TRADE EFFLUENT DISCHARGE INTO SEWERS - A GUIDEBOOK TO GOOD PRACTICES

1st Edition - Dec 2007
Whilst every care has been taken in the compilation of the information, responsibility for the accuracy thereof cannot be accepted.
WORKING TOGETHER TO ENSURE TRADE EFFLUENT COMPLIES WITH THE LEGISLATIONS

The Public Utilities Board (PUB) administers the Sewerage and Drainage Act (SDA) and its regulations, such as Sewerage and Drainage (Trade Effluent) Regulations (SD(TE)R). The main objectives of these legislations are:-

(i) Environmental protection.
(ii) Safeguard of water resources.
(iii) Safety of the public sewerage system.

The legislations also state the requirements for the discharge of trade effluent into public sewer. The discharge of non-compliant trade effluent may cause:-

(a) Disruption to the treatment process at the water reclamation plants (WRPs).
(b) Disruption to NEWater production, and
(c) Safety hazards such as fire and explosion.

PUB was assisted by the National Environmental Agency (NEA) in the enforcement of the legislation with respect to trade effluent until mid-2004. Since then, we have gradually taken over the enforcement of the legislations. We wish to inform you that all matters pertaining to the discharge of trade effluent into the public sewers now come under PUB. Thus, for the past 2 years, PUB has been actively engaging factories in dialogue sessions on good practices with regards to the SD(TE)R. We thought it might be useful for you if we compile some of the more commonly asked questions and important information as a guidebook.

By consciously taking steps to ensure that your trade effluent discharged into the public sewers complies with the legislations, you can facilitate the water reclamation and NEWater processes.

We hope that you will find this guidebook helpful and we look forward to a collaborative partnership with you.
1. PUB’s WATER LOOP

As the national water agency, PUB plans, manages and safeguards Singapore’s water resources. Our mission is to secure an efficient, adequate and sustainable supply of water. From rainwater collection to used water treatment, the entire water loop is managed by PUB.

By closing the water loop (Figure 1), PUB has put in place the Four National Taps, a long-term water supply strategy that ensures Singaporeans will have a sustainable supply of water for generations to come.

![Figure 1: PUB Water Loop](image-url)
2. WHERE DO YOU FIT IN THE PUB’s WATER LOOP

Used water discharged from industries is collected and conveyed via an extensive sewerage reticulation system for treatment at water reclamation plants (WRPs). These constitute the sewerage system (Figure 2). Used water is a resource and the treated used water can be further purified using advanced membrane technology to produce NEWater.

3. OUR WATER RECLAMATION PROCESS

- **Used Water Treatment Process**

In the water reclamation plant, the used water is separated into two streams for treatment - the liquid stream and the solid stream. The heart of the water reclamation plant is the biological treatment process in the aeration tanks which use micro-organisms to break down the pollutants in the used water.

A description of our used water treatment process at our WRPs is given in ANNEX (1).
- **NEWater Process**

  The treated used water produced by the water reclamation plant can be further purified using advanced membrane technology to produce high-grade reclaimed water. Treated used water goes through three main processes namely microfiltration, reverse osmosis and ultra-violet disinfection to produce NEWater.

  A description of our NEWater process is given in ANNEX (2).

4. **WHY MUST THE DISCHARGE OF TRADE EFFLUENT INTO SEWERS BE CONTROLLED?**

  Sewers carry used water to WRPs. WRPs treat the used water so that it can then be reused for other purposes, such as NEWater or discharged to the sea without affecting the environment. The used water is usually treated biologically, that is the used water is treated using micro-organisms.

  Unauthorised discharges of trade effluent into sewers are dangerous as they may damage the sewers, be a health hazard for sewerage workers or the general public, or inhibit or kill the micro-organisms which are used to treat the water, affecting the production of NEWater or the environment. For example, the presence of volatile solvents in certain quantities renders the atmosphere in the sewerage system explosive and can result in fire or explosion endangering persons working there.
5. WHAT ARE THE CONSEQUENCES OF DISCHARGE OF ILLEGAL TRADE EFFLUENT?

As the water reclamation process is biological in nature, certain contaminants like heavy metals and toxic substances may inhibit the activities of the micro-organisms and adversely affect the used water treatment process.

![Photo 1: Effluent chamber in a WRP covered with "foam". Illegal discharge of certain heavy metals which inhibit the biological treatment process and the breakdown of detergents can cause this.](image1)

![Photo 2: Raw sewage contaminated by the presence of remnants of partially degraded colored dyes in trade effluent discharged by factories.](image2)

If the water reclamation process is disrupted due to illegal discharge of substances into the sewers, the treated used water may not be able to meet the water standards to produce NEWater.
6. YOUR ROLE AND WHAT YOU CAN DO

You play an important role in PUB’s water loop. By taking steps consciously and responsibly to treat your trade effluent discharged into the public sewers, you can facilitate the water reclamation and NEWater processes. For example, it would be more efficient to segregate and collect liquid waste while it is still in its concentrated form for off-site disposal through licensed waste collectors. We have described the relevant details of what you can do in the form of answers to frequently asked questions by other factories who discharge trade effluent into sewers. These are presented in Section 9.

We have also listed some good practices in management of trade effluent discharge into sewers at ANNEX (3).

7. LEGISLATION RELATED TO TRADE EFFLUENT DISCHARGE INTO SEWERS

The Public Utilities Board (PUB) administers the Sewerage and Drainage Act (SDA) which governs the provision, operation and maintenance of our sewerage system. The treatment and discharge of trade effluent by factories into public sewers are regulated by the SDA and the Sewerage and Drainage (Trade Effluent) Regulations (SD(TE)R).

Sewerage And Drainage Act (SDA)

The main sections relevant to the discharge of trade effluent into sewers are:-

**SDA (Section 16) - Trade effluent not to be discharged into public sewers without Board’s approval**

(1) Any person who discharges or causes or permits to be discharged any trade effluent into any public sewer or any drain-line or sewer communicating with a public sewer without the written approval of the Board shall be guilty of an offence and shall be liable on conviction to a fine not exceeding $20,000.
(2) Where any trade effluent had been discharged from any premises into any public sewer or any drain-line or sewer communicating with a public sewer, it shall be presumed, until the contrary is proved, that the occupier of the premises has discharged or causes or permits to be discharged the trade effluent in contravention of subsection (1).

**SDA (Section 17) - Prohibition on discharge of dangerous trade effluent**

(1) Where the Board reports to the Minister that any trade effluent which is being discharged from any premises into the public sewerage system is dangerous to health or safety or will cause damage to the public sewerage system, the Minister may by order direct the occupier of the premises:-

(a) To cease immediately the discharge of such trade effluent into the public sewerage system;

(b) To take such steps as may be specified in the order to treat the trade effluent which is complained of; and

(c) To cease immediately the carrying on of any process or work which produces the trade effluent either indefinitely or until such steps as are specified in the order have been taken to treat the trade effluent before it is discharged into the public sewerage system.
Sewerage And Drainage (Trade Effluent) Regulations (SD(TE)R)

The SD(TE)R specifies the criteria you need to comply with if you wish to discharge trade effluent into the sewers. Main points are:-

(1) You need to have valid permit (Written Approval) to discharge:-
   
   (a) The Written Approval (WA) specifies the conditions you have to comply with;
   
   (b) You need to renew your WA if there is:-
       
       (i) A change in process or operation; or
       
       (ii) A change in the layout of the machinery, plant and equipment, which will affect the amount or the physical, organic or chemical nature of the trade effluent discharged.
   
(2) The quality of the trade effluent allowed to be discharged.

ANNEX (4) shows the water quality requirements for trade effluent discharge into public sewer.

You can apply for a WA online at www.pub.gov.sg
8. **PENALTY FOR DISCHARGING NON-COMPLIANT TRADE EFFLUENT**

The penalty for an offence under the SDA is a max fine of $20,000 and under the SD(TE)R’s a max fine of $5,000. For offences under item b, c and d, the WA may be revoked.

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<th>Offence Under</th>
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<td>(b)</td>
<td>Nature of effluent do not comply with regulations</td>
<td>SD(TE)R</td>
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<td>(c)</td>
<td>Effluent contained prohibited substances</td>
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<td>(d)</td>
<td>Effluent contained certain substances more than the allowable limits</td>
<td>SD(TE)R</td>
<td>Max fine of $5,000</td>
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9. FREQUENTLY ASKED QUESTIONS

In this section, we have compiled and addressed some of the frequently asked questions by factories who discharge trade effluent into sewers. We believe these will also be useful for you.

Q1. **What is trade effluent?**

Trade effluent refers to any liquid, including particles of matter and other substances suspended in the liquid, which is the outflow from any trade, business or manufacture or of any works of engineering or building construction.

Q2. **Does the act apply to me?**

If your company produces trade effluent which you intend to discharge into a public sewer, you have to apply for a Written Approval (WA) from PUB. The WA specifies the conditions that you have to comply with if you want to discharge trade effluent into the sewers.

You can apply for a WA online from the PUB website at [www.pub.gov.sg](http://www.pub.gov.sg)

You are responsible for ensuring that trade effluent is collected and disposed off responsibly. Do remember that discharging trade effluent into a sewer without approval from PUB, or discharging non-compliant trade effluent into public sewers is a violation of the SDA and is **illegal**. As a business operator, you have a duty to ensure that any waste you generate is handled safely and in accordance with all environmental legislations.

Q3. **Is my WA valid for all the operations of my business?**

The WA is valid for your business in the location applied for. You don’t have to re-apply for a new WA unless there is (a) a change in process or operation or (b) a change in the layout of the machinery, plant and equipment, which will affect the amount or the physical, organic or chemical nature of the trade effluent discharged.
### Action | Penalty
--- | ---
My factory has ceased operations | Inform PUB in writing to cancel the WA. Your WA will be cancelled and any deposit paid (applicable to those paying monthly trade effluent fees) will be refunded after settling all outstanding bills.
My factory has shifted to a new location | Inform PUB in writing of new address and apply for a new WA. Provide an updated business registration certification from the Accounting & Corporate Regulatory Authority (ACRA).
My factory has changed its status e.g. from sole proprietor to private limited | Inform PUB in writing of new status and apply for a new WA. Provide an updated business registration certification from ACRA.
My factory has changed its name | Inform PUB in writing of change in name and attach a copy of the updated business registration certification from ACRA. You need not apply for a new WA.
My factory is undergoing a change in trade activity which will increase the volume of trade effluent to be discharged | Inform PUB in writing of the new activity and the volume of trade effluent to be discharged. Provide a copy of the updated process drawing and other relevant documents e.g. chemical usage. You need not apply for a new WA if the nature of the effluent remains the same.

WA is accomplished by a validity period. Please check the validity period of your WA and to re-apply for a new WA before the existing one lapses.

**Q4. What kind of trade effluent can be discharged into the public sewers?**

All trade effluent discharged into public sewers must meet the criteria specified in the SD(TE)R under the following headings:-

(a) Nature and type of trade effluent,
(b) Trade effluent to be free of certain substances, and
(c) Maximum concentrations of certain substances.

Please check out the water quality requirements for trade effluent discharge into public sewer in ANNEX (4) for details.
Q5. What should I do with trade effluent that does not comply with the requirements for discharge into sewers?

If you are not able to meet any of the criteria, you can either:

(a) Install a used water treatment facility in your premises to pre-treat the non-compliant trade effluent so that the water quality parameters are within the acceptable limits and remove the prohibited substances from your trade effluent before discharging it into the sewers, or

(b) Engage a licensed waste collector to collect and dispose off your trade effluent off-site.

Q6. What do I need to do if my company generates toxic industrial wastes?

The handling of toxic industrial wastes is regulated by the Environmental Public Health Act (EPHA), governed by the National Environmental Agency (NEA). Under the EPHA, you need to engage a licensed toxic waste collector to collect and dispose off your toxic waste off-site. You will also need to properly account for all your waste generation. You may also be required to declare your waste disposal through NEA’s e-consignment system. For more information on the proper handling of toxic industrial wastes, please refer to the NEA’s website at www.nea.gov.sg. You should not engage a General Waste Collector to collect your toxic industrial wastes.

Q7. If my trade effluent has BOD and SS exceeding 400 mg/l which I cannot treat, what can I do?

You may apply for permission to discharge the trade effluent under the “Trade Effluent Tariff Scheme”. Under this scheme, upon approval from PUB, you will pay fees for the discharge of such trade effluent into public sewers. The fees payable shall be in accordance with the scale set out in ANNEX (4).

However, approval will not be granted for the discharge of trade effluent which contains:

(a) Biochemical Oxygen Demand (BOD) greater than 6,000 mg/l of the trade effluent, or

(b) Total Suspended Solids (TSS) greater than 6,000 mg/l of the trade effluent, or

(c) Chemical Oxygen Demand (COD) greater than 10,000 mg/l of the trade effluent or three times the concentration of BOD in the trade effluent, whichever is the lower.
Q8. What should I do if there is an accidental discharge of non-compliant trade effluent into the sewers?

If you know or suspect that there is an accidental discharge or non-compliant trade effluent being discharged into the sewers, please inform us as soon as possible. We can then alert the water reclamation plants of any incoming non-compliant trade effluent, allowing them to take the necessary action.

You can contact us through PUB-ONE, our 24 hour toll free hotline at 1800-284 6600.

Q9. What precautions can I take to avoid discharging non-compliant trade effluent into sewers?

Here are some practical and simple tips you can follow to help avoid discharging any illegal trade effluent accidentally:

(a) Make sure you have an updated and accurate sanitary drainage plan available at all times, clearly identifying the locations and flow of all existing drains and sewers around your premises.

(b) You should maintain your pre-treatment plant (if you have) properly so that it can function effectively. Examples of common pre-treatment plants are oil interceptors and pH neutralizing systems.

(c) You should know where the discharge points for collection of spent solvents for disposal by licensed waste collectors. When making a discharge of trade effluent, always check that you are connected to the correct system.

(d) Store and handle raw materials, wastes, chemicals and fuels responsibly, so that they do not enter the sanitary drainlines, floor traps and sewers on your premises.

(e) Have available commercial spill kits or absorbent granules/sawdust at locations where spills or leaks of pollutants can occur and find their way into sewers. Make sure your staff know where they are and how to use them.

(f) Good practice for clearing solvent spill - do not wash up the spill; use absorbent, spill kits, paper wipes or rags to absorb or wipe up the spillage and dispose them as solid wastes; do not wash the rags for re-use.
(g) Ensure that all relevant employees and contractors are familiar with and comply with your procedures for handling, disposing and discharging liquid wastes.

(h) Explore possibilities for using alternative materials and practices.

Q10. How can a maintenance schedule help me?

If you have a pre-treatment plant in your facility, a maintenance schedule is essential to ensure that the plant is operating properly and treating your trade effluent adequately. You may refer to your operation manuals or the consultant, or your vendor or contractor to plan a comprehensive inspection and maintenance schedule.

Here are some useful pointers for you to take note of:-

(a) Keep records of all the servicing and calibration intervals of all the process instruments used in the pre-treatment plant.

(b) Implement a servicing schedule for tasks including thorough inspection of the equipment and replacement of any consumable parts on a regular basis.

(c) Keep proper records of the mechanical components such as the pumps and stirrers in the pre-treatment plant.

Q11. How can a process monitoring schedule for the pre-treatment plant help me?

Together with a maintenance schedule, a process monitoring schedule effectively monitors the performance of your treatment process.

Here are some useful pointers for you to take note of:-

(a) Implement a schedule to regularly collect trade effluent samples from the pre-treatment plant and check that the treatment complies with the discharge limits as stipulated in the SD(TE)R. You may use commercially available analytical kits e.g. colorimetric tests.

(b) From time to time, collect and send trade effluent samples to an external accredited laboratory for accurate analysis.

(c) Keep records of all test results, monitor for any process trends and revise the maintenance and monitoring schedules accordingly.
Q12. What are some good practices that can be adopted in maintaining oil interceptors?

Here are some points you will find useful:

(a) An oil interceptor has to be maintained regularly so that it can continue to treat trade effluent properly. You should implement a maintenance schedule which requires regular check for:

(i) Excessive built-up of scum and debris which may get carried into the public sewers,

(ii) Build-up of oil stains on the walls of the interceptor, and

(iii) Sufficient water level in the interceptor.

(b) You are also encouraged to implement a monitoring schedule to regularly check the quality of the trade effluent discharged from oil interceptors. Trade effluent samples may be collected from the outlet of an interceptor and sent to accredited laboratories for two tests: “Oil-and-Grease (Total)” and “Oil-and-Grease (Hydrocarbon)”. If you operate a motor-shop or trade that involves the use of industrial solvents such as metal degreasers, you are also encouraged to send your trade effluent samples for “Gas Chromatographic Mass Spectrometry (GCMS)” analysis to detect for inflammable substances. Such laboratorial tests are useful for you to review your maintenance schedule of the oil interceptor.

(c) An oil interceptor needs to be cleaned periodically. In the cleaning process, please:

(i) Plug the outlet of the interceptor during the cleaning process so that no used water from the interceptor flows into the public sewers during the cleaning.

(ii) Use water-jet or steam to remove residual oil stains from the walls and T-pipes of the interceptor.

(iii) Engage a licensed waste collector to remove the contents in the interceptor into proper containers, to dispose off the contents in accordance to the Environmental Public Health (Toxic Industrial Waste) Regulations.
(iv) Inspect the interceptor thoroughly for cracks which can lead to water seepage.

(v) Re-fill the interceptor with clean water in all the compartments.

d) The collection, transportation and disposal of toxic wastes such as waste oil and spent solvents are regulated by the Environmental Public Health (Toxic Industrial Waste) Regulations, administrated by the National Environmental Agency (NEA). You are encouraged to seek NEA’s advice on the proper collection, transportation and disposal of waste oil and spent solvents.

Q13. Where should I collect samples?

The sample that you collect for analysis should be representative of the treatment quality of your pre-treatment plant. Samples of the treated trade effluent should be collected at the sampling tank or sump of the pre-treatment plant. See Figure 3.
Q14. What should I test for in the trade effluent samples?
The parameters or the pollutants to test for depend on the trade you are in. For instance, if you are operating an electroplating facility, the pollutants that you should be testing for are the heavy metals such as copper if you are involved in copper plating.

Q15. Whom can I send my sample to for 3rd party analysis?
You can send your samples to an accredited laboratory for analysis. For more information, please visit the Singapore Accreditation Council (SAC) website at http://www.sac-accreditation.org.sg

Q16. How can I find out more about the Acts and regulations?
To speak to PUB regarding the discharge of trade effluent into the public sewers, please contact:-

PUB-ONE (24 hour toll free hotline): 1800-284 6600

Or directly to the departments-in-charge at:-

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<td>Environment Building</td>
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<td>Singapore 228231</td>
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To read the Acts in detail, please visit the Attorney-General Chamber’s website at http://statutes.agc.gov.sg/. If you wish to obtain hard copies of the legislations or documents e.g. “Singapore Standards”, you can purchase them from SNP Corporation Ltd at:-

SNP Corporation Ltd
Legal Publishing
1 Kim Seng Promenade #18-01 /06
Great World City East Tower
Singapore 237994
http://www.snpcorp.com
Tel: (65) 6826 9691
ANNEX (1)

USED WATER TREATMENT PROCESS

In the past few decades, we have seen rapid development in the used water infrastructure. Today, Singapore has a world-class sewerage system where all of the population is served by modern sanitation.

Used water from both domestic and non-domestic sources is collected via a comprehensive network of underground public sewers. The collected used water is treated at the six water reclamation plants (WRPs) of PUB to render it clean for reuse or discharge into the sea.

Figure 1 shows the aerial view of a typical water reclamation plant.
Figure 2 shows the used water treatment process schematic.

LIQUID STREAM

- **Preliminary Treatment - Screen / Detritor / Cyclone**
  - Solid debris and grit materials in the raw used water are removed by screening (Figure 3) and other physical removal methods.
**Primary Treatment - Primary Sedimentation Tank / Primary Clarifier**

- Allows solid pollutants in suspension to settle to the bottom of tank as sludge (Figure 4).

- Lighter materials such as scum and greasy material are removed and combined with the sludge for further treatment (Solid Stream).

- Top water with reduced pollutants, called settled sewage, will then proceed for secondary treatment.

**Secondary Treatment - Biological Treatment Process**

- Consists of aeration tanks which act as bio-reactors and final sedimentation tanks.

- Biological treatment takes place in the aeration tank; oxygen is supplied by surface aerators (Figure 5) or diffused air system (Figure 6).

- Culture of micro-organisms (activated sludge) break down the dissolved organic pollutants in the used water, and they are converted to solid matter which can be separated by settling.

- At final sedimentation tanks (Figure 7), the mixture of treated water and activated sludge will settle and clear supernatant water is collected and discharged from the tank as final effluent (Figure 8).

- Most of the settled sludge is sent back to aeration tank to sustain the optimal bio-reaction process, and excess of it is sent for further treatment (Solid Stream).
Final Effluent

- The standard for final effluent is 20 mg/l biochemical oxygen demand (BOD) and 30 mg/l suspended solids (SS).
- Some final effluent is further treated into NEWater, and the rest discharged to the sea.

SOLID STREAM

Solid Treatment - Sludge Thickening

- Sludge is thickened to reduce the water content of the sludge.
- The process of thickening can be performed by dissolved air flotation thickeners or thickening centrifuges (Figure 9).
- The thickened sludge is then fed to anaerobic sludge digesters (Figure 10).
Solid Treatment - Sludge Digestion

- Another culture of micro-organisms that thrives in an anaerobic environment will break down the organic substances in the sludge.

- The biological treatment converts the organic matter into a useful by product, biogas, which contains up to 70% of methane.

- The biogas is then fed to dual-fuel engine generators (Figure 11) to generate electricity, which provides a substantial portion of the power requirement of the whole water reclamation process.
Solid Treatment - Sludge Dewatering

- Digested sludge is dewatered to further reduce the water content to facilitate handling for final disposal.
- The physical process of dewatering can be performed by filter press (Figure 12), belt press or dewatering centrifuge (Figure 13).
- The dewatered sludge is then disposed off at designated landfill.
NEWater is ultra-clean because it goes through a rigorous multi-barrier water reclamation process that ensures its quality and purity. These processes are shown in Figure 1 and are described briefly below.

**MICRO FILTRATION**

The treated used water is passed through membranes to filter out suspended solids, disease-causing bacteria and viruses. These are retained by the membrane. The filtered water that makes its way through contains only dissolved salts and organic molecules.
REVERSE OSMOSIS

In the next stage of the NEWater production process, a semi-permeable membrane is used. It has tiny pores which allow only very small molecules like water molecules to pass through. Undesired contaminants such as bacteria, viruses, heavy metals and pesticides cannot penetrate the membrane. See Figure 2.

Reverse osmosis is widely used in many other areas, such as the production of bottled water for drinking and ultra-pure water for wafer fabrication. It is even used to recycle water for drinking in space shuttles.

ULTRAVIOLET (UV) DISINFECTION

After reverse osmosis, the water is already of a very high grade. The final step, UV disinfection, is used as a safety back-up. It involves using ultraviolet light to ensure that any remaining organism is inactivated.

With the addition of chemicals to restore the pH balance, the NEWater is then ready for use.
ANNEX (3)

GOOD PRACTICES IN MANAGEMENT OF TRADE EFFLUENT DISCHARGE INTO SEWERS

(a) You are encouraged to have copies of the relevant legislations in your premises for reference. These include:-

(i) “Sewerage and Drainage Act” for trade effluent discharge and related matters

(ii) “Environmental Public Health Act” for the handling of toxic industrial wastes and related matters

You are also encouraged to refer to the “Code of Practice (Pollution Control)” and “Code of Practice (Sewerage and Sanitary Works)” for guidelines on good practices for specific scope of work.

(b) If you use chemicals and industrial solvents in your premises, you should obtain copies of the chemicals’ Material Safety Data Sheets (MSDS) from your chemical suppliers. Such MSDS provide relevant information e.g. the composition and instructions for proper disposal of spent chemicals.

(c) If you store chemicals and solvents in your premises, you must provide proper containment facilities for these substances. Proper containment methods include storing the containers on metal trays or building bund walls around the storage area, so as to avoid accidental leakage or spillage of chemicals into public sewers and drain lines.

(d) You should store materials such as grease, paints, detergents, metals, and raw materials in appropriate, labeled containers. All outdoor storage containers must have lids and the lids should be properly closed. You should also store stockpiled materials inside a building, under a roof, or covered with a tarp to prevent contact with rain.

(e) Maintenance work on equipment and vehicles should be done in designated or covered areas where the used water can be collected and disposed off separately. Drip pans to collect leaks or spills during maintenance activities should be used. The collected liquid shall be disposed off by licensed waste collectors.
(f) You are encouraged to provide spill kits in your premises in case of emergencies to clean up spillage of chemicals or petroleum in the premises. Soiled/contaminated absorbents e.g. soiled rags should be disposed off as solid waste.

(g) When removing oil and chemical stains off surfaces and on the floor, should first remove the stains locally, before wiping off the cleaning solvents and contaminated water using absorbents or rags. Such absorbents and rags should then be disposed off as solid waste.

(h) Empty drums and containers that were previously used for storing chemicals such as solvents and oil should be disposed off by licensed waste collectors or the chemical manufacturer. If you need to wash the containers for re-use, you have to ensure that the used water is properly collected and disposed off, to prevent prohibited pollutants in the used water from being discharged into the sewers.

(h) After any painting activity, paint brushes and other accessories used should be washed in a washing bay and the used water properly collected for disposal.

(j) You should brief your workers regularly on the proper disposal of waste generated from the factory’s trade activities. This will help prevent the disposal of illegal substances into public sewers due to ignorance.
ANNEX (4)
Refers to Sewerage and Drainage (Trade Effluent) Regulations 2008

WATER QUALITY REQUIREMENTS FOR TRADE EFFLUENT DISCHARGE INTO SEWERS

A. DISCHARGE LIMITS OF CERTAIN PARAMETERS AND SUBSTANCES IN TRADE EFFLUENT

(a) 6<pH <9
(b) Temperature < 45°C
(c) Caustic Alkalinity < 2,000 mg/l Calcium Carbonate per litre

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<th>Substances</th>
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</tr>
<tr>
<td>Detergents (LAS)</td>
<td>mg/l</td>
<td>30</td>
</tr>
<tr>
<td>Grease and Oil (Hydrocarbon)</td>
<td>mg/l</td>
<td>60</td>
</tr>
<tr>
<td>Grease and Oil (Non-hydrocarbon)</td>
<td>mg/l</td>
<td>100</td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/l</td>
<td>5</td>
</tr>
<tr>
<td>Barium</td>
<td>mg/l</td>
<td>10</td>
</tr>
<tr>
<td>Tin</td>
<td>mg/l</td>
<td>10</td>
</tr>
<tr>
<td>Iron (as Fe)</td>
<td>mg/l</td>
<td>50</td>
</tr>
<tr>
<td>Beryllium</td>
<td>mg/l</td>
<td>5</td>
</tr>
<tr>
<td>Boron</td>
<td>mg/l</td>
<td>5</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg/l</td>
<td>10</td>
</tr>
<tr>
<td>Phenolic Compounds (expressed as phenol)</td>
<td>mg/l</td>
<td>0.5</td>
</tr>
<tr>
<td>Fluoride</td>
<td>mg/l</td>
<td>15</td>
</tr>
</tbody>
</table>
### B. SUBSTANCES NOT TO BE DISCHARGED

The trade effluent discharged into a public sewer shall not contain any of the following substances:

(a) Any toxic industrial waste specified in the first column of the Schedule to the Environmental Public Health (Toxic Industrial Waste) Regulations;

(b) Calcium carbide;

(c) Petroleum spirit or other inflammable substances;

(d) Any organic compound specified in the First Schedule to the Sewerage and Drainage (Trade Effluent) Regulations;

(e) Any substance that either by itself or in combination or by reaction with other waste or refuse may give rise to any gas, fume, odour or substance which is or is likely to be a hazard to human life, a public nuisance, injurious or otherwise objectionable, or which prevents or is likely to prevent entry into the public sewer by workmen maintaining or repairing it;

(f) Yeast, spent or unspent molasses, crude tar, tar oil, crude oil, carbon disulphide, hydro-sulphide and poly-sulphide;

(g) Any radioactive material;

(h) Any waste or refuse liable to form a viscous or solid coating or deposit on any part of the public sewer or sewerage system;

(i) Any excessively discolouring substance;

(j) Any substance of a nature and quantity which is likely, either alone, in combination with or by interaction with other substance:

---

**Substances** | **Unit** | **Value**
--- | --- | ---
Cadmium | mg/l | 1
Chromium (trivalent and hexavalent) | mg/l | 5
Copper | mg/l | 5
Lead | mg/l | 5
Mercury | mg/l | 0.5
Nickel | mg/l | 10
Selenium | mg/l | 10
Silver | mg/l | 5
Zinc | mg/l | 10

Note: Where 2 or more of the metals listed in the table are present in the trade effluent, the total concentration of the metals shall not exceed 10 milligrams per litre.
(i) To cause a fire or an explosion in the public sewer or a sewerage system to which the public sewer is connected;

(ii) To cause damage to the public sewer or a sewerage system to which the public sewer is connected; or

(iii) To interfere with:-

• The proper working of a sewerage system to which the public sewer is connected, or any facility, machinery or equipment related or connected to the sewerage system;

• The proper working of any facility, machinery or equipment which treats sewage from the public sewer for reuse;

• Any process of treating trade effluent or other waste or refuse from the public sewer; or

• Any process of treating sewage from the public sewer for reuse;

(k) Any pesticide, fungicide, herbicide, insecticide, rodenticide or fumigant;

(l) Blood waste;

(m) Infectious waste.
### C. SCALE OF FEE FOR PERMISSION TO DISCHARGE TRADE EFFLUENT WITH BOD AND SS EXCEEDING 400 MG/L

<table>
<thead>
<tr>
<th>Concentration of BOD or TSS in milligrams per litre of trade effluent</th>
<th>Fee for Biochemical Oxygen Demand (Cents per cubic metre or part thereof)</th>
<th>Fee for Total Suspended Solids (Cents per cubic metre or part thereof)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceeding 400 but not exceeding 600</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>Exceeding 600 but not exceeding 800</td>
<td>42</td>
<td>30</td>
</tr>
<tr>
<td>Exceeding 800 but not exceeding 1,000</td>
<td>63</td>
<td>45</td>
</tr>
<tr>
<td>Exceeding 1,000 but not exceeding 1,200</td>
<td>84</td>
<td>60</td>
</tr>
<tr>
<td>Exceeding 1,200 but not exceeding 1,400</td>
<td>105</td>
<td>75</td>
</tr>
<tr>
<td>Exceeding 1,400 but not exceeding 1,600</td>
<td>126</td>
<td>90</td>
</tr>
<tr>
<td>Exceeding 1,600 but not exceeding 1,800</td>
<td>147</td>
<td>105</td>
</tr>
<tr>
<td>Exceeding 1,800 but not exceeding 2,000</td>
<td>168</td>
<td>120</td>
</tr>
<tr>
<td>Exceeding 2,000 but not exceeding 2,200</td>
<td>189</td>
<td>135</td>
</tr>
<tr>
<td>Exceeding 2,200 but not exceeding 2,400</td>
<td>210</td>
<td>150</td>
</tr>
<tr>
<td>Exceeding 2,400 but not exceeding 2,600</td>
<td>231</td>
<td>165</td>
</tr>
<tr>
<td>Exceeding 2,600 but not exceeding 2,800</td>
<td>252</td>
<td>180</td>
</tr>
<tr>
<td>Exceeding 2,800 but not exceeding 3,000</td>
<td>273</td>
<td>195</td>
</tr>
<tr>
<td>Exceeding 3,000 but not exceeding 3,200</td>
<td>294</td>
<td>210</td>
</tr>
<tr>
<td>Exceeding 3,200 but not exceeding 3,400</td>
<td>315</td>
<td>225</td>
</tr>
<tr>
<td>Exceeding 3,400 but not exceeding 3,600</td>
<td>336</td>
<td>240</td>
</tr>
<tr>
<td>Exceeding 3,600 but not exceeding 3,800</td>
<td>357</td>
<td>255</td>
</tr>
<tr>
<td>Exceeding 3,800 but not exceeding 4,000</td>
<td>378</td>
<td>270</td>
</tr>
<tr>
<td>Exceeding 4,001 but not exceeding 4,200</td>
<td>399</td>
<td>285</td>
</tr>
<tr>
<td>Exceeding 4,201 but not exceeding 4,400</td>
<td>420</td>
<td>300</td>
</tr>
<tr>
<td>Exceeding 4,401 but not exceeding 4,600</td>
<td>441</td>
<td>315</td>
</tr>
<tr>
<td>Exceeding 4,601 but not exceeding 4,800</td>
<td>462</td>
<td>330</td>
</tr>
<tr>
<td>Exceeding 4,801 but not exceeding 5,000</td>
<td>483</td>
<td>345</td>
</tr>
<tr>
<td>Exceeding 5,001 but not exceeding 5,200</td>
<td>504</td>
<td>360</td>
</tr>
<tr>
<td>Exceeding 5,201 but not exceeding 5,400</td>
<td>525</td>
<td>375</td>
</tr>
<tr>
<td>Exceeding 5,401 but not exceeding 5,600</td>
<td>546</td>
<td>390</td>
</tr>
<tr>
<td>Exceeding 5,601 but not exceeding 5,800</td>
<td>567</td>
<td>405</td>
</tr>
<tr>
<td>Exceeding 5,801 but not exceeding 6,000</td>
<td>588</td>
<td>420</td>
</tr>
</tbody>
</table>

No person shall discharge into any public sewer trade effluent containing -

(a) BOD greater than 6,000 milligrams per litre of the trade effluent;
(b) TSS greater than 6,000 milligrams per litre of the trade effluent;
(c) COD greater than 10,000 milligrams per litre of the trade effluent; or 3 times the concentration of BOD in the trade effluent, whichever is the lower.
About PUB

PUB is a statutory board under the Ministry of the Environment and Water Resources. It is the water agency that manages Singapore’s water supply, water catchment and used water in an integrated way. PUB won the 2007 Stockholm Industry Award and was named Water Agency of the Year at the Global Water Awards 2006.

About PUB’s tagline – “Water for All: Conserve, Value, Enjoy” PUB has ensured a diversified and sustainable supply of water for Singapore with the Four National Taps (local catchment water, imported water, NEWater, desalinated water).

To provide water for all, PUB calls on all Singaporeans to play our part to conserve water, keep our water catchments and waterways clean and build a relationship with water so we can enjoy our water resources. We can then have enough water for all uses – for industry, for living, for life.