# Liquid Streaming



**Δ Table 5.2.2 Liquid Stream Treatment Processes**

| Row[a] | Line[a] | Location and Function | Fire and Explosion Hazard | Ventilation[b] | Extent of Classified Location[c] | *NEC* Hazardous Location Classification (All Class I, Group D)[d] | Materials of Construction[e] | Fire Protection Measures |
|---|---|---|---|---|---|---|---|---|
| 1 | a | DIVERSION AND CONTROL STRUCTURES Not preceded by Primary Treatment with Skimming | Possible ignition of flammable gases and floating flammable liquids | A | Enclosed — entire space | Division 1 | NC | FE, H; CGD if enclosed in building |
| | b | | | B | Enclosed — entire space | Division 2 | NC, LC, or LFS | FE, H; CGD if enclosed in a building |
| | c | | | Not enclosed, open to atmosphere | Within a 3 m (10 ft) envelope around equipment and open channel | Division 2 | NC, LC, or LFS | FE and H |
| 2 | a | COARSE AND FINE SCREEN FACILITIES | Possible ignition of flammable gases and floating flammable liquids | A | Enclosed — entire space | Division 1 | NC | FE, H, CGD |
| | b | Removal of screenings from raw wastewater | | B | Enclosed — entire space | Division 2 | NC, LC, or LFS | FE, H, CGD |
| | c | | | Not enclosed, open to atmosphere | Within a 3 m (10 ft) envelope around equipment and open channel | Division 2 | NC, LC, or LFS | FE, H |
| 3 | | PUMPING STATIONS, DIVERSION STRUCTURES AND CONTROL STRUCTURES *(See Table 4.2.2.)* | | | | | | |
| 4 | a | FLOW EQUALIZATION TANKS | Possible ignition of flammable gases and floating flammable liquids | A | Enclosed — entire space | Division 1 | NC | FE, H; CGD if enclosed in a building |
| | b | Storage of raw or partially treated wastewater | | B | Enclosed — entire space | Division 2 | NC, LC, or LFS | FE, H; CGD if enclosed in a building |
| | c | | | Not enclosed, open to atmosphere | Within a 3 m (10 ft) envelope around equipment and open channel[f,g] | Division 2 | NC, LC, or LFS | FE, H |
| 5 | a | GRIT REMOVAL TANKS Separation of grit from raw wastewater | Possible ignition of flammable gases and floating flammable liquids | A | Enclosed — entire space | Division 1 | NC | FE, H; CGD if enclosed in a building |
| | b | | | B | Enclosed — entire space | Division 2 | NC, LC, or LFS | FE, H; CGD if enclosed in a building |
| | c | | | Not enclosed, open to atmosphere | Within a 3 m (10 ft) envelope around equipment and open channel[f,g] | Division 2 | NC, LC, or LFS | FE, H |
| 6 | a | PRE-AERATION TANKS | Possible ignition of flammable gases and floating flammable liquids | A | Enclosed — entire space | Division 1 | NC | H; CGD if enclosed in a building |
| | b | Conditioning of wastewater prior to further treatment | | B | Enclosed — entire space | Division 2 | NC, LC, or LFS | H; CGD if enclosed in a building |
| | c | | | Not enclosed, open to atmosphere | Within a 3 m (10 ft) envelope around equipment and open channel[f,g] | Division 2 | NC, LC, or LFS | H |

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Δ **Table 5.2.2** *Continued*

| Row[a] | Line[a] | Location and Function | Fire and Explosion Hazard | Ventilation[b] | Extent of Classified Location[c] | *NEC* Hazardous Location Classification (All Class I, Group D)[d] | Materials of Construction[e] | Fire Protection Measures |
|---|---|---|---|---|---|---|---|---|
| 7 | a | PRIMARY SEDIMENTATION TANKS | Possible ignition of flammable gases and floating flammable liquids | A | Enclosed — entire space | Division 1 | NC | H; CGD if enclosed in a building |
| | b | Separation of floating or settleable solids from raw wastewater | | B | Enclosed — entire space | Division 2 | NC, LC, or LFS | H; CGD if enclosed in a building |
| | c | | | Not enclosed, open to atmosphere | Interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 0.46 m (18 in.) above the top of the tank and extending 0.46 m (18 in.) beyond the exterior wall; envelope 0.46 m (18 in.) above grade extending 3 m (10 ft) horizontally from the exterior tank walls | Division 2 | NC, LC, or LFS | H |
| 8 | | AERATION BASIN, POND, LAGOON, OXIDATION DITCH, AEROBIC SUSPENDED GROWTH SYSTEMS, SEQUENCING BATCH REACTORS Aerobic treatment of wastewater open to the atmosphere | N/A | NR | | Classified (*see Primary Sedimentation*) Unclassified if process is preceded by primary sedimentation | NR | H |

*(continues)*

Δ Table 5.2.2 *Continued*

| Row[a] | Line[a] | Location and Function | Fire and Explosion Hazard | Ventilation[b] | Extent of Classified Location[c] | *NEC* Hazardous Location Classification (All Class I, Group D)[d] | Materials of Construction[e] | Fire Protection Measures |
|---|---|---|---|---|---|---|---|---|
| 9 | a1 | ENCLOSED AERATION BASIN, AEROBIC OR SUSPENDED GROWTH SYSTEMS, MEMBRANE BIOLOGICAL REACTORS | Possible ignition of flammable gases or floating flammable liquids | A (Interior of tank) | Entire enclosed space or tank of system | Division 1 | NC | NR |
| | a2 | Aerobic treatment not preceded by primary treatment with skimming | | A (Interior of tank) | Exterior of enclosed space or tank, installed in a building | Division 2 | NC, LC, or LFS | NR |
| | a3 | | | A (Interior of tank) | Exterior of enclosed space or tank, installed outdoors; envelope 0.46 m (18 in.) surrounding tank | Division 2 | NC, LC, or LFS | NR |
| | b1 | | | B (Interior of tank maintained at negative pressure) | Entire enclosed space or tank of system | Division 2 | NC, LC, or LFS | NR |
| | b2 | | | B (Interior of tank maintained at negative pressure) | Exterior of enclosed space or tank, installed in a building | Unclassified | NC, LC, or LFS | NR |
| | b3 | | | B (Interior of tank maintained at negative pressure) | Exterior of enclosed space or tank, installed outdoors | Unclassified | NC, LC, or LFS | NR |
| | c | | | Not enclosed, open to atmosphere | Interior of tank from the minimum operating water surface to the top of the tank wall; envelope 0.46 m (18 in.) above the top of the tank and extending 0.46 m (18 in.) beyond exterior wall; envelope 0.46 m (18 in.) above grade and extending 3 m (10 ft) horizontally from the exterior tank walls | Division 2 | NC, LC, or LFS | NR |
| 10 | a1 | RESIDENTIAL ENCLOSED AERATION BASIN, AEROBIC OR SUSPENDED GROWTH SYSTEMS, MEMBRANE BIOLOGICAL REACTORS | Possible ignition of flammable gases or floating flammable liquids | A (Interior of tank) | Entire enclosed space or tank of system | Division 2 | NC | NR |
| | a2 | Aerobic treatment not preceded by primary treatment with skimming, serving one but not more than five dwellings | | A (Interior of tank) | Exterior of enclosed space or tank, installed in a building | Unclassified | NC, LC, or LFS | NR |
| | a3 | | | A (Interior of tank) | Exterior of enclosed space or tank, installed outdoors | Unclassified | NC, LC, or LFS | NR |

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Δ Table 5.2.2 *Continued*

| Row[a] | Line[a] | Location and Function | Fire and Explosion Hazard | Ventilation[b] | Extent of Classified Location[c] | *NEC* Hazardous Location Classification (All Class I, Group D)[d] | Materials of Construction[e] | Fire Protection Measures |
|---|---|---|---|---|---|---|---|---|
| 11 | | ENCLOSED AERATION BASIN, AEROBIC OR SUSPENDED GROWTH SYSTEMS, MEMBRANE BIOLOGICAL REACTORS<br>Aerobic treatment of wastewater preceded by primary treatment with skimming | N/A | NR | Entire enclosed space | Unclassified | NC, LC, or LFS | NR |
| 12 | | TRICKLING FILTER, BIO-TOWER, AEROBIC FIXED-FILM SYSTEMS<br>Aerobic biological treatment of wastewater | Not normally a significant hazard; however, these processes might contain materials that are combustible under certain conditions | NR | N/A | Classified *(See Primary sedimentation)* Unclassified if unit process is preceded by primary sedimentation | NR | H |
| 13 | a | ANAEROBIC TOWERS, ANAEROBIC FIXED-FILM SYSTEM | Normally produces combustible gas as treatment process by-product | N/A | Tank interior | Division 1 | NC | FE and H |
| | b | Anaerobic biological treatment if sealed from atmosphere | | N/A | 3 m (10 ft) envelope around tank | Division 2 | NC, LC, or LFS | FE and H |
| 14 | a | GAS-HANDLING SYSTEMS FOR LIQUID TREATMENT PROCESSES | Combustible gas, often under pressure | A | Enclosed — entire space | Division 1 | NC | FE and H |
| | b | | | B | Enclosed — entire space | Division 2 | NC, LC, or LFS | FE and H |
| | c | | | Not enclosed, open to atmosphere | Within a 3 m (10 ft) envelope around equipment[f] | Division 2 | NC, LC, or LFS | FE and H |
| 15 | | OXYGEN AERATION TANKS<br>Tanks for aerobic treatment of wastewater using high-purity oxygen rather than air | Ignition of flammable gases and floating flammable liquids in an oxygen-enriched environment | N/A | Enclosed space | Division 2 (If unit process is not preceded by primary sedimentation, see Primary sedimentation Tanks in Table 5.2.2 for classification.) | Any equipment or material within the reactor space should be safe for exposure to volatile in an oxygen-enriched atmosphere | Special provision for LFL monitoring and automatic isolation of equipment and oxygen supply |
| 16 | | INTERMEDIATE, SECONDARY, OR TERTIARY SEDIMENTATION TANKS<br>Separate floating and settleable solids from wastewater at various treatment stages | N/A | NR | N/A | Classified *(See Primary sedimentation)* Unclassified if unit process is preceded by primary sedimentation | NR | H |
| 17 | | FLASH MIXER OR FLOCCULATION TANKS<br>Tanks for mixing various treatment chemicals with wastewater | N/A | NR | N/A | Classified *(See Primary sedimentation)* Unclassified if unit process is preceded by primary sedimentation | NR | H |
| 18 | | NITRIFICATION AND DENITRIFICATION TANKS<br>Tertiary treatment of wastewater to reduce or remove nitrogen | N/A | NR | N/A | Classified *(See Primary sedimentation)* Unclassified if unit process is preceded by primary sedimentation | NR | H |

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Δ Table 5.2.2 *Continued*

| Row[a] | Line[a] | Location and Function | Fire and Explosion Hazard | Ventilation[b] | Extent of Classified Location[c] | *NEC* Hazardous Location Classification (All Class I, Group D)[d] | Materials of Construction[e] | Fire Protection Measures |
|---|---|---|---|---|---|---|---|---|
| 19 | | BREAKPOINT CHLORINATION TANKS AND CHLORINE CONTACT TANKS<br>Application of chlorine in aqueous solution to wastewater | N/A | NR | N/A | Unclassified | NR (These unit processes use corrosive chemicals that require the use of specific materials of construction. Special consideration should be given to these materials of construction.) | H |
| 20 | | AMMONIA STRIPPING TOWERS | *(See Trickling filter in Table 5.2.2.)* | N/A | N/A | Unclassified | NR (These unit processes use corrosive chemicals. Special consideration should be given to these materials of construction.) | H |
| 21 | | INTERMEDIATE OR FINAL PUMPING STATIONS AND OTHER UNIT PROCESSES AND STRUCTURES NOT SPECIFICALLY ADDRESSED IN THIS TABLE. Preceded by primary treatment with skimming | N/A | NR | N/A | Unclassified | NR | H |
| 22 | | GRAVITY AND PRESSURE FILTERS<br>Filtering of treated wastewater through sand or other media | N/A | NR | N/A | Unclassified | NR | H |
| 23 | | CARBON COLUMN OR TANKS<br>Vessels containing carbon for tertiary treatment of wastewater | Significant hazard from combustible carbon material | N/A | N//A | Unclassified | NR | H |
| 24 | | ON-SITE OZONE GENERATION SYSTEM AND OZONE CONTACT TANKS<br>Ozone generation and purification for disinfection of wastewater | Similar to oxygen generation with addition of being highly corrosive *(See Table D.1.1)* | N/A | N/A | Not covered in this standard | NR | NR |
| 25 | | BACKWASH WATER AND WASTE BACKWASH WATER HOLDING TANKS<br>Tanks for temporary storage of backwash water | N/A | N/A | N/A | Unclassified | NR | H |
| 26 | | ULTRAVIOLET DISINFECTION UNIT<br>Disinfection of wastewater effluent by ultraviolet radiation | N/A | NR | N/A | Unclassified | NR | H |

*(continues)*

Δ **Table 5.2.2** *Continued*

| Row[a] | Line[a] | Location and Function | Fire and Explosion Hazard | Ventilation[b] | Extent of Classified Location[c] | *NEC* Hazardous Location Classification (All Class I, Group D)[d] | Materials of Construction[e] | Fire Protection Measures |
|---|---|---|---|---|---|---|---|---|
| 27 | | EFFLUENT STRUCTURES<br>Various structures conveying treated wastewater away from treatment processes | N/A | NR | N/A | Unclassified | NR | H |
| 28 | | ODOR-CONTROL AND VENTILATION SYSTEMS SERVING CLASSIFIED LOCATIONS<br>*(See Table 4.2.2)* | | | | | | |

Note: The following codes are used in this table:
A: No ventilation or ventilated at less than 12 air changes per hour.
B: Continuously ventilated at 12 air changes per hour in accordance with Chapter 9.
C: Continuously ventilated at six air changes per hour in accordance with Chapter 9.
CGD: Combustible gas detection system.
D: No ventilation or ventilated at less than six air changes per hour.
FE: Portable fire extinguisher.
H: Hydrant protection in accordance with 7.2.4.
LC: Limited-combustible material.
LFS: Low flame spread index material.
N/A: Not applicable.
NC: Noncombustible material.
*NEC*: In accordance with *NFPA 70*.
NR: No requirement.

[a]The "Row" and "Line" columns are used to refer to specific figures in A.5.2 and specific requirements for each location and function.
[b]This column indicates the ventilation requirements for processes. Additional ventilation requirements are provided in Chapter 9. Ventilation signaling and alarm requirements are provided in Chapter 7.
[c]Open channels and open structures upstream from the unit processes are classified the same as the downstream processes they supply.
[d]These unit processes use corrosive chemicals that can have a deteriorating effect on conductors and equipment. Electrical equipment should be identified for use in the operating environment.
[e]This column indicates the materials of construction for processes. Materials of construction for buildings in which these processes are housed are in accordance with the applicable building code and construction requirements provided in Chapter 8.
[f]The area beyond the envelope is unclassified.
[g]Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: (1) interior of the tank from the minimum operating water surface to the top of the tank wall; (2) envelope 0.46 m (18 in.) above the top of the tank and extending 0.46 m (18 in.) beyond the exterior wall; (3) envelope 0.46 m (18 in.) above grade extending 3 m (10 ft) horizontally from the exterior tank walls.