instructions.

(2) Care shall be taken to establish satisfactory jointing techniques for all water services pipework.

(3) All piping and fittings shall be cleaned internally and be made free from particles of sand, soil, metal fillings and chips.

(4) Every joint between pipes, or between the pipes and fittings, shall be made in a manner commensurate with, or appropriate to the materials from which the pipes and fittings are manufactured.

(5) Every joint and connection in a potable water system shall be watertight under an internal water pressure of not less than that prescribed for the class of pipe installed.

(6) Jointing of iron pipes shall conform to the following requirements—

(a) the spigot and socket joints of iron pipes shall be caulked with lead with the joint being made by first caulking spun yarn, which shall be clean and sterile, then filling the remainder of the joint space by running in molten lead, taking care that no dross enters the joint and then thoroughly caulking the

lead, and the lead need not extend into the joint further than the back of the groove formed in the socket; and

(b) flanged connections shall be made with screwed or cast on flanges as specified in subparagraph (7) for steel pipes.

(7) Jointing of steel pipes shall conform to the following requirements-

(a) welded joints shall not be used where a protective lining would be damaged by heat;

(b) screwed joints in steel piping shall be made with screwed socket joints using wrought-iron, steel or malleable cast iron fittings;

(c) exposed threads left after jointing shall be painted or, where installed underground, thickly coated with bituminous or other corrosion preventive coating; and

(d) flanged joints shall be made with screwed socket or welded flanges of steel or cast iron using jointing rings and, if necessary, a suitable jointing paste with the nuts carefully tightened, in opposite pairs, until the jointing ring is sufficiently compressed between the flanges for a watertight joint.

(8) Jointing methods for copper pipes shall be in accordance with the manufacturer's recommendations.

(9) Jointing of unplasticized PVC pipes shall conform to the following requirements-

(a) mechanical joints in unplasticized PVC piping shall be made by the use of push-fit integral elastometric sealing rings which are compressed when the plain ended pipes are inserted in the adjoining sockets with the plain pipe ends chamfered and the surfaces cleaned and lubricated, the chamfered pipe ends inserted fully into the adjoining socket or as far as any locating mark put on the spigot end by the manufacturer and the sealing rings in compliance with approved standard;

(b) compression joints shall be of the non-manipulative type;

(c) where solvent-cement-welded joints are used in unplasticized PVC piping, they shall be made using a solvent cement complying with approved standards recommended by the manufacturer of the pipe;
(d) below ground and in confined location above ground, mechanical joints shall be used in preference to solvent-cement joints;
(e) notwithstanding subparagraph (d), in accessible positions above ground, solvent-cement joints can be used; and
(f) flanged joints used for connections to valves and fittings shall be with corrosion resistant or immune backing rings and bolting.

(10) Jointing of polyethylene pipes shall conform to the following standards—
(a) mechanical joints shall be made using either plastics or metal compression fittings, to ensure satisfactory jointing of the materials from which the pipe and fittings are made, compatibility shall be established and the manufacturer's instructions shall be carefully followed; and
(b) solvent-cement welding shall not be used to join polyethylene piping.

**6. Connections between different materials.**

(1) The use of different pipe materials shall be avoided as far as practicable unless where parts of an existing service are to be replaced or extended.

(2) Where connections are to be made, adaptor couplings shall be used wherever possible.

(3) Where suitable adaptors are not available for the particular joint required, both materials shall be adapted to threaded ends which shall be screwed together, if male and female, or shall be connected by a nipple, socket or union.

(4) Joints in buried pipework shall be kept to the absolute minimum and joints between pipes of different materials shall be restricted to connections between large supply pipes similar to suppliers' mains and pipes serving individual buildings.

(5) Service connections to cast iron and steel pipes shall be made by drilling and tapping the pipe and screwing in a copper or copper alloy union ferrule.

(6) smaller pipes shall be connected by any appropriate method described below—

(a) for making service connections to unplasticized PVC pipes, a saddle shall be fixed round the larger pipe and a ferrule screwed into the saddle with the saddle manufacturer's instructions complied to in all aspects;

(b) service connections to polyethylene pipes shall be made using either a saddle-fusion fitting or a self-tapping saddle; or

(c) branch pipes shall be connected to a main pipe by using ferrule or Tee (leadless collar), depending upon the sizes of the pipes to be jointed.

**7. Jointing pipes to cisterns.**

(1) Cisterns or tanks shall be properly supported to avoid undue stress on the pipe connections and holes shall be correctly positioned for the connection of pipes to cisterns.

(2) All debris, filings and borings shall be removed from the inside of the cistern.

(3) For steel pipes to steel or glass reinforced plastics cisterns, the threaded end of the pipe shall be secured in the hole in the cistern either by backnuts and washers both inside and outside or by using bolted or welded flanged connections.

(4) For copper or plastics pipe to steel, or glass reinforced plastics cisterns, a copper alloy connector or equivalent having a shoulder to bear on the outside of the cistern and secured by a backnut to the inside shall be used with corrosion resistant washers used both on the inside and the outside of the cistern.

(5) Connections to concrete cisterns shall be made with short thread (with or without flanged connections) having a puddle flange either cast or welded on taking care to ensure that the connections are properly aligned both in the horizontal and vertical planes when being cast into the concrete, which shall be compacted around the puddle flange to ensure a watertight joint.

**8. Quality of water supply.**

(1) Public water suppliers are obliged to provide a supply of wholesome water which is suitable and safe for drinking and culinary purposes.

(2) Water supply installations shall be constructed so that water delivered is not liable to become contaminated to the extent that it is a hazard to health or is unfit for its intended use.

(3) The installation in subparagraph (2), shall not adversely affect drinking water in any of the following ways-

(a) by materials in contact with water being unsuitable for the purpose;
(b) by cross connection between pipes conveying water supplied by the water undertaker with pipes conveying water from some other source;
(c) by stagnation particularly at high temperatures; or
(d) as a result of backflow of water from water-fittings or water-using appliances into pipework connected to mains or to other fittings and appliances.

(4) Guidelines for drinking water quality shall be as established by the World Health Organization (WHO) set out in Table 1 under Schedule 1.

(5) There shall be no connection in a potable water system through which any foreign matter or non-potable water may enter the potable water system.

(6) A person shall not interfere with a potable water system in a manner which may cause the water to become non-potable.

(7) A pipe or fitting that has been used for any purpose other than the distributing, of potable water shall not be installed in a potable water system.

(8) Non-potable water may be used for flushing water closets and urinals and other appliances not requiring potable water, provided such water shall not be accessible for drinking or culinary purposes.

(9) For the purpose of preventing non-potable water being mistaken for potable water, all piping distributing non-potable water shall be identified by distinct, easily recognizable, permanent marking and shall not be accessible as a supply of water for drinking, or for preparation of food.

(10) Non-potable water shall not be distributed to any part of food-processing establishment or where food is processed.

**9. Preservation of water quality.**

(1) A potable water system shall be separated from and be independent of a supply system for non-potable water.

(2) A pipe conveying non-potable water or sewage shall not be installed where it may contaminate the water in a tank for potable water that is not a sealed tank, or any food-handling equipment.

(3) A sewage ejector or any part of a sewage ejector shall not be connected to any part of a potable water system.

(4) Every well pump, filter, softener, appliance, or device connected to a potable water system shall be provided with covers, walls, copings or casings to entirely exclude superficial ground or surface water and other sources of contamination.

(5) Pipes, water fittings and storage cisterns made from or internally lined with lead shall not be used in any new installation or to replace any existing lead pipe or lead lined cistern.

(6) A pipe, fitting or storage cistern shall not be lined or coated internally with coal tar or with any material which will affect the potability of the water.

(7) A pipe or fitting shall not be laid in, on or through foul soil, refuse, sewer, cesspool or refuse chute or any manhole connected with them or any substance that might have an adverse effect on water quality unless the pipe is—

(a) laid through a water tight, corrosion-resistant conduit of sufficient length and strength to afford adequate protection to the pipes, or

(b) fixed not less than 600.0mm above the surface of the ground likely to be contaminated.

(8) A plastic pipe shall not be laid where oil or petrol leakage or spillage could be expected to occur unless suitable measures are taken to prevent contact of any oil or petrol with the plastic pipes or where possible migration of petroleum materials and phenols from contaminated soils might occur.

(9) The water distribution system shall be protected from backflow and every water outlet protected from backflow, preferably by having the outlet end from which the water flows, spaced a

distance above the flood-level rim of the receptacle into which the water flows sufficient to provide a minimum required air gap.

(10) Positive measures shall be taken to prevent—

(a) the ingress of contaminated water to any part of a water installation;

(b) the backflow of water from the installation to the supply mains; and

(c) pumping on supply pipes without the permission of the water supplier which may cause backflow in adjacent pipes as shown in Figure 1 set out in Schedule 1.

(11) The minimum air gap required between a faucet, spout or distribution pipe supplying potable water, a fixture and the flood level rim or top surface water level of the fixture shall not be less than 50mm for dwelling houses, and not less than three times the effective diameter of the inlet valve for other buildings.

(12) Air gaps shall be measured between the lowest point of the discharging pipe and the invert of the overflow of the fixture or tank.

(13) Subject to the requirements of subparagraph (15), where it is not practicable to provide an air gap as specified, a backflow preventer may be installed on the distributing pipe in a readily accessible position between the last valve on the distributing pipe and the outlet.

(14) A backflow preventer shall be installed in a manner so that its critical level is above the flood-level rim of the fixture, or the highest possible water level in the tank, a vertical distance of which shall not be less than four times the diameter of the inlet of the control valve, or 100 mm, whichever is the greater.

(15) Where a tank that is not a pressure tank is constructed or located in such a way that it is not practicable to provide the minimum

air gap above the flood-level rim of the tank, or to install a back-flow preventer—

(a) the tank shall have an over-flow outlet consisting of a channel or pipe below the flood level rim and below all pipes supplying water to the tank;

(b) the vertical distance from the lowest point of any of the supply pipes to the top of the over-flow outlet shall be not less than one and half time the minimum air gap;

(c) the total effective opening of the overflow outlets shall be such that, when water is flowing into the tank at maximum rate with all inlets fully opened and all outlets closed except the overflow outlets, water shall not rise to a point above the top of the highest over-flow outlet a distance greater than one half the minimum air gap;

(d) the overflow shall have unobstructed discharge to the open air;

(e) the channel or pipe shall have unobstructed discharge cross-section area throughout its length of not less than the effective opening of the outlet; and

(f) the discharge end of the overflow pipe shall be fitted with a stack flap of approved design and material to prevent the entry of all foreign matter.

(16) Every draw-off tap or similar fitting installed to discharge water into a sink, wash basin, bath or similar appliance shall be installed so that the vertical distance between the point of discharge of the fitting and the spill-over level of the receiving appliance shall not be less than that indicated in Table 2 set out in Schedule 1 for the size of the fittings concerned.

(17) Where it is not possible to provide a minimum air gap, the water outlet shall be protected with approved method of backflow prevention satisfactory to the Authority.

(18) Every bidet connected to a supply pipe shall be —

(a) of the over-rim water fed type, and

(b) installed and arranged so that the vertical distance between each point of discharge of water and the spill-over level of the bidet shall not be less than that indicated in Table 2 set out in Schedule 1 for the size of the water inlet fitting concerned.

(19) Every bidet that does not comply with subparagraph (18), and, in particular, every ascending-type bidet shall be supplied with water by one of the following methods —

(a) hot and cold water supplies shall each pass through a protected cistern providing an air gap indicated in Table 2 set out in Schedule 1 before being mixed, if required, and fed to the bidet and the cisterns concerned shall not be connected to any other point of draw-off or use of water except a draining tap;

(b) hot and cold water supplies shall be connected to a separate float-operated valves controlling flow into a single protected cistern in which mixing takes place from which water is drawn to supply the bidet; or

(c) any other approved methods satisfactory to the Authority.

(20) Every supply pipe conveying water to a cistern, whether or not fitted to a float-operated valve shall be provided with air gaps above the spill-over level of the cistern if—

(a) the cistern receives or contains any substance harmful to health; or

(b) the cistern is a flushing cistern or is holding water for non-domestic purposes.

(21) A supply pipe or cistern used for conveying or receiving water supplied by a public water supplier shall not be connected so that it can receive or convey water for any non-domestic purpose or water that is not supplied by a public water supplier, except where

the water supplied by a public water supplier is discharged into a cistern through an air gap.

**10. Cold water supply.**

(1) A cold tap which is likely to be used for drinking water and all such taps not connected directly to the suppliers mains shall be supplied from a storage cistern.

(2) A drinking water point shall not be installed at the end of a long pipe where only small volumes of water are drawn-off.

(3) To reduce the risk of stagnation, the layout of the pipework shall be arranged, where possible, so that fittings down-stream of a drinking water point have a high demand.

(4) Water shall be supplied to cold taps either directly from mains via a service pipe or indirectly from a cold water storage cistern protected in accordance with paragraph 9 but in some cases, a combination of the two methods may be used.

(5) Notwithstanding the requirements in subparagraph (4), the method of supply shall be related to the size and usage of the building and the number of appliances to be served.

(6) Where the available pressure is insufficient to supply the whole of a building and the water supplier is unable to increase the supply pressure in the suppliers mains, consideration shall be given to installing a pumped system.

(7) Storage cisterns and their lids for domestic water supply purposes shall not impart taste, colour, odour or toxicity to the water, nor promote microbial growth.

(8) Storage cisterns above 5000.00 L capacity should preferably

be divided into two or more compartments to avoid interruption of the water supply when carrying out repairs or maintenance of the cistern.

(9) A cistern from which water for domestic purposes may be drawn shall be—

(a) a water tight vessel having a tight fitting;
(b) where necessary, lined or coated with a material suitable for use in contact with potable water and must not deform unduly in use;
(c) where necessary, insulated against heat;
(d) with access for inspection and maintenance;
(e) supported on a firm level base capable of withstanding the weight of the cistern when filled with water to the rim; and
(f) provided with an inlet including a float-operated control valve, outlet, overflow and drain pipes.

(10) Every public, commercial or industrial building shall be provided with water storage tanks or cisterns such that the total storage capacity of the tanks or cisterns, is enough for not less than twenty-four-hours water supply to the buildings and the recommended minimum storage of water is set out in Table 3 of Schedule 1.

(11) Tanks other than pressure tanks shall be protected against contamination and pollution.

(12) Overflow pipe of adequate size shall be provided in water storage tanks or cisterns, and in no case shall the overflow pipes be connected directly to any drainage system.

(13) Every water supply tank or cistern, shall be provided with a valve drain line located at its lowest point.

(14) A cistern shall not be buried or sunk in the ground unless special measures are taken to detect leakage and protect the cistern from ingress of contaminants.

(15) Unless used only for non-potable water, every underground cistern shall be located so that ingress of surface water or ground water cannot occur, and such cisterns shall be well ventilated and protected from ingress of animals and insects and accessible for maintenance.

(16) The outlet of any over flow pipe shall be located at a minimum level of 200.0 mm above finished ground level or at other level satisfactory to the Authority.

(17) Cisterns resting on ground within the premises of a building should be well ventilated with screened openings as prescribed in subparagraphs (18) and (19) and protected from ingress of animals.

(18) Cisterns mounted within the premises of a building should be well ventilated and protected from ingress of birds, animals and insects and provided with access to the interior of the cistern for maintenance.

(19) Ventilation openings should be screened by corrosion-resistant mesh.

(20) Inlet pipes and float-operated control valves shall conform to the following standards—

(a) except for interconnected cisterns arranged to store water at the same level, every pipe supplying water to storage cistern shall be fitted with a float-operated valve or some other equally effective device to control the inflow of water and maintain it at the required level;

(b) the water level shall be at least 50.0mm below the lowest point of the lowest overflow pipe connection;

(c) the inlet control device shall be suitable for the particular application, bearing in mind the supply pressure and the temperature of the water in the cistern; and

(d) every float-operated valve shall be securely fixed to the storage cistern it supplies and, where necessary, braced to

prevent the thrust of the float causing the valve to move and so affect the water level.

(21) Outlet pipes shall conform to the following standards —

(a) the heights of connection to outlet pipes heights up to the invert of outlet pipes above the bottom of a gravity cistern of capacity 5000.0L and above shall not be less than 80.0mm;

(b) such heights shall not be less than 50.0mm for cisterns of capacity less than 5000.0L;

(c) outlets should be provided with suitable strainers of corrosion resistant material; and

(d) for pump suction cisterns, the height of connection of suction pipes shall comply with the provisions of subparagraphs (28), (29) and (30).

(22) Overflow pipes shall be—

(a) made of rigid corrosion resistant material;

(b) greater in size than the inlet pipe to the cistern;

(c) capable of discharging the inflow calculated hydraulically taking into account the maximum head available at the inlet to the cistern, size of the orifice and the type of overflow outlet; and

(d) capable of discharging where it is readily visible in order not to cause damage or nuisance.

(23) Cisterns shall be provided with valved drains located at their lowest point with the floor of the cisterns laid to a slight fall to the drains.

(24) Where a tank is connected to a potable water system, the tank shall have a valved drain line connected at the lowest point of the tank.

(25) Where the drain line discharges into a receptacle, the discharge outlet of the drain line shall be located above the flood level rim or receptacle, a distance not less than the specified air gap.

(26) Storage tanks shall conform to the requirements of standards approved by the Authority.

(27) A water service pipe shall not be connected to an underground storage tank without the written permission of the Authority.

(28) The effective capacity of storage shall be taken as the measurement between the normal water level in the cistern or tank and the low water level X shown in Figure 2 set out in Schedule 1, where—

(a) low water level X is taken to be the lowest level before a vortex is created causing the pump to draw air; and

(b) the effective depth is then multiplied by the average surface area of the storage to obtain the effective capacity.

(29) Where the suction pipe is taken from the side of the storage, as shown in Figures 2 (b) and (e) of Schedule 1, the clearance between the base of the storage and the lowest part of the pump suction pipe shall be not less than the dimension B as given in the figure.

(30) Where a suction pipe draws from a sump in the base of a storage, the sump length shall be not less than the dimensions indicated in figures 2(d), (e) and (f) of Schedule 1 provided that—

(a) in addition, the sump width shall be not less than 3.6D where D is the nominal diameter of the suction pipe; and

(b) the point of entry shall be located centrally across the width of the sump.

(31) When an approved vortex inhibitor is installed, the following variations to the dimensions given in subparagraph (17) shall apply—

(a) dimension A in Figure 2 set out in Schedule 1 may be disregarded and low water level X may be taken as the level at which vortexing commences.

(b) dimension B in Figure 2 set out in Schedule 1 may be taken

from the base of the tank to the level at which vortexing commences in Schedule 1 Figure 2(a).

(32) In designing the storage capacity, account shall be taken of the pattern of water use in the premises concerned and, where possible, to assess the likely frequency and duration of break down in supply from the water supplier's mains.

**11. Stopcocks and valves.**

(1) All shut-off valves, or stopcocks used on any section of the water supply system shall be of high quality material approved by the Building Committee.

(2) All shut-off valves, or stopcocks of 50mm diameter or less used on a direct, or street pressure system, the shall be of the screwed down pattern, globe variety or any other pattern recommended by the Building Committee.

(3) All shut-off valves or stopcocks larger than 50mm diameter used on a direct or street pressure system, the shut-off valve or stopcocks shall be of the bolted down pattern, gate variety or any other pattern recommended by the Building Committee.

(4) All shut-off valves or stopcocks used on the low pressure side of indirect, or gravity fed system, the shut-off valve, or stopcocks shall—

(a) be of the screwed down pattern;

(b) be installed in such a manner that they are readily accessible and facilitate the draining of the system at sections of it; and

(c) be constructed to have an effective opening not less than half the cross-section area of the pipe to which the shut-off valve or stopcock is fitted.

(5) In all buildings, shut-off valves shall be installed at the foot of each riser and stopcocks, or valves shall be installed at each sanitary appliance.

(6) In public building, stop-cocks or valves shall be installed at the foot of each riser, or where there is no riser, at the place where each distributing pipe serving more than three fixtures, shall connect to the service pipe and at each fixture or at each battery of wash basins.

(7) In multiple dwellings, the water supply for each family unit shall be controlled by an arrangement of shut-off valves which shall permit each group of fixtures or individual fixture to be shut off without interference with the water supply to any other family unit, or portion of the building.

(8) In a public building, shut-off valves shall be installed so that the water supply to equipment in each separate room may be shut-off without interference with the water supply to any other room or portion of the building.

(9) A valve in the water supply distribution system, except a valve immediately controlling the supply to one fixture, when opened in full, shall have a cross section area of the smallest orifice, or opening through which the water shall flow, not less than the cross-section area of the nominal size of the pipe in which the valve is installed.

(10) A ball valve used in the water supply system shall be horizontal, or vertical in design, and the design or type shall conform to the standards approved by the Building Committee.

(11) A ball valve shall not have its entire body submerged beneath the surface of the water in the cistern it serves.

(12) All ball valves provided with piping so arranged as to discharge water into a cistern below its water level, shall be provided with a silencer tube that has an air-hole, or other means of preventing back siphonage.

(13) The flow from any water main to any water service pipe, and within the water service pipes, shall be controlled by means of isolating valves.

(14) Isolating valves as prescribed in Table 4 of Schedule 1 shall be installed so that they are accessible.

**12. Pumps and equipment.**

(1) Electrically driven centrifugal pumping plant shall be used and pumps shall be duplicated and used alternatively.

(2) All provisions shall be made for the pumps to be supplied by an alternative power supply in the event of mains failure.

(3) Pumps shall be of either a horizontal or vertical type, directly coupled to their electric motors.

(4) Pumps shall be sized so that each pump is capable of overcoming the static lift plus the friction losses in the pipework and valves.

(5) All pumps connected directly to the service pipe, full allowance shall be made, when calculating the required pump head for the pressure already in the service pipe, since the pump head is added to this and does not cancel out an existing pressure.

(6) The fittings of motors with sleeve-type super-silent bearings shall be considered in order to achieve quiet running.

(7) Automatic control of pumping plant shall be essential and pressure switches, level switches or high-level and low-level electrodes shall give reliable control, and other methods of control, both mechanical and electrical can be adopted after approval of the Building Committee.

(8) Pumping equipment shall be controlled via a pump selector switch and an ON/OFF/AUTO control.

(9) Pumps shall be capable of being stopped or started manually.

(10) Pumps shall be controlled to limit the number of starts per hour to within the capacity of the pump.

**13. Air compressors.**

(1) Small air compressors used for charging pneumatic pressure vessels or pressure tanks shall be of the reciprocating type, either air or water cooled.

(2) The air to be compressed shall be drawn from a clean cool source and shall be protected from contamination.

**14. Pump room.**

(1) A pump room shall be of adequate size to accommodate all the plant and to provide adequate space for maintenance and replacement of parts.

(2) A pump room shall be dry, ventilated and protected from flooding.

(3) Entry of birds and small animals shall be prevented and access shall be restricted to authorised persons.

**15. Installation of pumps.**

Pumps shall—

(a) be installed on a base to suit satisfactory operation of the pump;

(b) have vibration eliminators at the base of the pump, on the suction side and the delivery side of the pump, so as to minimise the transmission of noise into the building structure and along the piping system and to prevent undue stress being placed on the pump;

(c) have isolation valves on the delivery side and the suction side of the pump;

(d) have a non-return valve on the delivery side of the pump before the isolation valve;

(e) have pressure gauges on the inlet and outlet of the pump; and

(f) have unions or flanges to enable the pump's removal.

**16. Water meters.**

(1) Water meters shall be located as follows—

(a) within the property; in an accessible position;

(b) proximity to isolating valve being positioned immediately downstream of the meter isolating valve;

(c) proximity to street-alignment being as near as practicable to the street alignment; and

(d) in other locations as required by the National Water and Sewerage Corporation.

(2) Water meters shall be installed—

(a) so as to be accessible for reading, maintenance or removal; and

(b) in horizontal position unless designed to operate otherwise.

(3) Water meters to be installed inside buildings shall be fixed with the dial not more than 1.5m above floor level and readily visible for reading.

(4) Water meters to be installed below ground level shall be located in a chamber that has a cover capable of being removed by one person and a base that enables drainage.

(5) Water meters DN50.0mm or larger in size, shall be supported independently of the pipe work.

**17. Hot water supply.**

(1) The hot water services shall be designed to provide, so far as is practicable, hot water at the locations, in the quantities and at the temperatures required by the user at the least overall cost, taking account of installation, maintenance and energy costs.

(2) The choice of the hot water heating system between instantaneous and hot water storage system shall be made bearing in mind the objectives in subparagraph (1) and the characteristics of the different systems with the system being sized to meet the requirements of the user as closely as possible.

(3) In the instantaneous system, the water shall be heated as used, with no storage, and the capacity of the heater shall be equal to the peak demand.

(4) Gas-fired instantaneous water heaters installed in bath rooms shall be of the room-sealed type.

(5) In the storage system hot water shall be heated continuously or intermittently as desired.

(6) The choice between the vented and the unvented type of installation of the storage system shall be in accordance with the following—

(a) vented hot water storage systems are fed with cold water from a storage cistern situated above the highest outlet to provide the necessary pressure in the system and which accommodates expansion of the water when it is heated;

(b) an open vent pipe shall be installed from the top of the hot water storage vessel to a point above the cold water storage cistern, into which it is arranged to discharge;

(c) the main characteristics of vented systems are—

(i) explosion protection is provided by the open vent pipe and the cistern, involving no mechanical device; and

(ii) the storage provides a constant low pressure and a reserve of water in case of supply failure, but needs to be protected against the ingress of contaminants.

(d) unvented systems can be fed from a storage cistern, either

directly or through a booster pump, but usually are fed from the supply pipe, either directly or via a pressure reducing valve;

(e) the main characteristics of unvented systems are as follows—

(i) explosion protection is provided by safety devices that need periodic inspection and maintenance;

(ii) mains fed systems have no reserve of water but higher pressures are available if required; and

(iii) allows quicker installation than vented systems but involves more costly components.

(7) Connection to hot water storage vessels shall be arranged so that the cold water feed pipe is connected near the bottom of the vessel.

(8) The cold feed pipe shall be sized in accordance with subparagraph (16).

(9) In systems incorporating a hot water storage vessel, the hot water draw-off shall be arranged to be from the top of the vessel, or as near as there to as practicable.

(10) Hot water distribution pipes shall be sized in accordance with subparagraph (16).

(11) Hot water distribution system shall be designed so that the hot water appears quickly at draw-off-taps when they are opened.

(12) The length of pipe measured from the tap to the water heater or hot water storage vessel shall be as short as possible and shall not exceed the values given in Table 5 set out in Schedule 1.

(13) Where the lengths shown in Table 5 under Schedule I are exceeded, the pipe shall be insulated

(14) When draw-off points are situated at a distance from the hot water storage vessel or water heater, consideration shall be given to the use of separate water heater close to those draw-off points.

(15) Where the provision in subparagraph (14) is impracticable, re-circulation with flow and return pipes to the storage vessel shall be considered and the circuit shall be well insulated to reduce the heat losses from pipe runs.

(16) In systems where it is not possible to attain gravity circulation, a non-corroding circulating pump shall be installed to ensure that water within the circuit remains hot.

(17) The amount of hot water to be stored shall be related to the likely consumption and recovery rate.

(18) Minimum hot water consumptions for domestic uses are shown in Table 6 set out in Schedule 1.

(19) For efficiency of operation and conservation of heat, the hot water storage vessel and, preferably, all the hot water piping shall be lagged with insulating material.

(20) The hot water storage vessel shall be fitted with a thermostat to keep the water at the required temperature and save energy.

(21) Hot water storage vessel should be installed so that the hot water floats on the relatively cold water, and hot water can be drawn-off even though a substantial quantity of cold feed water may have recently flowed into the vessel.

(22) Whenever a water heater, is supplied from a header tank or storage cistern, that heater shall be fitted with a pressure relief expansion pipe connected to the hot water distribution network and the relief expansion pipe shall rise to and discharge into the header tank.

(23) The pressure relief expansion pipe shall be protected against contamination and shall be insulated against extremes of temperature; and shall have the lowest point of its discharge positioned to provide

an air-gap of not less than 100mm between it and the top surface level of the water in the storage cistern.

(24) Where the Building Committee requires, a check valve shall be installed in the cold water supply line to each heater.

(25) Where the water supply to the hot water system is not from a header tank or storage cistern, pressure relief valve shall be installed in place of the pressure relief expansion pipe on equipment used for heating or storing hot water and the rate of discharge of the valve shall limit the pressure rise for any given rate of heat input to 10% of the pressure at which the valve is set to open.

(26) A temperature relief valve shall be installed for all equipment used for the heating, or storage of hot water; and each valve shall be rated as of its calorific capacity at 990C and it shall be capable of discharging sufficient hot water to prevent any further rise in temperature.

(27) A combination pressure and temperature relief valves shall be considered acceptable subject to the requirements of subparagraphs (23) and (24).

(28) A temperature relief valve shall be located directly above the cistern served.

(29) A pressure relief valve shall be located adjacent to the equipment served and there shall be no check valve, or shut-off valve between a relief valve and the heater or tank for which it is installed.

(30) Where either or both pressure relief and temperature relief valves are installed, checking and certification shall be carried out at the time of installation, and annually thereafter by a Building Control Officer who shall issue a fitness certificate which shall be displayed in a position adjacent to the equipment.

(31) Any equipment found to have unsatisfactory valves shall be withdrawn from service immediately and the Building Control Officer shall report the withdrawal and findings to the Building Committee.

(32) The outlet of a pressure, temperature, or other relief valve shall not be connected to the drainage system directly.

(33) Any storage tank for domestic hot water shall have clearly and indelibly stamped in the metal, or marked upon a plate welded it, on to it, or otherwise permanently attached, the maximum allowable working pressure and the marking shall be placed in an accessible position on the outside of the tank to make inspection readily possible.

(34) All relief valves shall be approved by the Building Committee before installation.

(35) Subject to the requirements of subparagraph (36) below, where a cooling jacket, or a condenser, industrial or special appliance is constructed or located so that the prescribed minimum air gap is not provided, or where a back-flow preventer is not installed, the jacket, condenser or appliance shall not be connected to or supplied directly from a potable water system.

(36) Water from a potable water system may be used in a jacket condenser or appliance where the potable water is first discharged into a tank conforming to the requirements and is not returned to the potable water system from the jacket, or condenser or appliance.

(37) A polyethylene service pipe shall not be installed to supply hot water, unless a check valve is installed on the distributing pipe supplying the hot water tank.

(38) Where a check valve is installed on the distributing pipe supplying hot water, the hot water tank shall be equipped with a

pressure relief valve designed to open whenever the water in the tank reaches a pre-determined pressure and a temperature relief valve for which the sensing element shall be within top 150mm of the tank and designed to open whenever the sensing element reaches a pre-determined temperature.

(39) The energy supply to each heater shall be under effective thermostatic control to prevent the temperature of the stored water from rising above the normal expected hot water temperature.

(40) The energy supply to each heater shall be fitted with a temperature operated, manually reset energy cut-out independent thermostatic control, which shall operate if the thermostat fails and the storage vessel overheats.

(41) Adequate means of dissipating the heat input shall be made in case both the temperature thermostat and the energy cut-out fail and the dissipation shall be accomplished with either of the following:—

(a) a vent pipe capable of carrying away the maximum energy output from the heater at the normal working pressures of the system;

(b) a temperature relief valve located within the top 20% of the water in the vessel and preferably within 150mm of the top of the vessel which opens at a preset temperature to permit the overheated water to escape safely from the hot water storage heater before it boils; valves shall not be fitted between the temperature relief valve and the heater, the water discharged from the temperature relief valve shall be removed from the point of discharge to a safe place.

(42) Whether hot or cold water is involved, it shall be ensured that no part of the system bursts due to the hydraulic pressure to which it is subjected.

(43) It shall be ensured that the pressure in the system shall never exceed the safe working pressure of the component parts.

(44) Where necessary, the supply pressure shall be controlled by break cisterns or by pressure-reducing valves.

(45) Where un-vented storage-type water heaters are used, an expansion relief valve shall be fitted in the cold feed to the heater and no valves (other than a draining tap) shall be fitted between the expansion relief valve and the heater or hot water storage vessel, the expansion or pressure relief valve setting shall be the maximum working pressure plus 0.5kg/cm2 to 1.5kg/cm2.

(46) any Water discharged from an expansion valve shall be discharged safely in a similar manner to that of temperature relief valve.

(47) Provision may also be made to accommodate expansion water by one of the following alternative methods—

(a) allow the expansion water to travel back along the cold feed pipe, provided that heated water cannot reach any branch cold feed outlet; or

(b) where reverse flow along the cold feed is prevented, e.g. by check valve or pressure reducing valve, an expansion vessel shall be provided to accommodate expansion water; the vessel shall be sized in accordance with the volume of water heated and the water temperature rise to limit the pressure to the maximum working pressure of the system and the expansion vessel shall accommodate an expansion equal to 4% of the total volume of water heated.

**18. Pipe sizing.**

(1) The sizes of the pipes and fittings used in a water service shall be such as will provide an adequate rate of delivery of water without recourse to wasteful oversizing.

(2) The installation shall be sized so that design flow rates given in Table 8 set out in Schedule 1 will be available at each outlet when only that outlet is open and at all outlets for most of the time and the pipes and fittings shall be sized so that the water velocity in any pipe does not exceed those given in Table 9 set out in Schedule 1.

(3) Pipe sizing shall be calculated in accordance with the capacity and working pressure.

(4) The amount of either hot or cold water used in any building is variable, depending on the type of occupancy and time of day and optimum pipe sizes shall be designed to meet peak demand.

(5) A demand rate and corresponding loading unit for various appliances is—

$$Z = \left(\frac{q}{0.25}\right)^2 0 \qquad (1.1)$$

specified in Table 4.8 in which the loading values Z are such that:
Where q is the flow rate of appliances in l/s.

(6) The constant is based upon by granting a flow rate of 0.25 l/s, a unit loading.

(7) Where it is unlikely that all draw-off points will be in simultaneous use, the probable design flow Q is given by—

$$Q = 0.25\sqrt{Z_1 + Z_2 + .. + Z_n}$$

This equation is valid for situations where an individual draw-off is not greater than 0.5ls unless it is certain that such flows will be for a short interval only.

(8) Where a high proportion of appliances are likely to be in simultaneous use such as in schools, gymnasia, theatre halls or factories, design flow in accordance with capacity shall be used in consultation with the Building Committee.

(9) Continuous flow outlets shall be taken into account by adding 100% of their flow rate to the design flow rate for other appliances obtained by using loading units.

(10) Although there are differences in the rates of flow and pattern of demand between hot and cold water consumptions, for practical reasons, 75% and 100% of the total flow rate can be taken for the hot and cold water demands respectively in pipe sizing.

(11) The design flow rates to storage cisterns shall be determined by dividing the cistern capacity by filling time and where individual houses or flats are supplied from individual minimal-sized storage cisterns, filling time shall be less than 1.0hr; for larger installations, filling times depend upon usage.

(12) The water service pipe from street main to a building shall be of sufficient size to furnish an adequate flow of water to meet the requirements of the building.

(13) The communication pipe linking the Authority's main to the service supply pipe of any building shall be of sufficient size to provide adequate supply of water to meet the requirements of the building at peak demand.

(14) The communication pipe shall be placed below the crown of the road or less than 450 mm beneath the surface of the ground, if it is not in the road.

(15) The communication pipe shall have a shut-off/stop cock valve within and near to the boundary of the property and, where necessary,

with a meter down-stream of the shut-off/stop cock valve, and the shut-off/stop cock valve and meter shall be adequately protected and be readily accessible;

(16) Where a water supply pipe is attached to the external walls of a building, or otherwise exposed to the external air, the pipe, where necessary, shall be insulated against extremes of temperature in an approved manner.

(17) Materials for pipes, fittings, and valves used in water service lines shall be of a quality not less than medium weight, or class, or grade.

(18) Pipes, fittings and valves used in distribution and branch supply piping shall be of a high quality material or any other material approved by the Building Committee, but not section of the line shall be subjected to a working pressure, which at any time is greater than half the rated pressure of any pipe, fitting or valve of the section of the line.

(19) The supply line taken from pressure or gravity tanks shall be valved at, or near the source, and an interior stop-and-waste valve, or cock shall be provided for each exterior outlet or group of outlet.

(20) Any tank connected to a potable water distribution pipe shall be equipped with a ball valve in the water-inlet line, and a drain-off valve, which should be a full way gate valve.

(21) Every pressurised tank connected to a potable water distribution pipe shall, in addition to the requirements of subparagraph (20), be fitted as approved by Building Committee.

(22) Non-pressurised tanks connected to potable distribution pipes shall, in addition to the requirements of subparagraph (20), be fitted with an overflow pipe.

(23) The water supply to every fixture shall be such that a sufficient amount of water is available to flush the fixture to the extent necessary to maintain sanitary condition.

(24) The water distribution pipe or branch in building shall be of size adequate to provide positive flow and pressure to each fixture, and in no case shall the size of water supply pipe to fixture be less than that prescribed in Table 7 set out in Schedule 1.

(25) Minimum, fairly constant residual pressure at the point of outlet discharge shall be not less than 0.20 kg/cm2 for all appliances except where for flush valves and special equipment which may require higher pressures, values in accordance with manufacturer's requirements can be taken.

(26) Where water pressures are excessive, air chambers or other approved mechanical devices shall be provided to reduce water hammer or line noises to such an extent that no pressure hazard to the piping system will exist.

**19. Accessibility of pipes and water fittings.**

(1) A designer of a water supply system shall arrange the pipe work so that it is freely accessible for repair and maintenance.

(2) The main factors to consider before deciding what degree of accessibility is required include—

(a) the use to which the building is put, importance of aesthetic considerations, consequences of leakage from inaccessible parts of the pipe work; whether or not the system will be subject to routine inspection and maintenance;

(b) the increase or decrease in capital or maintenance costs arising from the provision of improved accessibility, ease of forming ducts or chases, changes of pipe runs, ease of provision of removable access panels or covers, availability of multi service walkways or crawl ways in

which water pipes may be installed; and

(c) the pipework materials and jointing methods, reliability of joints, resistance to both internal and external corrosion, flexibility of pipe when inserted in curved ducts or sleeves.

(3) Where a pipe passes through a building, it shall be arranged so as to accommodate differential movement and shall be accessible for withdrawal and replacement.

(4) Where a sleeve is used for this purpose, it shall be capable of resisting external loading and shall be sealed at each end with a material of permanently flexible form to allow movement of the pipe.

(5) The diameter of the sleeve and the radius of any bends shall be such as to permit the ready insertion and withdrawal of the pipe.

(6) A sleeve intended for carrying a water pipe shall not contain any other pipe or cable.

(7) A pipe or pipe joint in or under a building shall not be embedded in any wall or solid floor or in any material below a solid floor at ground level except in cases refered to in subparagraphs (a), (b) and (c) or unless equivalent method of installation satisfactory to the Building Control officer is made for the accessibility of pipes during inspection and maintenance—

(a) the embedding of any pipe and associated pipe, joints in properly formed chases in a wall or solid floor that is subsequently plastered or screeded if the pipes or pipe joints can be exposed for repair or replacement by cutting or chipping away the surface layers of the plaster or screed;

(b) the enclosing of any pipe and associated pipe, joints in a purpose-made duct or chase in a solid floor in such a way that the pipe and pipe joints can be exposed for purpose of examination, repair or replacement without endangering the structural integrity of the building; or

(c) the enclosing of any pipe and associated pipe, joints in a purpose-made chase in a solid wall in such a way that the pipe and pipe joints can either be capped off and isolated or be exposed for purposes of examination, repair or replacement without endangering the structural integrity of the building.

(8) Pipes and pipe joints installed in ceilings shall be accessible for purposes of examination, repair or replacement and supported adequately as specified in paragraph 20.

(9) Valve chambers shall be provided to give access for operation and maintenance of underground valves which may be made of brick or concrete.

(10) Alternatively, vertical guard pipes or precast concrete encasement can be provided to enclose valves.

(11) Brick or concrete chambers shall be constructed of sufficient dimensions to permit repairs to be carried out to the fittings.

(12) Every aboveground valve shall be so placed that it is readily accessible for operation and maintenance.

(13) Any cover of aboveground valves shall be fixed by removable fastenings.

(14) Every storage cistern shall be so placed and equipped that the interior can be inspected and cleaned and the float-operated valve can be maintained.

**20. Installation of pipework.**

(1) Pipes, fittings and components shall be handled carefully to reduce damage.

(2) Manufacturers' advice should be followed concerning how their products should be loaded, transported, unloaded and stored.

(3) In installations that do not have limited straight runs and many bends and offsets, allowance for expansion and contraction of the pipes shall be made by forming expansion loops, introducing changes of direction to avoid long straight runs or fitting proprietary expansion joints.

(4) In installations with limited straight runs and many bends and offsets, thermal movement is accommodated automatically.

(5) Piping shall be retained in position by brackets, clips or hangers.

(6) Brackets, clips and hangers shall be—

(a) formed of suitable materials;
(b) securely attached to the building structure and not to any other service;
(c) designed to withstand the applied loads;
(d) protected against corrosion where exposed to corrosive environment;
(e) of like material or lined with a non-abrasive, inert material for that section where contact with the pipe work may occur; and
(f) installed so that no movement can occur while a valve is operated.

(7) The method of supporting or spacing of pipes by means of brazing or welding a short section of any material to the surface of each pipe shall not be permitted.

(8) The spacing for fixings of internally located piping shall be in accordance with Table 10 set out in Schedule 1.

(9) Iron pipes shall be secured by heavy weight holder-bats of iron or low carbon steel either built- in or bolted to the structure.

(10) Copper and stainless steel piping shall be secured by copper, copper-alloy, plastics clips or brackets.

(11) Steel piping shall be secured by steel, copper alloy, suitable plastics clips or brackets and copper clips or brackets shall not be used for fixing steel piping.

(12) Plastic piping shall be secured by suitable metal, plastic clips or brackets giving allowance made for free lateral movement within the clips and brackets.

(13) Piping that is insulated shall be secured on clips or brackets that allow sufficient space behind the back of the pipe and the batten or wall to which the pipe is fixed for the insulation to be properly installed.

(14) Piping shall be housed in properly constructed builders work ducts or wall chases with adequate supports and have access for maintenance and inspection in accordance with paragraph 19.

(15) Piping laid through notches, holes or chases shall not be subjected to external pressure, shall be free to expand or contract and piping through walls and floors shall be sleeved.

(16) Taps not fixed directly to an appliance shall be screwed into a suitable pipe fitting, or the pipe immediately adjacent to the tap, shall be firmly secured to a suitable support, to prevent strain on the pipe and its joints when the tap is operated.

(17) Electrical cables and gas pipes shall not be installed within 100.0mm of any water service.

(18) Except where permitted by the Authority, the underground water service and the building drain or building sewer shall not be less than 3 metres apart horizontally, and shall be separated by undisturbed or compacted earth.

(19) Where the Authority permits a water service pipe and the building drain or building sewer to be placed less than 3 metres apart horizontally, the following conditions shall apply—

(a) the bottom of the water service pipe, at all points, shall be at least 300mm above the top of the sewer line at its highest point;

(b) the water service pipe shall be placed on solid ground at least 300mm to one side of the sewer pipe; and

(c) the number of joints in the service pipe shall be kept to a minimum, and materials and joints of the sewer and water service pipe shall be installed in such a manner, and shall possess such strength and durability as to prevent the escape of solids, liquids, or gasses under all adverse conditions.

(20) The bottom of trenches shall be carefully prepared to a firm surface so that the barrels of the pipes when laid are well bedded for their whole length.

(21) Mud, rock projections, boulders, hard spots and local soft spots shall be removed and replaced with selected material consolidated to the required level.

(22) Pipes laid in the ground shall be provided with a minimum cover given in Table 11 set out in Schedule 1.

(23) In the refilling of trenches, the pipes shall be surrounded with not less than 75.0mm of compacted sand, or fine grained soil, with no hard-edged object permitted to come in contact with or rest against any pipe or fitting.

(24) Any back fill within 300.0mm of the top of the pipe shall be free from builder's waste bricks, concrete pieces, rocks or similar material which would be retained on a 75.0mm sieve.

(25) Electrical cables and gas pipes shall not be installed within 600.0mm of either side of a below ground water service but wherever

this separation cannot be achieved, the distance from any electrical cable or gas pipe may be reduced to 300.0mm provided that, within the exclusion zone, such electrical cable or gas pipe is suitably marked with bricks, stone masonry or equivalent durable material painted red.

(26) Any below-ground crossover of water service, within the exclusion zone shall—

(a) cross at angle not less than 450;
(b) have a vertical separation of not less than 100.0mm, and
(c) be suitably marked with bricks, stone masonry; or equivalent durable material and painted red.

(27) Water service pipes shall not be laid in a trench excavated for a foul drain but wherever it is not practical to do otherwise, water pipes may be laid in the same trench as a sanitary drain as shown in Figure 3 set out in Schedule 1 and provided the following conditions are observed—

(a) the water service shall be located on a shelf or ledge, excavated at one side of the trench not less than 50.0mm from the continuation of the trench, or on compacted bedding;
(b) the underside of the water pipe is at least 100.0mm above the top of the foul drain; and
(c) the number of joints in the water service pipe shall be kept at a minimum.

(28) Pipes shall be kept clean and, immediately before laying each pipe and fitting, shall be thoroughly cleaned internally and the open end temporarily capped until jointing takes place; particular care shall be taken to keep the joints clean and after laying and jointing, the leading end shall remain capped.

(29) Pipes passing through corrosive materials shall be provided with approved coatings, sheathings or wrappings or other means of protection against damage from external corrosion.

(30) Where ferrous and non-ferrous pipes or fittings are joined together, protection against galvanic corrosion shall be provided by—

(a) fitting a plastic connector or a short length of plastic pipe between the dissimilar metals, for threaded type joints; or

(b) fitting an insulated gasket between flanges, insulating sleeves along the bolts, and insulating washers under the bolt head and nut, for flanged type joints.

(31) Thrust blocks as shown in Figure 4 set out in Schedule 1 shall be installed—

(a) at all bends or junctions,

(b) at the termination of pipe work;

(c) at valves installed in the pipe work;

(d) at the reducing fitting in the direction of smaller pipe;

(e) at changes of direction in excess of 5o; and

(f) at grades in excess of 1:5.

(32) Thrust blocks shall be constructed of concrete with one side bearing against a firm vertical face of the excavation and designed to resist the thrust produced by the test pressure to be transmitted to the surrounding soil without the maximum bearing pressures of the soil and the pipework material being exceeded.

**21. Cleaning and disinfection of the supply system.**

(1) All water storage tanks for potable water shall be cleaned and disinfected—

(a) prior to initial use; and

(b) whenever the storage tank is taken out for inspection, repairs, painting or other activity that might lead to contamination of water.

(2) The tank shall be drained and all debris and sludge removed as follows—

(a) the surfaces of walls, floor and operating facilities shall be thoroughly cleaned using a high pressure water jet, sweeping, scrubbing or other similar effective means; and

(b) all water, dirt, and other material accumulated in this cleaning process shall be flushed or otherwise removed from the tank.

(3) After cleaning, the tank shall be disinfected by filling it to overflow level with potable water to which enough chlorine is added to provide a free chlorine residual, in the tank of not less than 10.0mg/l, at the end of retention time.

(4) The retention time shall not be less than 6.0hrs, and the tank shall be drained after disinfection and flushed out with potable water prior to being put back into service.

(5) Water services used to supply potable water shall be protected against contamination during storage, construction and repairs that might lead to contamination of water.

(6) On completion of the installation or repairs, water services shall be flushed at each discharge point to remove any dirty water or debris from the service.

(7) After flushing, water services shall be chlorinated before being placed in service.

(8) Water services shall be disinfected, so that, after retention period of 6.0hrs, a free chlorine residual of not less than 10.0mg/l is obtained throughout the service.

(9) After the applicable retention period, the service shall be flushed until chlorine measurements show that the concentration in the water leaving the service is not higher than that generally prevailing in the suppliers' distribution system or is acceptable for domestic use.

**22. Identifying and recording piping locations.**

(1) Consideration shall be given to the need to locate the position of pipes and valves.

(2) Valve chambers shall be lettered to indicate what service is below them and where possible, durable marks should be set up to

indicate the pipe service, the size, the position and depth below the surface.

(3) In any building other than a single dwelling, every supply pipe and every pipe for supplying water solely for firefighting purposes shall be clearly and indelibly marked to distinguish them from each other and from every other pipe in the building.

(4) All piping conveying non-potable water shall be adequately and durably identified by a distinctive colouring paint so that it will be readily distinguished from piping carrying potable water.

(5) During the installation of a water supply system, records of all fitments shall be kept.

(6) On completion of the work, drawings shall be prepared on durable material of the `as fixed' installation and handed to the building owner.

**23. Inspection, testing and commissioning.**

(1) Inspections and tests shall be undertaken as the work proceeds and records of all tests required by the specification shall be kept by the installer.

(2) The timing of tests shall be arranged as follows—

(a) interim tests - as soon as practicable after completion of the particular section, with particular attention to all work which will be concealed; and

(b) final tests - to be carried out on completion of the work on the water services and prior to handing over.

(3) Satisfactory completion of an interim test does not constitute a final test.

(4) Items failing any tests shall be corrected immediately and re-tested before further work proceeds.

(5) Visual inspections shall be carried out at both interim and final testing in order to detect faults in construction or material not shown up under test but which could lead to failure at a later date, possibly after expiry of the contractual maintenance period.

(6) All internal pipe work shall be inspected to ensure that it has been securely fixed.

(7) All sanitary fitments shall be inspected to ensure that they are properly supported and secured, that they are clean and free from swarf and that cisterns are provided with correctly fitting covers before testing takes place.

(8) Trenches shall be inspected to ensure that excavation is to the correct depth to guard mechanical damage due to traffic or other activities.

(9) In visual inspection of pipe lines laid in open trenches, particular attention shall be paid to the pipe bed, the line and the level of the pipe, irregularities at joints, the correct fitting of valves, the correct installation of thrust blocks where required, and ensure that protective coatings are undamaged.

(10) After satisfactory visual inspections have been completed, hydraulic pressure testing shall be carried out on the installation and compressed air may be used as well for the pressure test.

(11) When the installation is complete, it shall be slowly filled with water, with the highest draw-off point open to allow air to be expelled from the system.

(12) It is desirable that the installation then be tested hydraulically in the following way—

(a) subject the pipes, pipe fittings and connected appliances to a test pressure of 10.0kg/cm2 or at least two times the

maximum working pressure, whichever is greater, with the pressure applied and maintained for at least one hour;

(b) inspect the installation including all cisterns or water heaters for leaks.

(13) Each draw-off tap, shower fitting and float-operated valve shall be checked for rate of flow against the specified requirements and any defects revealed by any of the foregoing tests shall be remedied and the tests repeated until a satisfactory result is obtained.

(14) After laying, jointing and anchoring, the pipeline shall be slowly and carefully filled with water so that all air is expelled and then tested under pressure.

(15) Interim tests shall be applied to every pipeline and for buried pipelines, the tests shall be carried out before backfilling is placed over the joints and long pipelines should be tested as the work proceeds.

(16) Final tests shall be carried out only when all relevant work is complete and completion for buried pipelines includes backfilling, compaction and surface finish.

(17) All tests should be conducted immediately prior to occupation of the building and where long lengths of buried pipelines are laid clear of the general construction area, it may be practicable to carry out final tests for completed sections as work proceeds.

(18) The test pressure shall be at least twice the maximum working pressure or 10.0kg/cm2 whichever is greater.

(19) Pressure gauges shall be checked and re-calibrated, where necessary, before the test.

(20) To avoid the risk of contamination, water used for testing shall be obtained from potable supply.

**24. Residential buildings.**

(1) Except as provided in subparagraph (2), in every residential building—

(a) where male and female persons are intended to share waterclosets, the number of water closet fitments provided shall be not less than the number specified in Part 1 of Table 1 set out in Schedule 2;

(b) where separate waterclosets are provided for male persons and for female persons, the number of water closet fitments provided for—

(i) female persons must be not less than the number specified in Part II of Table 1 set out in Schedule 2; and

(ii) male persons must be not less than the number specified in Part III of Table 1 set out in Schedule 2.

(c) where separate waterclosets are provided for male persons and for female persons and urinals are installed for the use of male persons, the number of watercloset fitments and urinals provided for male persons must be not less than the number specified in Part IV in Table 1 set out in Schedule 2; and

(d) the number of lavatory basins, and baths or showers, provided must be not less than the number specified in part V of Table 1 set out in Schedule 2.

(2) For the purposes of this paragraph the number of persons in a residential building is determined at the rate of 1 person for every $9m^2$ of the useable floor area of the building.

**25. Latrine fitments to be provided where soil fitments are prohibited.**

(1) Where, in any case, the installation of soil fitments is, under this Code prohibited—

(a) latrine fitments shall be provided in lieu of water closet fitments, and the number of latrines shall be not less than the number of water closet fitments required by paragraph 24 as the case may be; and

(b) bucket urinals shall be provided in lieu of urinals, and, likewise, the number of bucket urinals shall be not less than the number of urinals required by paragraph 24, as the case may be.

(2) Where, under paragraph 24, the provision of watercloset fitments is required, trough waterclosets may be provided and, for the purposes of that paragraph, every metre of trough watercloset shall be deemed to be the equivalent of one watercloset fitment.

(3) Where, under paragraph 24 the provision of urinals is required, and trough urinals are installed, every 0.5 m of trough urinals shall, for the purposes of that paragraph, be deemed to be the equivalent of one urinal.

**26. Sanitary fitness for persons employed in a residential building.**

(1) For the avoidance of doubt, watercloset fitments, urinals and lavatory basins required to be provided in this part, shall not exempt any person from providing such watercloset fitments, urinals and lavatory basins for persons employed or likely to be employed in the residential building, place of public entertainment, cinema or restaurant.

(2) Where a watercloset fitment, trough watercloset, latrine fitment or urinal, is provided in a residential building there shall be a permanent connection to the building, of a supply of water which is satisfactory and sufficient in all respects for the purpose of flushing every such watercloset fitment, trough watercloset, latrine fitment or urinal and for all other purposes for which such supply is to be used.

(3) Where a waste fitment or shower is provided in a residential

building, there shall be a permanent connection to the residential building of a supply of water which is satisfactory and sufficient in all respects for all the purposes for which every such waste fitment or shower is to be used and for all other purposes for which such supply is to be used.

(4) The connection of a supply of water for the purposes of sub paragraph (2) and (3) shall be—

(a) of a supply of water from the National Water and Sewerage Corporation has granted permission in writing on application;

(b) of a supply of water from a well within the site of the building where National Water and Sewerage Corporation has granted permission in writing on application; or

(c) if in all the circumstances of the case National Water and Sewerage Corporation is satisfied that it is not reasonable that the connection be of a supply of water from the waterworks or from a well within the site of the building, of a supply of water from such other source as the National Water and Sewerage Corporation may permit or direct.

(5) In determining whether a supply of water is satisfactory and sufficient under this paragraph, regard shall be had to the nature, type and size of the building, the purpose for which it was constructed or is intended to be or is used and all the purposes for which the supply of water is or is likely to be used.

*Plumbing - Soil Fitments and Waste Fitments*

**27. Disposal of soil.**

All soil shall be properly conducted, by means of suitable soil pipes, to drains provided for the carriage of foul water.

**28. Waste pipe.**

(1) Save as provided in subparagraphs (2) and (3), waste pipes shall discharge in the open air—

(a) over or into a suitable channel within 1 meter of a properly trapped gully;

(b) into a gully, above the level of the water therein; or
(c) into a suitable hopper head.

(2) Waste pipes from lavatory basins may discharge-
(a) into a suitable drainage channel immediately below the lavatory basins, if such drainage channel discharges into a trapped gully; or
(b) into a common waste pipe, if the common waste pipe discharges through a trap and has adequate means of access for cleaning.

(3) Subject to any other provision under this Part, waste pipes may be connected to a soil pipe.

**29. Materials for soil fitments.**
Every soil fitment shall be constructed of glazed earthenware, enamelled fire clay or any other material approved by the Building Committee.

**30. Construction of watercloset fitments.**
(1) Every watercloset fitment, other than a squatting type fitment, shall be of such shape, capacity and mode of construction as to retain a sufficient quantity of water and to receive normal deposits of excrement into such water without undue soiling of the sides of the fitment.

(2) Every watercloset fitment, other than a squatting type fitment, shall be provided with a hinged seat or a suitable seat rim or inset.

**31. Construction of trough waterclosets.**
The channel of a trough watercloset shall be at most 5m and shall have an even fall towards the outlet trap of not less than 1 in 30.

**32. Construction of urinal channels.**
The channels of every stall and trough urinal shall have an even fall towards the outlet trap of not less than 1 in 120 and no part of any such channel shall be more than 6m from the trap to which it discharges.

**33. Flushing water supply.**

(1) For every watercloset fitment, trough watercloset, urinal and slop sink, a plumbing system shall be provided to supply water for flushing purposes.

(2) Every part of the plumbing system, including any storage tank for water solely for flushing purposes, shall be constructed of material that is suitable for use with salt water.

**34. Flushing rim.**

Every watercloset fitment, bidet, basin-type urinal and slop sink shall be provided with a suitable flushing rim for the effectual flushing of the fitting.

**35. Flushing cisterns.**

(1) Subject to paragraph 36, every watercloset fitment, trough watercloset, urinal and slop sink shall be provided with a flushing cistern.

(2) The flushing cistern shall—

(a) in the case of watercloset fitments and slop sinks—

(i) discharge to the watercloset fitment of a slop sink, on each occasion such fitment is used, not less than 9 litres and not more than 14 litres of water; and

(ii) be provided with a ball valve so arranged as to re-fill the cistern within 2 minutes;

(b) in the case of trough waterclosets, be fitted with automatic discharging apparatus arranged as to discharge-

(i) at the highest point of the channel; and

(ii) at such intervals as may be necessary to ensure adequate cleaning of the closet, not less than 9 litres of water for every metre of the channel; and

(c) in the case of urinals, be fitted with automatic discharging apparatus, arranged to discharge—

(i) into every basin or stall or, in the case of a trough urinal, every metre thereof; and
(ii) at such intervals as may be necessary to ensure adequate cleaning of the urinal, not less than 4.5 litres of water.

**36. Pressure valves.**

Save in the case of trough waterclosets and urinals, pressure valves may, where there is a suitable head of water, be installed for flushing purposes without the provision of a flushing cistern.

**37. Flushing pipes.**

The internal diameter of flushing pipes shall—

(a) in the case of watercloset fitments, trough waterclosets and slop sinks, be not less than 32 millimetres;
(b) in the case of urinals other than trough urinals, be not less than 15 millimetres for each basin or stall; and
(c) in the case of trough urinals, be not less than 15 mm for every metre thereof.

**38. Storage tanks for flushing water.**

(1) Every building shall be installed with a water storage tank purposely fitted for purposes of flushing watercloset fitments, trough watercloset, urinals or stop sinks.

(2) Water storage tanks—

(a) shall be placed in a position above the level of the highest fitment or on a suitable water tower;
(b) shall be fitted with a suitable close fitting cover; and
(c) shall be provided with adequate access to enable the tank to be entered and cleaned.

**39. Overflow pipes.**

(1) Every flushing cistern and water storage tank shall be provided with an overflow pipe.

(2) The overflow pipe from a water storage tank shall—

(a) have an internal diameter of one commercial size larger than the supply pipe to the cistern or tank;

(b) have a dip down, inside the tank, for purposes of terminating in a position not more than 150 mm above the bottom of the tank; and

(c) discharge in a conspicuous position.

**40. Traps for soil fitments.**

(1) Every soil fitment shall be provided with a suitable trap with a water seal of not less than 50 mm.

(2) The internal diameter of every trap shall be not less than—

(a) 80 millimetres, in the case of a watercloset fitment, slop sink, or urinal with more than 3 basins or stalls or with a channel longer than 2 m;

(b) 50 millimetres, in the case of a urinal with more than one and not more than 3 basins or stalls or with a channel not longer than 2 m;

(c) 40 millimetres, in the case of a bidet or urinal with a single basin or stall; and

(d) 100 millimetres, in the case of a trough watercloset.

**41. Traps for waste fitments.**

(1) Every waste fitment shall be provided immediately under the fitment with a suitable trap except that a trap shall not be required—

(a) where the waste pipe from such fitment—

(i) does not exceed 1 m in length; and

(ii) discharges over or into a suitable trapped gully;

(b) in respect of lavatory basins, where the waste pipes therefrom discharge in the manner provided by paragraph 28(2); and

(c) in respect of a range of shower baths, where the drainage channel is provided, at its lowest point, with a trap.

(2) Save as provided in subparagraph (3), every trap provided for a waste fitment shall have—

(a) an internal diameter of not less than 32 millimetres; and

(b) a water seal of not less than 40 millimetres.

(3) Where the waste pipe from a waste fitment is, under the provisions of subparagraph 28(3), connected to a soil pipe, the trap provided for the waste fitment shall—

(a) have an internal diameter of not less than 32 millimetres;

(b) have a water seal of not less than 80 millimetres; and

(c) be—

(i) adequately ventilated; or

(ii) constructed to prevent loss of water seal.

*Pipes and Eaves Gutters*

**42. Soil pipes.**

(1) The internal diameter of every soil pipe from a watercloset fitment or slop sink shall be not less than—

(a) 80 millimetres; or

(b) the internal diameter of the outlet pipe of the trap of any fitment to which the soil pipe is connected, whichever is greater.

(2) The internal diameter of every soil pipe from a urinal or bidet shall not be less than the internal diameter of the outlet pipe of the trap of any fitment to which the soil pipe is connected.

(3) Every soil pipe shall be properly connected to a covered drain without the intervention of any trap.

**43. Waste pipes.**

(1) Waste pipes to which the waste from one waste fitment is discharged shall have an internal diameter of not less than-

(a) 32 millimetres; or

(b) the internal diameter of the outlet of the trap to which the waste pipe is connected, whichever is the greater.

(2) Waste pipes to which the waste from more than one fitment is discharged shall be of adequate diameter to convey all waste.

(3) Every waste pipe shall terminate at its lower end not more than 150 millimetres above the channel or trapped gully over or into which it discharges.

**44. Bends in soil and waste pipes.**

(1) Soil pipes and waste pipes shall not have bends, except where it is necessary.

(2) Whenever a bend is necessary—

(a) the bend-

(i) shall have an obtuse angle;

(ii) shall have the largest practicable radius of curvature; and

(iii) shall not in any way change the cross section of the pipe; and

(b) a cleaning eye or other suitable means of access shall be provided at or near the bend.

**45. Access to soil and waste pipes.**

(1) Sufficient access shall be provided, by means of cleaning eyes or other approved method, to enable soil pipes and waste pipes to be cleared of any obstruction.

(2) Such access points shall be seated to allow clearance for the easy entry of cleaning rods.

**46. Anti-syphonage pipes.**

(1) Where—

(a) more than one trap of a watercloset fitment, urinal, slop sink or waste fitment is connected with one soil pipe; or

(b) more than one trap of a waste fitment is connected with one waste pipe, the traps shall be ventilated by means of anti-syphonage pipes; provided that if, in the case of waste fitments, the traps to the fitments are constructed to prevent loss of water seal, it shall not be necessary to provide an anti-syphonage pipe, unless the National Water and Sewerage Corporation requires.

(2) Every anti-syphonage pipe shall be connected with-

(a) the trap, if the connection with the anti-syphonage pipe is an integral part of the trap; or

(b) the branch soil pipe or branch waste pipe-

(i) on the side of the water seal nearest the main soil pipe or waste pipe; and

(ii) at a point not more than 300 mm from the trap outlet.

(3) The internal diameter of every anti-syphonage pipe shall—

(a) if the diameter of the soil pipe or waste pipe to which it is connected is 80 mm or more, be not less than 50 mm;

(b) if the diameter of such soil pipe or waste pipe is less than 80 mm, be not less than—

(i) two-thirds of the internal diameter of such soil pipe or waste pipe; or

(ii) 32 mm, whichever is the greater.

(4) The main anti-syphonage pipe may be connected to a soil pipe which, under paragraph 47(3), is acting as a ventilating pipe and every such connection shall be made at a point above the flood level of the highest fitment connected to the soil pipe.

**47. Ventilating pipes.**

(1) Every ventilating pipe for any drain or sewer shall be carried up to a height not less than 1 meter above the roof of the building to which it is fixed or, where such building has a pitched roof, above the eaves of the building.

(2) A ventilating pipe shall not be fixed to permit the escape of foul air from any drain, sewer, soil pipe or waste pipe into another building.

(3) Soil pipes or waste pipes may be carried up to a suitable height above the building to which they are fixed to act as ventilating pipes for any drain or sewer.

(4) The internal diameter of every ventilating pipe and of every soil pipe or waste pipe which, under subparagraph (3), is acting as a ventilating pipe, shall be not less than 80 mm.

(5) The open end of every ventilating pipe shall be provided with a suitable grating having apertures of an aggregate area not less than the sectional area of the pipe.

(6) Ventilating pipes shall not be used for the carriage of surface water.

**48. Rain water pipes.**

(1) Every rain water pipe discharging to a drain which is connected to a public sewer provided for the carriage of surface water shall—

(a) in the case of a rain water pipe situated outside a building, discharge not more than 150 mm above the level of the ground over a suitably trapped gully or into a trapped gully below the level of the grating, but above the level of the water in the trap; and

(b) in the case of a rain water pipe situated inside a building other than a rain water pipe used solely for the conveyance of rain water from a roof, be properly trapped with an efficient trap which shall be formed and fixed to maintain a water seal of not less than 75 mm.

(2) Every rain water pipe which discharges to a channel shall discharge at a height not more than 150 mm above the level of the top of the channel.

(3) Every rain water pipe which discharges, through a cast iron conductor, to the side channel in a street shall be provided, at the foot, with a shoe to ensure that any surface water discharged from the pipe will discharge directly into the conductor.

(4) The number and size of rain water pipes provided for any building shall be calculated at the rate of 700 square millimetres of pipe to every 10 square metres of horizontal roofed-over surface.

(5) Subject to paragraph 49, the diameter of every rain water pipe shall be not less than 65 mm.

(6) Rain water pipes shall not be connected with any soil pipe, waste pipe or ventilating pipe.

(7) Where a rain water pipe discharges, across any footpath, to the side channel of a street, it shall discharge through a cast iron conductor.

**49. Rain water pipes for verandas or balconies.**

(1) A rain water pipe provided for the carriage of surface water from a veranda or balcony shall, where there is, a suitable position, be connected to a rain water pipe provided for the carriage of surface water from the roof of the building.

(2) Where a rain water pipe provided for the carriage of surface water from a veranda or balcony discharges to a side channel in a street or connected through a rain water pipe for the carriage of surface water, the internal diameter of the rain water pipe from the veranda or balcony shall be not more than 40 millimetres.

**50. Materials for pipes.**

(1) Every soil pipe, waste pipe, anti-syphonage pipe, ventilating pipe, overflow pipe and every pipe connected with any drain provided for the carriage of foul water shall be—

(a) circular in shape; and
(b) fabricated from cast iron, steel, copper or other approved material.

(2) Every rain water pipe shall be fabricated from cast iron, copper or other approved material.

(3) The materials used to fabricate the pipes in subparagraph (1) shall be free from any defects.

**51. Connections of pipes.**

Every connection of a soil pipe, waste pipe, anti-syphonage pipe, ventilating pipe, rain water pipe or overflow pipe with any other pipe, or with a trap, gutter or other fitting, as the case may be, shall be made in a manner suitable to the nature of the materials of which such pipe and such other pipe or trap, gutter or other fitting are fabricated for purposes of being water tight.

**52. Fixing of pipes.**

(1) Every soil pipe, waste pipe and rain water pipe shall be securely fixed to the wall of the building for which it is provided.

(2) A hole which is made on the floor or wall in order to admit any such pipe shall be properly filled in and sealed round the pipe.

**53. Pipes in ducts.**

Where a soil pipe, waste pipe, anti-syphonage pipe, ventilating pipe, or rain water pipe is fixed in a duct within a building, access panels of a suitable size shall be provided to avail adequate access to all pipe connections within the duct.

**54. Eaves gutters.**

(1) Eaves gutters shall be—
(a) made of cast iron or other approved material;
(b) fixed at a gradient not less than 1 in 100; and

(c) properly connected to rain water pipes.

(2) The size of eaves gutters shall be calculated at the rate of 700 mm2 of cross sectional area of gutter to every 7 m2 of horizontal roofed-over surface.

*Drainage Works*

**55. Drainage of buildings.**

Every building shall be provided with pipes, drains and channels as are necessary for the disposal of all foul water and surface water from the building.

**56. Disposal of foul water.**

(1) Drains and private sewers, provided for the carriage of foul water, shall, where there is a public sewer provided for the carriage of foul water at a suitable level and position within 30 meters of the boundary of the lot on which the building, for which such drains or private sewers are provided, is erected, be connected to the available public sewer.

(2) Where there is no public sewer, the National Water and Sewerage Corporation may, by order in writing, require the owner of any building to provide a septic tank, a cesspool or other approved facility.

**57. Disposal of surface water.**

(1) Save as provided in subparagraph (2), all surface water from a building shall, if there is a public sewer, provided for the carriage of surface water, at a suitable level and position within 30 m of the building, be conducted, by means of rain water pipes and drains provided for the carriage of surface water, to the public sewer or, where there is no such public sewer, shall be conducted, to the satisfaction of the Building Committee, to a public channel provided for the carriage of surface water or to the side channel in a street.

(2) Where there is no public sewer and no public channel or side channel in a street, surface water shall be conducted, to the satisfaction of the Building Committee, to a stream course or nullah.

**58. Pipes carrying surface water not to discharge across surface of footpath.**

A pipe provided for the carriage of surface water from a building shall not discharge across the surface of any footpath or passage.

**59. Disposal of sub-soil water.**

Drains provided for the carriage of sub-soil water may be connected to a private or public sewer provided for the carriage of surface water or to a drain provided for that purpose.

**60. Materials for drains.**

(1) Covered drains, except covered drains provided for the carriage of sub-soil water and covered sewers shall be made with good sound pipes of glazed earthenware, stone ware, concrete, cast iron or other approved material.

(2) Drains and sewers above the ground shall be laid with cast iron pipes or other approved materials.

(3) All pipes used in the construction of any drain or sewer shall—

(a) be of true bore;
(b) have smooth internal surfaces; and
(c) be impervious.

(4) Cast iron sewage pipes shall be protected against rust and corrosion by a suitable asphaltic coating.

(5) Earthenware, stone ware and concrete pipes shall—

(a) in the case of pipes with a diameter not exceeding 150 millimetres, have a thickness equal to not less than one-ninth of the diameter of the pipe; and
(b) in the case of pipes with a diameter exceeding 150 millimetres, have a thickness equal to not less than one-twelfth of the diameter of the pipe.

**61. Sub-soil water drains.**

Drains provided for the carriage of sub-soil water shall be constructed with clay field pipes or other suitable pipes and shall be laid to adequate falls.

**62. Size of drains.**

(1) All drains and sewers shall be of adequate, but not excessive, size for the purpose for which they are provided.

(2) A covered drain shall not have an internal diameter of less than 100 millimetres.

**63. Laying of drains and sewers.**

(1) All drains and sewers, except drains provided for the carriage of sub-soil water and traps shall be firmly laid on a bed of concrete not less than 100 millimetres in thickness and at least 150 millimetres wider than the diameter of the pipe or trap, and shall be hunched with concrete so that the full width of the bed is carried up to the level of the horizontal diameter of the pipe and from that point splayed up on both sides of the pipe from the full width of the bed to meet the pipe barrel tangentially.

(2) All drains and sewers shall be supported along the full length of the barrels and not by the sockets.

(3) Where any drain or sewer is laid in soft and yielding ground—

(a) adequate support shall be provided for such drain or sewer; and

(b) save where the same are provided for the carriage of sub-soil water, the pipes shall be completely surrounded by at least 100 mm of concrete.

(4) Cast iron pipes above the ground may be carried on adequate piers or other sufficient supports, if such support is provided at each joint.

**64. Drains and sewers in gathering grounds to be watertight.**

(1) Every drain or sewer provided for the carriage of foul water from any building which lies within a gathering ground shall be watertight and shall—

(a) be laid in pipes of cast iron or other approved material and be of such design and construction of resisting the pressure to which it is likely to be subjected;

(b) have any hatch box constructed on the drain or sewer so that the hatch box is capable of resisting the pressure to which it is likely to be subjected; and

(c) have every joint in the drain or sewer made in lead, or other approved material for purposes of resisting the pressure to which the drain or sewer is likely to be subjected.

(2) Every joint in a drain or sewer referred to in subparagraph (1) shall be made by bolting the flanges together securely with suitable metallic or asbestos gaskets or shall be of such other approved construction for purposes of resisting the pressures to which the drain or sewer is likely to be subjected.

(3) Hatch boxes shall be provided to a drain or sewer referred to in subparagraph (1)—

(a) at intervals not exceeding 30 m in the drain or sewer;

(b) at changes of gradient, if the Building Committee requires; and

(c) at every change in direction in the drain or sewer provided that no hatch box is required where the change in direction does not exceed $10^{0}$ and is made by means of a purpose-made bend.

(4) Notwithstanding subparagraph (3), not more than one manhole shall be permitted in each drain or sewer.

(5) Every hatch box shall be constructed of cast iron or other approved material and shall have a hatch or door securely bolted at the top.

**65. Falls of drains.**

Every drain or private sewer shall be laid with a minimum fall from its highest inlet to its connection with a public sewer or other outlet in accordance with the parameters set in Table 2 of Schedule 2.

**66. Junctions of drains.**

(1) The junction of a single branch drain with another drain at an angle of not more than 45◦ in the direction of flow may be made by means of a purpose-made Y junction.

(2) The junction of every other branch drain with another drain shall be made within a manhole, obliquely at an angle of not more than 60º in the direction of flow of such other drain, and shall be above the invert of such other drain.

**67. Joints.**

(1) Every joint in a drain or sewer shall be made in a proper and efficient manner so as to render the drain or sewer watertight and capable of resisting a pressure of a head of water of-

(a) 1.5 m; or

(b) a vertical distance between the invert level of the pipe joint and the level of the top of the manhole immediately preceding the joint, whichever is the greater, and no material forming the joint shall project into the interior of any pipe in such manner as to cause any obstruction in the drain or sewer.

(2) The joints of cast iron socketed pipes shall be made with a gasket of hemp or yarn, and shall be properly caulked with metallic lead or other approved material.

(3) The joints of cast iron flanged pipes shall be made by bolting the flanges together securely with a suitable metallic or asbestos gasket.

(4) The joints of earthenware, stone ware or concrete pipes shall be made with a gasket of hemp or yarn, and cement mortar or other approved material.

**68. Inlets to drains.**

(1) Subject to subparagraph (2), every inlet to a drain or sewer shall be properly trapped by an efficient trap, which shall be formed and fixed to maintain a water seal of not less than 75 mm.

(2) Subparagraph (1) shall not apply—

(a) to an inlet for a soil pipe or a ventilating pipe;

(b) to an inlet for the carriage of any trade effluent;

(c) where no other means of connection is practicable; or

(d) to an inlet to a drain used solely for the conveyance of rain water from a roof.

**69. Ventilation.**

(1) Every drain provided for the carriage of foul water shall be ventilated at its highest point by means of a ventilating pipe having an internal diameter of not less than 50 millimetres.

(2) Every manhole in which a disconnecting trap is fixed shall be adequately ventilated.

(3) Branch drains shall be ventilated at their highest point, if the Building Committee so requires.

**70. Traps not to be between ventilated points.**

A trap or other obstruction to the free circulation of air shall not be placed between the ventilation openings at the lower and higher ends of any drain or sewer.

**71. Drains and sewers under buildings.**

(1) All drains and sewers under a building shall be laid in straight lines and shall be laid with cast iron sewage pipes.

(2) Where any drain or sewer is laid through any building, or where any building is constructed over any drain or sewer, relieving arches or beams shall be provided to protect such drain or sewer and to prevent any load from the building being transmitted to such drain or sewer.

**72. Manholes and cleaning eyes to be provided.**

(1) Manholes shall be provided—

(a) at every change in direction in any drain or sewer except where—

(i) the change in direction does not exceed 45 degrees;

(ii) the internal radius of the bend is not less tha 6 times the internal diameter of the drain or sewer, or

(iii) the change in direction is made by means of a purpose-made; and

(b) at changes of gradient, if the Building Committee so requires.

(2) Manholes or cleaning eyes shall be provided at intervals not exceeding 60m in every drain and sewer.

**73. Construction of manholes.**

(1) Every manhole shall be of such size and form as to allow ready access for rodding.

(2) A manhole shall be fabricated from—

(a) brickwork in cement mortar at least 215 mm in thickness;

(b) concrete at least 125 mm in thickness; or

(c) other approved impervious material.

(3) The foundation of every manhole shall be constructed of concrete not less than 150 mm in thickness.

(4) Benchings shall be formed above the level of every drainage channel in a manhole to fall towards such channel at a gradient of 1 in 2.

(5) The benchings and all the internal faces of every manhole shall be rendered with cement mortar to provide a smooth and impervious surface.

(6) Every drainage channel in a manhole shall be not less than half round glazed earthenware or cement rendered, and shall have a diameter not less than that of the largest drainage inlet into and not more than that of the outlet from the manhole.

(7) Every drainage inlet to a manhole shall discharge into the drainage channel therein with properly made bends constructed within the benching of the manhole.

(8) Every manhole shall be fitted, on a level with the ground surface, with a cast iron airtight cover of adequate strength and approved design, except that every manhole inside or under a building shall be fitted with a double-sealed cast iron airtight cover.

**74. Disconnecting traps.**

(1) Every drain and sewer shall be provided with a suitable and efficient disconnecting trap for the carriage of foul water.

(2) Every drain and sewer provided for the carriage of surface water except where such drain or sewer is connected to a stream course or an open nullah shall be provided.

(3) Every trap and the manhole in which it is fixed shall be situated on land owned by the owner or owners of the building or buildings for which the drain or sewer is provided, at a position as near as practicable to the place at which such drain or sewer is connected to a public sewer or, in the case of a drain or sewer, provided for the carriage of surface water, which is connected to a covered nullah, at a position as near as practicable to the nullah.

(4) Every trap shall be—

(a) fixed within a manhole;
(b) formed and fixed as to have a water seal of not less than 75 mm; and
(c) provided as an integral part of the trap, with a cleaning eye.

**75. Gullies.**

(1) Open trapped gullies shall be covered with a suitable grating having openings equal to an area not less than the cross sectional area of the outlet of the trap.

(2) Where sealed trapped gullies are used, adequate provision shall be made for the ventilation of the space above the water level of the trap.

**76. Cleaning eyes.**

Every cleaning eye shall be—
(a) fitted with a cover, in order to make the cleaning eye airtight and watertight; and
(b) of such size as to allow easy entry for cleaning rods.

**77. Filling in of drainage trenches.**

(1) All trenches in which drains or sewers have been laid shall be carefully filled in, around and above the drains or sewers, with earth which shall be carefully rammed and consolidated.

(2) Stones or other material which may not pass through a 50 mm ring shall not be deposited in any trench within 300 mm of the top of any drain or sewer.

**78. Surface water channels.**

(1) Channels provided for the carriage of surface water shall be of adequate size, constructed of approved impervious material, finished off smooth and laid to a gradient of not less than 1 in 100.

(2) Suitable grilles shall be provided to prevent sand, silt and other debris from entering any public sewer, public channel, nullah or stream course.

(3) A cover in a foot-path to a channel for the carriage of surface water shall be flush with the path surface and any hole in such cover or between the cover and another shall not exceed 20 mm in one dimension.

*Septic Tanks*

**79. Disposal of effluent.**

(1) An owner of a building shall, before installing a septic tank, submit to the National Water and Sewerage Corporation for approval of the methods by which it is intended to dispose of the effluent and sludge from the septic tank.

(2) The National Water and Sewerage Corporation shall not give approval if, in their opinion, the method proposed is likely to cause a nuisance or injury to health.

**80. Dip pipes.**

The inlet to and the outlet from a septic tank shall be by means of dip pipes of such depth as to avoid disturbance of the top scum.

**81. Ventilation.**

In every septic tank the space between the top of the water level and the underside of the cover shall be—

(a) adequately ventilated; or

(b) provided with adequate means for drawing off gases.

*Cesspools*

**82. Situation of cesspools.**

A cesspool shall not be situated—

(a) within 20m of any spring, stream of water or well, the water from which is used, or likely to be used, for drinking or domestic purposes or for the manufacture or preparation of articles of food or drink for human consumption or for the cleansing of vessels used in the manufacture or the preparation of such articles; or

(b) within 15 m of any building in which any person resides or works.

**83. Disposal of contents.**
Every cesspool shall be situated in away that ensures adequate means for removing its contents without carrying them through any building in which any person resides or works.

**84. Capacity.**
(1) Every cesspool shall have such minimum capacity as shall be determined by the Building Committee in the manner prescribed by subparagraph (2).

(2) The cesspool shall be of such capacity as to be capable of storing the quantity of soil and waste discharged into it during a period of one month.

(3) The quantity of soil and waste discharged shall be calculated at the rate of 135 L for each day for each person using or likely to use the soil fitments or waste fitments installed in the building for which the cesspool is provided.

(4) For the purposes of this standard, the number of persons using or likely to use the soil fitments or waste fitments installed in any building shall be determined by the Building Committee.

*Testing of Drainage Works*

**85. Procedure for application to test drainage works.**
(1) The registered general building contractor or the registered specialist contractor appointed in respect of any drainage works shall, on the completion of such works, but before any trenches in which drains or sewers have been laid are filled in, apply, in writing, to the National Water and Sewerage Corporation for the drainage works to be tested.

(2) Upon application, the National Water and Sewerage Corporation may inspect and test the drainage works and shall—

(a) if satisfied with the result of the test, notify the registered general building contractor or the registered specialist contractor appointed in respect thereof accordingly; or

(b) if they are not satisfied, order the work to be carried out as may be necessary to cause the works to comply with these paragraphs.

(3) An order made under subparagraph (2)(b) shall be in writing and shall specify—

(a) the work to be carried out; and

(b) the period of time within which such work must be carried out.

(4) After the expiry of the period specified in the order under subparagraph (3), the National Water and Sewerage Corporation shall again inspect and test the drainage works and, where, they find noncompliance to the order, require the general building contractor or the registered specialist contractor to rectify the unsatisfied works.

(5) In respect of every inspection and test made in accordance with subparagraph (4), the registered general building contractor or the registered specialist contractor appointed in respect of the drainage works shall pay a prescribed fee.

(6) Where the National Water and Sewerage Corporation does not test any drainage work within 30 days of the receipt of an application under subparagraph (1), the trenches in which any drains and sewers have been laid may be filled in.

**86. Power of National Water and Sewerage Corporation to require drainage trenches to be opened.**

(1) Save where a trench in which drains or sewers have been laid is filled in pursuant to the provisions of paragraph 85(6), where a trench in which drains or sewers have been laid is filled in before

the National Water and Sewerage Corporation has, under paragraph 85, notified the registered general building contractor or the registered specialist contractor appointed in respect of the drainage works that it is satisfied with the result of a test, the National Water and Sewerage Corporation may require such registered general building contractor or the registered specialist contractor to open and uncover the drainage works in order to enable him or her to carry out an inspection and test.

(2) Works under this paragraph shall be carried out by the National Water and Sewerage Corporation and at the cost of the developer or project owner.

**87. National Water and Sewerage Corporation to make connection of drain and private sewer to public sewer or nullah.**

(1) The connection of every drain or private sewer to a public sewer or nullah shall be made by the National Water and Sewerage Corporation who may recover the cost as provided in subparagraph (3).

(2) National Water and Sewerage Corporation shall not make any such connection until they are satisfied that the drainage work, of which the drain or private sewer forms part, have been carried out in accordance with the provisions of this Code.

(3) Where a drain is connected to a public sewer, the National Water and Sewerage Corporation may recover the cost of making the connection from the owner of the building for which the drain is provided.

(4) Where a private sewer is connected to a public sewer, the National Water and Sewerage Corporation—

(a) may, where the buildings for which the private sewer is provided are owned by the same person, recover the cost of making the connection from the person; or

(b) shall, where the buildings are owned by different persons, apportion the cost of making the connection equally among the persons and may recover from each of them a portion of the cost.

**88. National Water and Sewerage Corporation to provide required disconnecting trap.**

(1) Every disconnecting trap, required by paragraph 74, to be provided, shall be fixed, and the manhole in which the trap is fixed shall be constructed, by the National Water and Sewerage Corporation who may recover the cost of the work as provided in subparagraph (2).

(2) Where the trap and manhole so fixed and constructed, respectively, are provided for a drain, the National Water and Sewerage Corporation may recover the cost from the owner of the building for which the drain is provided.

(3) Where the trap and manhole fixed and constructed, respectively, are provided for a private sewer, the National Water and Sewerage Corporation—

(a) may, where the buildings for which the private sewer is provided are owned by the same person, recover the cost from the person, or

(b) shall, where such buildings are owned by different persons, apportion the cost equally among the persons and may recover from each of the persons his or her portion of the cost.

PART IV — HEATING VENTILATION AND AIR CONDITIONING

**89. Air-conditioning and ventilation systems.**

(1) An air-conditioning system or artificial ventilation system in a building shall be designed to prevent the distribution of products of combustion in the event of a fire in the building.

(2) An air shaft or duct used for air-conditioning or artificial ventilation, including an internal or external insulation and any flexible joint, shall be constructed of non-combustible material or material which has been favorably evaluated by the Building Committee as being suitable for the shaft, duct, joint or insulation except that—

(a) approved combustible flexible connections may be used where the length of the connection does not exceed 1.5m and the connection does not pass through any wall or floor which is required to have a specified fire resistance; and

(b) approved combustible flexible joints not more than 250 mm in length may be used in any plant room where the plant room is protected by a smoke detection system.

(3) A fire damper shall be provided in an air duct in a position where the duct passes through a required division or occupancy separating element or any element required for the enclosure of an emergency route or passes into any duct.

(4) A fire damper shall—

(a) close automatically upon the operation of a suitably located sensing device actuated by an abnormal rise in the temperature or by the presence of smoke or combustion gases in the air duct;

(b) be provided with adequate access, the position of which shall be clearly marked, for inspection, maintenance and resetting of the mechanism;

(c) be so installed as to remain in position at the protected opening even if the air duct distorts during a fire; and

(d) be provided with an overriding fusible link.

**90. Materials in air duct systems.**

(1) Except as provided in subparagraphs (2) to (4), all ducts, duct connectors, associated fittings and plenums used in air duct systems shall be constructed of steel, aluminum alloy, copper, or similar non-combustible material.

(2) Ducts, associated fittings and plenums are permitted to contain combustible material provided they—

(a) conform to the appropriate requirements for “Test for Air Ducts”;

(b) are used only in horizontal runs in a building required to be of noncombustible construction;
(c) are not used in vertical runs serving more than 2 storeys in a building required to be of non-combustible construction, and
(d) are not used in air duct systems in which the air temperature may exceed 120°C.

(3) Duct sealants shall have a flame-spread rating of not more than 25 and a smoke developed classification of not more than 50.

(4) Duct connectors that contain combustible materials and that are used between ducts and air outlet units shall—
(a) conform to the appropriate requirements for "Test for Air Ducts";
(b) be limited to 4 m in length;
(c) be used only in horizontal runs; and
(d) not penetrate required fire separations.

(5) Materials in sub-paragraphs (1) to (4) installed in a location where they may be subjected to excessive moisture shall have no appreciable loss of strength when wet and shall be corrosion resistant.

(6) All duct materials and fittings shall be—
(a) suitable for exposure to the temperature and humidity of the air being conveyed; and
(b) resistant to corrosion due to contaminants in the air being conveyed in the duct.

**91. Connections and openings in air duct systems.**
(1) Air duct systems shall have—
(a) tight-fitting connections throughout; and
(b) no openings other than those required for proper operation, inspection and maintenance of the system.

(2) Access openings shall be provided in duct systems to allow the removal of material that may accumulate in plenums and ducts.

**92. Duct coverings, linings, adhesives and insulation.**

(1) Coverings, linings and associated adhesives and insulation of air ducts, plenums and other parts of air duct systems shall be of non-combustible material when exposed to heated air or radiation from heat sources that would result in the exposed surface exceeding a temperature of 120°C.

(2) When combustible coverings and linings, including associated adhesives and insulation, are used, they shall have a flame-spread rating of not more than 25 on any exposed surface or any surface that would be exposed by cutting through the material in any direction, and a smoke developed classification of not more than 50, except that the outer covering of ducts, plenums and other parts of air duct systems used within an assembly of combustible construction may have an exposed surface flame-spread rating of not more than 75 and may have a smoke developed classification greater than 50.

(3) Combustible coverings and linings in subparagraph (2) shall not flame, glow, smoulder or smoke when undergoing a hot-surface performance test at the maximum temperature to which the coverings and linings are to be exposed in service.

(4) Except as provided in subparagraph (5), foamed plastic insulation shall not be used as part of an air duct or for insulating an air duct.

(5) Foamed plastic insulation may be used in a ceiling space that acts as a return air plenum provided the foamed plastic insulation is protected from exposure to the plenum.

(6) Combustible coverings and linings of ducts, including associated adhesives and insulation, shall be interrupted at the immediate area of operation of heat sources in a duct system, such as electric resistance heaters or fuel-burning heaters or furnaces, and where the duct penetrates a fire separation.

(7) Linings of ducts shall be installed so that they will not interfere with the operation of volume or balancing dampers, fire dampers, fire stop flaps and other closures.

**93. Underground ducts.**

(1) Underground ducts shall—

(a) be constructed and installed with a slope to provide interior drainage to all low points; and

(b) not be connected directly to a sewer.

(2) A clean-out or pump-out connection shall be provided in an underground duct system at every low point of the duct system.

**94. Fire dampers.**

Fire dampers shall not fail when tested in accordance with ISO 10294-1.

**95. Smoke detector control.**

Air handling systems shall incorporate smoke detector control where required.

**96. Exhaust ducts and outlets.**

(1) Except as provided in subparagraph (2), exhaust ducts of non-mechanical ventilating systems serving separate rooms or spaces shall not be combined.

(2) Exhaust ducts of non-mechanical ventilating systems serving similar occupancies may be combined immediately below the point of final delivery to the outside, such as at the base of a roof ventilator.

(3) Exhaust ducts of ventilating systems shall have provision for the removal of condensation where this may be a problem.

(4) Exhaust outlets shall be designed to prevent back draft under wind conditions.

(5) Except as permitted in subparagraph (6), exhaust systems shall discharge directly to the outdoors.

(6) Auxiliary rooms, mechanical rooms or storage rooms are permitted to be ventilated into a storage garage, provided that—

(a) they are accessible only from that storage garage;

(b) they have no openings or duct penetrations through the walls separating the room from adjacent spaces other than that storage garage and other auxiliary, mechanical or storage rooms;

(c) the exhaust contains no contaminants that would adversely affect the air quality in the storage garage; and

(d) they are provided with—

(i) carbon monoxide monitoring devices; and

(ii) a light switch which is interlocked with the operation of the exhaust fan serving the room.

(7) Exhaust ducts connected to laundry drying equipment shall be—

(a) independent of other exhaust ducts;

(b) designed and installed so that the entire duct can be cleaned; and

(c) constructed of smooth corrosion-resistant material.

(8) Except as provided in subparagraph (10) and except for self-contained systems serving individual dwelling units, exhaust ducts serving rooms containing water closets, urinals, basins, showers or slop sinks shall be independent of other exhaust ducts.

(9) Except as provided in subparagraph (10) and except for self-contained systems serving individual dwelling units, exhaust ducts serving rooms containing residential cooking equipment shall be independent of other exhaust ducts.

(10) Two or more exhaust systems described in subparagraphs (8) and (9) may be interconnected or connected with exhaust ducts serving other areas of the building provided—

(a) the connections are made at the inlet of an exhaust fan, and all interconnected systems are equipped with suitable back pressure devices to prevent passage of odours from one system to another when the fan is not in operation; or

(b) the exhaust ducts discharge to a shaft that is served by an exhaust fan having a capacity that is equal to or greater than the combined capacity of the exhaust fans discharging to the plenum multiplied by the operation diversity factor, provided that the exhaust fan serving the shaft operates continuously.

(11) Where exhaust ducts containing air from conditioned spaces pass through or are adjacent to unconditioned spaces, the ducts shall be constructed to prevent condensation from forming inside or outside of the ducts.

(12) Where an exhaust duct system is used for smoke removal in a high building, the following requirements shall apply—

(a) means of venting each floor area to the outdoors shall be provided by windows, wall panels, smoke shafts or, except as provided by subparagraph (5), the building exhaust system;

(b) fixed glass windows shall not be used for the venting required by subparagraph (1) if the breaking of the windows could endanger pedestrians below;

(c) openable windows used for the venting required by subparagraph (1) shall be permanently marked so that they are easily identifiable;

(d) elevator hoistways shall not be designed for the venting required by subparagraph (1);
(e) in a building that is not sprinkled, venting of floor areas required in subparagraph (1) shall not be provided by the building exhaust system.

(13) If a vertical service space contains an exhaust duct that serves more than one fire compartment, the duct shall have a fan located at or near the exhaust outlet to ensure that the duct is under negative pressure.

(14) Except as provided in subparagraph (15), exhaust air shall be provided at a rate not less than 24 l/s for each water closet, urinal, shower or slop sink.

(15) Exhaust air shall be provided for fixtures in dwelling units.

(16) Except for wash basins or lavatories, sanitary facilities in a food premises shall be mechanically ventilated and shall be capable of exhausting air at the rate of not less than 24 l/s for each sanitary fixture listed in subparagraph (17).

(17) The mechanical ventilation described in subparagraph (16) applies to rooms containing water closets, urinals, basins, showers or slop sinks.

(18) Where collective venting of multiple installations of laundry-drying equipment is used, the ventilation system shall—
(a) be connected to a common exhaust duct that is vented by one central exhaust fan;
(b) incorporate one central lint trap;
(c) include an interlock to activate the central exhaust fan when laundry-drying equipment is in use; and
(d) be provided with make-up air.

(19) Exhaust ducts or vents connected to laundry-drying equipment shall discharge directly to the outdoors.

**97. Interconnection of systems.**

(1) In a residential occupancy, air from one suite shall not be circulated to any other suite or to a public corridor or public stairway.

(2) Except as permitted by subparagraphs (3) and (7), air duct systems serving storage garages shall not be directly interconnected with ductwork serving other areas of the building.

(3) Where exhaust ducts are provided in conformance with subparagraph (7), they may exhaust through an enclosed storage garage prior to exhausting to the outdoors provided—

(a) the storage garage exhaust system runs continuously;

(b) the capacity of the storage garage exhaust system is equal to or exceeds the volume of the exhaust entering the garage; and

(c) a leakage rate 1 smoke/fire damper is provided near the duct outlet location in the storage garage to prevent air from the storage garage from entering the exhaust ductwork system in the event the building's exhaust fan is shut down.

(4) Except for public corridor separations or as permitted in subparagraphs (5) and (6), a public corridor or corridor serving the public shall not be used as a portion of a supply, return or exhaust air system serving adjoining areas, other than as part of a supply air system serving toilet rooms, bathrooms, shower rooms and similar auxiliary spaces opening directly to the public corridor or corridor used by the public.

(5) A public corridor may be used as part of an engineered smoke control system.

(6) Infiltration due to corridor pressurization is permitted into a residential occupancy from a public corridor.

(7) Auxiliary rooms, mechanical rooms or storage rooms are permitted to be ventilated into a storage garage, provided that—

(a) they are accessible only from that storage garage;

(b) they have no openings or duct penetrations through the walls separating the room from adjacent spaces other than that storage garage and other auxiliary, mechanical or storage rooms; and

(c) the exhaust contains no contaminants that would adversely affect the air quality in the storage garage.

**98. Ducts in exits.**

(1) Except as permitted in subparagraph (2), duct penetration of fire separations separating exits from the remainder of the building shall be in accordance with this Code.

(2) Duct penetration of fire separations separating exits from the remainder of the building is permitted if the duct—

(a) is designed for the purposes of firefighting and occupants' safety; or

(b) only serves the exit from a dedicated rooftop air make-up unit.

**99. Make-up air.**

(1) In ventilating systems that exhaust air to the outdoors, provision shall be made for the admission of a supply of make-up air in sufficient quantity so that the operation of the exhaust system and other exhaust equipment or combustion equipment is not adversely affected.

(2) Make-up air facilities required by subparagraph (1) shall be interlocked with the exhaust devices they serve so that both operate together.

(3) Where make-up air facilities are intended to introduce air directly from the outdoors to occupied parts of the building in cold seasons, they shall incorporate means of tempering that air to maintain the indoor design temperature.

**100. Supply, return, intake and exhaust air openings.**

(1) Supply, return and exhaust air openings located less than 2 000 mm above the floor in rooms or spaces in buildings shall be protected by grilles having openings of less than 15 mm diameter.

(2) Outdoor air intakes and exhaust outlets on the exterior of buildings shall be designed or located so that the air entering the building system will not contain more contaminants than the normal exterior air of the locality in which the building is situated.

(3) Exterior openings for outdoor air intakes and exhaust outlets shall be shielded from the entry of rain and shall be fitted with corrosion-resistant screens of mesh having openings not larger than 15 mm, except where experience has shown that climatic conditions require larger openings to avoid icing over of the screen openings.

(4) Screens required in subparagraph (3) shall be accessible for maintenance.

(5) Combustible grilles, diffusers and other devices for supply, return and exhaust air openings in rooms shall conform to the flame-spread rating and smoke developed classification requirements for the interior finish of the surface on which they are installed.

**101. Filters and odour removal equipment.**

(1) Air filters for air duct systems shall conform to the requirements for ISO 16890-1.

(2) When electrostatic-type filters are used, they shall be installed so as to ensure that the electric circuit is automatically de-energized when filter access doors are opened and, in dwelling units, when the system circulating fan is not operating.

(3) When odour removal equipment of the adsorption type is used it shall be—

(a) installed to provide access so that adsorption material can be reactivated or renewed; and
(b) protected from dust accumulation by air filters installed on the inlet side.

(4) Facilities for flushing and drainage shall be provided where filters are designed to be washed in place.

**102. Air washers and evaporative cooling sections or towers.**

(1) The filter and water evaporation medium of every air washer and evaporative cooling section enclosed within a building shall be made of non-combustible material.

(2) Sumps for air washer and evaporative cooling sections shall be constructed and installed so that they can be flushed and drained.

**103. Fans and associated air handling equipment.**

(1) Fans for heating, ventilating and air-conditioning systems shall be located and installed so that their operation—
(a) does not adversely affect the duct required for proper operation of fuel-fired appliances; and
(b) does not allow the air in the air duct system to be contaminated by air or gases from the boiler-room or furnace-room.

(2) Fans and associated air handling equipment, such as air washers, filters and heating and cooling units, when installed on the roof or elsewhere outside the building, shall be of a type designed for outdoor use.

**104. Vibration isolation connectors.**

(1) Vibration isolation connectors in air duct systems shall be non-combustible, except that combustible fabric connectors are permitted provided they—
(a) do not exceed 250 mm in length; and

(b) are not used in a location where they are exposed to heated air or radiation from heat sources that may cause the exposed surface to exceed a temperature of 120°C.

**105. Clearances of ducts and plenums.**

The clearances from combustible material and supply plenums, supply ducts, boots and register boxes of heating systems shall conform to the requirements of paragraph 106.

**106. Return-air system.**

(1) The return-air system shall be designed to handle the entire air supply.

(2) Where any part of a return duct will be exposed to radiation from the heat exchange or other radiating part within the furnace, such part of a return duct directly above or within 600 mm of the outside furnace casing shall be noncombustible.

(3) Return ducts serving solid fuel-fired furnaces shall be constructed of noncombustible material.

(4) Where combustible return ducts are permitted, they shall be lined with noncombustible material below floor registers, at the bottom of vertical ducts and under furnaces having a bottom return.

(5) The return-air system shall be designed so that the negative pressure from the circulating fan cannot affect the furnace combustion air supply nor draw combustion products from joints or openings in the furnace or flue pipe.

(6) Return-air inlets shall not be installed in an enclosed room or crawl space that provides combustion air to a fuel-fired appliance.

**107. Air ducts for low capacity systems.**

(1) Materials in supply ducts shall conform to the requirements of this paragraph.

(2) Galvanized steel or aluminum supply ducts shall conform to Schedule 3

(3) The design of fitting for ducts shall conform to SMACNA, "HVAC Duct Construction Standards – Metal and Flexible", except that metal thickness shall conform to Schedule 3.

**108. Construction and installation of ducts and plenums.**

(1) Rectangular panels in plenums and ducts more than 300 mm wide shall be shaped to provide sufficient stiffness.

(2) Where the installation of heating supply ducts in walls and floors creates a space between the duct and construction material, the space shall be fire stopped with noncombustible material at each end.

(3) Ducts shall be securely supported by metal hangers, straps, lugs or brackets, except that where zero clearance is permitted, wooden brackets may be used.

(4) All round duct joints shall be tight-fitting and lapped not less than 25 mm.

(5) Rectangular duct connections shall be made with S and drive cleats.

(6) Trunk supply ducts shall not be nailed directly to wood members.

(7) Branch ducts shall be supported at suitable spacings to maintain alignment and prevent sagging.

(8) Combustible ducts in concrete slabs-on-ground that are connected to a furnace supply plenum shall be located not closer than 600 mm to that plenum and not less than 600 mm from its connection to a riser or register.

(9) Ducts in or beneath concrete slabs-on-ground shall be watertight, corrosion, decay and mildew resistant.

(10) Where a supply duct or return duct is not protected by an insulated exterior wall or where the duct is exposed to an unheated space it shall be insulated to provide a thermal resistance of not less than RSI 2.1.

(11) Supply ducts and return ducts located in both conditioned and unconditioned spaces or outdoors and all joints of the ductwork shall be sealed.

(12) Underground ducts shall—

(a) be constructed and installed with a slope to provide interior drainage to all low points; and

(b) not be connected directly to a sewer.

(13) A clean-out or pump-out connection shall be provided in an underground duct system at every low point of the duct system.

**109. Warm-air supply outlets.**

(1) In a dwelling unit, a warm-air supply outlet shall be provided in each finished room that is located adjacent to unheated space, exterior air or exterior soil.

(2) Except as provided in subparagraph (3), when a room described in subparagraph (1) is located adjacent to exterior walls, such outlets shall be located so as to bathe at least one exterior wall or window with warm air, except in bathrooms, utility rooms or kitchens, where this may not be practical.

(3) Where the heating system is also designed to provide ventilation air, ceiling outlets or outlets located high on interior walls may be installed, provided the outlets are—

(a) designed for this purpose; and

(b) installed with diffusers.

(4) At least one warm-air supply outlet shall be provided for each 40 m2 of floor surface area in unfinished basements serving dwelling units, located so as to provide adequate distribution of warm air throughout the basement.

(5) At least one warm-air supply outlet shall be provided for each 80 m2 of floor surface area in heated crawl spaces serving dwelling units, and it shall be located so as to provide adequate distribution of warm-air throughout the crawl space.

(6) Except for pipeless furnaces and floor furnaces, the capacity of warm-air supply outlets serving dwelling units shall be not less than the design heat loss from the area served and shall not exceed 3 kW per outlet.

(7) In basements and heated crawl spaces, the calculated heat gain from the supply ducts and plenum surfaces may be considered in calculating the design heat loss.

(8) The temperature of supply air at the warm-air supply outlets shall not exceed 70°C.

(9) Warm-air supply outlets located in finished areas shall be provided with diffusers and adjustable openings and shall not be located on a furnace plenum.

(10) Air duct systems serving storage garages shall not be interconnected with other parts of the building.

**110. Adjustable dampers and balance stops.**
All branch supply ducts for residential systems shall be equipped with volume control dampers at the boot to permit balancing or shall be fitted with a diffuser incorporating an adjustable and lockable volume control device that can be set in a fixed position.

**111. Return-air system.**
(1) The return-air system shall be designed to handle the entire air supply.

(2) Except as provided in subparagraphs (3) and (4), return ducts shall be constructed of material having a surface flame-spread rating of not more than 150.

(3) Where any part of a return duct will be exposed to radiation from the heat exchanger or other radiating part within the furnace, such part of a return duct directly above or within 600 mm of the outside furnace casing shall be noncombustible.

(4) Return ducts serving solid fuel-fired furnaces shall be constructed of non-combustible material.

(5) Combustible return ducts shall be lined with non-combustible material below floor registers, at the bottom of vertical ducts and under furnaces having a bottom return.

(6) Spaces between studs and joists used as return ducts shall be separated from the unused portions of such spaces by tight-fitting metal stops or wood blocking.

(7) A vertical return duct shall have openings to return air on not more than 1 floor.

(8) A public corridor shall comply with paragraph 97(4) and (5).

(9) The return-air system shall be designed so that the negative pressure from the circulating fan cannot affect the furnace combustion air supply nor draw combustion products from joints or openings in the furnace or flue pipe.

(10) Return-air from a dwelling unit shall not be recirculated to any other dwelling unit.

(11) Except for floor levels that are less than 900 mm above or below an adjacent floor level that is provided with a return-air inlet, at least one

return-air inlet shall be provided in each floor level in a dwelling unit.

(12) Provision shall be made for the return of air from all rooms by leaving gaps beneath doors, using louvered doors or installing return duct inlets.

(13) Return-air inlets shall not be installed in an enclosed room or crawl space that provides combustion air to a furnace.

**112. Coverings, linings and insulation.**

(1) Foamed plastic insulation may be used in a ceiling space that acts as a return air plenum, provided the foamed plastic insulation is protected from exposure to the plenum.

(2) Linings of ducts shall be installed so that they will not interfere with the operation of volume or balancing dampers.

**113. Clearances of ducts and plenums.**

(1) Where the plenum clearance is 75 mm or less, the clearance between a supply duct and combustible material shall—

(a) be equal to the required plenum clearance within 450 mm of the plenum; and

(b) be not less than 12 mm at a distance of 450 mm or more from the plenum, except that this clearance may be reduced to zero beyond a bend or offset in the duct sufficiently large to shield the remainder of the duct from direct radiation from the furnace heat exchanger.

(2) Where the plenum clearance is more than 75 mm but not more than 150 mm, the clearance between a supply duct and combustible material shall—

(a) be equal to the required plenum clearance within a horizontal distance of 1 800 mm of the plenum; and

(b) be not less than 12 mm at a horizontal distance of 1 800 mm or more from the plenum, except that this distance may be

reduced to zero beyond a bend or offset in the duct sufficiently large to shield the remainder of the duct from direct radiation from the furnace heat exchanger.

(3) Where the plenum clearance is more than 150 mm, the clearance between a supply duct and combustible material shall—

(a) be equal to the required plenum clearance within a horizontal distance of 1 000 mm of the plenum;

(b) be not less than 150 mm within a horizontal distance between 1 000 mm and 1 800 mm from the plenum; and

(c) be not less than 25 mm at a horizontal distance of 1 800 mm or more from the plenum, except that this distance may be reduced to 8 mm beyond a bend or offset in the duct sufficiently large to shield the remainder of the supply duct from direct radiation from the furnace heat exchanger.

(4) Where a register is installed in a floor directly over a pipeless furnace, a double-walled register box with not less than 100 mm between walls, or a register box with the warm-air passage completely surrounded by the cold-air passage, shall be permitted in lieu of the clearances listed in subparagraphs (1), (2) and (3).

**114. Exhaust ducts and outlets.**

(1) Where an exhaust duct passes through or is adjacent to unheated space, the duct shall be insulated to prevent moisture or condensation in the duct.

(2) Exhaust outlets shall be designed to prevent back draft under wind conditions.

(3) Exhaust ducts directly connected to laundry drying equipment shall be independent of other exhaust ducts.

(4) Exhaust systems shall discharge directly to the outdoors.

**115. Make-up air.**
In ventilating systems that exhaust air to the outdoors, provision shall be made for the admission of a supply of make-up air in sufficient quantity so that the operation of the exhaust system and other exhaust equipment or combustion equipment is not adversely affected.

**116. Supply, return, intake and exhaust air openings.**
(1) Supply, return and exhaust air openings in rooms or spaces shall be protected by grilles having openings of a size that will not allow the passage of a 15 mm diameter sphere.

(2) Outdoor air intakes and exhaust outlets at the building exterior shall be designed or located so that the air entering the building system will not contain more contaminants than the normal exterior air.

(3) Exterior openings for outdoor air intakes and exhaust outlets shall be shielded from the entry of snow and rain and shall be fitted with corrosion-resistant screens of mesh having openings not larger than 15 mm, except where climatic conditions may require larger openings.

(4) Screens required in subparagraph (3) shall be accessible for maintenance.

(5) Combustible grilles, diffusers and other devices for the supply and return air openings installed in walls and ceilings shall have a flame-spread rating of—
(a) not more than 200 in bathrooms; and
(b) not more than 150 in rooms or spaces other than bathrooms.

## Part V — Fire Safety

**117. General requirement.**
(1) A building shall be so designed, constructed and equipped so that in case of fire—
(a) the protection of occupants or users in the building is ensured and that provision is made for the safe evacuation of the occupants or users;

(b) the spread and intensity of fire within the building and the spread of fire to any other building will be minimised;
(c) sufficient stability will be retained to ensure that the building will not endanger any other building;
(d) provided that in the case of any multi-storey building no major failure of the structural system shall occur;
(e) the generation and spread of smoke will be minimised or controlled to the greatest extent reasonably practicable; and
(f) adequate means of access and equipment for detecting, fighting, controlling and extinguishing such fire, is provided.

(2) The requirements of subparagraph (1) shall be deemed to be satisfied where the design, construction and equipment of a building—
(a) is the subject of an acceptable rational design prepared by a qualified person; or
(b) complies with fire safety requirements; provided that where the Building Committee is of the opinion that such compliance would not conform with all the requirements of subparagraph (1), Building Committee shall, in writing notify the owner of the building of its reasons for its opinion and may require the owner to submit for approval a rational design as contemplated in this subparagraph.

(3) An owner of a building who fails to—
(a) conform to the approved designs;
(b) provide sufficient fire extinguishers to satisfy the requirements of subparagraph (1), installs fire extinguishers that do not comply with the relevant ISO 7165 specification, or fails to ensure that the fire extinguishers are installed, maintained and serviced in accordance with ISO 11601:1999; or
(c) maintain any other provision made to satisfy the requirements of this paragraph commits an offence.

(4) A person who—
(a) causes or permits any escape route to be rendered less

effective or to be obstructed in any way which may hinder or prevent the escape of any person from a building in the case of fire or any other emergency; or

(b) occupies a building without a valid certificate of occupancy issued by Building Committee, commits of an offence.

**118. Design of fire installations.**

In any fire installation—

(a) adequate pumping connections and means of measuring water pressure shall be provided;

(b) isolating valves shall be provided to control the flow of water to the installation, and to points within the installation, as the Building Committee may require; and

(c) the quantity, pressure and rate of flow of water shall be adequate for the supply of any hose reel, hydrant or sprinkler system.

**119. Communication pipe.**

A fire installation shall be connected to a communication pipe located at a position and depth determined by the Building Committee.

**120. Isolating valves.**

An isolating valve shall be fitted in any fire installation at a position not more than 1.5m inside the boundary of the site.

**121. Approved fire installations.**

An approved fire installation shall be connected to a communication pipe supplied by the National Water and Sewerage Corporation provided that the Building Committee may permit the fire installation to be connected to—

(a) an approved alternative source of supply, or

(b) any source of non-potable water, where such water is not to be used for domestic purposes.

**122. Fire installations.**

(1) A fire installation shall be so constructed as to provide—

(a) a quantity of water sufficient for the effective operation of that number of hose reels, hydrants and sprinkler heads which may be operated or come into operation simultaneously in any division;

(b) a flow pressure, at any hose reel or hydrant, of not less than 300kN/m2 and a flow rate of not less than—

(i) 0.5 litres per second per hose reel; and

(ii) 20 litres per second per hydrant; and

(c) a flow pressure and flow rate at the control valve of any sprinkler system appropriate to the hazard rating of the system.

(2) In any fire installation—

(a) the nominal diameter of—

(i) a communication pipe serving the installation shall be not less than 75 mm;

(ii) a pipe supplying water to any fire hydrant shall be not less than 75 mm provided that, where the length of the pipe is more than 50 m the nominal diameter of the pipe and of the communication pipe to which the installation is connected shall be not less than 100mm; and

(iii) a service pipe supplying water to a hose reel on any one storey of a building shall be not less than—

(aa) 25 mm, if it serves 1 or 2 hose reels;

(bb) 32 mm, if it. serves 3 hose reels;

(cc) 40 mm, if it serves 4 or 5 hose reels; and

(dd) 50 mm, if it serves more than 5 hose reels;

(b) a pipe which serves any hydrant and hose reel installation or an automatic sprinkler installation, shall be provided with a twin pumping connection;

(c) a pipe serving only hose reels shall be provided with a single pumping connection; and

(d) a pipe fitted with one or more fire-pump connections shall be fitted with a pressure gauge reading up to 2 500 kN/m2 and a reflux valve so located as to shut off automatically the direct supply of water from the local authority system to the installation whenever and for so long as any fire pump connection is in use.

(3) A reflux valve in a fire installation shall not be positioned as to prevent or hinder the flow of water from any fire-pump connection to any hose reel or hydrant connected to the installation.

(4) A fire installation shall be connected—

(a) directly to the communication pipe where the local authority's water supply is capable of providing the 'pressure and rate of flow required for hose reels contemplated in subparagraph (1); or

(b) to a storage tank of adequate capacity where required by the Building Committee.

(5) The storage tank shall be connected, supplied with water and controlled in accordance with the following requirements—

(a) the point of connection between the storage tank and any supply pipe shall be above the level of the outlet of the topmost hose reel;

(b) water shall be supplied in a manner adequate to fill and to maintain it automatically to its required capacity except when any hose reel connected to it is in use, and where the supply of water is controlled by a ball valve, the valve shall have a diameter of not less than 20 mm and shall be fitted with a manually operated shut-off valve;

(c) a reflux valve shall be provided on a pipe at a position between the topmost hose reel and the point of connection of the pipe to the storage tank and arranged as to cut off the flow of water from the tank whenever and for so long as any associated fire-pump connection is in use; and

(d) a manually operated shut-off valve shall be provided on a pipe at a position between a fire-pump connection and any hose reel supplied by the fire- pump connection and so arranged that the flow of water direct to the hose reel may be cut off when the fire-pump connection is not in use.

(6) A fire installation equipped with automatic pump starting mechanisms shall be fitted with an alarm system designed to emit a continuous audible warning whenever and for so long as any pump installed in the installation is set in motion.

(7) A fire installation equipped with manual pump starting mechanisms shall be kept constantly charged with water and shall at all times be under the supervision and control of a person who is fully conversant with all the technical details of the installation and its warning devices.

(8) An alarm system shall be provided with an alarm cancel button.

(9) A pump unit and its starting and driving mechanisms shall be installed in a ventilated compartment constructed to have a fire resistance rating of not less than 120 minutes and where any such compartment is located at or below ground level, the entrance or other means of access shall abut on a street, public place or an open area on the site provided that, where any such compartment is located in any basement, the means of access shall be enclosed by walls having a fire resistance rating of not less than 120 minutes and shall not be used as a means of access to any other part of the building.

*Fire Alarm System*

**123. General design considerations.**

(1) A fire alarm system shall be designed such that-

(a) the earliest possible definite warning of fire is given;

(b) a false fire alarm is avoided, and that the system is capable of indicating the location of the origin of the fire alarm in

order to facilitate the safe evacuation of the premises and to direct the fire fighters; and

(c) the system performs its function with great reliability.

(2) The equipment, wiring and use of a fire alarm system shall be exclusive to that system, and its power supply shall be provided independently from those for any other equipment.

(3) The audible and visual alarm signals shall be used solely for the fire alarm purpose, and the signals shall not rest automatically.

(4) The fire alarm and associated indicating panel shall be sited where they can be under constant observation when the premises are occupied, and shall be accommodated in a room—

(a) in the direct vicinity of the main entrance;

(b) that provides adequate protection against ambient influences which could impair operations including vibration, smoke, dust, gases, vapour, produced by machinery and other plants; and

(c) that has climate suitable for proper operation of the fire alarm control and indicating panel.

(5) The design of a fire alarm circuit shall provide facilities for rapid and reliable transmission of initiated signals when manual call points or detectors are operated, and when specified faults occur, to the control and indicating equipment.

(6) Any resultant signal shall be transmitted by the simplest possible circuitry to sounders and other indicating equipment and to any equipment which is to be operated by the fire alarm system including fire extinguishers, fire protection traps or local plant facilities.

(7) Where chances of malfunction are high in fire alarm system, discriminatory circuitry shall be incorporated in the system so that false alarms are identified.

(8) Except in buildings where fire can be located without delay, the fire alarm system shall include an identification panel designed to show clearly the location of the origin of the alarm.

**124. Manual call points location, construction and requirements.**

(1) A manual call point shall be operated by a spring-loaded switch, which is held in "non- alarm" position and protected from accidental operation by a cover usually of glass and where the glass cover is broken, the glass cover shall release the switch to an "alarm" position and so that the system starts to operate.

(2) Manual call points shall—

(a) be constructed of pressed metal, cast metal or plastic materials that will not be adversely affected by the ambient temperature;

(b) be rigid enough in construction to withstand the abuse to which they are likely to be subjected, without deterioration or reduction in their ability to operate effectively when required to do so;

(c) have contacts that are capable of operating satisfactorily during the design life of the installation;

(d) be coloured "signal red" over at least 50% of their visible area;

(e) have replaceable glass cover or plastic coated glass element; pressing or breaking the cover shall automatically operate the call point, and shall include description of the method of operation by a concise inscription including the word "FIRE" on case, or suitably inscribed plate behind the glass cover; and

(f) incorporate means whereby satisfactory operation may be readily and individually tested including opening the front by means of special keys.

(3) A striker shall be provided adjacent to the call point to facilitate breaking the glass.

(4) The manual call points shall be—

(a) located such that a person does not have to travel more than 30m from any position within the premises in order to activate the fire alarm;

(b) located on the exit routes and, in particular, on the floor landing of staircases and on exits to the street; and

(c) fixed at a height of 1400mm above the floor at easily accessible, well illuminated and conspicuous positions free from obstruction.

(5) Where manual call points are incorporated in an automatic fire alarm system, they shall be included in such a way that the operation of any one of them produces the same effects as though fire had been detected by a fire detector in the same zone.

**125. Selection of fire detectors.**

(1) When selecting the type of detectors, the probable development of fire at the incipient stage, the room height, the ambient conditions and all sources of spurious alarms in the area to be monitored shall be taken into consideration.

(2) Where development of a smoldering fire is anticipated at the incipient stage of fire with intense smoke generation, very little or no flame radiation smoke detectors shall be used.

(3) Where a rapid development of the fire is anticipated at the incipient stage of a fire with intense heat generation, intense flame radiation, and generation of smoke, smoke detectors, heat detectors, flame detectors, or combinations of the various types of fire detectors shall be used.

(4) Where smoke damage is anticipated at the incipient stage of a fire owing to room occupancy and is likely to pose a risk to human life, materials and goods sensitive to smoke, smoke detectors shall be used.

(5) Where a very rapid development of the fire is anticipated with a high degree of probability, an automatic extinguisher system shall be considered.

(6) Where high or suddenly rising temperature owing to natural conditions or conditions resulting from normal operations are likely to occur, fixed-temperature detectors shall be used.

**126. Siting of detectors.**

(1) Building and installation complexes shall be monitored or covered completely and effectively enclosed space shall be considered separately for this purpose in accordance with the limits of spacing for the types of detectors concerned.

(2) Rooms divided into sections by walls, partitions or storage racks reaching 300 mm of the ceiling or where goods might be stacked in defined areas to a corresponding height, shall have detectors for each section or passageway.

(3) Hoists, elevators and similar flue-like openings shall be monitored by detectors at the top.

(4) Staircases shall be monitored by detectors on each floor.

(5) The inter-relationship between the suitability of the various types of fire detectors and room height shall be considered when sitting fire detectors.

(6) Heat sensitive point detectors shall be mounted so that their heat sensitive elements are positioned not less than 25mm and not more than 150 mm below the ceiling or the underside of the roof.

(7) Where a ceiling is crossed by beams, girders or other structural features having a depth of 500mm or more, at least one detector shall be installed in each "pocket" formed between each

feature, and the detectors shall not be less than 500mm from any beam, girder or wall.

(8) Smoke detectors shall be sited at the highest part of the enclosed areas, and shall be mounted such that their sensing area is not less than 25mm or more than 600mm below roof ceiling, except as may be indicated by site tests.

**127. Audible and visual alarms.**

(1) At least two sounders shall be installed inside a building.

(2) In case of an automatic system, an additional sounder outside the building preferably near fire brigades access shall be installed.

(3) Alarm sounders shall satisfy the following requirements—

(a) the type, number and location of the alarm sounders shall be such that the alarm is distinct from the background noise in every part of the premises;

(b) the noise from the alarm sounders shall be quite distinct from any other sounders likely to be heard; and

(c) the alarm sounders of the same kind on a particular installation shall produce a similar sound.

(4) Where a general alarm is undesirable in buildings such as department stores, entertainment places or hospitals, the alarm system shall be restricted to the provision of sounders out of the hearing of the public or patients.

(5) The sounders shall be supplemented by an adequate number of visual signals throughout the premises for staff recognition only or by discrete special alerting facilities.

(6) Silencing switches shall only be installed for transferring an alarm or fault warning to a supervisory sounder, and shall be arranged to put out of service the smallest practicable number of manual call points and detectors.

(7) The operation of a silencing switch shall not cancel the indications of the alarm or fault on any indicator concerned while an alarm or fault condition exists, and shall not prevent the proper receipt of alarms or fault warnings on any circuit other than those with which the silencing switch is associated.

(8) Where it is desired to distinguish between an alert and an evacuate signal, a two-stage alarm shall be used in which the first type of signal indicates an alert and the second type indicates a need to evacuate the locality.

(9) Visual signals shall be used to supplement audible alarms.

(10) The operation of a sounder shall not be prevented by a defect in a visual signal or vice versa.

(11) In situations where a normal type of alarm sounder may be ineffective; where the background noise is excessive or where the occupants are deaf, visual signals such as rotating beacon lamps shall be used in addition to the alarm sounder.

(12) Where public-address equipment is used instead of conventional sounders, it shall be ensured that—

(a) alarm of fire is automatically transmitted over the public address system, taking priority and over-riding every other facility and circuit conditions of the public address system;

(b) other signal such as meal-break, start and stop work, are not broadcast by the public address equipment in a manner which can be confused with a fire alarm signals; and

(c) during alarm conditions, all microphones are automatically disconnected, except one designated a "fire microphone" which is retained in circuit such that it can be used for announcements and instructions relating to the fire;

**128. No smoking signs.**
"No smoking" signs of an approved size shall be prominently displayed in suitable positions in any division, occupancy, room or any other part of a building where flammable substances are dealt with, used or stored and on the outside of any door.

*Fire Suppression*

**129. Provision of fire-fighting equipment.**
(1) Fire-fighting equipment in any building shall be so installed as to be ready at all times for its purpose.

(2) The disposition of such fire-fighting equipment shall be clearly visible or shall be indicated by symbolic signs which shall comply with the requirements set by the Building Committee.

(3) The owner of any building shall keep available for inspection by the Building Committee or Building Control Officer a record of the maintenance of fire-fighting and protection equipment.

**130. Water reticulation for fire-fighting purposes.**
(1) Any rational design of a fire installation shall make provision for water to be supplied in sufficient quantity, pressure and rate of flow.

(2) Where a fire installation is not the subject of a rational design it shall comply with the requirements in this Code.

**131. Hose reels.**
(1) Hose reels for the purposes of fire fighting shall be installed in all buildings of two or more storeys in height or in any single-storey building of more than 250m2 in floor area at a rate of 1 hose reel for every 500m2 or part thereof of floor area of any storey, provided that such hose reels shall not be required in any building classified H4 or in any dwelling unit provided with independent access to ground level.

(2) A hose reel installed in the building shall comply with the requirements contained in ISO 4642-1.

(3) An installed hose reel shall be positioned to ensure that the end of the hose will reach any point in the area to be protected.

(4) Any hose reel installed in any building shall bear, in a prominent position on the reel disc facing the user, the mark of standardization that meets the requirements recognized by the Uganda National Bureau of Standards.

(5) Where a satisfactory water supply and pressure are not available, two fire extinguishers complying with the requirements contained this Code shall be provided in place of each required hose reel.

**132. Hydrants.**

(1) Subject to direction by the Building Committee, hydrants shall be provided in—

(a) any building exceeding 12 m in height; and

(b) any occupancy classified B1, B2, C1, C2, C3, D1, D2, E1, E2, E3, F1, F3, H1, J1, J2, J3 or J4 of any height and of a total floor area exceeding 1 000 m2 as specified in table 1 set out in Schedule 4.

(2) A hydrant required in terms of subparagraph (1) shall be provided at the rate of not less than one per 1 000m2 or part thereof of total floor area and not less than one per storey of such building or occupancy, as the case may be, and shall be distributed in such a manner that the fire hose contemplated in subparagraph (3) will reach every part of the relevant area.

(3) A hydrant shall, where required by the Building Committee, be provided with a length of appropriate fire hose 30m in length together with couplings and a 16 mm internal diameter nozzle.

(4) The hose and nozzle in subparagraph (3), shall when positioned in the open air or in any factory building be suitably housed in a hose cabinet provided that this requirement shall not apply in any occupancy classified J4.

(5) In any permanent amusement park or exhibition ground, shopping centre or group housing, cluster housing, or town house complex there shall be installed ground or raised hydrants so placed that no point in such amusement park or exhibition ground or shopping centre or in any building in such housing complex shall be at a greater distance than 90m from any hydrant.

(6) A hydrant required in terms of this paragraph shall comply with the requirements of the Building Committee.

(7) A hydrant shall not be used for any other purpose other than fire protection without express permission of the National Water and Sewerage Corporation.

(8) Where the gradient of an existing street or property is changed at the request of the property owner, such that an existing public fire hydrant will not be at the proper elevation with respect to the ground, the hydrant will be raised or lowered at the expense of the property owner.

(9) Nothing shall be erected or planted which shall interfere with the use of a fire hydrant and sufficient clearance shall be maintained around the hydrant to permit easy connection of hoses and full circle operation of the hydrant using regular hydrant wrenches and hose spanners.

(10) Shrubs, trees, flowers or weeds shall not be planted nor permitted to grow so as to prevent full view of a fire hydrant from the street.

(11) The hydrant bonnets shall be color coded to show the amount of water that can be discharged out of them as follows—

| Bonnet Colour | Litres per Minute |
|---|---|
| Green | 4,000 or greater |
| Orange | 2,000 - 4,000 |
| Red | less than 2,000 |

**133. Sprinkler systems.**

(1) Subject to any other requirements under this Code, a sprinkler system shall be installed—

(a) in any building exceeding 15m in height except where such building is exclusively of an occupancy classified G1 where the division size is not greater than 500m2, or of an occupancy classified H3;

(b) in any basement storey which exceeds 500m2 in floor area and such storey is not naturally ventilated; and

(c) in any other storey which exceeds 500 m2 in total floor area and such storey is not provided with breakable or openable panels suitable for smoke-ventilation.

(2) A concealed space, not being a roof space, which has a clear height exceeding 800 mm and a total area of compartment of more than 100m2 above any ceiling or a total area of compartment of more than 300m2 below any raised floor shall be equipped with a sprinkler system.

(3) A sprinkler system shall be fitted with a twin coupling for the attachment of a fire-pump provided that—

(a) the coupling shall be painted lime yellow;

(b) the pressure exerted by the pump shall not be more than 1000 Nm-2; and

(c) the pressure limitation shall be clearly marked on such coupling.

**134. Portable fire extinguishers.**

(1) A building containing an occupancy given in Table 2 set out in Schedule 4 shall, for the relevant occupancy and floor area, be provided with portable fire extinguishers, in approved positions.

(2) The Building Committee may specify the type of portable fire extinguisher to be provided and may require that a number of fire extinguishers shall be installed in excess of the number indicated in Table 2 set out in Schedule 4 if in its opinion any particular hazards or risks warrant such increase.

(3) A portable fire extinguisher installed in a building shall comply with the requirements contained in ISO: 11011602:2006 and ISO11602.1999, and shall be installed, maintained and serviced in accordance with Uganda National Bureau of Standards' requirements.

(4) A portable fire extinguisher shall bear the mark of standardization as contemplated in this Code or where it cannot so bear such mark, be clearly marked by the Uganda National Bureau of Standards to indicate that it has been evaluated by and is acceptable to the Uganda National Bureau of Standards.

(5) The type of fire extinguisher shall, for the occupancy in which it is installed, have a capacity or mass rating as follows—

(a) for an occupancy classified A1, A2, A3, A4, A5, E1, E2, E3, F1, F2, F3, G1,H1, H2 or H3—

| | | |
|---|---|---|
| (i) | water type | 9 litres |
| (ii) | foam type | 9 litres |
| (iii) | carbon dioxide type | 4.5kg |
| (iv) | dry chemical type | 9 kg |
| (v) | inergen/aragonite | |
| (vi) | or any other approved fire extinguisher. | |

(b) for an occupancy classified B1, B2 , B3, C1,C2, C3, D1, D2, D3, D4, J1, J2, J3 or J4 —

| | | |
|---|---|---|
| (i) | water type | 9 litres |
| (ii) | foam type | 9 litres |
| (iii) | carbon dioxide type | 4.5 kg |
| (iv) | dry chemical type | 9 kg |
| (v) | inergen/aragonite | |
| (vi) | or any other approved fire extinguisher. | |

**135. Mobile unit fire extinguishers or trolley fire extinguishers.**

(1) A fire extinguisher exceeding the capacities prescribed for a portable fire extinguisher by the Uganda National Bureau of Standards specification and fitted with suitable wheels for transportation shall be deemed to be a mobile fire extinguisher.

(2) A mobile fire extinguisher may replace portable fire extinguishers provided that—

(a) the capacity of any mobile fire extinguisher shall be at least equal to the combined capacity of the number of portable fire extinguishers it replaces;

(b) it contains the same extinguishing medium as required for such portable extinguishers;

(c) it replaces such portable extinguishers only on the floor and within the division concerned;

(d) the floor area to be served by it does not exceed 500% of that given in Table 2 set out in Schedule 4 or 1 000 m2 on a single level, whichever is the lesser;

(e) the extinguishing medium complies with the appropriate requirements of the Uganda National Bureau of Standards; and

(f) the mobile fire extinguisher is kept in a readily accessible position.

**136. Fire stopping of inaccessible concealed spaces.**

Where in any building, there is an inaccessible concealed space with a maximum dimension of more than 5m, the space shall—

(a) be fire stopped whether it contains combustible material or not;

(b) where it is within any non-combustible building element, be fire stopped not less than every 5m measured horizontally or vertically provided that this requirement shall not apply to the cavity of any masonry cavity wall; and

(c) where it is within any combustible building element, be fire stopped not less than every 3 m measured in both directions.

**137. Protection in service shafts.**

(1) The walls of any internal service shaft shall have a fire resistance of not less than the requirements for structural stability given in Table 3 set out in Schedule 4, subject to a maximum requirement of 120 minutes.

(2) Where any vertical service shaft is provided in any building and the shaft does not contain any combustible material, it shall be fire stopped at the level of every fifth storey above the bottom of the shaft.

(3) Where the shaft is so provided and it contains any combustible material it shall be fire stopped at the level of every storey above the bottom of the shaft.

(4) Where any vertical service shaft is used for ventilation or contains non-combustible plumbing or drainage services or is a non-combustible rubbish chute, no fire stop shall be required within the shaft.

(5) Where any horizontal service shaft passes through any separating element and the element is required to have a fire resistance, the shaft shall be fire stopped where it passes through the element.

(6) Where any service penetrates a separating element such separating element shall be completely sealed around such service.

**138. Services in structural or separating elements.**

(1) A service pipe, conduit, duct, sleeve, cable or other equipment recessed into any structural or separating element which is required to have a fire resistance shall be set into the element in a manner that the fire resistance is not reduced to below the required fire resistance.

(2) A service that penetrates through any wall or floor where the wall or floor is required to have a fire resistance shall be sealed in a manner that the fire shall not penetrate the wall or floor.

**139. Smoke control.**

(1) Notwithstanding any other requirements in this Code, a room with a floor area of more than 500 m2 shall be provided with—

(a) a system of mechanical smoke ventilation; or

(b) roof ventilators, openable windows or panels to permit smoke ventilation and the roof ventilators, openable windows or panels shall—

(i) have an aggregate area of not less than 3% of the floor area of the room or, in the case of any single storey building where the room has an occupancy classified D2 or D3, not less than 1.5% of the floor area of the room;

(ii) be located in the roof or in the upper third of the walls, as the case may be, and be distributed in such a way that smoke will be evenly extracted from all parts of the room; and

(iii) be designed to open automatically when activated by heat or smoke detectors or, where not so designed, shall be capable of being manually operated, without the use of special tools, from the floor of the room.

(2) Provided that where the room is so situated that neither a roof space or an external wall of the building form part of the room, the room shall be equipped with a system of mechanical smoke ventilation.

(3) Where openable panels are provided on any building elevation for the purpose of smoke ventilation, the position of the panels shall be suitably marked on the outside of the building to permit easy identification by the fire services.

**140. Evacuation procedures.**

(1) An owner or occupier of a building shall have an emergency evacuation coordination procedure posted along all floor exits to be used in the event of fire or other hazardous materials emergency.

(2) An owner or occupier of a building shall have an emergency evacuation diagram displayed in a form that would be easily understood by a person who would be likely to be reading the diagram, if the person were reading the diagram in the event of a fire or other hazardous materials emergency.

(3) An owner or occupier of a building shall have evacuation signs and evacuation diagrams for a building appropriately located on each evacuation route of the building having regard to the number and location of exits in the building and the evacuation sign and diagram must be—

(a) displayed in a conspicuous position; and

(b) securely attached to a wall or the internal side of a door.

(4) An owner or occupier of a building shall have arrangements for the evacuation of persons with special needs from a building in the event of a fire or other hazardous materials emergency.

**141. Fire and evacuation plans.**

(1) An owner or occupier of a building shall ensure the fire and evacuation plan for the building is kept in written form and includes—

(a) the evacuation diagram of the building; and

(b) if an evacuation diagram has been made for a part of the building, the evacuation diagram of that part of the building.

(2) The fire and evacuation plan shall take into account the evacuation coordination procedures stated in the fire and evacuation plans for all parts of the building occupied by secondary occupiers.

(3) An owner or occupier of a building shall keep a relevant approval document for the building, or a copy of the document, with the building's fire and evacuation plan.

(4) An owner or occupier of a building shall—

(a) ensure the fire and evacuation plan for the building is made available for inspection in the building during its normal business hours; and

(b) allow a person to inspect the fire and evacuation plan free of charge.

(5) An owner or occupier of a building shall carry out a review of the fire and evacuation plan for the building at intervals of not more than one year.

**142. Fire and evacuation instructions in buildings used for temporary events.**

(1) Before any person starts to work in the building, the owner or occupier shall give the person general evacuation instructions and first-response evacuation instructions for the building.

(2) Before the building is used for conducting the event, the occupier shall give the evacuation coordination instructions for the building to—

(a) the evacuation coordinator for the building; and

(b) the persons responsible for carrying out the evacuation coordination procedures under the fire and evacuation plan for the building.

**143. Fire and evacuation instructions for high occupancy buildings.**

(1) The owner or occupier of a high occupancy building shall appoint a person who holds a current building fire safety qualification as the fire safety adviser for the building.

(2) The owner or occupier of a high occupancy building shall give general evacuation instructions for the building to a person who starts working in the building, as soon as practicable but no later than 2 days after the person starts working in the building.

(3) The owner or occupier shall give first-response evacuation instructions for the building to a person who starts working in the building, as soon as practicable but no later than one month after the person starts working in the building.

**144. Maintenance of fire safety installations.**

(1) An owner or occupier of a building shall ensure that maintenance of each fire safety installation for the building is carried out by an appropriately qualified person.

(2) The owner of a building shall ensure each fire safety installation for the building is inspected and tested at least once a year.

(3) Any person who is carrying out, or has carried out, maintenance of a fire safety installation for a building and becomes aware, or ought reasonably to be aware, of a critical defect in the installation shall give the occupier of the building a notice about the defect in the approved form within 24 hours after the person carries out the maintenance of the installation.

(4) If the record of maintenance for a fire safety installation for a building shows that repair or other corrective action is required for the installation, the owner or occupier of the building shall ensure the repair is carried out or the corrective action is taken no later than one month after the maintenance of the installation was carried out, unless the occupier has a reasonable excuse.

## Part VI— Lifts

**145. Provision of lifts.**

Every building of 15 m or more above the ground level shall be provided with one or more passenger lifts.

**146. Installation and operation of lifts.**

(1) The selection and installation of passenger lifts, service or goods lifts shall be in accordance with ISO 4190 parts 1 to 6.

(2) A person shall not without the permission of the Building Committee install or operate any other means of vertical transportation of passengers or goods not referred to in subparagraph (1).

**147. Liftwell enclosure.**

Each well shall be totally enclosed by imperforate walls, floor and ceiling.

**148. Liftwell inspection and emergency doors and inspection traps.**

(1) Inspection and emergency doors, and inspection traps to a well, shall not be permitted except on grounds of safety to users or the requirements of servicing.

(2) Inspection doors shall have a minimum height of 1.4m and a minimum width of 600 mm.

(3) Emergency doors shall have a minimum height of 1.8m and a minimum width of 500 mm and in addition the emergency doors shall—

(a) be located in a position readily accessible to rescuers; and

(b) bear on its outside face a notice in English in letters and characters not less than 25mm high as follows—

**"DANGER UNAUTHORISED ACCESS PROHIBITED**
**LIFTWELL RESCUE DOOR**
**CLOSE AND LOCK THIS DOOR"**

(4) Inspection traps shall have a maximum height of 500mm and a maximum width of 500mm.

(5) When the distance between consecutive landing door sills exceeds 11m, intermediate emergency doors shall be provided, such that the distance between sills is not more than 11 m.

(6) Inspection and emergency doors and inspection traps shall be imperforate and shall not open towards the interior of the well.

(7) Inspection doors, emergency doors and inspection traps shall be provided with a key-operated lock, capable of being reclosed and relocked without a key.

(8) Inspection and emergency doors shall be capable of being opened from inside the well without a key even when locked.

**149. Ventilation of a liftwell.**

(1) A well shall be suitably ventilated and it shall not be used to provide ventilation of rooms other than those for the service of lifts.

(2) Openings shall be made at the top of a well, with a minimum area of 1 % of the area of the horizontal cross section of the well, ventilating to the open air either directly or via ducting or the machine or pulley room, provided that in no case the ventilation openings shall be less than 0.15 m2 net free area.

**150. Walls, floor and ceiling of a liftwell.**

(1) The structure of a well shall be able to support at least the loads which may be applied by the machine, by the guides at the moment of safety gear operation, or in the case of off-centering of the load in a car, by the action of buffers, or those which may be applied by an anti-rebound device.

(2) In the case of hydraulic lifts the structure of a well shall be able to support at least the loads which may be applied—

(a) by the machine, the jacks and guides;

(b) by the buffers, any safety gear, clamping device or other devices, at the moment of application;

(c) to off-centering of loads in the car.

(3) The walls, floor and ceiling of a well shall be, constructed of non-combustible and durable materials which do not assist the creation of dust and shall have sufficient structural strength.

(4) The inner surface of all walls shall form a continuous vertical surface composed of smooth and hard elements unless, such surface is inaccessible from the top of a car or from the top of the car via its adjacent installation such as a counterweight and structural supports.

**151. Lift pit.**

(1) The lower part of a well shall consist of a pit impervious to infiltration of water, the bottom of which shall be smooth and approximately level, except for any bases for buffers, guides and jacks and for water drainage devices.

(2) An access door shall be provided to the pit if the pit depth exceeds 1.6m and if the layout of the building so permits.

(3) Where an access door is provided it shall—

(a) have a minimum height of 1.4 m and a minimum width of 600 mm;

(b) bear on its outside face a notice in English in letters and characters not less than 25mm high as follows—

**"DANGER UNAUTHORIZED ACCESS PROHIBITED**
**LIFTWELL**
**CLOSE AND LOCK THIS DOOR"**

(4) If there is no other access a permanent means of access with suitable hand holds at an appropriate height above the sill shall be provided inside the well, easily accessible from the landing door, to permit maintenance personnel to descend safely to the floor of the pit and such means of access shall not project into the clear running space of any lift equipment.

**152. Exclusive use of a liftwell.**

A well shall be exclusively for a lift and shall not contain cables or any other devices other than for the lift nor shall it be fitted with fire sprinklers.

**153. Outside of a liftwell.**

(1) Every landing entrance shall incorporate a sill of sufficient strength to withstand the passage of loads being introduced into a car.

(2) A slight counter slope shall be provided in front of each landing sill to avoid water from washing, sprinkling, draining or entering into a well.

(3) On the outside of a well at each landing level, as near as practical to the landing door or, where there are two or more adjoining lifts, the landing door of one in every two lifts, there shall be displayed a notice in English in letters and characters not less than 15mm high as follows—

**"WHEN THERE IS A FIRE DO NOT USE THE LIFT"**

**154. Machine and pulley rooms.**

(1) The machine and its associated equipment shall be in a special room, comprising solid walls, ceiling and door or trap.

(2) Machine or pulley rooms shall be used only for accommodating the equipment necessary for the operation of a lift with the exception of—

(a) machines for service lifts and escalators;
(b) equipment for air-conditioning or ventilating the rooms; and
(c) fire service installations and equipment as may be required by the officer responsible for fire prevention and rescue services for the rooms except for fire sprinklers.

(3) Machine rooms shall be placed above a well.

**155. Machine and pulley room access.**

(1) Access to machine and pulley rooms shall be from common areas without necessitating entry into private premises.

(2) The access ways to the machine rooms and the entrances shall be at least 2 m high provided that door sills and edges with a height not exceeding 400 mm are permitted.

(3) Access for persons to machine or pulley rooms shall be effected entirely by way of stairs if the difference in levels so requires but where it is impractical to install stairs, then ladders may be used provided that the following conditions are satisfied—

(a) the ladder shall be permanently fixed;

(b) if greater than 2m in height the ladder shall be fitted with safety hoops or other suitable fall arrest system; and

(c) adjacent to the top end of the ladder, there shall be a platform with railings and one or more hand holds within easy reach.

(4) Access shall be provided for hoisting of heavy equipment during erection and, if need be, its replacement, so that this can be done safely, especially avoiding handling on stairs.

**156. Dimensions of machine and pulley rooms.**

(1) The dimensions of machine rooms shall be sufficient to permit easy and safe access for maintenance personnel to all components, especially the electrical equipment in the machine rooms.

(2) In no case shall the clear height of machine rooms for movement or working be less than 2.1 m; this full height for movement or working shall be taken to the underside of the

structural roof beams and measured from the floor of the access area or the floor of the working area.

(3) The height under the roof of pulley rooms shall be at least 1.5m.

(4) When the machine room floor comprises a number of levels, differing by more than 500 mm, stairways or steps and guard rails shall be provided.

(5) When the floor of the machine room has any recesses more than 500 mm deep and less than 500 mm wide, or any channels, they shall be covered with steel chequer plate of 4 mm thick or other equivalent materials having adequate strength to support the weight of maintenance personnel.

**157. Doors and trap doors to machine and pulley rooms.**

(1) Access doors shall have a minimum width of 600 mm and a minimum height of 1.8 m for machine rooms, and 1.4 m for pulley rooms and shall not open towards the inside of the room.

(2) Access trap doors for persons shall give a clear passage of at least 800 mm x 800 mm, and shall be counter-balanced, all trap doors, when they are closed, shall be able to support two persons, that is able to resist a vertical force of 2 kN at any position, without permanent deformation.

(3) Trap doors shall not open downwards and where hinges are used, they shall be of a type which cannot be unhooked.

(4) Doors or trap doors shall—

(a) be fitted with locks having keys which can be opened without a key from inside the room; and

(b) bear on the outside face a notice in English in letters and characters not less than 25 mm high as follows—

**"DANGER**
**UNAUTHORIZED ACCESS PROHIBITED**
**MACHINE ROOM**
**CLOSE AND LOCK THIS DOOR"**

(5) Trap doors used only for access of material shall be locked from the inside only.

**158. Machine rooms and enclosures.**

(1) The machine and its ancillary equipment shall be accommodated in an enclosure within a lift well, or in a separate machine room.

(2) For service lifts of a rated load of 150 Kg and above, the machinery space floor area shall not be less than 1.5 m x 1.5 m and the clear heights shall not be less than 1.2 m; for service lifts of a rated load below 150 Kg, the machinery space depth shall not exceed 600 mm and the clear height shall not be less than 800 mm.

(3) The machine room shall be soundly constructed, weather-proof and dry and shall be safe for access by maintenance personnel to all equipment.

(4) For service lifts of a rated load of 150 Kg and above, the floor of the machinery space shall be of adequate strength at every point to withstand the load of maintenance personnel and equipment.

(5) For service lifts of a rated load below 150 Kg—

(a) the maintenance personnel, shall be able to reach every part of the equipment inside the machinery space with his hands while standing outside the space; and

(b) rigid partition or wire mesh shall be provided to prevent any object from falling down into the lift well from the machinery space.

(6) The machine room shall be accessible for maintenance and inspection purposes.

(7) An access door to a machine room shall—

(a) for service lifts of a rated load below 150 kg, be not less than 800 mm in height and have a width of 900 mm or the full width of the machinery space, whichever is less;

(b) for service lifts of a rated load of 150kg and above, be not less than 1.0m in height and have a width of not less than 1.2 m;

(c) be facing the machine and its ancillary equipment to allow installation and maintenance work;

(d) be lockable; and

(e) bear on its outside face a notice in English in letters and characters not less than 25 mm high as follows—

**"DANGER, UNAUTHORIZED ACCESS PROHIBITED MACHINE ROOM CLOSE AND LOCK THIS DOOR"**

(8) The machine room shall not be used for purposes other than for the lift and shall not contain ducts, cables or devices other than those for the lift.

**159. Machine rooms and driving and return stations.**

(1) Where separate machine rooms, or separate driving and return stations are provided, the machines and associated equipment shall be in a special room, comprising solid walls, ceilings and door or traps.

(2) Separate machine rooms and separate driving and return stations shall be used for accommodating the equipment necessary for the operation of the elevators and escalators respectively; provision of the following is, however, permitted—

(a) machines for lifts or service lifts;

(b) equipment for air-conditioning or ventilating the rooms; and

(c) fire service installations and equipment as may be required by the officer responsible for fire prevention and rescue services for the rooms.

(3) Fire sprinklers shall not be fitted in the rooms.

(4) Separate machine rooms and separate driving and return stations shall be of sufficient size to permit easy and safe access for maintenance personnel to all the components, especially the electrical equipment and in all cases, the clear height of the rooms and stations shall be more than 2.1 m.

(5) Access for persons to separate machine rooms and separate driving and return stations shall be effected entirely by way of stairs if the difference in levels so requires but where it is impractical to install stairs, then ladders may be used provided that the following conditions are satisfied—

(a) the ladder shall be permanently fixed;
(b) if greater than 2 m. in height, the ladder shall be fitted with safety hoops or other suitable for arrest system; and
(c) adjacent to the top end of the ladder, there shall be a platform with railings and one or more hand holds within easy reach.

(6) Access doors or inspection traps to separate machine rooms or separate driving and return stations shall bear on their outside face a notice in English in letters and character not less than 25 mm as follows—

**"DANGER**
**UNAUTHORIZED ACCESS PROHIBITED MACHINE ROOM**
**CLOSE AND LOCK THIS DOOR"**

**160. Steps and landings.**

(1) An unrestricted area shall be provided at each landing of an escalator to accommodate passengers.

(2) The unrestricted area shall have—

(a) width of not less than the distance between the handrail centerlines of the escalator; and

(b) a depth, measured from the end of the balustrade, of not less than 2.5 m, or not less than 2 m if the width of the unrestricted area is increased to at least double the distance between the handrail centre lines.

(3) A clear height of not less than 2.3 m shall be provided above—

(a) the steps of an escalator at all points; and

(b) any unrestricted area provided in accordance with subparagraph (1).

**161. Obstructions.**

(1) Where any part of a building obstructs or may obstruct passengers riding on escalators, for example, at floor intersections or on criss-cross escalators, protection against injury to persons such as imperforate triangular guards shall be provided in accordance with this Code.

(2) The horizontal distance between the outer edge of a handrail of an escalator and any wall or any part of a building likely to cause an obstruction shall under no circumstances be less than 80 mm.

**162. Firefighting lifts.**

(1) In any building exceeding 18 m in height, there shall be provided at least one firefighting lift to serve all stories including the basement.

(2) A firefighting lift shall be in a separate shaft and have on each storey, a lobby separated from any other lobby or space by walls and doors which shall have a fire resistance of not less than 120 minutes.

(3) A firefighting lift shall—

(a) have internal dimensions of not less than 1.1 m wide by

2.1 m deep and have a clear door width of not less than 800mm;

(b) be clearly identified as a firefighting lift on every storey;

(c) be capable of being stopped at any storey and have access to all storeys;

(d) be kept available for use at all times;

(e) be subject to independent control during an emergency;

(f) continue to be workable during an emergency when all other lifts have been brought to the main entrance storey;

(g) be provided with a source of emergency power which will enable the lift to operate together with its lights and extract fan for not less than 120 minutes in the event of failure of the mains supply; and

(h) be provided with means of oral communication to a control point or to a control room where the a room is provided.

**163. Stretcher lifts.**

(1) In any building exceeding six storeys in height and where one or more lifts are installed at least one lift shall have dimensions 1.1m wide by 2.1m deep and the entrance to the lift shall be not less than 800 mm in width.

(2) Where the building exceeds 30 m in height the power supply to the motor operating the stretcher lift shall be protected against the effect of fire for at least 120 minutes.

**164. Lift shafts.**

(1) In a building of 15m or more in height, a lift or bank of lifts shall be provided with a lift lobby at every level of discharge which shall be free of combustible material, be divided from the remainder of the floor area by means of walls having a fire resistance of not less than 30 minutes and any door in the walls be of an automatic or self-closing type, with edges fitted with flexible seals to prevent the passage of smoke and air.

(2) Access doors shall not be within a lift lobby.

(3) A lift shaft shall have a fire resistance of not less than the requirements for structural stability given in Table 3 set out in Schedule 4, subject to a maximum requirement of 120 minutes, and shall be so designed that not more than four lifts are accommodated in any one subdivision of the shaft.

(4) In any storey of a building, where a lift in a bank of lifts discharges into a division different from that into which the other lifts discharge, the lift shall be accommodated in a separate shaft.

**165. Fire safety of lifts.**

(1) A decorative finish or floor covering of lifts shall not have a fire index of more than 2 when tested in accordance with ISO: 4190: 1-6.

(2) The controls of any lift shall be designed such that in the event of fire, the lift shall be brought automatically to the main entrance storey without stopping and shall remain there with its doors open.

(3) The requirements of subparagraph (2) shall not apply to any building with classification of occupancy H3 or H4.

**166. Enclosure and position of lifts and motor rooms.**

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

(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 m2 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 material 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 may be within the staircase enclosure if protected by solid fire-resisting enclosures and solid timber type doors or steel shielded gates. If the motor room is situate at the head of the shaft, the enclosure to the lift, may consist of metal grilles with collapsible lattice gates at openings.

**167. Certificate of efficiency.**

(1) An electric passenger lift shall be maintained and inspected at least once every six months by a competent lift engineer, and a certificate by such engineer to the effect that the whole installation is in safe working order, shall be submitted to the Building Committee by the owner of the premises at least once in every twelve months.

(2) A certificate issued under subparagraph (2) relating to any lift or hoist other than an electric passenger lift shall be submitted to the Building Committee whenever required.

SCHEDULE I
WATER REQUIREMENTS

*Paragraph 8(4)*

**TABLE 1: WHO GUIDELINES FOR DRINKING WATER QUALITY**

| **Parameter** | **Unit** | **Guideline Value** |
|---|---|---|
| Microbiological quality | | |
| Feacal coliforms | number/100ml | Zero* |
| Coliform organisms | number/100ml | Zero* |
| Inorganic constituents | | |
| Arsenic | mg/l | 0.05 |
| Cadmium | mg/l | 0.005 |
| Chromium | mg/l | 0.05 |
| Cyanide | mg/l | 0.1 |
| Fluoride | mg/l | 1.5 |
| Lead | mg/l | 0.05 |
| Mercury | mg/l | 0.001 |
| Nitrate | mg/l(N) | 10 |
| Selenium | mg/l | 0.01 |
| Aesthetic quality | | |
| Aluminium | mg/l | 0.2 |
| Chloride | mg/1 | 250 |
| Colour | True colour unit (TCU) | 15 |
| Copper | mg/l | 1.0 |
| Hardness | mg/l(as $CaCo_3$) | 500 |
| Iron | mg/l | 0.8 |
| Manganese | mg/l | 0.3 |
| PH | | 6.5 to 8.5 |
| Sodium | mg/l | 200 |
| Total dissolved solids | mg/l | 1000 |
| Sulphate | mg/l | 400 |
| Taste and odour | | Inoffensive to most consumers |
| Turbidity | NTU | 5 |
| Zinc | mg/l | 5.0 |

* Treated water entering the distribution system

**FIGURE 1**

*Paragraph 9(10)(c)*

**BACKFLOW CAUSED BY PUMP INSTALLATION**

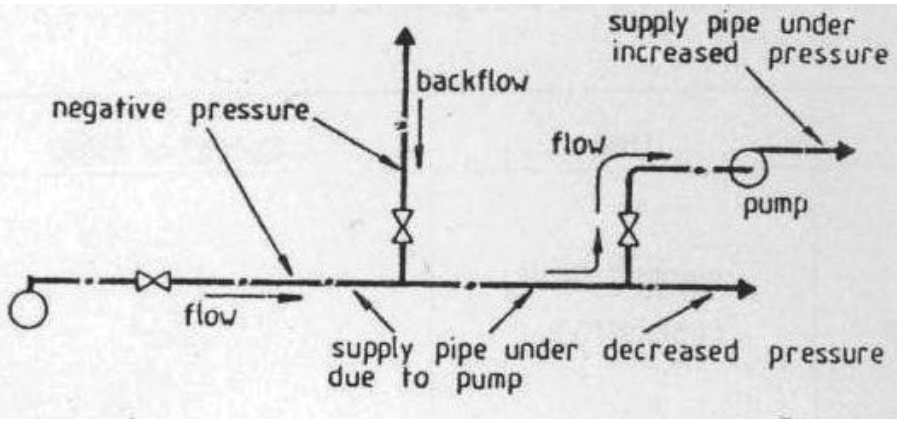



**TABLE 2**

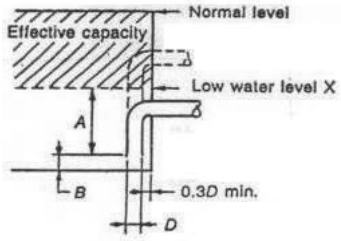
**MINIMUM AIR GAP [MM]**

*Paragraphs 9(16),(18)(b) 19(a)*

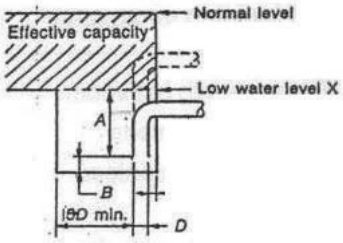
| **Diameter of the effective opening of water service** | **Minimum air gap** |
|---|---|
| < 9 | 20 |
| > 9 < 12 | 25 |
| > 12 < 20 | 40 |
| >20 < 25 | 50 |
| >25 | 2 x effective opening |

**FIGURE 2**
**VERTICAL CROSS-SECTIONS SHOWING EFFECTIVE CAPACITY OF STORAGE**

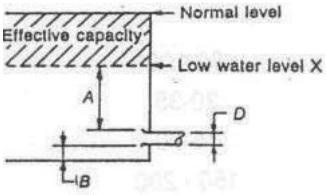
*Paragraphs 10(28),(29),(30),(31)*



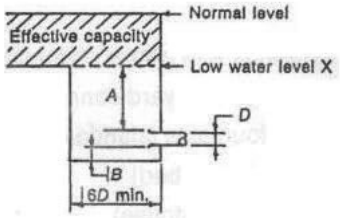

(a) Storage with vertical suction pipe



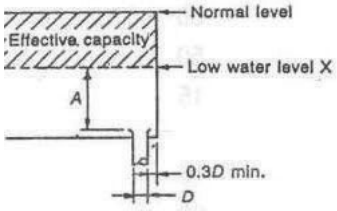

(d) Sump with vertical suction pipe



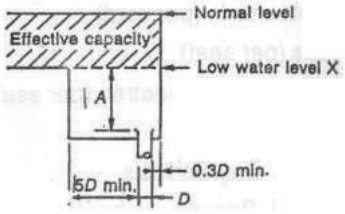

(b) Storage with side suction pipe




(e) Sump with side suction pipe




(c) Storage with bottom suction pipe




(f) Sump with bottom suction pipe

millimetres

| Nominal diameter of suction pipe | Dimension A | Dimension B |
|---|---|---|
| 65 | 250 | 80 |
| 80 | 310 | 80 |
| 100 | 370 | 100 |
| 150 | 500 | 100 |
| 200 | 620 | 150 |
| 250 | 750 | 150 |

**TABLE 3: RECOMMENDED MINIMUM STORAGE OF WATER FOR DOMESTIC USES**

*Paragraph 10(10)*

| **Type of building occupancy** | **Consumption per Head per day(l)** |
|---|---|
| (a) Factories with bathroom | |
| (i) with canteen | 45 |
| (ii) without canteen | 40 |
| (b) Factories without bathroom | |
| (i) with canteen | 25 |
| (ii) without canteen | 20 |
| (c) Dwellings with house connections | 60-100 |
| (d) Dwellings with yard connection | 30-35 |
| (e) Public fountains (standard pipes) | 15-20 |
| (f) Hospitals (per bed) | 150 - 200 |
| (g) Hostels (dormitories) | 60 |
| (h) Hotels (per bed) | 100 - 150 |
| (i) Offices | 25 |
| (j) Restaurants (per seat) | 60 |
| (k) Bars (per seat) | 50 |
| (l) Cinemas and theatres (per seat) | 15 |
| Schools: | |
| (i) Day Schools | 15 |
| (ii) Boarding schools | 60 |

**NOTES:**

(1) For occupancies other than those listed in the table above, water consumption values may be taken from similar occupancies described in the table.

(2) For occupancies other than in (1) above, water consumption values satisfactory to the Authority may be taken.

**TABLE 4: ISOLATING VALVES FOR WATER SERVICES**

*Paragraph 11(14)*

| Location | Type of Valve |
|---|---|
| (a) General | |
| (i) At the water main tapping | stop valve |
| (ii) At the meter | stop valve |
| (iii) At each flushing cistern | service valve |
| (iv) At each appliance | service valve |
| (v) At each pressure limiting valve | stop valve |
| (vi) At each pumping apparatus | stop valve |
| (vii) At each storage tank(inlet) | stop valve |
| (viii) At each storage tank outlet | stop valve |
| (b) Multiple buildings/multi-storey | |
| (i) At each branch serving individual building | stop valve |
| (ii) At each branch serving each floor in building of 2 or more storeys | stop valve |
| (iii) At each group of fixtures | stop valve |

**TABLE 5 : MAXIMUM LENGTHS OF UNINSULATED DISTRIBUTING PIPES**

*Paragraph 12(12)*

| Outside diameter of distributing pipe (mm) | Maximum Length (m) |
|---|---|
| Not exceeding 12 | 20 |
| Exceeding 12 but not exceeding 22 | 12 |
| Exceeding 22 but not exceeding 28 | 8 |
| Over 28 | 3 |

**TABLE 6: RECOMMENDED MINIMUM STORAGE OF HOT WATER FOR DOMESTIC USES**

*Paragraph 12(18)*

| Type of Building Occupancy | Consumption per head per day (L) |
|---|---|
| (a) Factories with bathroom | 4.5 |
| (i) with canteen | 4.0 |
| (ii) without canteen | |
| (b) Factories without bathroom | |
| (i) with canteen | 2.5 |
| (ii) without canteen | 2.0 |
| (c) Hospitals (per bed) | * |
| (d) Hostels (dormitories) | 20 |
| (e) Hotels (per bed) | 35 |
| (f) Restaurants (per seat) | 10 |
| (g) Boarding Schools | 15 |

* Hot water consumption values conforming to local conditions may be taken from good engineering practices in agreement with the Authority.

**TABLE 7: MINIMUM PIPE SIZE OF FIXTURES**

*Paragraph 18(24)*

| Fixture | Minimum pipe size: nominal internal diameter (mm) |
|---|---|
| Bath tub | 12 |
| Bidet | 12 |
| Combination sink and tray | 12 |
| Drinking fountain | 12 |
| Dishwater, domestic | 12 |
| Kitchen sink, domestic | 12 |
| Kitchen sink, commercial | 20 |

| Fixture | Minimum pipe size: nominal internal diameter (mm) |
|---|---|
| Lavatory | 12 |
| Laundry tray 1, 2 or 3 compartments | 12 |
| Shower, single head | 12 |
| Sink, service, slop | 12 |
| Sink, service, slop | 12 |
| Sink, flushing, slop | 20 |
| Urinal, flush tank | 12 |
| Urinal, direct flush valve | 20 |
| Water closet, flush valve type | 25 |
| Water closet, tank type, hose bib | 12 |
| Wall hydrant | 12 |

**TABLE 8: FLOW RATES AND LOADING UNITS**

*Paragraph 18(2)*

| Appliance | Flow Rate l/s | Loading Units Z |
|---|---|---|
| (a) WC cistern/bidet/wash basin | 0.125 | 0.25 |
| (b) Flush valve (urinal) | 0.125 | 0.50 |
| (c) Sink | 0. 25 | 1.00 |
| (d) Shower | 0. 25 | 1.00 |
| (e) Bath | 0. 35 | 1.96 |
| (f) Flush valve(WC) | 0. 52 | 4.32 |
| (g) Laundry tub | 0. 25 | 1.00 |
| (h) Washing machines (dish washer) | 0. 25 | 1.00 |
| (i) Hose tap (20 nom-size) | 0. 30 | 1.44 |
| (j) Hose tap (15 nom-size) | 0. 20 | 0.64 |
| (k) Cistern for urinal | 0.004 | * |
| (l) Spray tap(Drinking fountain) | 0. 04 | * |

Loading unit value can be calculated from Equation (1).

## TABLE 9: MAXIMUM WATER VELOCITIES IN PIPE WORK

*Paragraph 18(2)*

| **Water temperature (oC)** | **Maximum water velocity (m/s)** |
|---|---|
| 10 | 3.0 |
| 50 | 3.0 |
| 70 | 2.5 |
| 90 | 2.0 |

NOTE: These maxima do not apply to small bore connections of limited length supplied as parts of taps, etc.

**TABLE 10: SPACING OF BRACKETS AND CLIPS**

*Paragraph 20(8)*

| | **Maximum Spacing of Brackets and clips, in Metres** | | | | | |
|---|---|---|---|---|---|---|
| **Nominal Pipe size** | **Steel pipes** | | **Copper Pipes** | | **Unplasticized PVC, and polyethylene pipes** | |
| | **Horizontal or graded pipes** | **Vertical pipes** | **Horizontal or graded pipes** | **Vertical pipes** | **Horizontal or graded pipes** | **Vertical Pipes** |
| DN15 | 2.0 | 2.4 | 1.80 | 1.50 | 0.60 | 1.20 |
| DN20 | 2.4 | 3.0 | 2.40 | 1.80 | 0.70 | 1.40 |
| DN25 | 2.4 | 3.0 | 2.40 | 2.00 | 0.75 | 1.50 |
| DN32 | 2.7 | 3.0 | 3.00 | 2.50 | 0.85 | 1.70 |
| DN40 | 3.0 | 3.6 | 3.00 | 2.50 | 0.90 | 1.80 |
| DN50 | 3.0 | 3.6 | 3.00 | 3.00 | 1.05 | 2.10 |
| DN65 | 3.0 | 3.6 | 3.00 | 3.00 | 1.20 | 2.40 |
| DN80 | 4.0 | 4.5 | 4.00 | 4.00 | 1.35 | 2.70 |
| DN100 | 4.0 | 4.5 | 4.00 | 4.00 | 1.50 | 3.00 |
| DN125 | 4.5 | 5.0 | 4.00 | 4.00 | 1.70 | 3.40 |
| DN150 | 4.5 | 5.5 | 4.00 | 4.00 | 2.00 | 4.00 |

NOTE: Due to water pressure effects, additional brackets, clips or hangers may be required to prevent movements.

## TABLE 11: MINIMUM COVER FOR PIPES

*Paragraph 20(22)*

| **Location** | **Minimum cover measured below ground surface level (mm)** |
|---|---|
| Subject to vehicular traffic | 450 |
| All other locations | 225 |

Note: For pipes to be buried in heavy truck areas special consideration should be taken to protect them from damage.

## FIGURE 3: LAYING OF WATER SUPPLY PIPE WORK IN SAME TRENCH AS FOUL DRAINS

*Paragraph 20(27)*

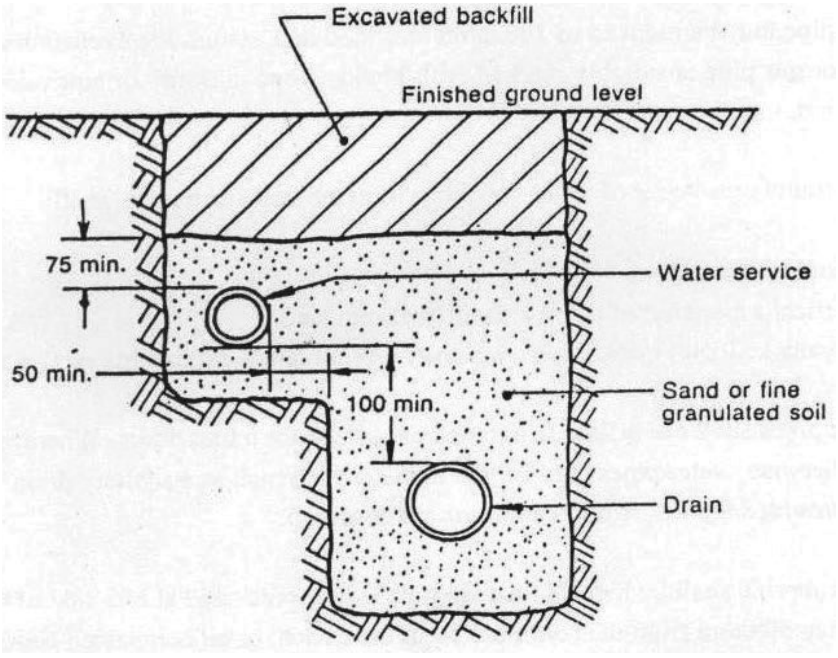
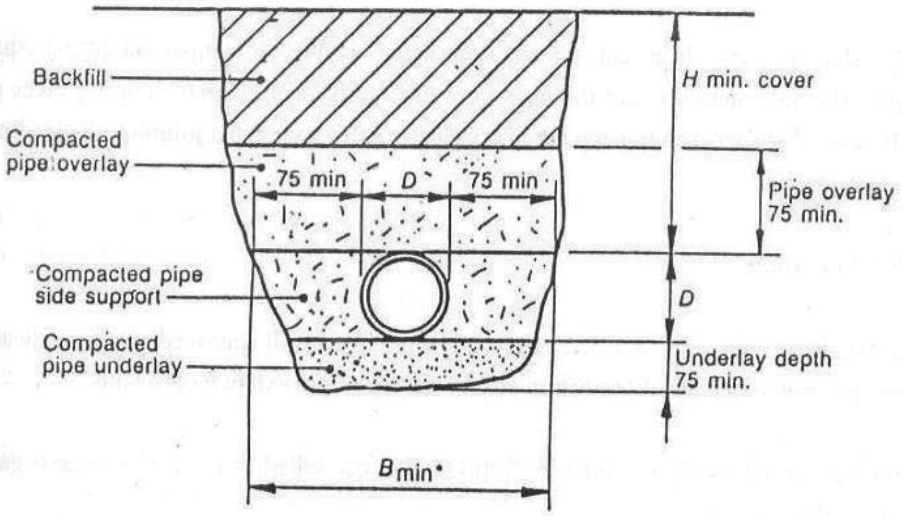


**FIGURE 4: TYPICAL INSTALLATION IN A TRENCH**

*Paragraph 20(31)*




* $B_{min} = D + 150$ mm

DIMENSIONS IN MILLIMETRES

SCHEDULE 2
WATER CLOSETS

**TABLE 1 - REQUIRED NUMBER OF WATERCLOSETS.**

*Paragraph 24(1)(a)*

| **No. of persons residing or likely to reside in the building** | **No. of watercloset fitments** |
|---|---|
| 1-8 inclusive | 1 |
| More than 8 | 2 and 1 additional water closet fitment for every 15 such persons, or part thereof, over 20. |

**PART II**

*Paragraph 24(1)(b)(i)*

| **No. of female persons residing or likely to reside in the building** | **No. of watercloset fitments** |
|---|---|
| 1-8 inclusive | 1 |
| More than 8 | 2 and 1 additional watercloset fitment for every 15 such persons, or part thereof, over 20. |

**PART III**

*Paragraph 24(1)(b)(ii)*

| **No. of male persons residing or likely to reside in the building** | **No. of watercloset fitments** |
|---|---|
| 1-8 inclusive | 1 |
| More than 8 | 2 and 1 additional such fitment for every 15 such persons, or part thereof, over 20. |

**PART IV- NUMBER OF WATER CLOSET FITMENTS AND URINALS**

*Paragraph 24(1)(c)*

| **No. of male persons residing or likely to reside in the building** | **No. of watercloset fitments** | **No. of urinals** |
|---|---|---|
| 1-2 inclusive | 1 | 1 |
| More than 12 | 2 and 1 additional watercloset fitment for every 20 such persons, or part thereof, over 25. | 2 and 1 additional urinal for every 20 such persons, or part thereof, over 25. |

**PART V- NUMBER OF LAVATORY BASINS, BATH OR SHOWERS**

*Paragraph 24(1)(d)*

| **No. of persons residing or likely to reside in the building** | **No. of lavatory basins** | **No. of bath or showers** |
|---|---|---|
| 1-8 inclusive | 1 | 1 |
| More than 8 | 2 and 1 additional lavatory basin for every 15 such persons, or part thereof, over 20. | 2 and 1 additional bath or shower for every 15 such persons, or part thereof, over 20. |

**TABLE 2 - PERMISSIBLE FALLS IN DRAINS**

*Paragraph 65*

| **Diameter of pipe** | **Fall** |
|---|---|
| 100 mm | 1 in 40 |
| 150 mm | 1 in 70 |
| 225 mm | 1 in 100 |
| 300 mm | 1 in 150 |

SCHEDULE 3

**SPECIFICATION OF DUCTS**

*Paragraph 107(2),(3)*

| **Item** | **Column 1** | **Column2** | **Column3** | **Column4** | **Column5** |
|---|---|---|---|---|---|
| | Type of duct | Maximum diameter, mm | Maximum Width or Depth mm | Minimum Metal Thickness, mm | |
| | | | | Duct Material | |
| | | | | Galvanized Steel | Aluminum |
| 1. | Round ducts serving single dwelling units | ≤125 | - | 0.254 | 0.30 |
| 2. | Round | 350 | | 0.33 | 0.30 |
| | | >350 | | 0.41 | 0.41 |
| 3. | Rectangular, enclosed | | 350 | 0.33 | 0.30 |
| | | | >350 | 0.41 | 0.41 |
| 4. | Rectangular, not enclosed, for single dwelling units, with required clearance up to 12 mm | | 350 | 0.33 | 0.41 |
| | | | >350 | 0.41 | 0.48 |
| 5. | Rectangular, not enclosed, with required clearance of more than 12 mm | | 350 | 0.41 | 0.41 |
| | | | >350 | 0.48 | 0.48 |

SCHEDULE 4

**TABLE 1 - TYPES OF OCCUPANCIES**

*Paragraph 133(1)(b)*

| 1 | 2 |
|---|---|
| **Types of Occupancies** | **Class of occupancy** |
| Entertainment and public assembly | A1 |
| Theatrical and indoor sport | A2 |
| Places of instruction | A3 |
| Worship | A4 |
| Outdoor sport | A5 |
| *High risk commercial service | B1 |
| *Moderate risk commercial service | B2 |
| *Low risk commercial service | B3 |
| Exhibition hall | C1 |
| Museum | C2 |
| Cultural and heritage sites | C3 |
| High risk industrial | D1 |
| Moderate risk | D2 |
| Industrial Low risk | D3 |
| Industrial Plant room | D4 |
| Places of detention | E1 |
| Hospital | E2 |
| Other institutional (residential) | E3 |
| Large shop | F1 |
| Small shop | F2 |
| Wholesalers' store | F3 |
| Offices | G1 |
| Hotel | H1 |
| Dormitoy | H2 |
| Domestic residence | H3 |
| Detached dwelling house | H4 |
| High risk storage | J1 |
| Moderate risk | J2 |
| Storage Low risk | J3 |
| Parking garage | J4 |

**TABLE 2 — PROVISION OF PORTABLE EXTINGUISHERS**

*Paragraph 134(1)*

| **1** | **2** |
|---|---|
| **Classification of occupancies** | **Number of portable fire extinguishers relative to floor area** |
| B1,D1,D2 ,J1,J2,J3 | 1 per 100m2 |
| A1,A2,A3, B2, C1, C2, D3, E1,E2, E3, F1,F2, F3,G1,H1, H2 | 1per 200m2 |
| A4, A5, B3 D4, H3, J4 | 1 per 400m2 |

**TABLE 3 — STABILITY OF STRUCTURAL ELEMENTS OR COMPONENT**

*Paragraph 137(1) & 164(2)*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Occupancy | | Stability, minutes | | | | |
| | Class of occupancy | Single storey building | Double storey building | 3 -10 storey building | 11 storey building and over | Basement in any building |
| Entertainment and public assembly | A1 | 30 | 60 | 120 | 120 | 120 |
| Theatrical and indoor sport | A 2, | 30 | 60 | 120 | 120 | 120 |
| Places of instruction | A3, | 30 | 30 | 90 | 120 | 120 |
| Worship | A4, | 30 | 60 | 90 | 120 | 120 |
| Outdoor sport | A5 | 30 | 30 | 60 | 90 | 120 |
| High risk commercial service | B1 | 60 | 60 | 120 | 180 | 120 |
| Moderate risk commercial service | B2 | 30 | 60 | 120 | 120 | 120 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Occupancy | | Stability, minutes | | | | |
| | Class of occupancy | Single storey building | Double storey building | 3 -10 storey building | 11 storey building and over | Basement in any building |
| Low risk commercial service | B3 | 30 | 30 | 90 | 120 | 120 |
| Exhibition hall | C1 | 60 | 90 | 120 | 120 | 120 |
| Museum<br>Cultural and heritage sites | C2<br>C3 | 30<br>30 | 60<br>60 | 90<br>90 | 120<br>120 | 120<br>120 |
| High risk industrial | D1 | 60 | 90 | 120 | 180 | 240 |
| Moderate risk industrial | D2 | 30 | 60 | 90 | 120 | 180 |
| Low risk industrial | D3 | 30 | 30 | 60 | 120 | 120 |
| Plant room | D4 | 30 | 30 | 60 | 90 | 120 |
| Places of detention | E1 | 60 | 60 | 90 | 120 | 120 |
| Hospital | E2 | 60 | 90 | 120 | 180 | 120 |
| Other institutional (residential) | E3 | 60 | 60 | 120 | 180 | 120 |
| large shop | F1 | 60 | 90 | 120 | 180 | 120 |
| Small shop | F2 | 30 | 60 | 120 | 180 | 120 |
| Wholesalers' store | F3 | 30 | 90 | 120 | 120 | 120 |
| Offices | G1 | 30 | 30 | 60 | 120 | 120 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Occupancy | | Stability, minutes | | | | |
| | Class of occupancy | Single storey building | Double storey building | 3 -10 storey building | 11 storey building and over | Basement in any building |
| Hotel | H1 | 30 | | | 1 20 | 120 |
| Dormitory | H2 | 30 | | | 120 | |
| Domestic residence | H3 | 30 | | | 120 | 120 |
| Detached dwelling house | H4 | 30 | | | N/A | 120 |
| High risk storage | J1 | 60 | | | 1 80 | 240 |
| Moderate risk storage | J2 | 30 | | | 120 | 180 |
| Low risk storage | J3 | 30 | | | 90 | 120 |
| Parking garage | J4 | 30 | | | 90 | 120 |

NOTE: NA= Not applicable

HON. MONICA AZUBA NTEGE
Minister of Works and Transport.