

How Does Your Wastewater Treatment Facility Comply with NFPA Standard 820?

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Outline

- Background
- NFPA 820 Applicability to Wastewater Treatment Facilities
- Hazardous Area Classifications
- Treatment Plant Area Classifications
- Locations of Concern

Background

- NFPA 820 – Standard for fire protection in wastewater treatment and collection facilities:
 - Development based on fire or explosion incidents, infrequent but severe
 - 1990 - First issued recommended practice
 - 1992 – Document scope revised
 - 1995 – Changed to a standard that contains mandatory requirements
 - 1999 – Editorial changes made document more enforceable
 - 2012 – Latest issue



Background

- NFPA 820 is a standard, state specific design requirements also need to be taken into account
- Wisconsin Administrative Code
- 10 State Standards adopted by many states and modified by individual states

Recommended Standards for Wastewater Facilities

2004 Edition

**Policies for the Design, Review, and Approval
of Plans and Specifications for Wastewater Collection and Treatment Facilities**

A Report of the Wastewater Committee of the
Great Lakes–Upper Mississippi River Board
of State and Provincial Public Health and Environmental Managers

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Purpose

The purpose of the NFPA 820 standard is to provide a degree of fire and explosion protection and reduce or eliminate the effects of fire or explosion at wastewater collection, transportation, and treatment facilities.

Applicability to Wastewater Treatment Facilities

- NFPA 820 establishes minimum requirements for protection against fire and explosion hazards in wastewater treatment plants:
 - Standard applies to new installations
 - Standard applies to additions or modifications to existing facilities
 - Used by designers/owners in risk assessment for existing facilities

Applicability to Wastewater Treatment Facilities

Example: A gasoline tanker may spill a large load of gasoline into a storm (combined) sewer which could be conveyed to the plant – may be a more relevant issue in smaller plants

Areas with exposed wastewater are considered a Class I, Division 1 hazard whereas areas conveying, metering, or pumping in enclosed pipes are Class I, Division 2

Hazardous Area Classifications

- From the National Electric Codes – Chapter 5 – Special Occupancies:
 - **Class I, Division 1** – Location in which ignitable concentrations of flammable gases can exist under normal operation conditions.
 - OR**
 - Ignitable concentrations of gases may exist frequently because of repair, maintenance or leakage.
 - OR**
 - **Class I, Division 1** - Breakdown or facility operation of equipment might release ignitable concentrations of flammable gases and might also cause simultaneous failure of electrical equipment to cause electrical equipment to become a source of ignition.

Hazardous Substances

- **Sludge (Primary, Digested, Waste Activated, Thickened)**
 - Buildup of methane gas or flammable vapors in an enclosed tank or well
 - Leakage of sludge handling equipment and buildup of flammable gases in an enclosed room
- **Gas (Natural or Digester)**
 - Most hazardous in underground tunnels where there is no direct path to ventilate a leak from a pipe
 - Digester gas may be odorless whereas natural gas is scented

Hazardous Substances

- **Combustible Dusts**

- Hazard limited to dry biosolids materials
- Ventilation cannot reduce a dust hazard as ventilation may create fugitive dusts which can be distributed throughout the facility
- Areas in and around sludge drying and storage areas are hazardous within a ten foot envelope of the equipment. Beyond that the areas are unclassified.

Hazardous Area Definitions

- Class (I, II, or III) defines the general nature of hazardous material in the location
- Division (1 or 2) defines probability of hazardous material being present in an ignitable concentration within the location
- Group (A-G) defines the hazardous material in the surrounding atmosphere
 - Most common hazards are Class I, Group D (methane) and Class II, Group G (dried sludge dust)

Hazardous Area Definitions

- Class I, Div 1: Where ignitable concentrations of flammable vapors are present under normal operation conditions
- Class I, Div 2: Where ignitable concentrations of flammable vapors are present under abnormal operating conditions
- Class II, Div 1: Where ignitable concentrations of combustible dusts are present under normal operating conditions
- Class II, Div 2: Where ignitable concentrations of combustible dusts are present under abnormal operating conditions

Hazardous Area Classifications

- **Class I, Division 2** – Ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation.

OR

- Flammable gases are handled but in which the gases will normally be confined within closed systems from which they can escape only in case of rupture, breakdown, or abnormal operation.
- Adjacent to a Class 1, Division I locations unless gases are prevented from accessing the adjacent area by positive pressure ventilation from a clean air source and effective safe guards against ventilation facilities are provided.

NFPA 820 Tables 4 and 5 Define Locations, Hazards, Ventilation, NEC Ratings and Fire Protection Measures

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FIRE PROTECTION IN WASTEWATER TREATMENT AND COLLECTION FACILITIES

Chapter 5 – Liquid Stream Treatment Processes

5.1* General.

5.1.1 This chapter shall establish minimum criteria for protection against fire and explosion hazards associated with liquid stream treatment processes.

5.1.2 This chapter shall not apply to treatment systems serving individual structures or treatment systems that principally treat industrial wastes.

5.2* Design and Construction. The design and construction of liquid stream treatment processes shall conform to Table 5.2.

Table 5.2 Liquid Stream Treatment Processes

Row	Line	Location and Function	Fire and Explosion Hazard	Ventilation	Extent of Classified Area ¹	NEC-Area Electrical Classification (All Class I, Group D) ²	Material of Construction for Buildings or Structures	Fire Protection Measures
1	a	COARSE AND FINE SCREEN FACILITIES Removal of screenings from raw wastewater	Possible ignition of flammable gases and floating flammable liquids	A	Enclosed—entire space	Division 1	NC	FE, H, and CGD if enclosed
	B			Division 2		NC, LC, or LFS		
	c			Not enclosed, open to atmosphere	Within a 3 m (10 ft) envelope around equipment and open channel			

Physical Separation

- Physical separation required between hazardous and non-hazardous area
- Definition:
 - NFPA 820 3.3.47* - A gastight partition between two adjacent spaces, or two nonadjacent spaces, with no means of gas communication between the spaces.
 - NFPA 820 Annex A.3.3.47 - Personnel entry to the separate spaces is by **individual, grade-level exterior access ports** with no physical connection between the two.

Vestibules

- Use methods detailed in NFPA 496 for pressurization of electrical rooms adjacent to hazardous areas
- Positive air pressurization when doors are closed prevents hazardous gases from entering Unclassified Areas
- High air velocity when doors are open carries any hazardous gases away from the Unclassified Areas
- Alternative to true physical separation

Prominent Treatment Plant Class I Division I Classified Areas (Ventilation less than 12 AC/Hr)

- Preliminary Treatment - Coarse and fine screen facilities



Prominent Treatment Plant Class I Division I Classified Areas (Ventilation less than 12 AC/Hr)

- Grit removal tanks



Prominent Treatment Plant Class I Division I Classified Areas (Ventilation less than 12 AC/Hr)

- Digester gas processing rooms



Prominent Treatment Plant Class I Division I Classified Areas (Ventilation less than 12 AC/Hr)

- Anaerobic digester control buildings
- Anaerobic digesters, both fixed and floating cover



Prominent Treatment Plant Class I Division I Classified Areas (Ventilation less than 12 AC/Hr)

- Sludge storage, wet well, blending tanks, pits and holding tanks



Prominent Treatment Plant Areas with Both Class I – Division I and Class I – Division II Classified Areas

- Digester gallery locations with digester gas piping



Prominent Treatment Plant Class I - Division II Classified Areas

- Pumping dry wells, meter vaults, scum handling



Prominent Treatment Plant Class I - Division II Classified Areas

- Selected boiler room areas



Prominent Treatment Plant Unclassified Locations

- Grit handling building (vs. grit removal)



Prominent Treatment Plant Unclassified Locations

- Coarse and fine screenings handling buildings



Prominent Treatment Plant Unclassified Locations (with ventilation and other safeguards)

- Sludge dewatering buildings containing centrifuges, gravity belt thickeners, belt and vacuum filters and filter presses



Prominent Treatment Plant Unclassified Locations

- Plant effluent pumping/conduits and disinfection



Locations of Concern

- Preliminary treatment & screening areas:
 - Rated Class I, Division I, Group D, if ventilated at less than 12 AC/Hr (outside uncontaminated air)
 - Rated Division 2 if ventilated at 12 AC/Hr of outside uncontaminated air

Locations of Concern

- Electrical Room in Class I, Division I Area Requires:
 - Positive pressure outside uncontaminated air ventilation to maintain 60 FPM through each door leading to the classified Division I, or Division 2 Area
 - Means for detecting failure of positive pressure system

Locations of Concern

- Electrical Room (continued)
 - Power loss of pressurization to an electric room shall de-energize power to screening room (if Class I, Division I Environment)
 - Power for the positive pressure system shall be obtained ahead of any service disconnects to the electric room or supplied from a separate power source

Improvement Strategies

- Full compliance with standard over time as specific areas are upgraded or improved over time.
- Partial compliance with standard over time as specific areas are upgraded or improved over time. Examples are electrical component upgrades, increased ventilation, air monitors and physical separation measures.
- Meet state code requirements and elect to maintain existing safety measures.

Summary / Considerations

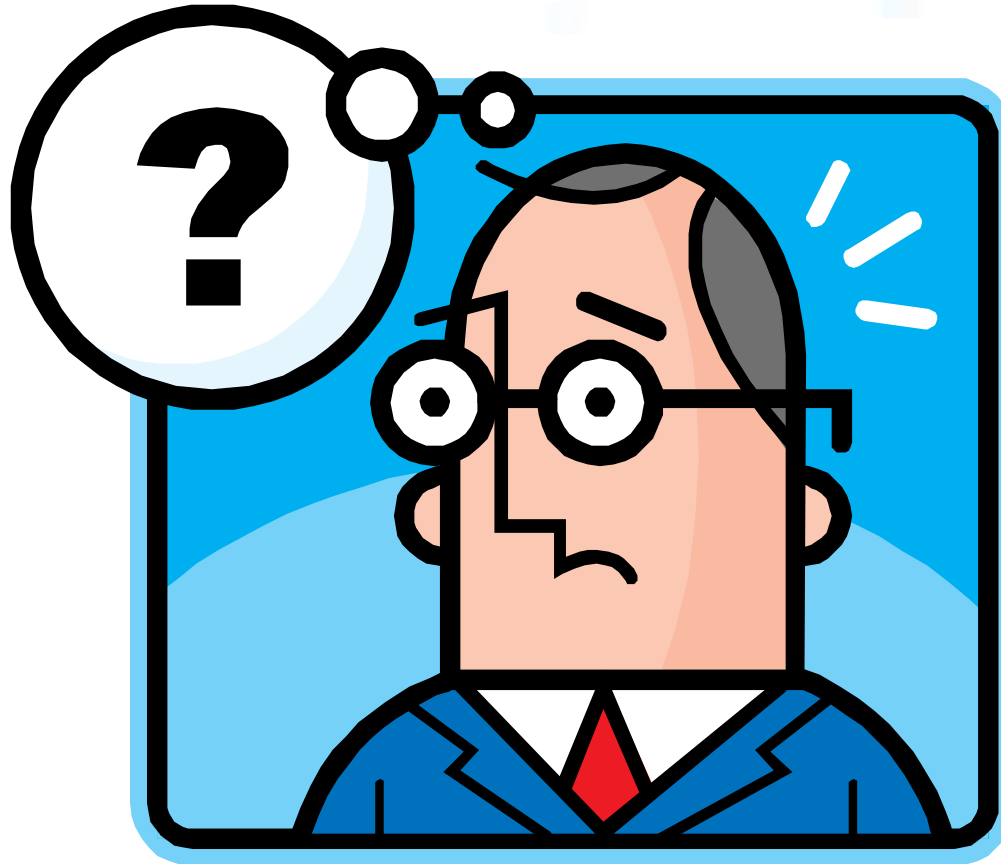
- Full compliance with the standard is expensive with respect to operating costs and electrical installation
- Heat recovery units for exhaust are desirable but maintenance is an issue
- Arc flash applicability to panels located in classified areas

Summary / Considerations

- Outside air ventilation alone can reduce corrosive concentrations in process rooms and provide benefits beyond classification ratings



Questions / Comments?



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