
Understanding NFPA 820 – Fire and Explosion Protection in Wastewater Treatment Facilities

WWOA October 8, 2009

By

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NFPA 820 Outline

- ◆ Purpose of NFPA 820
- ◆ Hazards at a Wastewater Treatment Plant
- ◆ Requirements of NFPA 820
- ◆ National and Local acceptance of NFPA 820
- ◆ Review Format of Ratings Portion of NFPA 820
- ◆ Examples – Ratings of Spaces
- ◆ Applying NFPA 820 to Existing WWTP

Purpose of NFPA 820

- ◆ To provide a degree of fire and explosion protection for life, property, continuity of mission, and protection of the environment
- ◆ To reduce or eliminate the effects of fire or explosion by maintaining structural integrity, controlling flame spread and smoke generation, preventing the release of toxic products of combustion, and maintaining serviceability and operation of the facility

Purpose of NFPA 820 (cont)

- ✦ Particularly concerned with hazards created by flammable/combustible gases, liquids, or dusts at wastewater treatment plants and related facilities
- ✦ Only deals with process areas within the plant and collection system
- ✦ Defines the hazard and classification for the process areas

Purpose of NFPA 820 (cont)

Aurora, MN WWTP
May 5, 2004



Main Control
Building



Purpose of NFPA 820 (cont)



- ✦ Believed to be caused by digester gas leakage through open sludge piping
- ✦ Ignited by pilot light in control building
- ✦ Evacuated neighborhood due to chlorine leak
- ✦ 0 fatalities (operators left 40-minutes prior)

Hazards

◆ Flammable/Combustible Gases and Liquids

◆ Methane/Biogas/Digester Gas

- Formed by the biological degradation of volatile solids, typically in the absence of free oxygen (ie. digesters produce methane)
- Can occur in a controlled environment (Anaerobic Digester) or an uncontrolled environment (wastewater and sludge pipelines).
- Methane (Natural gas) is also piped for plant heating and other uses.

Hazards (cont)

◆ Flammable/Combustible Gases and Liquids

◆ Flammable hydrocarbons

- Gases, solvents, oils, and greases.
- Typically illegally flushed into sewer system.
- Can be present in combined storm/sanitary systems due to leakage into storm sewers or spills.

Hazards (cont)

- ◆ Flammable/Combustible Gases and Liquids

- ◆ Scum

- ◆ Typically fats and grease from cooking or processing of food
- ◆ In the preliminary processes, may contain flammable hydrocarbons since both will float to the surface

Hazards (cont)

◆ Combustible Dusts

- ◆ Dried sludge (typically greater than 85% solids) contains similar energy content as low grade coal
- ◆ Air bound dusts from the drying or handling processes can create extremely violent explosions

History

- ✦ Originated in 1990
- ✦ Changed from “Recommended Practice” to a Standard in 1995
- ✦ Current Edition: 2008

NFPA 820

Standard for
Fire Protection in
Wastewater Treatment
and Collection
Facilities

2008 Edition



NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 820 History

- ◆ 1990 – Recommended Practices for Fire Protection in Wastewater and Collection Facilities
- ◆ 1995 - Standard for Fire Protection in Wastewater and Collection Facilities

NFPA – National Fire Protection Association

- ◆ **Code** – A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.
- ◆ **Standard** – A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law.

Local and National Adoption of NFPA 820

- ◆ Some states have adopted NFPA 820
 - ◆ Vermont – Building and Fire Safety Code
 - ◆ Florida – Florida Fire Prevention Code
- ◆ Some cities have design guidelines to conform to NFPA 820
- ◆ NFPA 820 has not been widely adopted

Ratings of Spaces - Tables

- ◆ NEC Area Classification – National Electrical Code NFPA 70
 - ◆ Defines the hazard rating of the space or envelope
 - ◆ Class I, Division 1, Group D, Hazardous Classified Location
 - ◆ Class I, Division 2, Group D, Hazardous Classified Location
 - ◆ Class II, Division 1, Group G, Hazardous Classified Location
 - ◆ Unclassified



Row	Line	Location and Function	Fire and Explosion Hazard	Ventilation	Extent of Classified Area	NEC-Area Electrical Classification (All Class I, Group D)	Material of Construction for Buildings or Structures	Fire Protection Measures
16	a	WASTEWATER PUMPING STATION WET WELLS Liquid side of a pumping station serving a sanitary sewer or combined system	Possible ignition of flammable gases and floating flammable liquids	A	Entire room or space	Division 1	NC, LC, or LFS	CGD
	B			Division 2				

Ratings of Spaces - Tables

- ◆ NEC Area Classification (cont)

- ◆ Class

- ◆ I = Flammable Gas

- ◆ II = Combustible Dust

- ◆ Division

- ◆ 1 = Present Under Normal Operating Conditions

- ◆ 2 = Not Present Under Normal Operating Conditions

- ◆ Group

- ◆ D = Flammable gas and vapor

- ◆ G = Combustible dusts

Ratings of Spaces - Tables

◆ Location and Function

- ◆ Location is typically above or below grade or open to atmosphere
- ◆ Function is the process contained within the space. Process with higher hazard will govern the space



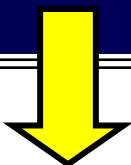
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Ratings of Spaces - Tables

◆ Fire and Explosion Hazard

◆ Offers a brief description of the potential hazards

◆ Ignition of flammable gases or floating liquid

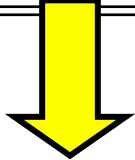


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Ratings of Spaces - Tables

✦ Ventilation


- Offers alternate ventilation rates to achieve lower hazard classifications
- All ventilation rates based on 100% outside air
 - ✦ A – No vent or less than 12 air changes per hour (AC/Hr)
 - ✦ B – Continuously ventilated at least 12 AC/Hr
 - ✦ C - Continuously ventilated at least 6 AC/Hr
 - ✦ D – No vent or less than 6 AC/Hr
 - ✦ NA – Not applicable
 - ✦ NR – No requirement
 - ✦ NNV – Not normally ventilated
 - ✦ Not enclosed, open to atmosphere

Row	Line	Location and Function	Fire and Explosion Hazard	Ventilation	Extent of Classified Area	NEC-Area Electrical Classification (All Class I, Group D)	Material of Construction for Buildings or Structures	Fire Protection Measures
								

Ratings of Spaces - Tables

✦ Extent of Classified Area

- ✦ Defines the boundary of the classified space
- ✦ May be entire space or an envelope around equipment, openings, or tankage
- ✦ For enclosed spaces, the envelope may vary depending on ventilation rates



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Ratings of Spaces - Tables

◆ NEC Area Classification

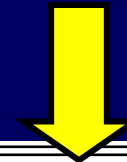
◆ Defines the hazard rating of the space or envelope

◆ Class I, Division 1, Group D, Hazardous Classified Location

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	B			Division 2				

Ratings of Spaces - Tables

◆ Materials of Construction for Buildings or Structures

- ◆ LC – Limited Combustible material
- ◆ LFS – Low Flame Spread material
- ◆ NC – Noncombustible material
- ◆ NR – No requirement

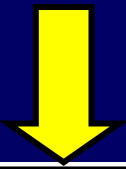


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Ratings of Spaces - Tables

◆ Fire Protection Measures

- ◆ CGD – Combustible gas detection system (fixed system)
- ◆ FAS – Fire alarm system
- ◆ FDS – Fire detection system
- ◆ FE – Portable fire extinguisher
- ◆ FSS – Fire suppression system
- ◆ H – Hydrant protection
- ◆ NA – Not applicable
- ◆ NR – No requirement



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	B			Division 2				

Example – Screening Facility

Row	Line	Location and Function	Fire and Explosion Hazard	Ventilation	Extent of Classified Area ¹	NEC-Area Electrical Classification (All Class I, Group D)	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			B		Division 2		
	c			Not enclosed, open to atmosphere	Within a 3-m (10-ft) envelope around equipment and open channel ^{2,3}			

Applying NFPA 820 to Existing Plants

- ◆ Plants built prior to 1990 typically have areas that do not meet comply with NFPA 820
 - ◆ Areas with exposed wastewater rated Class I, Division 1, Group D, Hazardous classified location
- ◆ Issues at existing Plants
 - ◆ No physical separation between classified location and unclassified location. Gas tight partition required between classified location and unclassified location.

Applying NFPA 820 to Existing Plants

- ◆ Issues at existing Plants
 - ◆ Areas that should be classified Class I, Division 2 are unclassified. These areas are not physically separated from unclassified areas.
- ◆ Typical areas of concern at existing Plants
 - ◆ Digester complex
 - ◆ Tunnels connecting classified building to unclassified buildings
 - ◆ Below grade sludge and wastewater pumping
- ◆ Each area at existing Plants needs to be reviewed on a case-by-case basis