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TOWARDS A BETTER MOSQUITO CONTROL POLICY

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This Information Circular on mosquito control aims to give all South Pacific territories an idea of what can be achieved in the field of sanitary engineering with a view to reducing the mosquito problem in inhabited areas.

The first part consists of a draft regulation which has recently been studied by the Public Health Engineer of the South Pacific Commission on behalf of the Health Department of French Polynesia.

The second part is devoted to the most common sanitary engineering measures which should be considered in cases of urbanization, road construction, rural development, in addition to the usual routine sanitation rules.

DRAFT REGULATION CONCERNING GENERAL RULES FOR MOSQUITO CONTROL

Article 1 - Buildings together with their courtyard and annexes, must be maintained by their inhabitants in a state of constant cleanliness. The land must be cleared of weeds and undergrowth, and all collections of stagnant water (i.e. those lying in the same place or container for more than six days), which may be a breeding place for mosquitoes must be eliminated. These include:

Brackish-water marshes
Fresh-water marshes
Tyres
Small containers: vases, cans, water bottles, coconut shells, sea-shells, etc.
Large containers: old drums and barrels
Water tanks
Washing facilities
Ponds
Sand traps
Public Works equipment: truck trays, dredger buckets
Boats
Scrap yards, abandoned vehicles
Gutterings
Flat roofs
Tree holes
Seepage drains
Flooded cellars or underground premises for telephone connections
Septic tanks, ditches
Flooded basements

Swamps
Wells
Household water ditches
Ponds and ditches which are neither cleared of weeds nor stocked with fish
Pandanus leaves
Crab holes
Holes in rocks

Receptacles of vegetal origin should be burned, or buried if burning is not possible. Those to be kept should be emptied, and placed under shelter or open end down. Tree holes should be concreted, or filled with compressed vegetal soil sloping towards the outside.

Article 2 - The Public Health Department should order all marshy land in which mosquitoes breed to be either filled or drained or both. All undrainable stagnant water which has been officially shown to contain mosquito larvae must be covered with a thin layer of a fatty or greasy substance approved by the Public Health Department. This should be carried out on a monthly basis by the owner or user of the land, or failing this, at their expense, by the Public Health Department.

Article 3 - Ponds for decorative or watering purposes, vases containing plants or flowers, animal troughs, tubs, tar or petrol drums and all other containers must be fully emptied and cleaned inside and outside at least twice weekly. The same applies to public property (parks, gardens, cemeteries, etc.).

Article 4 - Grease traps, septic tanks, drain pipes, manholes and inspection holes as well as all other receptacles connected with housing premises must be regularly inspected by users. Whenever they are shown to contain mosquito larvae, users will be required to drain and clean them, or to apply approved larvicide. Users unable to do so personally are to report to the Public Health Authorities who will indicate the necessary measures.

Article 5 - Canoes are to be emptied of rain water once a week. When the identity of an owner who fails to comply is unknown, the Public Health Department will be authorized to confiscate the craft. This is to apply to all types of sea-going craft left on land.

Article 6 - Those in charge of buildings, housing estates or earthwork projects, or any other project involving a change in the configuration of the site will be required to provide a short memorandum describing all temporary or permanent measures taken with a view to effective control of potential larvae breeding sites. A diagram should be attached if necessary.

This measure is in particular intended to apply to outlets for rainwater, household and garden water, and any other water which may form permanent or temporary collections either in the open air or in any non-airtight receptacle, or in unused Public Works equipment.

Article 7 - Reservoirs and water tanks should be fitted with non-rusting protective wire gauze of 1 mm. mesh maximum. They must be permanently kept clean. The same applies to intermediary tanks in water supply systems.

Unused tanks should be eliminated. Outlet pipes for those remaining in use must include a trap or interceptor. Their ventilation shaft should be protected by non-rusting 1 mm. wire gauze or by any other equally effective method. Cesspool ventilation shafts are to be protected by the same means.

Article 8 - Inspection holes must be designed in such a way that the base is at the same level as the lower part of the outlet pipe. Stoppers must not have any concave surfaces, and must be perfectly air and water-tight. The same applies to grease traps, sumps, dead wells and other such devices when authorized.

Article 9 - Basements and cellars of houses and buildings should have openings fitted with wire gauze as defined in Article 7 above. The Public Health Department may order the ground inside to be covered with an adequate layer of sand and gravel at the expense of the owner of the building.

Article 10 - Sewage treatment plants, drinking water plants, household waste treatment plants and dumps must be designed so as to avoid providing larvae breeding sites. Blueprints for the construction of all such plants must include the descriptive memorandum mentioned in Article 6.

Street drainage outlets and rainwater sumps should never include a trap or interceptor.

Article 11 - New roads should be designed in such a way as to avoid collection of surface water. All holes or hollows must be eliminated by filling or draining at the time of construction. Drainage systems must have sufficient capacity for rainwater to be totally drained off within 48 hours of the end of a storm. The base of drainage pipes is to be extended beyond the outlet so as to form a hollow in which rainwater may collect. They must have a downward gradient of at least 3 mm. per linear metre.

Article 12 - Regular larval control measures (removal of weeds, larvae-eating fish, larvicidal products, etc.) must be applied to all ponds, pools, etc. in the vicinity of houses.

Article 13 - Taro fields or other types of field requiring a permanent or semi-permanent layer of water must be stocked with larvae-eating fish.

On this type of flooded land, drainage facilities - in all cases where drainage is possible - must be so designed as to ensure drainage of excess water within five days of the end of a rainstorm, on the basis of five-yearly local rainfall statistics.

Article 14 - Cesspools, septic tanks and similar devices may be treated with larvicide, but the concentration should not be so high as to hamper bacterial action. Protection systems mentioned in specific regulations concerning septic tanks and similar must be fitted.

Article 15 - Disinsectisation is to be carried out once a month, at the expense of the owner, and under supervision by the appropriate department, in all cinemas, theatres, etc.

Article 16 - The preceding provisions, applicable to all unused land, empty plots, building sites, etc. are to be enforceable by the Public Health Department. After notice has been officially served, owners who fail to comply may be ordered by the authorities to carry out clearing, cleaning and any other mosquito control methods, at their expense and without prejudice to fines and other legal penalties in force.

Article 17 - A dengue fever control committee, comprising territorial Department Heads, together with other persons, was instituted by virtue of Decree N° 504/s of 28 February 1972.

Article 18 - In cases of emergency, when there is a danger of a dengue fever epidemic in the Territory, each township or borough may form local committees, whose members will include the mayor, the headmaster of the school, together with other representatives of the locality, of Church groups, of youth movements, etc.

The main function of these committees is to assist the staff of the Public Health Department in publicizing the measures to be taken in case of an outbreak, and in having all mosquito control measures - in particular those contained in this regulation - implemented as effectively and as swiftly as possible in their own community.

MOSQUITO CONTROL: SOME SANITARY ENGINEERING MEASURES

Experience has shown that, considering most of the methods used today throughout the world, total eradication of mosquitoes is purely wishful thinking. Permanent mosquito control is, however, possible, and its effect in the vicinity of inhabited areas can, in the long run, be extremely beneficial for the protection of local populations, in particular against disease-carrying mosquitoes.

If satisfactory results are to be attained, it will often be necessary to combine several forms of control. We are acquainted with three such methods, which are already being applied or about to be applied in the South Pacific:

- Chemical control: insecticides are used against adults, but even more effectively against larvae.

- Biological control, of which several forms are possible (use of cannibal larvae, or larvae-eating fish, etc.).

- Physical control, which can be classified essentially under two headings:

  - elimination of artificial breeding sites and of some natural breeding sites. This concerns everybody;

  - sanitary engineering, which concerns a wide range of occupations - engineers, architects, foremen of building sites and roadworks, research departments, etc. - and often a large number of private individuals.

Some basic sanitary engineering principles are discussed here.

The ideal would be for all built up areas to have both sewers and rainwater sumps channelling effluents towards - respectively - well-designed treatment plants and natural outlets such as the ocean.

Since this is not the case, some of the various techniques which can be envisaged for small-scale projects are given below.

I. HOUSES AND BUILDINGS

Construction of inspection holes

The lowest surface of all outgoing pipes must be at the same level as the base of the inspection hole. Covers must be airtight and their outer surface contain no concave part.

Water tanks

These must have an airtight cover and a curved ventilation shaft featuring fine anti-mosquito mesh at the opening. They must also have a drainage plug.

Septic tanks and Polynesian-type settling sumps

Construction should be standardized, and Polynesian-type sumps progressively eliminated. Septic tank effluents must subsequently be channelled into a proper treatment system. All component parts of the effluent circuit must be entirely airtight, and airshafts fitted with anti-mosquito netting.

Grease-traps

These should also be standardized; and in addition covered and airtight.

Rainwater collectors

These should never incorporate a trap or interceptor, since there may often be a substantial time lapse between two storms, with the result that trapped water is not renewed and may become a very active breeding site.

Basements and cellars

These are generally difficult to drain. Consequently, if there is a risk of flooding, the ground is to be covered with a layer of gravel, crushed shell or sand. Openings are to be fitted with anti-mosquito netting.

Built terraces

Terraces must feature a gradient of at least 0.003 metre/m, sloping downwards to drain pipes, the number and diameter of which are to be calculated on the basis of five-yearly rainfall statistics. Failing this, terraces are to be covered with gravel or similar material.

Waste and sewage treatment stations

All manholes and inspection holes, including grid-bars and sand-traps must be covered. Preference should be given to treatment plants featuring a ventilation system which stirs up the water, since mosquitoes lay only in still water. All outlets must be in the form of closed sloping pipes, in a series of drops in level. It is imperative that drying beds have an efficient draining system.

II. ROADS AND BUILDING SITES

Building sites

These must have shelters, a shed or outhouse for storing equipment and a toilet for workers. Where substantial earthworks are involved, provision must be made for total drainage of rainwater within 48 hours of the end of a storm.

Filling

Newly filled land must have a drainage system. Ditch drainage is suitable provided it conforms with technical specifications which the appropriate department will supply on request (ditch depth, longitudinal slope, cross-section, embanking, etc. depending on the amount of water to be drained and the roughness coefficient of the filler material). The surface of the filled area should always feature a certain gradient, and never be horizontal.

Road construction

Certain road-building methods lead to the formation of hollows in which floodwater or rainwater gather. Projects must provide for either the filling of such hollows (and draining) or the digging of a cross-drain under the road, with the greatest possible hydraulic efficiency.

Road drainage

Road construction projects must provide for total rainwater drainage within 48 hours, with reference to five-yearly rainfall statistics. This presupposes:

- the digging of ditches which must be concreted if possible;
- drain pipes of sufficient diameter and number;
- suitable gradients (too flat - stagnation; too steep - erosion which may create further stagnation downstream);
- cross-drain flush with invert;
- invert extended downstream, so as to channel the water better in the appropriate direction.

Laying of pipes and mains

During these operations, trenches generally remain open too long, with the result that water gathers in them. They should therefore be filled in as laying proceeds, although this is of course not always possible. It is preferable to lay such pipes on a layer of sand, as this gives greater absorption. Trenches must be horizontal. Pumps for removing accumulated water may be placed at the lowest points. It would be advisable to avoid work of this nature during the wet season.

III. HYDRAULICS

Irrigation

Irrigation systems must be planned so as to avoid bringing in excessive amounts of water. In addition provision must always be made for eduction outlets.

Drainage

The following is an excellent method of draining stagnant water. Clay or perforated plastic pipes may be used; they should be laid in either a branched or a herringbone pattern, particular attention being paid to the eduction system. Once again, water drainage capacity calculations must take account of five-yearly rainfall statistics, the permeability and structural characteristics of the ground, and lastly the duration of the larval cycle of the mosquitoes concerned. The requisite formulae may be obtained from engineering departments.

Oxidation tanks

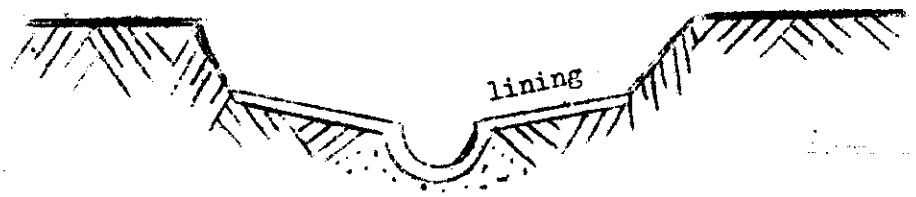
These tanks, whether natural or not, should be regularly cleared of weeds if not lined with a material preventing the growth of plants. Their banks, which should have a gradient of at least 1 in 3, should also be cleared of weeds. The surface layer of the banks should be of a concrete/soil mixture or any other stable material. A drainage system may be built, and in addition oxidation tanks should have a spill-over device or similar, so as to prevent undue variations in the surface level.

Ditches

Ditches in residential areas provide larvae breeding sites for different species of mosquitoes. It is vital that they have optimal flow characteristics, i.e.

- longitudinal gradient
- roughness coefficient of the walls.

There is no point in covering a ditch if these two criteria are not respected. It is recommended that ditches be lined with concrete or bitumen, have a central shallow drain and a longitudinal gradient of at least 0.003 m/m.



Central shallow drain

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