City of Loveland
Department of Water & Power

Industrial Pretreatment Program

Requirements for the Reduction and Treatment of Waste from Alcohol Beverage Manufacturers

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Requirements for the Reduction and Treatment of Waste from Alcohol Beverage Manufacturers

1. INTRODUCTION

Alcohol Beverage Manufacturers use various grain products and yeast, have similar processes and equipment to produce the alcohol, and generate various quantities and types of liquid and solid wastes during the manufacturing process.

Various literature indicates a large percentage (70% – 80%) of the water used to manufacture alcohol ends up as effluent (discharged water). Much of that comes from draining and cleaning the equipment, overflow, spillage, and an occasional rejected batch of alcohol.

The wastes produced are high in organic material and suspended solids such as biochemical oxygen demand (BOD), chemical oxygen demand (COD), and total suspended solids (TSS). The wastes also have pH values that can be less than 5.5 or greater than 11.5. Other wastes of concern include: ammonia nitrogen, nitrate/nitrite, phosphorous, certain metals, and sulfides.

The wastes produced by Alcohol Beverage Manufacturers can cause issues in the City of Loveland’s wastewater collection system and Wastewater Treatment Plant (WWTP). The discharges referenced above can generate odors, corrode sewer pipes, and adversely impact the WWTP biological organisms. These high-strength wastes require additional costs to treat, can be the cause of costly repairs to the sewer infrastructure, and could negatively affect regulatory discharge limitations imposed on the WWTP.

City of Loveland pretreatment staff performed inspections at some of the local breweries after they were in operation. The inspections revealed that at least one brewer eliminated the use of filtering the solid waste (which resulted in sewer backups), that brewers do not treat wastewater to meet pH limits, and brewers have installed additional equipment. This results in an increased waste load to the sewer collection and treatment systems.

Chapter 13.10 of the Loveland Municipal Code contains the Wastewater Pretreatment Program requirements for the control of the discharge of industrial wastewater into the sanitary sewer. Section 301.A states “All industrial users shall provide wastewater treatment as necessary to comply with this chapter and shall achieve compliance with applicable categorical pretreatment standards, local limits, Best Management Practices (BMPs), and the prohibitions set out in Sections 13.10.202 through 13.10.205.”

Much of the information in this document will pertain to breweries, but it also encompasses distilleries, wineries, and similar facilities since the pollutants are similar.
2. **Definitions**

For purposes of this document:

*Alcohol* means beer, wine, distilled spirits, and liqueurs.

*Alcohol Beverage Manufacturer (ABM)* means a brewery, distillery, hard cidery, winery, or similar facilities where solid and liquid waste are produced as part of the operations.

*Best Management Practices (BMPs)* means a schedule of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent discharge problems. BMPs include pretreatment requirements, operating procedures, or practices to control drainage from process operations, spills, or waste disposal.

*BIOCHEMICAL OXYGEN DEMAND (BOD)* is a measurement of wastewater constituents that can be biologically oxidized.

*Chemical Oxygen Demand (COD)* is a measurement of wastewater constituents that can be oxidized.

*Stainless Steel* is an alloy steel with a bright silvery finish. The alloy generally has an 11% - 26% chromium base, with various percentages of metals (nickel, molybdenum, etc.).

*Total Suspended Solids (TSS)* is a measure of suspended solids in the wastewater.

3. **Alcohol Beverage Manufacturing Processes**

Manufacturing alcohol requires a series of steps. Depending on the type of alcohol produced and the size of the facility, not all steps may be used, other steps may be included, or steps might be combined. Although the steps may function similarly, they may have another name in a winery or a distillery operation.

The following is a brief explanation of the steps used to make alcohol. Although much of the information pertains to a brewery operation, several of the steps are applicable to distillers and wineries.

**Malting**: Malting is the process where grain is soaked in water, germinated, dried, and sometimes roasted. The grain most often used is barley, but wheat, rye, sorghum, and oats may also be used. Roasting the grains gives beer its color and taste. The lighter the roast the lighter the beer. The heavier the roast, the darker the beer. Some ABMs choose to perform malting; others purchase pre-malted grain.

**Milling**: The malted grain is sent through a grist mill to crack (crush) the grain and open the husk of the kernels; this is called grist. Some ABM crush their grain; while others purchase crushed grain.

**Mashing**: Mashing is done in the Mash Tun. It is where the crushed grain (grist) is combined with warm water to activate the enzymes. Water is combined with the grist in one of two ways:
i. Infusion mashing, the grains are heated up in one vessel (the mash tun);

ii. Decoction mashing, a portion of the mash is transferred from the mash tun and boiled in a separate vessel (called the kettle), then returned to the original mash.

The liquid consisting of water and sugar resulting from mashing is called wort. The combination of water, sugar, and grain is called mash.

**Lautering:** Lautering is done in a Lauter Tun to separate the wort (sugary water) from the spent grain using water to extract more fermentable sugars (*e.g.*, sparging). This step is eliminated if the ABM is trying to get the alcohol as high as possible.

**Boiling and Hopping:** Boiling the wort ensures sterility. Hops are added to the wort. Hops can be added anytime during or after the boil process depending on the flavor and aroma desired by the brewer.

**Hop Back/Whirlpool:** A hop back is typically used with whole hop cones, but a whirlpool is used with hop pellets. The Whirlpool is a specially designed container that clarifies the wort by removing protein and hop solids through settling. These solids are known as trub. A *Hop Back* is a type of vessel for whirlpooling used to filter the trub.

**Heat Exchanger:** A heat exchanger is used to reduce the temperature of the wort desired for fermentation. Water heated by this exchange is often used by brewers to start a new brewing cycle.

**Fermenting:** A fermentation tank usually has a conical bottom. Wort is transferred to the tank. Yeast is added to breakdown the sugars extracted resulting in alcohol and carbon dioxide (CO2). When fermentation is complete, the yeast become dormant and begin to settle to the bottom of the fermentation vessel.

**Conditioning / Krausening:** Conditioning reduces the levels of undesirable by-products to produce a more finished and desirable product. Krausening is a secondary fermentation typically used to produce lagers. Krausening involves adding fermenting wort and yeast to help carbonation and to eliminate unwanted aspects of the primary fermentation.

**Filtering:** Filtration removes excess yeast, hops, grain, and particles. Filtering can be achieved using simple mesh screens to more elaborate diatomaceous earth materials.

**Brite Tanks:** – Brite tanks are used to store the finished product (typically beer).

**Packaging/Distribution:** Packaging involves putting the alcohol in the bottles, cans, kegs, or barrels prior to distribution.

**Aging:** Aging means setting the product aside in oak barrels, or in containers with oak, other wood, fruit, etc., to alter the character of the finished product.

**A. Other Distillery Processes**

**Distilling:** Distillation is a method of separating compounds by boiling and then condensing
and collecting the alcohol. There are two primary methods of distillation, each used for different purposes:

i. **Pot Distillation** - most commonly used for flavored spirits, such as whisky, brandy, schnapps, etc.

ii. **Reflux Distillation** – most commonly used for distilling neutral spirits (vodka), some rum, and gin.

**B. Other Winery Processes**

**Fining:** The process of adding an agent (such as bentonite or gelatin) to help clarify and stabilize the finished wine. This operation is done before bottling to help ensure the product will not be cloudy or flocculant in the bottle.

**Lees:** The spent yeast cells that die out and accumulate on the bottom of winemaking vessels after the population has completed the fermentation.

**Maceration:** The process of soaking crushed grapes, seeds, and pulp in the wine must to extract color and aroma compounds as well as tannins.

**Must:** refers to the soupy mass of squished skins, seeds, and pulp that are fermented together. *Must* can be a mixture of juice, seeds, skins, and pulp for red or rose wines or only the juice for white wines.

**Pomace:** The solid portion of the *Must*.

**Racking/Clarification:** The process of decanting/siphoning the wine from one vessel to another to separate the lees (dead yeast and solids) from the wine. Racking may occur an average of three times during the winemaking process: once during fermentation, once after fermentation and once more after fining. Some wineries may choose to perform additional Racking.

The following table shows a comparison of the basic steps used to manufacture beer, distilled spirits, and wine. As stated above, there may be other steps (processes) involved in making alcohol beverages depending on the manufacturer and their size of operation.

<table>
<thead>
<tr>
<th>Typical Processes to Produce Alcohol</th>
<th>Brewery</th>
<th>Distillery</th>
<th>Winery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malting</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Milling/Crushing</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mashing</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lautering</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiling</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fermentation</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Filtering/Clarification</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaging/Aging</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Distilling</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Following are example process flow schematics for different ABMs.

Example Brewer Process Schematic

Note: At certain facilities some steps may be combined with others.
Example Distillery Process Schematic

Example Winery Process Schematic
4. **Wastes and Effects**

Manufacturing alcoholic beverages requires significant volumes of water, especially for beer. Depending on how efficient a brewer is, it can take between 4 – 8 gallons of water to produce 1 gallon of beer. ABMs produce various amounts of liquid waste. The City of Bend, Oregon together with 10 Barrel Brewing Company report 4 – 10 barrels of wastewater (124 – 310 gallons) is generated for each barrel (31 gallons) of beer brewed. The King County Industrial Waste Program reports the breweries they permit generate on average 2.5 gallons of wastewater for each gallon of beer produced. The Napa Sanitation District reports 6 gallons of wastewater is produced per gallon of wine.

Wastewater comes from drainage, spills, cleaning, sanitizing, bad product, bottling, and floor wash-downs. Many tanks used to produce and store alcohol are made of stainless steel that require routine cleaning and sanitizing typically with the use of acidic and caustic cleaners. Acidic wastewater can have negative effects on the wastewater collection system and the wastewater treatment process.

ABMs produce various types of solid waste:

- Typical solid waste from a brewery includes spent grains, trub (*hops & protein*), yeast (*cake or slurry*), and diatomaceous earth slurry from filtration.
- Typical solid waste from a winery includes stems, skins, and seeds.

Solid wastes can accumulate in the sewer collection system, taking up valuable space and causing unacceptable conditions (backups, odors, corrosion, etc.). Solids that make their way to the WWTP will also take up valuable space. Solids in the wastewater are known as Total Suspended solids (TSS).

In addition to TSS, another pollutant is Biochemical Oxygen Demand (BOD). BOD and TSS monitoring data from King County Washington, Bloomington, Indiana and information presented at a Craft Brewers Conference are shown below as well as BOD and TSS data compiled by Napa Sanitation District on the wineries in their area. The values vary significantly depending on the ABM’s operation and measures in place to manage the wastes generated.

<table>
<thead>
<tr>
<th>King County Washington</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>BOD mg/l</td>
</tr>
<tr>
<td>TSS mg/l</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bloomington, IN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>BOD mg/l</td>
</tr>
<tr>
<td>TSS mg/l</td>
</tr>
</tbody>
</table>
Excessive amounts of TSS and BOD can affect the collection system, the WWTP biological processes, and lead to additional operational and maintenance costs.

5. **Prohibited Discharges**

The Loveland Municipal Code has contained prohibited discharge standards since July 1970 (Ordinance #1099). Much of the waste produced from manufacturing alcohol contains pollutants that are prohibited from being discharged into the sewer system due to the various problems they can create or cause. Following is a list of those pollutants that pertain to alcohol beverage manufacturing and the section of city code that regulates the pollutants.

- The pH of the wastewater from alcohol manufacturing ranges from 3 to 12 standard units (s.u.). Wastewater with a pH lower than 5.5 s.u. or greater than 11.5 s.u. is prohibited by City Code 13.10.202.2.2 from discharge to the sewer.

- Any wastewater with a pH less than or equal to 2 s.u. (\(\leq 2.0\)) or greater than or equal to 12.5 s.u. (\(\leq 12.5\)) is considered hazardous waste, prohibited by City Code 13.10.609, and must be reported to the City of Loveland Pretreatment Program, Colorado Department of Public Health and Environment, and the Environmental Protection Agency.

- The wastes discharged can produce hydrogen sulfide gas, which can create explosive conditions, endanger worker health, and is the cause of most sewer odors. These are prohibited by City Code Sections 13.10.202.2.1, 13.10.202.2.7, and 13.10.202.2.9.

- Hydrogen sulfide gas can be converted to sulfuric acid, which causes corrosion in the sewer mains and lift stations. If the corrosion is severe enough, it will lead to structure failure and cause an uncontrolled release of wastewater and disruption of service. Discharge of corrosive wastewater is prohibited by City Code Section 13.10.202.2.2.

- Temperature of the wastewater from certain processes used to manufacture alcohol can be up to 200° F. If the facility is close to the WWTP the discharge could result in a violation of City Code Section 13.10.202.2.5 by exceeding the city standard of 104° F.
- The solids concentration ranges from 100 to over 8,000 mg/l. Solids will settle in the sewer line and eventually obstruct the flow of wastewater causing a backup. In addition, yeast can create a jelly like substance (slime) in the sewer line and create an obstruction or backup. Solids that can cause obstruction are prohibited by City Code Section 13.10.202.2.3.

- The pollutants produced in manufacturing alcohol are also high in BOD and COD and are prohibited by City Code Section 13.10.202.2.4. The BOD from a brewery can range from 700 to over 24,000 mg/l. Literature reviewed reports COD can range from 1,096 to 8,926 mg/l. Excessive BOD can decrease the oxygen in the wastewater and cause the bacteria (needed to treat the wastewater) to die.

- Other pollutants such as phosphorous, ammonia, and metals may also be of concern.

The volume, concentration, and frequency of the wastes discharged can cause capacity issues at the City of Loveland’s WWTP. Pursuant to (current) Colorado law, C.R.S. section 25-8-501 (5) (d) & (e), when the WWTP is at eighty percent of capacity (flow, BOD) it is required to plan for a facility expansion. By ninety-five percent of capacity the WWTP is required to begin construction of an expansion.

The City of Loveland’s WWTP is primarily designed to treat domestic sewage. Customers who discharge non-domestic type wastewater are called Industrial Users. Industrial Users’ wastewater typically contain pollutants or chemicals that have the potential to harm the sewer collection system or adversely affect the WWTP treatment processes.

To prevent harm to the sewer system, the WWTP, and the Big Thompson River, Industrial Users may be required to use treatment techniques and/or management practices to reduce or eliminate the discharge of harmful pollutants to the sewer system; this is called "pretreatment".

Considering the above, the increase in ABMs, and the concern with an increase in pollutants to the sewer system, the City of Loveland’s Pretreatment Program finds it necessary to implement pretreatment requirements for ABMs to:

- Ensure the wastes produced are properly treated, managed, and disposed;
- Prevent degradation of the wastewater collection system;
- Prevent adverse effects at the WWTP; and
- Protect City workers.

6. Regulatory Options

Loveland Municipal Code Chapter 13.10 authorizes the issuance of wastewater discharge permits and other control mechanisms to prevent the introduction of pollutants into the sewer system that could adversely affect the facilities, structures, or equipment used to collect, transport, or treat the wastewater. In addition, the City may deny or condition new or increased contributions of pollutants by industrial users where such contributions could cause problems.
A. **Wastewater Discharge Permit**

Issuing a Wastewater Discharge Permit would be costly and burdensome to ABMs. At a minimum, the business would be required, at its expense, to install and maintain pretreatment equipment, install and maintain sampling and monitoring equipment, sample their discharge, and meet local discharge limits.

The Pretreatment Program would be required to inspect and sample the wastewater to verify compliance and would recover the cost of performing such inspections and sampling.

Issuing a discharge permit is an option for an ABM that the City may deem to be a Significant Industrial User (SIU) or where compliance is not achieved.

B. **Control Mechanism**

The discharge from most ABMs will be considered acceptable if they take active measures to prevent contaminants such as solids, high temperatures, and extremes in pH from discharge to the sewer system. A suitable control mechanism for this approach is Best Management Practices or BMPs.

BMPs are intended to reduce the solids and organic load to the sanitary sewer as well as the effects of those wastes. Using BMPs may also result in a cost savings to the business by reducing water and chemical usage at the facility.

City Code Section 13.10.304 provides the authority to develop BMPs for categories of industrial users, such as ABMs. The Pretreatment Program intends to issue an “Authorization to Discharge” that specifies the requirements expected of an ABM.

7. **Requirements for Alcohol Beverage Manufacturers**

The following requirements are proactive techniques for ABMs to implement in order to prevent the discharge of undesirable pollutants to the sewer. The requirements are written with larger breweries in mind as those would have more impact on the sewer system.

ABMs should plan to have sufficient floor space for a wastewater pH equalization/treatment tank, treatment chemical containers, and solids handling equipment and storage. Section 10 of this document provides examples of treatment systems.

To meet the requirements, ABMs should use applicable BMPs contained in Section 11 of this document.

A. **Solids**

1. All floor drains must be fitted with covers or screening devices, which have openings small enough to prevent the pass-through of solids to the drain from the alcohol
producing processes. Solids shall be retained in a suitable container (totes, tanks, barrels, etc.) until disposed off-site.

2. Residual solids in hoses, pipelines, cookers, vessels, kettles, and tanks shall be collected and then removed by settling, straining, screening, filtering, or other approved method. The solids shall be properly stored until disposed off-site as solid waste, recycled as animal feed, compost, or other beneficial use.

3. Yeast (spent or active) shall not be disposed to the sanitary sewer. Yeast can be disposed of as a solid waste, recycled as animal feed, compost, or other beneficial purpose. Associated wastewater may be decanted and discharged to the sanitary sewer, provided it meets pH discharge limits between 5.5 and 11.5.

B. Wastewater & pH

1. All wastewater with the potential to have a pH less than 5.5 standard units (s.u.) or a pH greater than 11.5 s.u. shall be pretreated by:
   i. collecting the wastewater from individual wastestreams in a sufficiently sized container (tote, tank, barrel, etc.) and neutralizing the pH prior to discharge to the sewer, or
   ii. collecting all process wastewater in a sufficiently sized container (tote, tank, barrel, etc.) and neutralizing the pH prior to discharge to the sewer.

2. The pH of wastewater shall be tested prior to discharge with a pH meter or pH strips.
   i. The pH meter shall be calibrated in accordance with manufacturer’s specifications and documented.
   ii. pH measuring strips must be stored in a dry location protected from sunlight and used in accordance with manufacturer’s specification.

C. Temperature

Wastewater having a temperature that exceeds 140 degrees Fahrenheit shall not be discharged to the sewer.\(^1\) Exceptions may be granted depending on the volume, frequency, and temperature of the wastewater.

Wastewater in such quantities that causes the temperature at the WWTP influent to exceed 104 degrees Fahrenheit is prohibited.

D. Meters

Existing and new facilities shall have a meter(s) to measure the volume of water used to produce alcohol.

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\(^1\) The maximum suggested temperature rating for schedule 80 and SDR 35 PVC pipe and fittings is 140° F.
The City may also require a meter to measure the volume of wastewater discharged to the sanitary sewer to understand the ratio of water used to wastewater discharged.

E. Records

Facilities may be required to document any or all of the following:
  i. Daily water meter reading and gallons.
  ii. Number of barrels or gallons of alcohol produced.
  iii. Volume of wastewater captured, treated, and disposed.
  iv. Volume and type of solid wastes captured.
  v. Date and location where solid waste was disposed.
  vi. pH of the wastewater captured and after treatment before discharged to sewer.
  vii. pH meter calibration.

All records must be maintained on-site and available for review for the most current three (3) year period.

F. High Strength Sewer Surcharge

Wastewater from manufacturing alcohol is subject to a high strength sewer surcharge in accordance with Section 13.08.101 of the Loveland Municipal Code. The City may require the business to sample and analyze its discharge to determine the waste strength, use related industry values for waste strength, or the City may sample and analyze the wastewater to evaluate compliance and strength of the wastewater.

Sending excessive amounts of high-strength waste to the sewer can disrupt the sewer system and/or increase high strength surcharge fees. Minimize the volume of unused and off-spec product discharged to the sewer. For more information on reducing waste to the sewer see Section 11 of this document.

G. Other Requirements

1. New ABMs may be required to have drains from the alcohol process areas flow to a common drain, sump or wastewater tank where the wastewater can be properly managed and treated.
2. Existing ABMs may be required to have drains from the alcohol process areas flow to a common drain, sump or wastewater tank when compliance is not being achieved or operations are expanded.
3. A sample monitoring point may be required to ensure wastewater meets requirements.
4. ABMs shall provide appropriate reports or information to the director as the director may require.

8. ACCESS

In accordance with Section 13.10.701 of the Loveland Municipal Code, City of Loveland personnel shall be provided reasonable access to all facilities which directly or indirectly discharge to Loveland's sewage system at all times, including those occasioned by emergency conditions, and shall be allowed to perform inspections and take independent
9. **ENFORCEMENT ACTIONS**

   Enforcement actions resulting from non-compliance shall be applied in accordance with the Loveland Industrial Wastewater Discharge Regulations and the Loveland Pretreatment Enforcement Response Plan (ERP). A copy of the Regulations and the ERP can be found at [www.cityofloveland.org/pretreatment](http://www.cityofloveland.org/pretreatment).

10. **TREATMENT SYSTEMS AND MONITORING POINT**

   Example treatment systems are shown on the following pages in Figures 1 – 3.

   Depending on the size of the alcohol manufacturing operation, a treatment system can be as simple as that shown in Figure 1 or a more elaborate system as shown in Figure 3.

   If an ABM is required to install a monitoring point it must be easily accessible and located so that it is representative of the discharge from the manufacturing operations only (e.g., no restroom or restaurant drains).

   As referenced earlier, wastewater from alcohol manufacturing is subject to a high strength sewer surcharge. One factor used to determine the surcharge is discharge volume, which can be accomplished in two ways.

   1. Measuring the volume of all associated alcohol process wastewater discharged to the sanitary sewer. Figures 1 – 3 below show where a flow meter could be installed to measure the volume of wastewater.

   2. Using a water meter to measure the water associated with the brewery operations (i.e.; manufacturing alcohol, cleaning equipment, etc.).

   Sending excessive amounts of wastewater to the sewer can increase high strength surcharge fees.
In addition to collecting spent yeast, grains, hops and trub, consider collecting the following high strength wastes for beneficial reuse or disposal off-site:

- Off-spec and unused product
- Tank heels and initial rinse of tanks
- Product & yeast lost in racking and transfer
- Product lost in filtering, bottling, & kegging

Brewery Wastewater BMP Guidance
Example pH Neutralization Schematic – Single Daily Batch

Brewery Wastewater BMP Guidance

1. Sump pump(s) with level controls set to prevent gravity overflow through the sewer outlet under peak flow conditions from the production area. Check valve and flow control valve not shown.

2. Sump or lift station with protective grating.

3. Tank for self-neutralizing of acidic and alkaline industrial wastewater and for adjusting pH by addition of concentrated neutralizing chemicals. Wastewater to be collected for an entire workday to allow for batch treatment and discharge at the end of the workday. Conical tank with stand shown. A flat-bottom tank can be used as well, but solids handling is a bit more labor-intensive. The piping and valving shown allows for the tank to be operated in batch decant mode through the lower decant lines.

4. Use a mechanical mixer or hand paddle (for small tanks) to facilitate the neutralizing of acidic and alkaline industrial wastewaters.

5. Test wastewater batch with a pH probe to regulate the delivery of neutralizing chemicals to the tank. The pH probe needs to be located where it can be constantly submerged.

6. Valves in a normally-closed position. Side decant valves to be opened when decanting the neutralized and clarified tank wastewater in batch decant mode. Tank bottom valve to be opened for removal of settled solids or for tank cleaning.

7. Neutralizing chemicals to be added manually or with aid of a chemical metering pump.

8. Discharge pH probe positioned in a vented "T" to allow for ease of access and to remain constantly submerged during batch discharge.

9. Flow meter in valve box or other suitable structure with protective grating. The meter is to be installed per manufacturer's instructions and have datalogging capability.

Source: King County Washington Industrial Waste Program
Example pH Neutralization Schematic – Flow-Through or Multiple Batch

1. Sump pump(s) with level controls set to prevent gravity overflow through the sewer outlet under peak flow conditions from the production area. Check valve and flow control valve not shown.

2. Sump or lift station with protective grating.

3. Tank for self-neutralizing of acidic and alkaline industrial wastewater for adjusting pH by addition of concentrated neutralizing chemicals. Conical tank with stand shown. A flat-bottom tank can be used as well, but solids handling is a bit more labor-intensive. The piping and valving shown allows for the tank to be operated in flow-through mode through the upper overflow line or in batch decant mode through the lower decant lines.

4. Mechanical mixer with impeller or propeller blades to facilitate the neutralizing of acidic and alkaline industrial wastewaters. Mixer should be set at a slight angle and sized to turnover the tank volume at least a few times within the hydraulic retention time. Mixer mounting not shown to provide clarity to the schematic and as styles vary.

5. Controlling pH probe used, along with the pH controller (9), to regulate the delivery of neutralizing chemicals to the tank. The controlling pH probe can be moved to other locations within the tank based on the particular tank geometry and experience with what works best for stable pH control. For discharges in batch mode, the controlling pH probe needs to be a located where it can be constantly submerged.

6. Valves in a normally-closed position. Side decant valves to be opened when decanting the neutralized and clarified tank wastewater in batch decant mode. Tank bottom valve to be opened for removal of settled solids or for tank cleaning.

7. Chemical metering pump integrated with the controlling pH probe (5) through the pH controller (9). pH setpoints established to deliver acidic or alkaline concentrated neutralizing chemicals with a sufficient safety factor to ensure that the discharge pH probe (11) remains within local discharge limits.

8. Separate secondary containment for the concentrated acid and alkaline neutralizing chemicals.

9. pH controller integrated with the controlling pH probe (5) and chemical metering pumps (7).

10. pH and flow recorder and datalogger connected to the discharge pH probe (11) and flow meter (12) to monitor the pH and volume of the industrial wastewater discharged to the sanitary sewer. Any sanitary wastewater (e.g., restrooms, etc.) must enter downstream from the discharge pH probe (11) and flow meter (12).

11. Discharge pH probe positioned in a vented “T” to allow for ease of access and to remain constantly submerged.

12. Flow meter in valve box or other suitable structure with protective grating. The meter is to be installed per manufacturer’s instructions and have datalogging capability. Ability for the flow meter to integrate with an autosampler to collect flow-proportioned samples also may be required for large volume dischargers.

Source: King County Washington Industrial Waste Program
11. **Best Management Practices**

Best Management Practices (BMPs) are measures taken to prevent the discharge of undesirable wastewater and solids to the sanitary sewer that would not meet the requirements stated in Section 7 above. Below are some activities, prohibitions, procedures, and other practices to prevent sanitary sewer issues:

- Control liquids (wastewater) and solids at the source. Do not let them hit the ground.
  - Set aside sufficient floor space for a wastewater pH equalization/treatment tank, treatment chemical containers, and solids handling equipment and storage.
  - Use adequate size containers to capture and managed the wastes.
  - Capture liquid from cleaning or sanitizing equipment and neutralized.
  - Do not disconnect lines until the proper containment is in place to capture the waste.
  - Install screens that are easy to access and service. Use correct gauge screen to maximize solids removal.
  - Dry-sweep spills where possible using brooms, scrubbers and squeegees, and dispose of collected material in the trash. This reduces both water use and the organic load of wastewater.

- Batch treat the wastewater to meet pH limits (pH treatment requires adequate mixing).

- Leave a head space in tanks to prevent overflowing.

- Reuse hot water from the heat exchanger. Instead of discharging this hot water to the sewers, water can be directed back to the hot liquor tank for brewing the new batch.

- Wash water needs to be treated before discharging to it to the sewer system. Use a pressure washer or water-efficient nozzle during cleanup operations to reduce water use.

- A well-designed cleaning station can reduce the volume of water requiring treatment following the cleaning process.

- Use manual cleaning methods like scrubbing with scrub pads, brooms or brushes before hoses are used to reduce water usage and wastewater discharge.

- Store chemicals in low traffic areas to prevent and isolate a spill and to lessen the chance of an accidental spill.

- Reduce heat loss by fully insulating the water heater.

- Reduce single pass cooling and replace with a recirculation system.

- Conserving water can reduce wastewater and save money. Do not leave water running. Check for and fix leaks on equipment.

Additional examples of water conservation and BMPs can be found in the Brewers Association’s Water and Wastewater: Treatment/Volume Reduction Manual document (pages 20 to 35).

12. **References**
City of Loveland Municipal Code, Chapter 13.10 Wastewater Pretreatment Program Regulations.

City of Loveland Wastewater Treatment Plant Discharge Permit, CO0026701.

Code of Federal Regulations, Title 40 Part 403.

Brewers Association, Water and Wastewater Treatment/Volume Reduction Manual

Brewery sector recommendation memorandum, June 2016, by Arnaud Girard, KCIW Compliance Investigator, King County Washington.

Brewery Wastewater Best Management Practices presentation by Arnaud Girard, KCIW Compliance Investigator, King County Washington.


Brewer to Sewer presentation by Christina Davenport, Industrial Pretreatment Technician, City of Bend Oregon and Emily Edens, 10 Barrel Brewing Co.

Micro-breweries in Ashville, presentation by Jon van Hoff, Industrial Pretreatment Coordinator, Metropolitan Sewerage District of Buncombe County.


Tamara Roberts, Pretreatment Coordinator, Utilities Department, City of Bloomington, Indiana.
Dave Haughey, Pretreatment Coordinator, South Fort Collins Sanitation District.
Mary Paterniti, Pretreatment Coordinator, City of Longmont, Colorado.

Metropolitan Disposal System (Twin City area), Industrial Waste & Pollution Prevention (IWPP) Section Information for General Permits – Microbreweries, Brewpubs, and Distilleries.


minimum requirements for AMB’s producing less than 3,000 barrels per year or discharging less than 1,000 gallons per day.

ABMs producing 3,000 – 15,000 barrels per year or discharging between 1,000 – 24,999 gallons per day of process wastewater

ABMs producing more than 15,000 barrels per year or discharging 25,000 gallons per day or more of process wastewater may require a specific treatment system and discharge permit with specific pollutant discharge limitations.

New ABMs will be required to install a water meter to measure the usage for all activities related to producing alcohol. Existing ABMs expanding the facility, equipment, or production may be required to do the same.

New ABMs will be required to have all wastewater associated with producing alcohol flow to a central collection point. Existing ABMs expanding the facility, equipment, or production may be required to do the same.

Concerns may require changes, treatment,