

Standards for the Proper Management of Open and Closed Loop Wastewater

Guideline

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Applies To: All internal staff and contractors performing work on open and closed loop systems

The purpose of this document is to publish a standard to guide maintenance units and outside contractors in activities related to recovery and disposal of liquids in open and closed loop systems.

Open and closed loop systems are certain HVAC piping and storage systems containing non-potable liquids and include cooling towers, heating hot water systems, chilled water systems, and energy recovery systems. These systems often contain water treatment chemicals such as biocides, corrosion inhibitors, buffering agents, scale inhibitors, etc. The fluids in these systems could also contain glycol or other non-potable liquids.

Operation and maintenance of these systems frequently involves adding, removing, recovering, and disposing of fluids. To ensure compliance with Local, State, and Federal standards and regulations, Facilities Maintenance worked with the University of Michigan (U-M) Environment, Health, & Safety Department (EHS) to establish protocols on how these fluids **must** be managed.

Support for Meeting Discharge Requirements

U-M EHS provides technical and waste management assistance. For information on contacts and procedures, see the following web pages:

- <https://ehs.umich.edu/environmental/water/sanitary-drain-disposal/>
- <https://ehs.umich.edu/hazardous-waste/chemical-waste/>

Storm Water Drainage and Sanitary Sewer Systems

There are two types of water collection systems on campus. The storm drainage system collects storm water runoff from areas outside of buildings and from building rooftops. Storm water runoff receives little to no treatment before discharging to surface waters or infiltrating into the ground. Discharge of chemicals, cleaners, solids, etc. to the storm water drainage system is not permitted as it can be detrimental to receiving waters.

Sanitary sewer systems are designed to collect wastewater from building interiors and direct it to the City wastewater treatment plant (WWTP), where it is filtered and treated to remove contaminants prior to discharge to the Huron River. The WWTP regulates the concentration of certain chemicals and water chemistry permitted for discharge into the sanitary sewer system to help avoid detrimental effects to the treatment process. This is why liquids from looped systems **must** be evaluated prior to discharge.

Discharge of Liquids to the Storm Water Drainage System

No fluids from looped systems may be discharged into storm drains, roof conductors, or into the general environment, except de minimus (negligible) quantities of clean (city) water from cooling towers, as described below (see “Cooling Tower Loops”).

Discharge of Glycol

No glycol containing solutions may be discharged to the storm or sanitary sewer systems under any circumstance. Glycol (whether ethylene or propylene) **must** be either collected in containers for re-use or disposal by U-M EHS Hazardous Materials Management (HMM). Where glycol is used, for instance to winterize coils, rinse or flush water **must** also be collected for disposal until the concentration of glycol is less than 0.25%, which may then be discharged to the sanitary sewer system.

Note on Glycol for Winterizing Coils

Winterizing coils and piping with glycol is strongly discouraged. Creating dilute glycol solutions, particularly in chilled water systems, fosters biological growth and thereby accelerates corrosion and bio-fouling. This is costly in both labor and can cause serious damage to water systems. Allowing even trace amounts of glycol into a chilled water loop will likely lead to increased maintenance needs and damage to infrastructure. Where glycol use is absolutely necessary, the winterized equipment **must** not be placed back in service by opening the coil/piping to the rest of the system thus allowing glycol from the coil or piping to mix with the bulk system water. The glycol **must** first be drained and collected for proper disposal. The winterized equipment shall then be flushed with clean water, which is also collected. All glycol waste and wastewater must be collected in approved containers and staged in an appropriate location for collection and disposal by U-M HMM.

Discharge of Closed Loop Water to the Sanitary Sewer System

Wastewater from closed loop systems (such as chilled water or heating hot water, but not loop systems containing glycol) may be drained to sanitary if it meets specified conditions (See Table 1). Otherwise it **must** be collected and either reused or disposed of by U-M HMM. It **must** never be discharged to the storm sewer system or ground.

Table 1. Analysis Thresholds for Discharge to Sanitary (subject to change by the City)

CONSTITUENT	THRESHHOLD	CONSTITUENT	THRESHHOLD
Arsenic	< 2100 µg/L	Molybdenum	< 4900 µg/L
Barium	< 100 mg/L	Nickel	< 3000 µg/L
Beryllium	< 10 µg/L	Selenium	< 1400 µg/L
Cadmium	< 1000 µg/L	Silver	< 240 µg/L
Chromium	< 4000 µg/L	Zinc	< 3000 µg/L
Copper	< 4000 µg/L	pH	5 ≤ x ≤ 10
Lead	< 500 µg/L	Glycol	< 0.25%
Mercury	< 0.2 µg/L		

NOTE: If there is a chance that a system contains or contained Lithium Bromide, EHS may request to have Lithium included in the analysis at an additional cost.

Wastewater Analysis

Samples of loop wastewater **must** be collected by EHS staff (until such time as other approved staff are appropriately trained in proper sampling technique, as determined by EHS) in approved sample containers for analysis at an EHS approved laboratory. Contact U-M EHS a minimum of three (3) weeks ahead of planned work to allow for adequate time to obtain a sample, have it analyzed by the laboratory, and discuss disposal options upon receipt of the analytical report from the lab.

Cost for Analysis

Typical cost for analysis of the metals and pH noted above is approximately \$150. If there are constituents present in the loop water above City discharge limits noted above or the sample needs to be analyzed for glycol or lithium, additional testing may be required (~\$200 additional lab fee). ***Note**, there may be emergency situations that arise requiring analysis in a more timelier manner. It is possible to have samples analyzed and results returned within 48hrs of receipt by the lab, however, the costs of analysis would increase. All costs are to be recharged to the project.

Approval Notification Process

Maintenance staff should contact U-M Facilities Water Treatment Program Manager to coordinate with EHS to determine whether a closed loop has met analysis requirements and is approved for discharge to the sanitary sewer system. Outside contractors should work through their U-M project manager who will contact U-M EHS, as needed.

Cooling Tower Loops

All wastewater from cooling towers and associated system piping containing any chemicals **must** be discharged to sanitary drains, subject to limitations on concentration of chemicals, constituents, and materials specified herein.

Cleaning of Cooling Towers

It is acceptable to have otherwise unavoidable minimal quantities of clean (city) water reach roof or storm drains, if these result from seasonal cleaning of cooling towers (rinse and wash using no chemicals or cleaners), and then only when:

- As much of the water as possible is discharged to sanitary. This may require the use of pumps and drain hoses to get to a sanitary drain.
- The water in the tower and piping no longer contains any treatment chemicals or cleaners (i.e., treatment has been taken offline for a sufficient period, such as at fall shutdown, or at startup before treatment has been placed online, and provided no glycol or other antifreeze was utilized).
- Appropriate approved measures are taken to prevent discharge of solids (mud, sediment, debris, etc.) to roof drains/storm system.
- Completing a final rinse in the fall or pre-start cleaning in the spring (where no chemicals/cleaners are utilized or are present).
- Draining piping for winterization (such as water in equalizer lines), where the water remaining in pipes cannot be drained to sanitary, and provided it contains no chemicals.
- Opening drain valves to protect out-of-service towers and piping from freeze damage due to off-season rainwater accumulation in tower pipes and basins.

Solids Management from Cooling Tower Cleaning Activities

Cooling tower solids **must** be removed and disposed of in the standard solid waste stream (i.e., building dumpsters). Minimal amounts of solids which remain may be flushed or washed to a sanitary wherever possible, and otherwise to the roof if provision is made to control and prevent solids discharge to roof drains, which discharge to the storm sewer system. This may involve the use of filters in roof conductors/drains, which **must** be removed after the cleaning is completed (and the solids collected) to prevent roof flooding and damage that could be caused in the event of a storm.

General Information on Blow-down

Cooling tower blow-down and overflow piping **must** discharge to sanitary. Where city meters are present, blow-down **must** discharge through the meter(s), which are not to be bypassed or taken out of service. Tower overflow conditions which could result in spillage of tower water to roof (and hence to storm) **must** be prevented where possible, and corrected immediately if they occur.

Contact information

To arrange for testing, please contact U-M EHS-EP3 at 734-936-1920 or email stormwater@umich.edu

To arrange for drums or to discuss off-site disposal options, contact U-M EHS Hazardous Materials Management at 734-763-4568.

To discuss loop systems and/or pH adjustment, please call the U-M Facilities and Operations Water Treatment Program Manager at 734-764-3045.

Revision History

REVISION #	DATE	REVISION #	DATE	REVISION #	DATE	REVISION #	DATE
Original	04/29/16	2	07/26/18				
1	05/11/17						