

# GUIDELINES FOR THE DESIGN OF SMALL SEWAGE TREATMENT PLANTS

## 1. INTRODUCTION

Many areas of Hong Kong are not served by public foul sewers. Private developers in these areas are therefore required to provide their own sewage treatment facilities to treat the sewage to acceptable standards for direct discharge into the receiving waters. These guidelines have been prepared with a view to providing Authorized Persons and designers with general advice on the design of small sewage treatment plants (STP) for private development up to 2 000 population equivalent. In preparing the guidelines, special emphasis is placed on the problems that are usually found with small plants and appropriate design safety margins are incorporated. For plants serving population exceeding 2 000 the designer should approach the Environmental Protection Department to discuss the possibility of adopting a more rational design approach.

The function of an STP is for treating collectively any wastes of the kind that are ordinarily discharged from toilets, water closets, baths, showers, sinks, basins and other sanitary and kitchen fitments. The main concerns of the Environmental Protection Department on these small sewage treatment plants relate both to the adequacy of the treatment processes proposed and also to the uncertainty in ensuring proper long term operation and maintenance and hence the possibility of discharge of substandard effluent. The following guidelines therefore highlight the importance of good plant design, which among other objectives, should aim to make future operation easy and reliable.

It should be noted however, that for small developments with a population of less than about 50, the use of small sewage treatment plants should be avoided as far as possible. The possibility of primary treatment (e.g. septic tank) followed by soakaway, which essentially results in no open discharge of wastewater, should always be examined. Unless site percolation tests have shown this to be impractical and adverse conditions prevent, a septic tank together with its soakaway system will be preferred for these situations.

The Water Pollution Control Ordinance controls the discharge of wastewater, including treated effluent into waters within areas designated as Water Control Zones. The Authorized Persons may contact the Environmental Protection Department for information regarding details of the legislative control relevant to discharges from small STP.

A glossary of terms is given in Appendix 1.

## 2. GENERAL DESIGN CONSIDERATION

2.1 In order to ascertain the effluent quality requirements, a designer is encouraged to liaise with EPD by submitting the following information, prior to the design of STP:

- block and location plans of site;
- maximum number of persons (resident and non-resident) to be served;
- presence of shops, restaurants or other service trades;
- possibility of the need for future extensions to the plant;
- proposed location of discharge.

Based on such information, EPD will then formulate the required effluent quality standards.

- 2.2 All elements of the STP should be open to view as far as possible for easy operation and maintenance.
- 2.3 Mechanical equipment which is critical to the functioning of the STP should be provided with on-line standby units. For example, an on-line standby pump at the equalization tank and an on-line standby chlorine dosing pump at the chlorination tank should be provided.
- 2.4 Entrance to the STP should be by a proper door without the use of steps or ladders and accessible by a vehicle. A second pedestrian entrance/exit should be provided as far as possible for emergency purposes at the opposite end of the plant room.
- 2.5 Due consideration should be given to the possible initial low flow condition before full population is achieved. A multiple of smaller units (with gate or other shut-off arrangements) should be provided as far as possible in lieu of a single large unit.
- 2.6 Excessive quantities of grease and oil may cause malfunction of an STP. In such cases, arrangements should be made where practicable for grease and oil to be removed at source. A properly designed grease trap should be provided where restaurants or garages are to be served by the STP. In general, a grease trap should be designed to provide a minimum water retention time of 20 minutes for all wastewater discharged from restaurant kitchens during peak flow periods.
- 2.7 Swimming pool filter backwash, if any, should be discharged to the STP for treatment. Design of the STP should take into account the flow and loadings of such wastewater. Pool water itself should however be drained to the stormwater system.
- 2.8 Under special circumstances, an autostart standby power generator may be required if it is considered that discharge of untreated wastewater to a specific water course is unacceptable even for a brief period during power failure.
- 2.9 An STP design submission should include, but is not limited to:
  - key plan showing location of development and effluent discharge location;
  - plan and section showing the location of STP within the development in relation to residential units and surrounding facilities;

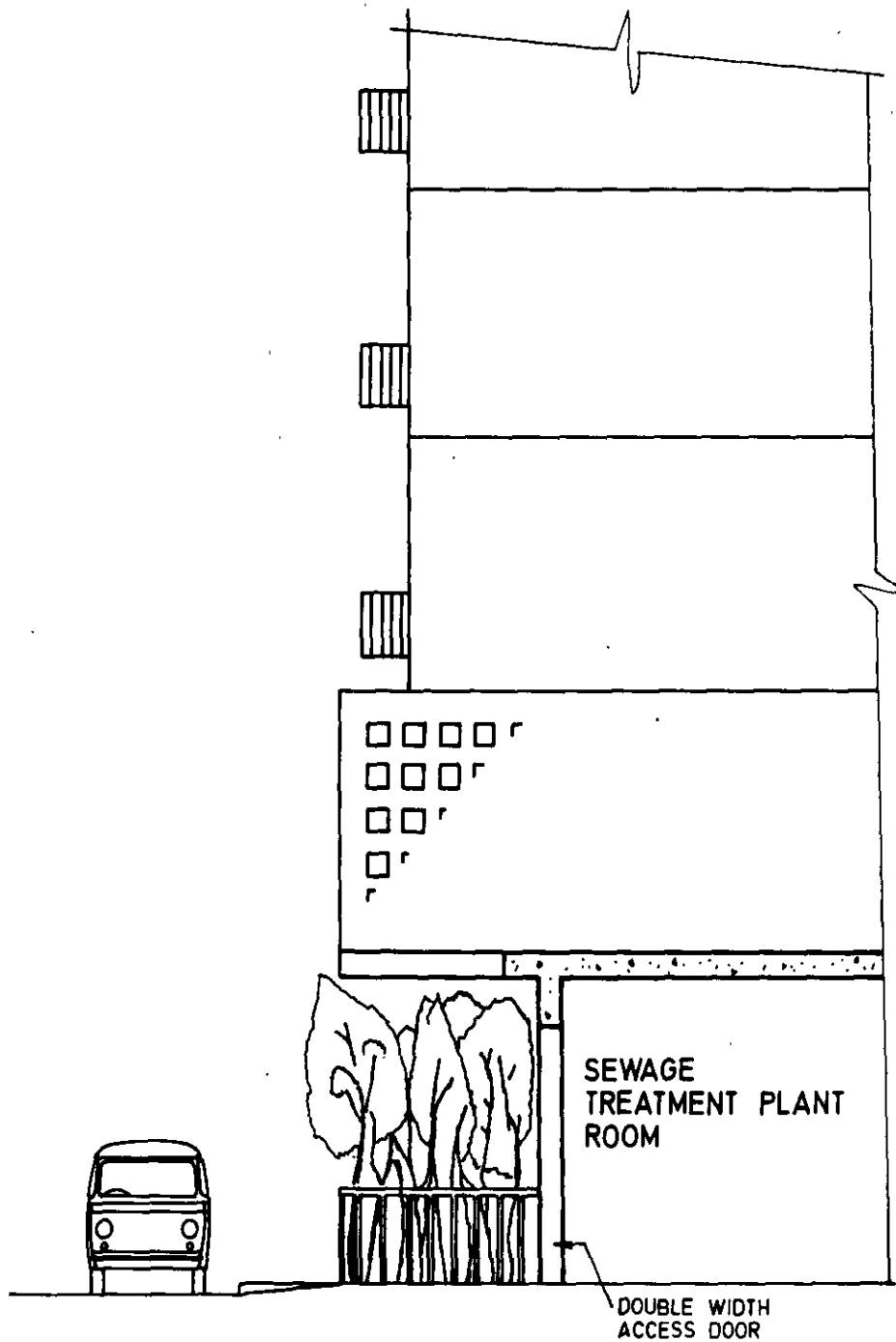


FIG. 1 GOOD VEHICULAR ACCESS AND PROPER ENTRANCE TO A SEWAGE TREATMENT PLANT

- process and instrumentation diagrams;
- hydraulic profile together with supporting calculations;
- detailed process design calculation;
- detailed drawings with plan and elevation showing plant room layout, including pipework and equipment;
- route of access to the plant room and access within the STP;
- ventilation and lighting details;
- equipment schedule showing number of duty and standby units, make, model number, capacity etc. The schedule should be shown on the drawing;
- equipment catalogues and operation/maintenance manual.

### 3. DESIGN PARAMETERS

3.1 The designer should give a reasonable estimate of population and a detailed breakdown of the total flow rate in the calculation.

3.2 The basic design parameters for residential populations shall be taken as follows:

- 0.30 to 0.46m<sup>3</sup>/h/d (cu.m. per head per day) depending on types of development
- 55g BOD/h/d
- 55g SS/h/d

For other types of population, reference should be made to Civil Engineering Manual Vol. 6 and Water Supplies Department Provisional Standing Order 1309, relevant data of which has been attached as Appendix 2. If service trades (shops, restaurants etc.) occur in the development, the flows and loads of the trades shall also be included as per Appendix 2.

3.3 The design peak flow arriving at the STP as a proportion of dry weather flow (DWF) shall be taken as:

- 6 DWF for population equal to or under 1 000,
- 4 DWF for population over 1 000 but not less than that based on 1000 population.

Either the STP can be designed for the above peak flow rate or it can be designed to cater for a peak flow of 3 DWF, excess flow over 3 DWF being equalized in an equalization tank. In the latter case the feed pumps must be sized accurately to avoid excessive peak flow rate production.

Equalization tanks should be designed to hold the excess flow for a period of two hours. Only the tank volume above the duty pump cut-in level should be considered as effective equalization volume. Air ejectors should be provided to prevent septicity of sewage.

3.4 Primary sedimentation tanks shall be designed for:

- maximum surface loading of 40 m<sup>3</sup>/m<sup>2</sup>/d at peak flow,

\* DISTANCE 'a' TO SATISFY THE  
REQUIREMENT THAT PUMP STARTS  
NOT TO EXCEED 10 TIMES PER HOUR

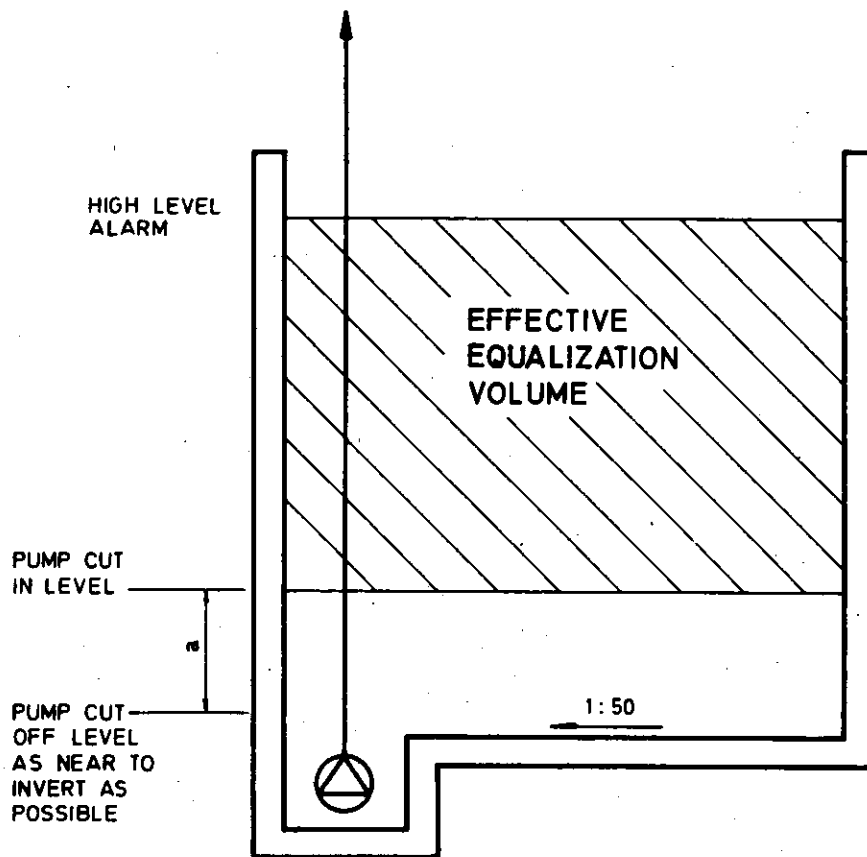


FIG.2 EFFECTIVE EQUALIZATION VOLUME IN AN  
EQUALIZATION TANK

- minimum retention time of 2 hours at peak flow,
- maximum weir loading of 250 m<sup>3</sup>/m/d at peak flow.

3.5 Final sedimentation tanks shall be designed for:

- maximum surface loading of 35 m<sup>3</sup>/m<sup>2</sup>/d at peak flow if they are preceded by Rotating Biological Contactor (RBC) or biological filters,
- maximum surface loading of 22 m<sup>3</sup>/m<sup>2</sup>/d at peak flow if they are preceded by the extended aeration process,
- minimum retention time of 2 hours at peak flow.

3.6 The reduction of total BOD by different stages of the primary treatment processes should be taken as follow:

- |   |   |      |
|---|---|------|
| • equalization tank                     | — | nil  |
| • coarse screen                         | — | nil  |
| • fine screen (max. opening 2 mm)       | — | 7.5% |
| • primary sedimentation                 | — | 30%  |
| • fine screen and primary sedimentation | — | 30%  |

The net BOD load going into the subsequent biological processes should be computed accordingly.

3.7 Biological processes should be designed to the following organic loading:

- RBC : 10 g total BOD/m<sup>2</sup>/d (i.e. per sq.m. of RBC surface) entering into the RBC or as recommended by manufacturer, whichever is smaller,
- Extended aeration : 0.07 kg total BOD/kg MLSS/d and MLSS in the range between 2 000 and 3 500 mg/L,
- Plastic biological filter (Biofilter) : 0.5 kg total BOD/m<sup>3</sup>/d (i.e. per cu.m. of media volume) or as recommended by manufacturer, whichever is smaller.
- For other biological treatment methods, such as sequential batch reactor, contact stabilization and other patented processes etc., organic loadings proposed in the design should be justified by supporting documents such as relevant literature, local monitoring results and catalogues.

3.8 Chlorination tanks should be designed for minimum 30 minutes contact time at peak flow.

3.9 Sludge quantities generated from the processes should include:

- solids removed from primary sedimentation, which should be taken as 70% of the influent SS.
- sludge yield from biological processes, which should be taken as 0.5 kg solids/kg BOD removed when preceded by primary sedimentation, or 1 kg solids/kg BOD removed when not preceded by primary sedimentation. In the latter case no inclusion of primary sludge is necessary.

3.10 Solid concentration of sedimentation tank sludge shall be taken as:

- 1% for extended aeration sludge,
- 2% for RBC, biological filter and primary sludge.

#### 4. PRACTICAL DESIGN AND INSTALLATION

4.1 A portable submersible pump should be provided in order to allow flexibility in operation. This pump can be used to recycle the plant effluent to maintain the STP in a working condition when incoming flow is low.

4.2 A general headroom of 3 m should be maintained for enclosed or underground STP with artificial ventilation. This may be reduced to 2.5 m at localized points, e.g. under beams.

4.3 For enclosed STP, a minimum air volume of 14 m<sup>3</sup> should be provided. Artificial ventilation should be provided with not less than 10 air changes per hour. Ventilation exhaust pipes should be carried up to a height not less than 1 m above the roof of the building at which the STP is located.

4.4 Access walkways of minimum 0.75 m clear width should be maintained within the STP for access to all areas requiring maintenance and operation. Walkways should have safety rails (preferably stainless steel) and toe boards. Walkways should be laid to a 1:25 crossfall to prevent ponding if of solid construction and they should not be obstructed by crossing pipework.

4.5 Where levels vary, staircases should be provided and not catladders or step irons.

4.6 All tanks should be provided with stainless steel ladder or step irons for access. Mild steel should not be used. Step irons should be spaced at 300 mm c/c horizontally and 250 mm c/c vertically.

4.7 If a tank has to be covered, stainless steel or aluminium alloy open mesh flooring should be used (aluminium should however not be used in chlorination facilities located in confined space). Open mesh flooring should be designed for 5kPA uniformly distributed load.

4.8 Provision of an emergency by-pass to the STP is not allowed under normal circumstances.

4.9 Fresh water taps for hoses and handwashing should be provided in the STP at convenient locations and should be shown on the drawings.

4.10 Electrical distribution boards and control panels should be installed in locations not liable to flooding and the locations shall be shown in the drawings. Panels should have a dehumidifying heater.

4.11 The control panel should incorporate a mimic/schematic diagram and all labels should be in both English and Chinese. All valves, penstocks, pumps etc. should be appropriately labelled.

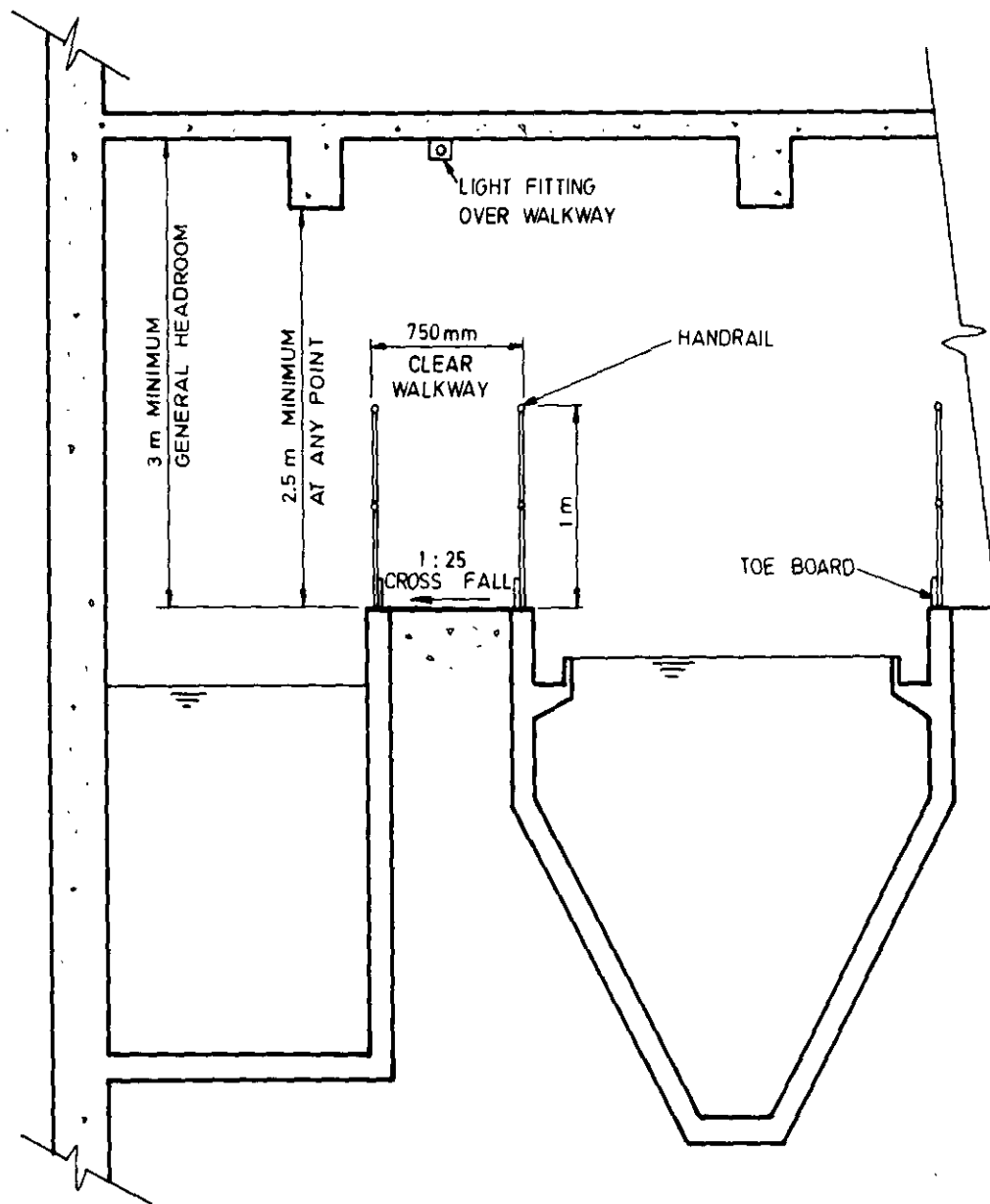


FIG. 3 HEADROOM AND WALKWAY REQUIREMENTS

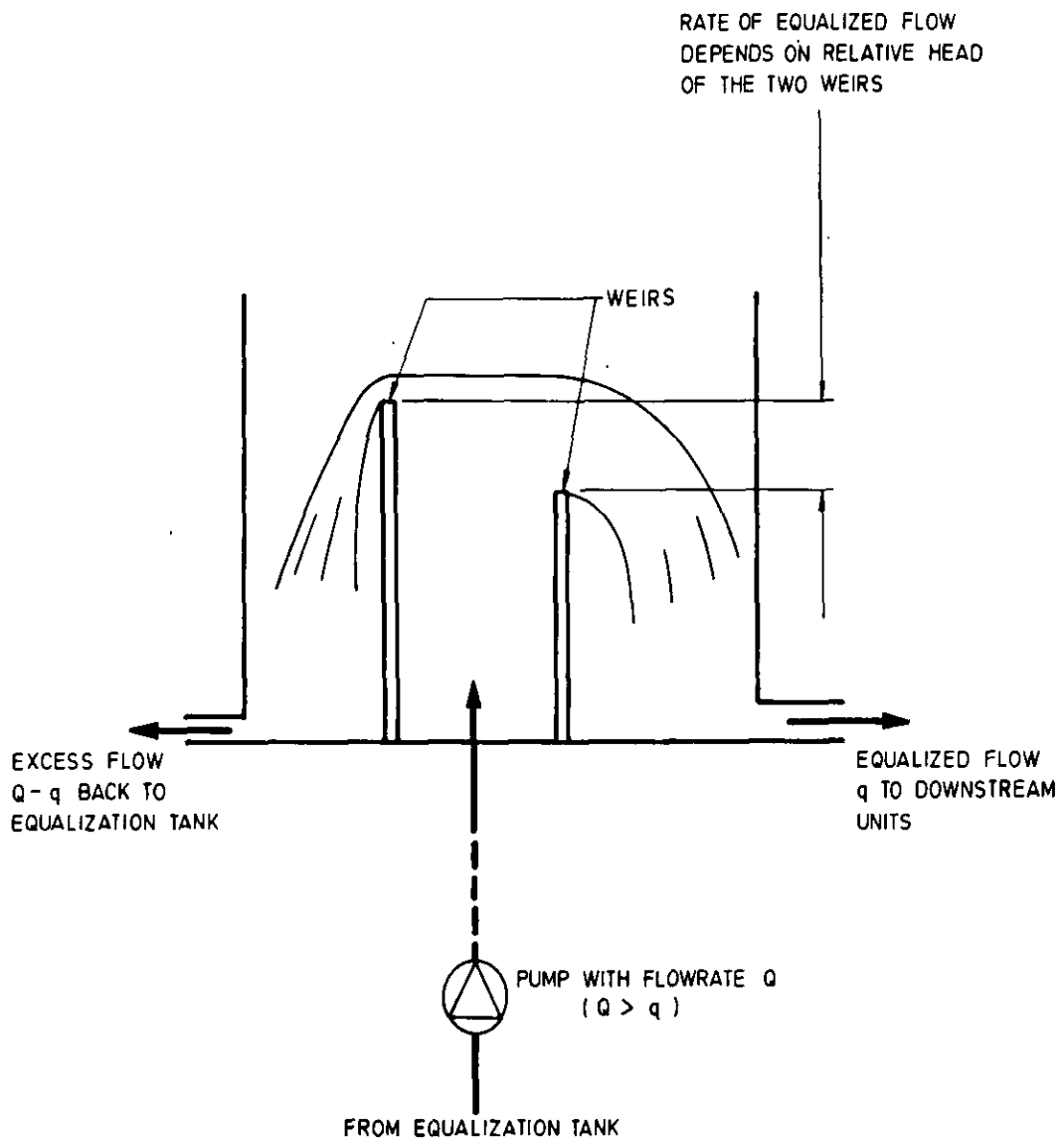


- 4.12 Hours run meters should be provided for all major equipment to record the total hours of operation. They should be of the non-resettable type.
- 4.13 Coarse screens should be provided to precede pumps. Fine screens should be placed downstream of equalization tanks equipped with air ejectors so as to minimize organic solids content in the screenings.
- 4.14 Mechanical screens should be the static type or of the type having the rakes moving in the bar openings and not on the bar. Either manual or mechanical by-pass screens should always be provided. The duty screen channel should have a high level overflow into the standby screen channel so that the flow diverts automatically through the standby screen in case the duty one is blocked.
- 4.15 Excessive screen channel width which results in shallow depth of flow should be avoided. In case of small developments where the smallest mechanical screen commercially available is still too wide, a manual screen may be used.

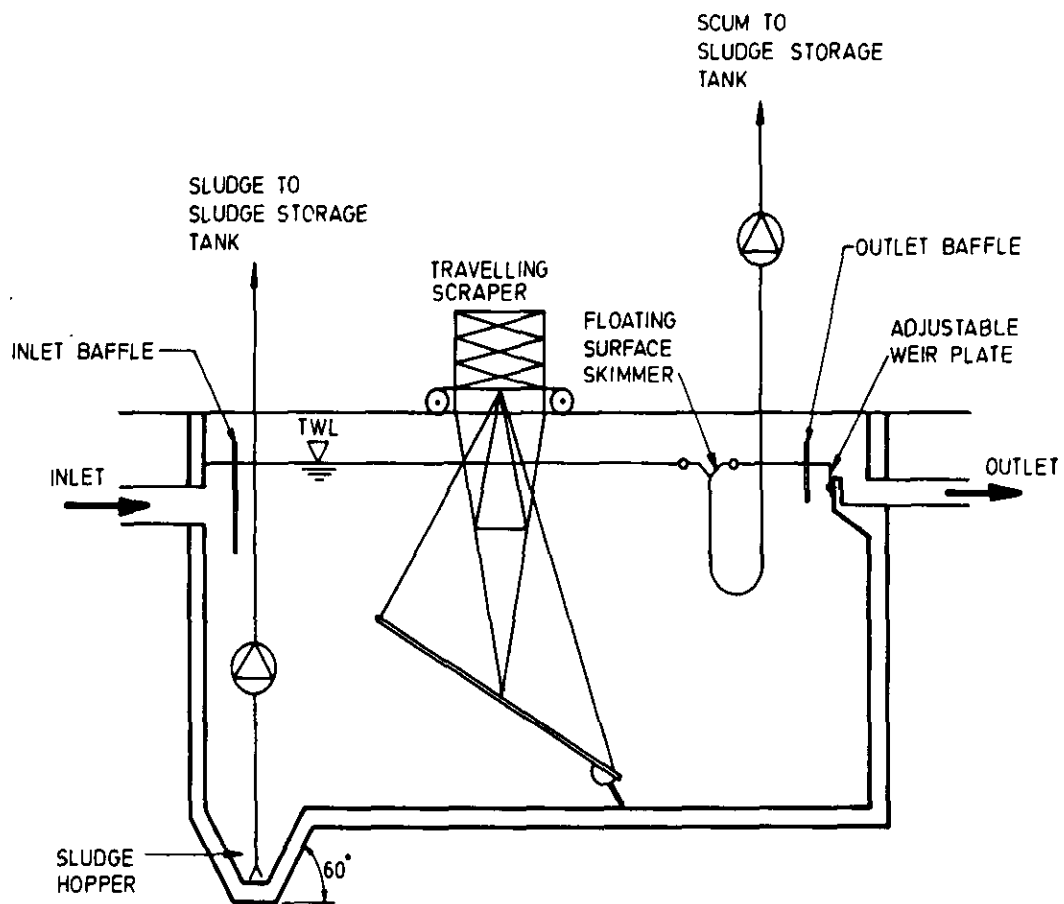
Bars of screen should be extended to the invert of the channel. For manual screens, consideration should be given to:

- access by operator;
- ease of removal of screenings by operator, including provision of suitable rake;
- draining of screenings;
- bagging and storage of screenings.

- 4.16 A perforated/mesh type drain tray (of stainless steel or plastic material) should be provided to allow the screenings to drain prior to packaging.
- 4.17 Pump sumps (including equalization tanks) should be designed to limit the pump starts to not more than 10 times/hour.
- 4.18 Electrical voltage for level sensors in pump sumps should not exceed 24 V to avoid electrical hazard.
- 4.19 High level alarms should be provided in all pump sumps. This should be in the form of visual and audio alarms connected to a suitable constantly manned location.
- 4.20 Pumps should be carefully chosen to correspond to the design duty point. Flow regulation tanks with control weir should be used if only bigger pumps are available.
- 4.21 Comminutors, especially the enclosed type, are discouraged as they often cause operational problems in the STP.
- 4.22 Sedimentation tanks should be designed either as rectangular horizontal flow tank, or as square/circular upward flow tank. For horizontal flow tank, the length to width ratio should not be less than 2. The use of tanks



**FIG. 4 TYPICAL DETAILS OF FLOW REGULATION TANK**  
( DESIGN FLOWRATE =  $q$  )



**FIG. 5 TYPICAL LONGITUDINAL SECTION OF  
 RECTANGULAR SEDIMENTATION TANK**

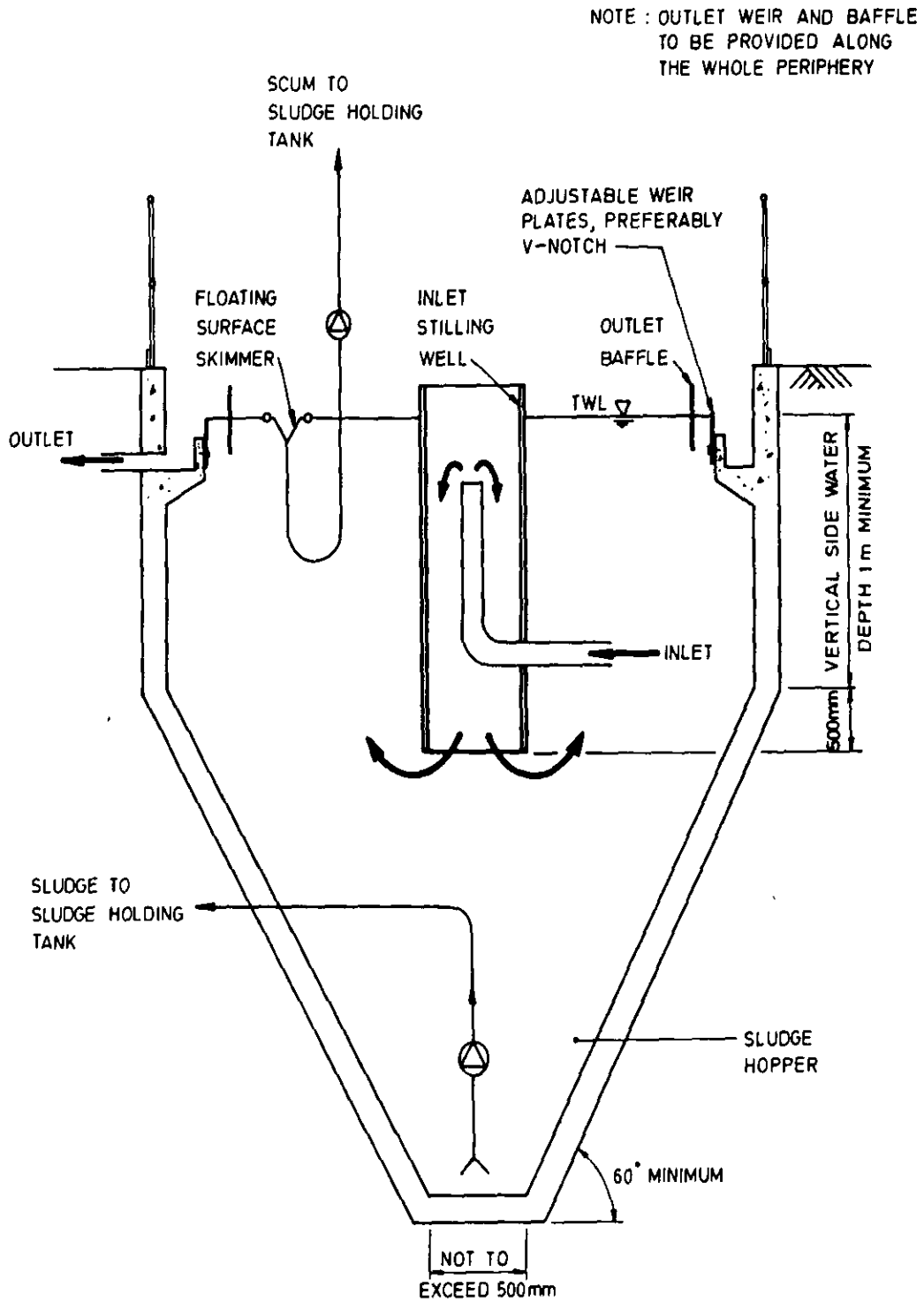
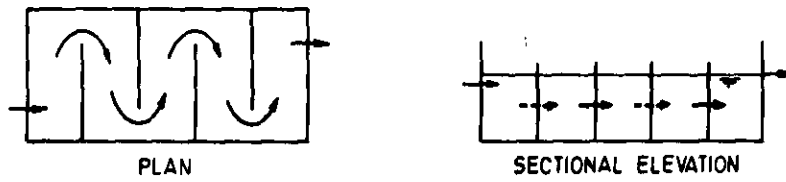


FIG. 6 TYPICAL SECTION OF A SQUARE/CIRCULAR  
UPFLOW SEDIMENTATION TANK

with length to width ratio between 1 and 2 should be avoided.

- 4.23 Upward flow sedimentation tanks should be provided with minimum 60° hopper wall slopes to facilitate easy sludge collection and removal.
- 4.24 Horizontal flow sedimentation tanks should be provided with a mechanical scraper system on a nominal floor slope, discharging to a sludge hopper. Twin tanks should preferably be used. If single tank is used, the scraper should be of the type that allows the underwater parts to be maintained without the need of shutting down the tank.
- 4.25 Adjustable weirs should be used for sedimentation tanks to enable fine levelling. V-notch weirs should be used where wide flow variation occurs. The side-wall height should be not less than 1 m in order to avoid sludge carryover. The layout should be such that the inlet arrangement never becomes submerged in sludge.
- 4.26 A chamber should be provided at the final sedimentation tank outlet after the weir for installation of recirculation pump in the event that the actual initial flow is much lower than the design flow (see 4.1 above).
- 4.27 Sludge in sedimentation tanks should be removed as frequently as possible, at least once per day by a suitable sludge withdrawal device such as submersible sludge pumps, airlifts or valves. A scum removal device should also be provided. The sludge and scum removal device should have independent adjustable control. Inspection trough should be provided at the discharge end for inspecting the quality of sludge withdrawn so that adjustment to the withdrawal system may be made accordingly.
- 4.28 Chlorination facility should include a flash mixing device followed by a plug flow contact tank. Baffles should be provided in chlorination tanks to prevent short-circuiting. Lateral baffling should be used for shallow tanks and up-and-over baffling should be used for deep tanks. Dechlorination facility may be required in situations where the residual chlorine poses hazard to fisheries or shellfisheries.
- 4.29 When tertiary treatment is required, disinfection (chlorination, ultra-violet radiation, ozonation, etc.) should be placed after tertiary treatment.
- 4.30 Sludge storage tanks should be provided with aerators when they are located in enclosed plant rooms to maintain the aerobic condition of the sludge. However, sludge storage tanks should preferably be ventilated separately to the exterior. Decanting facilities should be fitted to sludge storage tanks. Supernatant should be returned to the equalization tank.
- 4.31 Sludge pumps should be designed with positive suction head to minimize the possibility of clogging.
- 4.32 The diameter of the sludge draw-off pipework should be of a minimum



LATERAL BAFFLING FOR SHALLOW TANK



UP AND OVER BAFFLING FOR DEEP TANK

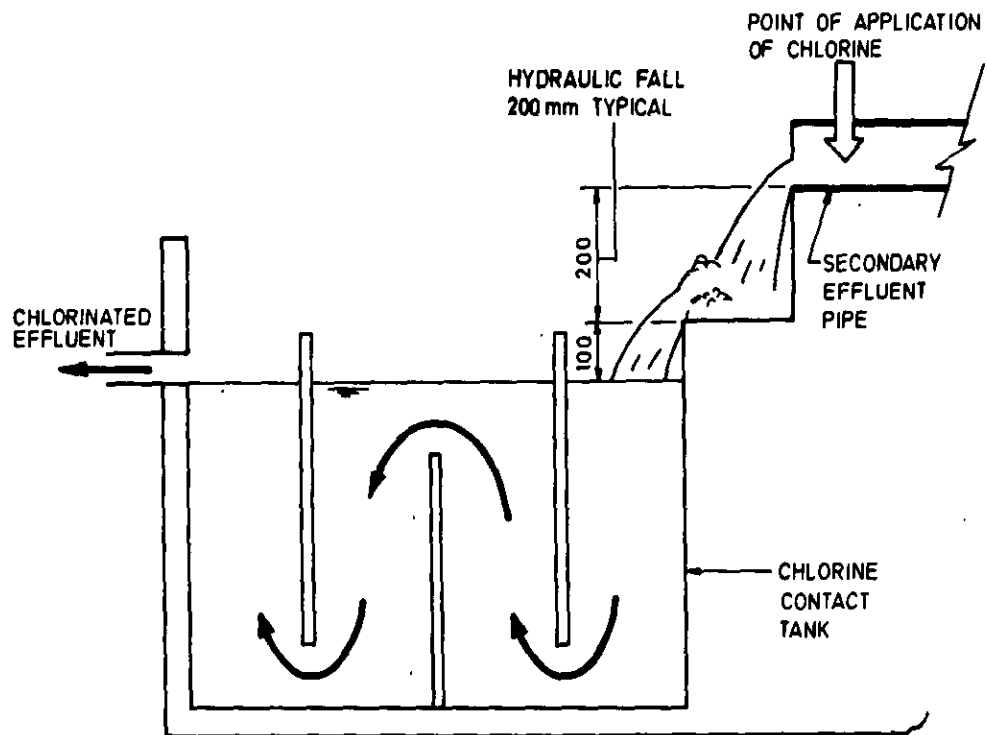


FIG. 7 TYPICAL ARRANGEMENT OF CHLORINATION SYSTEM

diameter of 80 mm in order to prevent pipe blockages.

- 4.33 A sludge dewatering machine capable of attaining 30% w/w dry solids content for landfill disposal and a sludge tank for emergency storage of 14 days sludge volume should be provided. For small STP serving less than 100 population, it may be acceptable to provide only a sludge storage tank for wet disposal provided that:
- a storage tank capable of holding 60 days sludge volume be provided,
  - vehicular access is maintained for desludging tankers,
  - written confirmation is provided from a desludging contractor undertaking to carry out the work and specifying the ultimate disposal site for the wet sludge.
- 4.34 An automatic flow measuring device with non-resettable type totalizer should be provided at suitable location for measuring the flow for STP serving a population of more than 50.
- 4.35 An easily accessible sampling point should be provided for taking samples of the treated effluent.
- 4.36 A minimum lighting intensity of 300 lux should be provided in the STP. Lights should be located where they are accessible for maintenance and replacement.

## 5. OPERATION AND MAINTENANCE

- 5.1 In selecting the type of treatment process, the designers should take due consideration of the availability of competent operators.
- 5.2 Only competent technicians should be assigned to operate the STP. The operator should be fully conversant with the recommended operating procedures as stipulated in the operation and maintenance manual.
- 5.3 If any part of the STP has to be covered, open mesh flooring should be used to allow easy visual inspection. Concrete covers should be avoided as far as possible. If concrete cover slabs have to be used, they should be liftable by two men, i.e. total weight should be less than 60 kg.
- 5.4 Screenings should be removed daily and therefore screen locations should be so designed to enable easy screenings removal. Screenings should be dripped dry and packed in heavy duty polythene bags for subsequent disposal.
- 5.5 The STP should be kept in a tidy state by good housekeeping. This includes regular hosing down and scraping the walkways, whitewashing the walls, cleaning and painting metal works, maintaining adequate lighting and ventilation etc.
- 5.6 Spare parts sufficient for 2 years operation as per manufacturers' recommendation should be provided with the equipment supply.
- 5.7 Powder type fire extinguishers and a first-aid box should be provided in an

easily accessible area in the plant. Life-buoys should be placed near deep, open liquid containing tanks.

- 5.8 An operation and maintenance manual should be submitted for approval. The copy that is to be placed in the STP should be in ring binder format with all papers laminated or enclosed in plastic. It should contain at least the following information, with an essential summary in Chinese:
- name and address of designer and contractor and date of installation;
  - process and instrumentation diagram;
  - detailed description of treatment processes;
  - control mechanism;
  - wiring diagram;
  - operating procedures for all treatment processes including likely operating problem and trouble shooting techniques;
  - routine maintenance schedule for all processes and equipment (daily, weekly, monthly, annual checklists etc.);
  - start up and shut down procedures;
  - equipment schedule with name and contact address of local agents;
  - list of spare parts provided on site and recommended stock levels at which new orders must be placed;
  - sampling and testing frequency and procedures for on-site testing;
  - emergency procedure (fire, power failure, etc.);
  - plant safety precautions;
  - sample log sheets.
- 5.9 A Chinese version of the daily work schedule, laminated or enclosed in plastic should be provided in the STP.

## 6. ENVIRONMENTAL CONSIDERATIONS

- 6.1 STP should be regarded as potential source of nuisance to the resident and the public, and therefore due consideration should be given to the minimization of odour, noise and safety problems.
- 6.2 STP should be sited with good buffering distance from houses, or enclosed to minimize adverse impact. Open STP should be fenced off to keep away trespassers.
- 6.3 Due consideration should be given to odour problem from STP. Ventilation exhaust pipes should be taken to roof level, or else odour treatment or masking facilities may be required (e.g. activated carbon, peat filters etc.).
- 6.4 To minimize noise problem from STP, the designer should consider the use of silencers, sound barriers, anti-vibration mounting and blowers with



motors of low r.p.m. (not exceeding 1 000 r.p.m.). Provision of an air blower is discouraged. Alternatively, use of submersible ejectors should be considered which would result in quieter operation. The intake and exhaust grills of the ventilation system should also be designed properly to reduce the whistling noise and should not point towards nearby buildings. Reference should be made to 'A Practical Guide for the Reduction of Industrial Noise' published by this Department.

- 6.5 STP should be designed to minimize visual impact. Landscaping with bushes and trees is encouraged, but not in places where the leaves may fall into the tanks.

## ABBREVIATIONS AND GLOSSARY OF TERMS

1. **Activated sludge**  
A secondary (biological) treatment process in which sewage is aerated with a biologically active sludge causing the microorganisms to remove pollutants from the sewage. A further settlement stage is required to separate the sludge.
2. **Baffle**  
A device used in a tank to promote a more uniform flow through the tank and to avoid short-circuiting.
3. **Biochemical oxygen demand (BOD)**  
The amount of dissolved oxygen consumed by microbiological action when a sample is incubated, usually for 5 days at 20°C. It is a measure of the concentration of biologically degradable pollutants in the sample.
4. **Biological filter (Biofilter)**  
A type of secondary treatment process which consists of a bed of inert material (moulded plastics, clinker, stones etc.) on to which microorganisms will grow so as to promote aerobic degradation of sewage.
5. **Comminutor**  
A grinder or shredder that converts bulky solid wastes into small particles.
6. **Dry weather flow (DWF)**  
The average daily flow to the treatment plant without the influence of stormwater infiltration due to rainstorms.
7. **Extended aeration**  
The extended aeration process is a type of secondary (biological) treatment. It is a modification of the conventional activated sludge process and operates in the endogenous phase of growth, in which there is not enough food remaining in the system to support all of the microorganisms present. The microorganisms are aerated and suspended within the sewage, where aerobic degradation of the pollutants takes place. Residence time is of the order of 24 hours compared to around 6 hours in conventional activated sludge tanks.
8. **Mixed liquor suspended solids (MLSS)**  
The concentration of dry solid (in milligrams per litre) of mixed liquor in the aeration tank of an extended aeration/activated sludge plant.
9. **Primary treatment**  
The treatment of sewage to a stage where the settleable pollutants are removed by physical means (usually gravity sedimentation).

## APPENDIX 1 (Cont'd.)

10. **Primary sedimentation tank**  
A primary treatment process. It is a gravity sedimentation tank in which the majority of settleable solids are removed from the crude sewage flowing through it. It is placed before the secondary (biological) treatment processes.
11. **Rotating biological contactor (RBC)**  
A type of secondary treatment process. It is a unit consisting of a series of closely spaced, parallel discs, mounted on a rotating shaft which is supported just above the surface of the waste water to be treated. Microorganisms grow on the disc surface where aerobic degradation of the pollutants takes place.
12. **Secondary sedimentation tank**  
Part of the secondary treatment process (e.g. biological filters or an activated sludge plant) in which settleable solids or humus resulting from the degradation of pollutants are separated from the effluent.
13. **Secondary treatment**  
Also called biological treatment, referring to the treatment of sewage to a stage where the pollutants (settleable, colloidal and dissolved) are removed biologically by the action of microorganisms.
14. **Septic tank**  
A primitive type of primary treatment process. It takes the form of a settlement tank in which the sludge is retained for sufficient time for the organic matter to undergo anaerobic decomposition.
15. **Sewage**  
The water-borne wastes of a community.
16. **Sludge**  
A mixture of solids and water produced during the treatment of sewage.
17. **Sludge yield**  
The quantity of solids left over at the end of the secondary treatment processes, consisting of dead cells, surplus microorganisms, non-biodegradable matters.
18. **Suspended solids (SS)**  
Solids in suspension in sewage liquors as measured by filtration through a glass fibre filter paper followed by washing and drying at 105°C. Expressed in milligrams per litre (mg/L).
19. **Tertiary treatment**  
A further stage of treating sewage following secondary (biological) treatment processes, usually by filtering the secondary effluent to remove suspended solids. Consequential removal of residual BOD may also occur.

## FLOW AND LOAD FOR DIFFERENT TYPES OF DEVELOPMENT

## FLOW

<i>Type of development</i>	<i>Recommended design flow rate (L/head/day)</i>
Residential R1	300
Residential R2	370
Residential R3	460
Residential R4	460
Modern Village Housing	300
Traditional Type Village Housing	185
Temporary Housing Area (THA)	185
Schools (Not including canteen)	23 (students, staff etc.)
Offices (Not including canteen)	55
Services (shops etc.)	70 (for equivalent population)
Restaurants/canteens	0.5m <sup>3</sup> /m <sup>2</sup> kitchen area/day

*Explanatory notes on types of development*

- *Private housing blocks in R1 zones, Private Sector Participation Schemes and Housing Authority Home Ownership Schemes*  
Residential One (R1) is the highest density residential planned use. Population densities may be around 1 740 persons per hectare, with a maximum plot ratio of 8.0.  
Generally, densities and plot ratios for Private Sector Participation Schemes and Housing Authority Home Ownership Schemes are similar to those found in R1 estates.
- *Private housing blocks in R2 zones*  
Residential Two (R2) is a medium density residential planned use. Population densities may be around 1 050 persons per hectare, with a maximum plot ratio of 5.0.
- *Private housing in R3 and R4 zones, villas and bungalows*  
Residential Three (R3) is a medium to low density residential planned use. Population densities may be around 470 persons per hectare, with a maximum plot ratio of 3.0. Residential Four (R4) is a low density residential planned use. Building height is restricted to no more than 2 storeys with a maximum plot ratio of 0.4.
- *Modern Village Houses*  
These are limited to a site area of approximately 65 square metres and to a height of 3 storeys, and which are in the New Territories Small House Category.

## LOAD

<i>Type of development</i>	<i>Recommended BOD load (g/head/day)</i>	<i>Recommended SS load (g/head/day)</i>
Residential, all types	55	55
School (not including canteen)	23	23
Office (not including canteen)	23	23
Factories (not including industrial and canteen wastes)	23	23
Services	to be pro-rata to equivalent residential population	
Restaurants/Canteens	300 g/m <sup>2</sup> kitchen area/d	300 g/m <sup>2</sup> kitchen area/d

The use of garbage grinders may increase the per capita contribution of BOD by about 30% and of SS by 60%, and such increases should be taken into account in the design of the STP.