

FESHM 8025: WASTEWATER DISCHARGE TO SANITARY SEWERS

Revision History

| Author | Description of Change | Revision Date |
|---|---|----------------------|
| E. Mieland C. Greer | <ul style="list-style-type: none">Added relevant reference to DOE Order 458.1 <i>Radiation Protection of the Public and the Environment</i> | August 2022 |
| E. Mieland, J. D. Cossairt, M. Quinn, C. Greer, E. Korzeniowski | <ul style="list-style-type: none">Revised references to radioactivity in water with respect to the FRCM.Editorial changes as needed. | February 2020 |
| Katie Swanson | Added applicability statement on leased spaces | January 2018 |
| Katie Kosirog | <ul style="list-style-type: none">Added the sentence, “<i>If discharging more than 50 gallons per day is imperative to the process, ESH&Q Section approval is needed.</i>” in Section 5.0, procedure number 7Hyperlinks for regulations removed due to ever-changing web addressesRemoved FESS form 8025, “FESS Form for Modifications to Fermilab Sanitary Sewerage Systems” and made it part of the DP-18 process | November 2014 |

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1.0 INTRODUCTION

Discharges to sanitary sewerage systems are regulated by the Illinois Environmental Protection Agency (IEPA) under authority delegated to the state by the U.S. Environmental Protection Agency. Ultimate authority is under the 1972 Clean Water Act (CWA) and amendments passed in 1977 (see APPLICABLE STANDARDS, below, for a complete list of state and federal standards).

Regulations apply to every user of a sewerage system and forbid the discharge of pollutants that might pass through publicly owned treatment works (POTW) untreated, or that could create an unsafe situation for POTW workers, or that might interfere with the operations of the POTW.

Illinois regulates the use of the sanitary sewerage system by enforcing the federal pretreatment program. Fermilab discharges are subject to discharge standards set by federal, state, and local regulations and ordinances. Effluents are conveyed to POTW facilities in Batavia and Warrenville/Naperville, and are subject to discharge limits set by municipal ordinance (see Table 2 for specific limits). Fermilab also holds Division/ Section specific pretreatment permits to release treated effluent to the sanitary sewerage systems from various industrial processes. These permits require periodic analysis and reporting to the IEPA.

This chapter describes procedures intended to protect the integrity of the Fermilab sanitary sewer system, and to ensure that discharge limits are not exceeded at the point where our discharge enters the public sewerage systems, i.e., at the Fermilab site boundaries.

This chapter only applies to the Fermilab site. Leased spaces will follow the rules and regulations set forth by the partnering institution and/or state or local codes and standards.

APPLICABLE STANDARDS

Illinois Plumbing Code at 77 Illinois Administrative Code (IAC) Chapter 890

Illinois NPDES regulations at 35 IAC Subtitle D

City Code for Batavia

City Code for Warrenville

DOE Order 458.1

2.0 DEFINITIONS

Derived Concentration Standards (DCS): The concentration of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 mrem (1 mSv). (DCS values are presented in DOE Technical Standard 1196-2011 and are discussed further in FRCM Article 1106).

Effluent: Any wastewater discharged, directly or indirectly, to the waters of the State (e.g., via a storm sewer or a sanitary sewer).

Neutralization: Decreasing the acidity or alkalinity of a substance by adding alkaline or acidic materials.

pH: A measure of hydrogen ion concentration in an aqueous solution. Solutions with a pH between 0 and 7 are acidic and solutions with a pH between 7 and 14 are basic.

Pollutant: Any substance introduced into the environment that adversely affects the usefulness of the resource.

Pollutant Load: The total amount of a pollutant in any given volume of wastewater (Concentration x Volume).

Pollution: The presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the CWA, the term is defined as a man-made or man-induced alteration of the physical, biological, or radiological integrity of water.

Pretreatment: Any process used to reduce a pollutant load before it enters the sewer system. Pretreatment of effluents requires a pretreatment permit from IEPA. Some examples of pretreatment might include neutralization, filtration, etc.

Publicly Owned Treatment Works (POTWs): A waste treatment works owned by a state or local government unit.

Sanitary Sewer: A sewer which carries sewage. Storm, surface, and ground waters are intentionally not admitted.

Sewage: The waste and wastewater produced by residential and commercial establishments and discharged into the sewers.

Storm Sewer: A sewer that is designed to drain excess rain water from streets, parking lots, sidewalks, roofs, etc.

Waste Treatment Plant: A facility containing a series of tanks, screens, filters, and other processes by which pollutants are removed from water.

Wastewater: The spent or used water from individual homes, a community, a farm, or an industry that contains dissolved or suspended matter.

3.0 RESPONSIBILITIES

3.1 ES&H Section

The ES&H Section is responsible for the development and implementation of the site wide surveillance and monitoring program to audit Division/Section/Project compliance with both internal and external discharge limits. In all matters relating to administrative aspects of existing or pending permits, ES&H will assume the role of lead communicator with DOE and the relevant agency.

Memorandum of Understandings may be put in place to further clarify responsibilities between the ES&H Section and D/S/Ps.

Additionally, DOE Order 458.1: *Radiation Protection of the Public and the Environment* requires sites to have a compliant Environmental Radiation Protection Program (ERPP). Fermilab's ERPP constitutes Fermilab's implementation plan for the requirements of the Order. Fermilab maintains and implements several plans and programs (this chapter included) for ensuring that the management of facilities, wastes, effluents, and emissions does not present risk to the public, workers, or the environment. ES&H is also responsible for preparing the reports required in Section 2.g(8) of the Contractor Requirement Document for DOE Order 458.1.

3.2 Division/Section/Project (D/S/P) Heads

D/S/Ps are responsible for:

- implementing this chapter (this includes consulting the ES&H Environmental Protection Group to provide advice on means and methods to remain in compliance with applicable standards and this chapter),
- knowledge of the infrastructure into which effluents from their areas are discharged, characterization of their waste streams (using sampling and analytical methods that conform to Standard Methods for the Examination of Water and Wastewater or an equivalent standard), and the maintenance of auditable records for all processes under their control,
- ensuring that any planned modifications to the sewerage system are included in the Director's Policy 18 review process,
- contacting the ES&H Section when a new industrial pretreatment permit is needed,
- sampling and providing all pertinent information needed for permit applications and reports.

3.3 FESS

FESS is responsible for:

- maintaining documentation of sewer lines, connections, flows, and the condition of the collection system,
- operating the deionization resin regeneration process located in the Central Utility Building (CUB) and sampling and maintaining records needed to satisfy the terms of the pretreatment permit associated with this process,
- approving the design of additions/modifications to the Fermilab sanitary sewer system, maintaining a liaison with POTW operators in Batavia and Warrenville/Naperville.

4.0 PROGRAM DESCRIPTION

Two separate sanitary sewer systems serve Fermilab, one of which is connected to the Batavia publicly owned sanitary system, and one to the Warrenville Fox Hollow Collection system which is treated at Naperville's Springbrook Water Reclamation Center (see Figure 1 for contributions to the two systems).

Decisions on disposal of process wastewater should always be made using any and all potential measures to eliminate or minimize wastes at the process level, including re-using or recycling process chemicals where appropriate. Please see FESHM chapter 8022 Waste Minimization and Pollution Prevention Awareness Program.

Fermilab has developed discharge criteria to aid employees in making informed decisions about the release of wastewater onsite. Prohibitions and discharge criteria set in this chapter have been chosen to meet concentration limits set by municipalities and our pre-treatment permits. These criteria prevent the introduction of any material into sanitary sewers that would interfere with the operation of POTWs, jeopardize equipment or compromise safety.

5.0 PROCEDURES

When new sewers or modifications to existing sanitary sewers are contemplated, the design must be reviewed through the FESS Design Review Process (DP-18). No division/section/project, employee, or contractor shall establish, or permit to be established any connection between sewerage and potable water supplies. All modifications to sewers must be done by contractors licensed by the state of Illinois.

Discharge of wastewater into the sanitary sewers from processes at Fermilab should proceed only after careful analysis. The ES&H Environmental Protection Group should always be consulted prior to the discharge, to ensure that this chapter is being followed correctly. The general steps to be taken are as follows:

1. Determine if there are further steps that may be available to minimize or prevent the discharge from the process. Possible steps include use of alternate chemicals that have less toxic properties, using fewer chemicals, re-capturing discharge to re-use or recycle materials either here or off site.
2. Ensure that none of the prohibitions (see Table 1) would be violated by the proposed discharge.
3. Verify that the process from which the discharge is planned is not a categorical process. The only way to assure that this step is completed is to compare the extensive list of categorical processes in the federal regulations (40 CFR 400-471) with the process at Fermilab that is producing the discharge. This step should be done by the ES&H Environmental Protection Group in consultation with the D/S/P. See Appendix A for examples of categorical pretreatment standards.
4. Determine the characteristics of the wastewater to be disposed of, including:
 - a. Volume (gallons),
 - b. Release rate (gallons per day),
 - c. Concentration of all regulated constituents (milligrams per liter),
 - d. pH,

- e. Radiological constituents and activity (picocuries per milliliter). See FRCM Chapter 11, Article 1106.
5. Calculate the daily pollutant load(s) by applying the following formula (Note that 1 gallon = 3.784 liters):
- $$\text{Concentration (mg/l)} \times \text{Volume (l)} = \text{Load (mg)}$$
- Ex: 164 mg/l of copper \times (400 gal \times 3.784 liters/gal) = 248,230 mg Cu
- (In this example we want to see if we can discharge daily a 400 gallon solution containing 164 mg/l of copper)
6. Compare the calculated load(s) with discharge criteria in Table 2. The load must be smaller than the factor in the table for the discharge to be allowable.
- Ex: In our example from above, the daily load from our Cu discharge, 248,230 mg is above the limit of 242,000 mg, and the discharge is prohibited.
7. Effluents with a pH equal to or below 2.0 or equal to or above 12.5 are considered Hazardous Wastes under RCRA regulations and may not be discharged without further treatment (i.e., neutralization). If the pH of a potential discharge falls between 2.0 and 5.5, or between 9.0 and 12.5, and all other discharge criteria are met, the wastewater may be discharged to the sanitary sewer at a rate not to exceed 50 gallons per day. If discharging more than 50 gallons per day is imperative to the process, ES&H Section approval is needed. Effluents with pH from 5.5 to 9.0 can be released if all other discharge criteria are met.
8. Effluents potentially containing radionuclides can be discharged only if they comply with discharge limits specified in DOE Order 458.1 as summarized in FRCM Chapter 11, Article 1106.

6.0 Table 1

MATERIALS PROHIBITED FROM DISCHARGE INTO FERMILAB SEWERAGE

These requirements apply at the point where the process discharge enters the Fermilab sewerage system, i.e., at the point of generation. The following substances are **prohibited in any amount** from entering into the system:

- Flammable and/or explosive materials,
- Any RCRA hazardous waste,
- Any solids or highly viscous substances (e.g., garbage, paper, cinders, sand, metal, rags, tar, wood, etc.),
- Biocides (toxins or poisons) in a quantity sufficient to disrupt the sewage treatment process,
- Storm water, surface water, ground water, roof runoff, subsurface drainage, cooling water or unpolluted process water,
- Ethylene glycol. However, a 50% solution of propylene glycol may be released at a rate not to exceed 100 gallons per day,¹
- pH less than 5.5 and more than 9.0 (in accordance with 5.0 Procedures, part 7),
- Any other material that would cause any disruption to the wastewater treatment process, such as, levels of chemical oxygen demand, oil and grease (more than one hundred (100) parts per million by weight), and suspended solids, etc. that will cause an interference with the POTW. (for a comprehensive list, see the city code for Batavia and city code for Warrenville),
- Water containing radionuclide amounts exceeding the thresholds established in the Fermilab Radiological Control Manual, Chapter 11 Articles 1104, 1105, 1106 and Appendix 11C.

¹ Agreement with City of Batavia Wastewater Treatment Facility, Byron Ritchason, Superintendent (1/12/12 via phone).

7.0 Table 2

**FERMILAB INTERNAL DISCHARGE LIMITS ON WASTEWATER SEWERAGE
 DISPOSAL
 (NON-RADIOLOGICAL CONSTITUENTS)²**

| Pollutant | Maximum Concentration (mg/L)³ | Maximum Daily Pollutant Load in a Process Effluent (in mg) |
|------------------|---|---|
| As | 0.50 | 60000 |
| Ba | 5.00 | 605000 |
| Cd | 0.30 | 36000 |
| Cr+3 | 3.00 | 363000 |
| Cr+6 | 0.60 | 72000 |
| Cu | 2.00 | 242000 |
| CN- | 0.50 | 60000 |
| Fe | 5.00 | 605000 |
| Pb | 0.25 | 30000 |
| Mn | 2.00 | 242000 |
| Hg | 0.0005 | 60 |
| Ni | 2.00 | 242000 |
| Phenols | 0.60 | 72000 |
| Se | 2.00 | 242000 |
| Ag | 0.10 | 12000 |
| Zn | 2.00 | 242000 |
| Propylene glycol | n/a | 100 gal (50/50 mix) |

² From 2001-2011, the average daily flow was 99,000 gallons per day to the Warrenville/Naperville system and 95,000 gallons per day to Batavia. As a conservative measure and because the flow varies, one third, of the average daily flow or 32,000 gallons per day is the mean daily flow used in calculating the maximum daily pollutant load. The maximum daily pollutant load is calculated by multiplying the mean daily flow by the maximum allowed concentration and rounding down to the nearest thousand.

³ City Code of Batavia and Warrenville

8.0 Figure 1

FERMILAB SEWER SYSTEMS

Note: Sanitary sewerage within the shaded areas generally runs to the indicated municipal systems. It is the responsibility of Fermilab personnel to insure through their Division/Section safety officer that the connection for each individual drain is known.



9.0 Appendix A

EXAMPLES OF INDUSTRIAL CATEGORIES SUBJECT TO NATIONAL CATEGORICAL PRETREATMENT STANDARDS⁴

| Industry 40 | CFR Section |
|--|-------------|
| Coil Coating | 467 |
| Electrical and electronic components manufacturing | 469 |
| Electroplating | 413 |
| Metal finishing | 433 |
| Photographic processing | 459 |

OPERATIONS THAT ARE INCLUDED IN THE METAL FINISHING CATEGORY (The six key metal-finishing operations are in boldface type)⁵

| | |
|--|-----------------------------------|
| Electroplating | Vapor plating |
| Electroless plating | Sputtering |
| Thermal infusion | Salt Bath descaling |
| Solvent degreasing | Electrostatic painting |
| Paint stripping | Painting |
| Vacuum metallizing | Electropainting |
| Assembly | Calibration |
| Testing | Mechanical plating |
| Conversion coating | Etching (chemical milling) |
| Printed circuit board manufacturing | Cleaning |
| Machining | Grinding |
| Polishing | Barrel finishing (tumbling) |
| Burnishing | Impact deformation |
| Pressure deformation | Shearing |
| Heat treating | Thermal cutting |
| Welding | Brazing |
| Soldering | Flame spraying |
| Sand blasting | Other abrasive jet machining |
| Electronic discharge machining | Electrochemical machining |
| Electron beam machining | Laser beam machining |
| Plasma arc machining | Ultrasonic machining |
| Sintering | Laminating |
| Hot dip coating | Thermal infusion |
| Anodizing | |

⁴For federal regulations applicable to specific industries see 40 CFR Sections 405-471.

⁵Federal regulations state that if a facility conducts any of six key metal-finishing operations, discharges from those six and from the remaining 40 processes included in the category are covered by federal standards.