LEGEND: **DRAFT 05/14/14**
Text to be *[deleted]* is in italics and bracketed.
Black bold text is added from 10 States Standards, Ch. 50 2004. **Orange bold** text is added for clarification.
Green bold text is added from 10 CSR 20-8.500(7)(A). **Blue bold** text is added from 10 CSR 20-8.020.
Underline text is added from the previous Stakeholder meeting on March 12, 2014.

Title 10 – DEPARTMENT OF NATURAL RESOURCES
Division 20 – Clean Water Commission
Chapter 8 – Design Guides

DRAFT AMENDMENT

10 CSR 20-8.140 *[Sewage]* Wastewater Treatment *[Works]* Facilities.

PURPOSE: This amendment will update the rule to current industry practices.

PURPOSE: The following criteria have been prepared as a guide for the [general] design [requirements for sewage] ***of wastewater*** *treatment [works]* ***facilities****. This rule is to be used with rules 10 CSR 20-8.110[–]* ***through*** *10 CSR 20-8.220 for the planning and design of the complete treatment facility. This rule reflects the minimum requirements of the Missouri Clean Water Commission [as]* ***in*** *regard[s]* ***to*** *adequacy of design, submission of plans, approval of plans, and approval of completed [sewage works.]* ***wastewater treatment facilities. It is not reasonable or practical to include all aspects of design in these standards. The design engineer should obtain appropriate reference materials which include but are not limited to: copies of all ASTM International standards pertaining to wastewater treatment facilities and appurtenances, design manuals such as Water Environment Federation's Manuals of Practice, and other wastewater treatment facilities design manuals containing principles of accepted engineering practice.*** *Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from* ***the 2004 edition of the*** *Great Lakes-Upper Mississippi River Board of State [Sanitary Engineers]* ***and Provincial Public Health and Environmental Managers*** *Recommended Standards for [Sewage Works]* ***Wastewater Facilities*** *and are based on the best information presently available. These criteria were originally filed as 10 CSR 20-8.030. It is anticipated that they will be subject to review and revision periodically as additional information and methods appear. [Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.]*

(1) Definitions. Definitions as set forth in the Clean Water Law and 10 CSR 20-2.010 shall apply to those terms when used in this rule, unless the context clearly requires otherwise. Where the terms **"**shall**"** and **"**must**"** are used, they are to mean a mandatory requirement insofar as approval by the *[agency]* **Missouri Department of Natural Resources (department)** is concerned, unless justification is presented for deviation from the requirements. Other terms, such as **"**should,**"** **"**recommend,**"** **"**preferred,**"** and the like, indicate *[discretionary requirements on the part of the agency and deviations are subject to individual consideration.]* **the preference of the department for consideration by the design engineer.**

(A) Deviations. Deviations from these rules may be approved by the department when engineering justification satisfactory to the department is provided. Justification must substantially demonstrate in writing and through calculations that a variation(s) from the design rules will result in either at least equivalent or improved effectiveness.

Deviations are subject to case-by-case review with individual project consideration.

[(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred gallons per day (22,500 gpd) (85.4 m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).]

(2) Applicability. This rule shall apply to all domestic wastewater treatment facilities. This rule shall supersede when there is a conflict with 10 CSR 20-8.020.

(3) *[Plant]* Location. *[The following items shall be considered when selecting a plant site: proximity to residential areas; direction of prevailing winds; accessibility by all-weather roads; area available for expansion; local zoning requirements; local soil characteristics, geology, hydrology and topography available to minimize pumping; access to receiving stream; downstream uses of the receiving stream and compatibility of treatment process with the present and planned future land use, including noise, potential odors, air quality and anticipated sludge processing and disposal techniques. Where a site must be used which is critical with respect to these items, appropriate measures shall be taken to minimize adverse impacts.]*

(A) General. Items to be considered when selecting a site are listed in 10 CSR 20-8.110(4)(C)8.C.

*[(A)]***(B)** Flood Protection.

1. The **wastewater** treatment *[works]* **facility** structures, electrical **equipment,** and mechanical equipment shall be protected from physical damage by the one hundred (100)-year flood.

A. A one hundred (100)-year flood plain must be based on the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) in effect at the time the facility plan is submitted to the department.

B. If FEMA flood plain information is not available, the plans shall include a one hundred (100)-year flood elevation based on the best information available.

C. The one hundred (100)-year water surface elevation must be marked on a hydraulic profile of the wastewater treatment facility in accordance with the vertical scale of the drawing.

2. Wastewater *[T]***t**reatment *[works]* **facilities** should remain fully operational and accessible during the twenty-five (25)-year flood. This **requirement** applies to new construction and *[to existing facilities undergoing]* **the** major modification **to existing facilities**.

(C) Potable Water Sources. Unless another distance is determined by the Missouri Geological Survey or by the department's Public Drinking Water Branch, the distance between wastewater treatment facilities and all potable water sources must be at least three hundred feet (300') (91.4 m).

(D) Access Road. An all-weather access road shall be provided from a public right-of-way to all wastewater treatment facilities. Sufficient room shall be provided at the site to permit turning vehicles around. In determining the type of roadway and method of construction, consideration shall be given to the types of vehicles and equipment necessary to maintain and operate the facility. Gravel roads to be used by heavy

vehicles shall have a minimum depth of six inches (6") (15.2 cm) of crushed rock material with a bottom layer of four inches (4") (10.2 cm) of two to three inches (2-3") (5.1-7.6 cm) size material and a top layer two inches (2") (5.1 cm) thick of three-fourths inch (3/4") (1.9 cm) size material. In general, the grade of the access road shall not exceed twelve percent (12%).

(4) Quality of Effluent. The required degree of wastewater treatment shall be based on 10 CSR 20-7.015, Effluent Regulations**,** *[and]* 10 CSR 20-7.031, Water Quality Standards**, and/or appropriate federal regulations including operating permit requirements**.

(5) Design.

(A) Type of Treatment. *[As a minimum, the following items shall be considered in the selection of the type of treatment: present and future effluent requirements; location of and local topography of the plant site; space available for future plant construction; the effects of industrial wastes likely to be encountered; ultimate disposal of sludge; system capital costs; system operating and maintenance costs, including basic energy requirements; process complexity governing operating personnel requirements; and environmental impact on present and future adjacent land use.]*

1. Items to be considered in selection of the appropriate type of treatment are presented in 10 CSR 20-8.110(4)(C).

2. The facility design shall provide the necessary flexibility to perform satisfactorily within the expected range of waste characteristics and volumes.

(B) Required Engineering Data for New Process **or Equipment and Application** Evaluation. The policy of the *[agency]* **department** is to encourage rather than obstruct the development of any **new** methods or equipment for treatment of wastewater. The lack of inclusion in these **design** standards of some types of wastewater treatment processes or equipment should not be construed as precluding their use.

1. Technology definitions not established in 10 CSR 20-8.

A. Innovative – Technologies in the development stage and/or have been tested at a laboratory or bench scale only.

B. Emerging – Technologies that have been tested at pilot or demonstration scale or have been implemented at full scale in less than three (3) installations in locations with a climate similar to Missouri.

C. Developing – Technologies with a demonstrated performance record, which includes three (3) separate full-scale installations in locations with a climate similar to Missouri and operating at a minimum of seventy-five percent (75%) of their design average flow for a period of three (3) years. These technologies have performed consistently as designed without major failure of the process, unit processes, or equipment.

2. Technology data request. The *[agency]* **department** may approve other types of wastewater treatment processes and equipment under the *[following]* condition*[s:]* **that** the operational reliability and effectiveness of the process or device shall have been demonstrated with a suitably-sized prototype unit operating at its design load conditions**,** to the extent required **by the department. To determine that such new processes and**

equipment or applications have a reasonable and substantial chance of success, *[by the agency;]* the *[agency may require]* **request for department approval shall include the following:**

A. *[m]***M**onitoring observations, including test results **of the influent and effluent,** and engineering evaluations, demonstrating the efficiency of *[the]* processes*[,]* **or equipment;**

B. *[d]***D**etailed description of the test methods**. The test methods shall be sufficiently sensitive analytical methods for detecting, identifying, and measuring the concentrations of pollutants**;

C. *[t]***T**esting, including appropriately-composited samples, under various ranges of strength and flow rates (including diurnal **variations**) and waste temperature**s** over a sufficient length of time to demonstrate **adequate** performance under **the range of** climatic and other conditions which may be encountered in the area of the proposed installations *[and]***. A control group may be required to demonstrate effectiveness;**

D. Description of manufacturer's warranty and/or performance warranty including all exclusions or limitations on the warranty;

E. Complete design requirements, calculations, and all assumptions;

F. Documentation of how the new process or equipment functions. All assumptions must be clearly documented and explained;

G. A discussion of actual, full-scale operating experience or pilot test work. For full-scale operating experience, the length of time that each installation has been in operation must be included. For pilot test work, a copy of the associated pilot test plan and final pilot test report must be included;

H. Discussion of known and/or anticipated start-up issues and operational issues that have occurred or may occur during the first year of operation;

I. A description of specific operator knowledge and skill that are needed to operate the proposed technology. This description must include an estimate increased operator attention needed during startup and the first year of operation; and

J. *[o]***O**ther appropriate information*[;]***.**

3. Pilot test plan. Pilot test plans shall be approved by the department prior to implementation of the new technology process or equipment. See 10 CSR 20-6.010(1)(B)8 for more information. Pilot testing project proposals shall include the following at a minimum in addition to the requirements of 10 CSR 20-8.110(4)(C):

A. Goals, objectives, and benefits with an explanation as to why a pilot study or field demonstration project is needed to obtain additional engineering data;

B. Literature search identifying key design parameters and related experience;

C. A description of the proposal with schematic diagrams, pictures, drawings, or any other important information;

D. Complete design requirements, calculations, and all assumptions;

E. Identification of associated environmental impacts, both direct and indirect;

F. Sampling and testing protocol. Sampling shall be in accordance with 40 CFR 136. The test methods shall be sufficiently sensitive analytical methods for

detecting, identifying, and measuring the concentrations of pollutants;
G. Complete schedule for testing and evaluation including start, completion, and submittal of summary report; and
H. Other appropriate information.

4. Supervised data. *[t]***T**he *[agency]* **department** may require that appropriate testing be conducted and evaluations be made under the supervision of a competent process engineer other than those employed by the manufacturer**,** *[or]* developer**, or patent holder**. **All required reports, proposals for testing including quality assurance/quality control, pilot test plans, and engineering evaluation of new processes or equipment shall be prepared by a Missouri registered professional engineer. All reports shall include an imprint of his/her registration seal with the date and engineer's signature affixed.**

5. Evaluation of data. One of the methods the department will evaluate the applicant provided effluent data will be to calculate the ninetieth (90th) percentile. The ninetieth (90th) percentile should determine the consistency of the new technology or equipment's performance. The department will compare the calculated value to the proposed applicable effluent limitations and water quality standards. If the applicant wants to remove any excursions from the evaluation, they must be documented and justified as not representative of the new technology or equipment.

6. Design by analogy. Data from similar full scale installations may be utilized in the design of developing technology. However, thorough investigation that is adequately documented shall be provided to the department to establish the reliability and applicability of the data and design.

(C) Design Period. The design period shall be clearly identified in the facility plan as required in 10 CSR 20-8.110(4)(C)3.

*[(C)]***(D)** Design Loads.

1. Hydraulic design.

[A. New systems.

(I) Undeveloped areas. The design for sewage treatment plants to serve new sewerage systems being built in currently undeveloped areas shall be based on an average daily flow of one hundred (100) gallons per capita (378 l/cap), unless water use data or other justification upon which to better estimate flow is provided.

(II) Existing developed areas. Consideration shall be given in the designs for sewage treatment plants to serve a new sewerage system for a municipality or sewer district for higher flow rates if a large percentage of older buildings are likely to contribute significant infiltration/inflow to the new sanitary sewer system through basement floor drains.

B. Existing systems. Where there is an existing system, the volume and strength of existing flows shall be determined. The determination shall include both dry weather and wet weather conditions. Samples shall be taken and composited so as to be accurately representative of the strength of the wastewater. At least one (1) year's flow data should be taken as the basis for the preparation of hydrographs for analysis

to determine the following types of flow conditions of the system: the annual average daily flow—as determined by averaging flows over one (1) year, exclusive of inflow due to rainfall; the minimum daily flow—as determined by observing twenty-four (24)-hour flows during dry weather (low rainfall period) when infiltration/inflow are at a minimum; wet weather peak flows—as determined by observing twenty-four (24)-hour flows during a period of one (1) year when infiltration/inflow are at a maximum; wet weather flows of seven (7)-day duration—as determined by observing for a period of one (1) year the daily flows during the immediate seven (7)-day period following rainfall sufficient to cause ground surface runoff; peak hourly flows—as determined by observing the maximum hydraulic load to the plant; and industrial waste flows—as determined by flow data, including water use records, for each of the industries tributary to the sewer system. The plant design flow selected shall meet the appropriate effluent and water quality standards in 10 CSR 20-7.015 and 10 CSR 20-7.031.]

A. Critical flow conditions.

(I) Flow conditions critical to the design of the wastewater treatment facility shall be as described in 10 CSR 20-8.110(4)(C)4.

(II) Initial low flow conditions must be evaluated in the design to minimize operational problems with freezing, septicity, flow measurements, and solids dropout.

(III) The design peak hourly flows shall be used to evaluate the effect of hydraulic peaks on unit processes, pumping, piping, etc.

B. Wastewater treatment facility design capacity.

(I) The wastewater treatment facility design capacity shall be as described in 10 CSR 20-8.110(4)(C)4.

(II) The design of treatment units that are not subject to peak hourly flow requirements shall be based on the design average flow.

(III) For facilities subject to high wet weather flows or overflow detention pumpback flows, the design maximum day flows that the facility is to treat on a sustained basis should be specified.

[C. Flow equalization. Facilities for the equalization of flows and organic shock load shall be considered at all plants which are critically affected by surge loadings. The sizing of the flow equalization facilities should be based on data obtained from paragraph (5)(C)1. of this rule and 10 CSR 20-8.120(5)(B).]

2. Organic design. **Organic loadings for wastewater treatment facility design shall be based on the information given in 10 CSR 20-8.110(4)(C)5. The effects of septage flow which may be accepted at the facility shall be given consideration and appropriate facilities shall be included in the design.**

[A. New system minimum design. Domestic waste treatment design shall be on the basis of at least 0.17 pounds (0.08 kg) of biochemical oxygen demand (BOD) per capita per day and 0.20 pounds (0.09 kg) of suspended solids per capita per day, unless information is submitted to justify alternate designs; when garbage grinders are used in areas tributary to a domestic treatment plant, the design basis should be increased to 0.22 pounds (0.10 kg) of BOD per capita per day and 0.25 pounds (0.11

kg) of suspended solids per capita per day; domestic waste treatment plants that will receive industrial wastewater flows shall be designed to include these industrial waste loads.

B. Existing systems. When an existing treatment works is to be upgraded or expanded, the organic design shall be based upon the actual strength of the wastewater as determined from the measurements taken in accordance with subparagraph (5)(C)1.B. of this rule, with an appropriate increment for growth.]

3. Shock effects. The shock effects of high concentrations and diurnal peaks for short periods of time on the treatment process, particularly for small **wastewater** treatment *[plants,]* **facilities and batch processes,** shall be considered.

[4. Design by analogy. Data from similar municipalities may be utilized in the case of new systems; however, thorough investigation that is adequately documented shall be provided to the agency to establish the reliability and applicability of the data.]

4. Flow equalization. Facilities for the equalization of flows and organic shock load shall be considered at all wastewater treatment facilities which are critically affected by surge loadings. The sizing of the flow equalization facilities should be based on data obtained herein and from 10 CSR 20-8.110(4)(C)4 and 10 CSR 20-8.150(7).

*[(D)]***(E)** Conduits.

1. All piping and channels *[should]* **shall** be designed to carry the maximum expected flows. The incoming sewer should be designed for unrestricted flow. Bottom corners of the channels*, [must]* **except final effluent channels, shall** be filleted. Conduits shall be designed to avoid creation of pockets and corners where solids can accumulate.

2. Suitable gates **or valves** should be placed in *[the]* channels to seal off unused sections which might accumulate solids. The use of shear gates**, stop plates,** or stop planks is permitted where they can be used in place of gate valves or sluice gates. *[Noncorrosive]* **Non-corrodible** materials shall be used for these control gates.

*[(E)]***(F)** Arrangement of Units.

1. Component parts of the *[plant]* **wastewater treatment facility** should be arranged for greatest operating and maintenance convenience, flexibility, economy, continuity of *[maximum effluent quality so as to facilitate]* **optimum effluent quality for water quality protection, economy of function, and ease of** installation of future units.

2. Adequate access and removal space shall be provided around all components to permit easy operation, inspection, maintenance, and/or removal and replacement without interfering with the operation of other equipment. Components located inside buildings or other structures shall be removable without affecting the structural integrity of the building or creating a safety hazard.

(G) Flexibility. Where duplicate units are provided, a central collection and distribution point including proportional flow splitting shall be provided for the wastewater flow before each unit operation. Exceptions to this central collection and distribution point requirement may be made, on a case-by-case basis, when the design incorporates more than one (1) unit process in the same physical structure.

*[(F)]***(H)** Flow Division Control.

1. Flow division control facilities shall be provided as necessary to *[insure]* **ensure positive, adjustable control of** organic and hydraulic loading *[control to plant]* **to the**

individual process units and shall be designed for easy operator access, change, observation**,** and maintenance.

2. The use of upflow division boxes equipped with adjustable sharp-crested weirs or similar devices is recommended.

3. The use of valves for flow splitting is not acceptable.

4. Appropriate flow measurement **facilities** shall be incorporated in the flow division control design.

(I) Odor Control. Provisions for odor control shall be considered in the design if the wastewater collection system is primarily composed of force mains or otherwise provides lengthy retention times, or if the wastewater treatment facility will provide raw sludge holding, raw sludge dewatering, or thermal treatment. Odor control provisions should be considered for sludge digestion processes, sludge dewatering processes, preliminary and primary wastewater treatment processes, and other processes that provide the opportunity for gas transfer or gas stripping activities to occur.

(6) *[Plant]* Details.

(A) Installation of Mechanical Equipment. The specifications should be *[so]* written **to ensure** that the installation and initial operation of major items of mechanical equipment will be *[supervised]* **inspected and approved** by a representative of the manufacturer.

(B) Unit Isolation.

1. Removal from service.

A. Properly located and arranged structures and piping shall be provided so that each unit of the *[plant]* **wastewater treatment facility** can be removed from service independently. The design shall facilitate *[plant]* **wastewater treatment facility** operation during unit maintenance and emergency repair so as to minimize deterioration of effluent quality and *[insure]* **ensure** rapid process recovery upon return to normal operational mode.

B. Unit isolation may be accomplished through the use of duplicate or multiple treatment units in any stage if the design average flow can be handled hydraulically with the largest unit out of service.

C. The actuation of all unit isolation systems shall require manual action by operating personnel. All power-actuated unit isolation systems shall be designed to permit manual operation in the event of power failure and shall be designed so that the valve will fail as is, upon failure of the power operator.

D. Due consideration shall be given to the need for lifting and handling equipment available to aid in unit isolation. In addition, the placement of structures and other devices to lift and handle heavy or large components should be considered in the design.

[1. Continuity during construction. Final plan documents shall include construction requirements as deemed necessary by the agency to avoid unacceptable temporary water quality degradation.]

2. Unit isolation during construction. Unit isolation during construction shall be in accordance with the requirements in 10 CSR 20-8.110(7)(D).

(C) *[Drains]* **Unit Dewatering, Flotation Protection, and Plugging**.

1. Means **such as drains or sumps** shall be provided to **completely** de*[-]*water each unit to an appropriate point in the process.

2. Lines feeding chemicals or process air to basins, wet wells, and tanks shall be designed to enable repair or replacement without drainage of the basins, wet wells, or tanks.

3. *[Due consideration shall be given to the possible need for hydrostatic pressure relief devices to prevent flotation of structures.]* **Suitable methods shall be included in the design to prevent flotation of structures in areas subject to high groundwater.**

4. Pipes subject to *[clogging]* **plugging** shall be provided with means for mechanical cleaning or flushing.

(D) Construction Materials. *[Due consideration should be given to the selection of materials which are to be used in sewage treatment works because of the possible presence of]* **Materials shall be selected that are appropriate under conditions of exposure to** hydrogen sulfide and other corrosive gases, greases, oils**,** *[or similar]* **and other** constituents frequently present in *[sewage]* **wastewater**. This is particularly important in the selection of metals and paints. Contact between dissimilar *[metals]* **materials** should be avoided **or other provisions made** to minimize galvanic action.

(E) Painting.

1. The use of paints containing lead or mercury should be avoided.

2. In order to facilitate identification of piping, particularly in *[the]* large**r** *[plants]* **wastewater treatment facilities**, it is suggested that **the** different lines be color-coded. The following color scheme **shown in Table 1** is recommended for purposes of standardization*[: sludge line - brown; gas line - orange; potable water line - blue; chlorine line - yellow; sewage line - gray; compressed air line - green; and water lines for heating digesters or buildings - blue with a six inch (6") (15 cm) red band spaced thirty inches (30") (76 cm) apart]*.

Table 1 – Piping Color Schemes

Pipe Line Type	Color Scheme
Raw sludge	**Brown with black bands**
Sludge recirculation suction	**Brown with yellow bands**
Sludge draw off	**Brown with orange bands**
Sludge recirculation discharge	**Brown**
Digested sludge	**Black**
Sludge gas	**Orange (or red)**
Natural gas	**Orange (or red) with black bands**
Nonpotable water	**Blue with black bands**
Potable water	**Blue**
Fire main	**Red**
Chlorine	**Yellow**
Sulfur dioxide	**Yellow with red bands**
Wastewater	**Gray**

Compressed air	**Dark green**
Process air	**Light green**
Water lines for heating digesters or buildings	**Blue with red bands**
Fuel oil/diesel	**Red**
Plumbing drains and vents	**Black**
Ferric Chloride	**Orange**
Polymer	**Purple**

3. The contents **and direction of flow** shall be stenciled on the piping in **a** contrasting color.

(F) Operating Equipment.

1. A complete outfit of tools, accessories**,** and spare parts necessary for the *[plant operator's]* **facility personnel's** use shall be provided.

2. Readily accessible storage space and workbench facilities *[shall]* **should** be provided**.** *[and c]***C**onsideration **should** be given to provision of a garage *[storage area]* for large equipment **storage**, maintenance**,** and repair.

(G) Erosion Control During Construction. Effective site erosion control shall be provided during construction. **Erosion control activities shall obtain a stormwater permit for land disturbance activities that meet the requirements of the land disturbance permit, in accordance with 10 CSR 20-6.200.**

(H) Grading and Landscaping. Upon completion of *[the plant]* **wastewater treatment facility construction**, the ground *[should]* **shall** be graded **and either sodded or seeded**. *[Concrete or gravel]* **All-weather** walkways should be provided for access to all units. Where possible, steep slopes should be avoided to prevent erosion **and to minimize slips, trips, and falls**. Surface water shall not be permitted to drain into any unit. Particular care shall be taken to protect trickling filter beds, sludge beds**,** and *[intermittent]* sand filters from stormwater runoff. Provision should be made for landscaping, particularly when a *[plant]* **wastewater treatment facility** must be located near residential areas.

(7) *[Plant]* Outfalls.

(A) *[Entrance]* **Discharge** Impact Control.

1. The outfall sewer shall be designed to discharge *[to the receiving stream]* in a manner acceptable to the *[agency]* **department**. Consideration should be given in each case to the following:

A. *[p]***P**reference for free fall or submerged discharge at the site selected;

B. *[u]***U**tilization of cascade aeration of effluent discharge to increase dissolved oxygen; **and**

C. *[l]***L**imited or complete across-stream dispersion as needed to protect aquatic life movement and growth in the immediate reaches of the receiving stream*[; appropriate effluent sampling in accordance with subsection (7)(C) of this rule]*.

(B) Protection and Maintenance. The outfall sewer shall be so constructed and protected against the effects of flood water, ice**,** or other hazards as to reasonably *[insure]* **ensure** its structural stability and freedom from stoppage. A manhole should be provided at the shore

end of all gravity **outfall** sewers extending into the receiving waters. Hazards to navigation shall be considered in designing outfall sewers.

(C) Sampling Provisions. All outfalls shall be designed so that *[a]* **twenty-four (24) hour automatic composite sampling or grab** sample**s** of the effluent can be obtained at a point after the final treatment process and before discharge to or mixing with the receiving waters.

(D) All outfalls shall be posted with a permanent sign indicating the outfall number (i.e., Outfall #001).

(8) Essential Facilities.

(A) Emergency Power Facilities.

1. General. All *[plants]* **wastewater treatment facilities** shall be provided with an alternate source of electric power **or pumping capability** to allow continuity of operation during power failures, except as noted in *[this subsection]* **the subparagraphs below**. **Refer to 10 CSR 20-8.130 for design details.** Methods of providing alternate*[s]* **sources** include**:**

A. *[t]***T**he connection of at least two (2) independent *[public utility]* **power** sources*[,]* such as substations*[;]* **able to supply power without interruption.** *[a]***A** power line from each substation is *[recommended, and will be]* required **if this method is used** unless*[,]* documentation is received and approved by the *[agency]* **department** verifying that **a** duplicate line is not necessary *[to minimize water quality violations]*;

B. *[p]***P**ortable or in-place **automatically starting** internal combustion engine equipment which will generate electrical or mechanical energy; *[and]* **or**

C. *[p]***P**ortable pumping equipment when only emergency pumping is required.

Where part or all of the engine-driven pumping equipment is portable, adequate emergency storage capacity with an alarm system shall be provided to allow time for detection of pump station failure and transportation and hookup of the portable equipment.

2. Provisions for testing. Testing provisions shall be included in the design of subparagraph (8)(A)1.B. of this rule requiring period testing to be accomplished while maintaining electric power to all vital components. Such provisions would involve an ability to conduct tests, such as actuating and resetting automatic transfer switches and starting and loading emergency generating equipment without taking essential equipment off-line. The electric power distribution system and equipment shall be designed to facilitate inspection and maintenance of individual items without interruption of operations.

3. Reliability of power service. A determination of the reliability of power service for a new wastewater treatment facility, written on each utility's letterhead and bearing the signature of a utility employee, shall be provided to the department and shall include:

A. State the service provided;

B. Identify the location of the wastewater treatment facility;

C. List the total number of outages that have occurred during the past two (2) years; and

D. Indicate the date and duration of each recorded outage.

[1.]**4. Power for aeration.** Standby generating capacity normally is not required for aeration equipment used in the activated sludge process. In cases where a history of **chronic,** long-term (four (4) hours or more) power outages **or reduced voltage** have occurred, auxiliary power for minimum aeration of the activated sludge will be required. Full power generating capacity may be required by the *[agency]* **department for waste discharges** *[on]* **to** certain **critical** stream segments **such as upstream of bathing beaches, public water supply intakes, or other similar situations**.

*[2.]***5. Power for disinfection.** *[Continuous d]***D**isinfection*[, where required,]* **and dechlorination, where applicable,** shall be provided during all power outages.

6. Power for data loggers. Computers configured to log data shall be supplied with an uninterruptable power supply (UPS). Each UPS shall monitor its own battery condition and issue alarms on low battery. UPSs configured to supply computers shall cause the computer to save all open files, without overwriting existing files, at the time of primary power failure and again with a low battery condition occurs.

(B) Alarm Systems. An audiovisual alarm system with a self-contained power supply to monitor the condition of equipment whose failure could result in a bypass or a violation of applicable effluent limitations shall be provided for all wastewater treatment facilities. Alarms shall also be provided to monitor conditions which could result in damage to vital components.

1. For continuously manned wastewater treatment facilities, the alarm system shall sound and be visible in areas normally manned and in areas near the equipment being monitored.

2. Facilities with a design flow of one hundred thousand (100,000) gallons (378.5 m^3) per day or greater that are not supervised twenty-four (24) hours per day, in addition to a local audiovisual alarm, must have telemetry with battery backup as part of the alarm system. The telemetry system must notify a facility operator in the event of an alarm.

3. The following requirements shall apply to all wastewater treatment facilities with the exception of facilities with a design flow of less than one hundred thousand (100,000) gallons (378.5 m^3):

A. A back up power supply, such as a battery pack with an automatic switchover feature, shall be provided for the alarm system (such that a failure of the primary power source would not disable the alarm system), unless an adequate alternate or back up power source is provided.

B. Test circuits shall be provided to enable the alarm system to be tested and verified to be working properly.

*[(B)]***(C)** Water Supply.

1. General. An adequate supply of potable water under pressure should be provided for use in the laboratory and for general cleanliness around the *[plant]* **wastewater treatment facility**. No piping or other connections shall exist in any part of the **wastewater** treatment *[works]* **facility** which, under any conditions, might cause the contamination of a potable water supply. The chemical quality should be checked for suitability for its intended uses*[,]* such as **in** heat exchangers, chlorinators, etc.

2. Direct connections. Potable water from a municipal or separate supply may be used

directly at points above grade for the following hot and cold supplies:

A. *[l]***L**avatory;
B. *[w]***W**ater closet;
C. *[l]***L**aboratory sink (with vacuum breaker);
D. *[s]***S**hower;
E. *[d]***D**rinking fountain;
F. *[e]***E**ye wash fountain; and
G. *[s]***S**afety shower.

3. Direct hot water connections. Hot water for any of *[these]* **the** units **listed in paragraph (8)(B)2. of this rule** shall not be taken directly from a boiler used for supplying hot water to a sludge heat exchanger or digester heating *[coils]* **unit**.

*[3.]***4.** Indirect connections. *[A reduced pressure backflow preventer or a break tank shall be used to isolate the potable system from all other plant uses other than those listed in paragraph (8)(B)2. of this rule. Where permanent connections are to be made to uses other than those listed in paragraph (8)(B)2. of this rule, a break tank shall be used. Where a break tank is used, water shall be discharged to the break tank through an air-gap at least six inches (6") above the maximum flood line, ground level or the spill line of the tank, whichever is higher. Backflow preventers shall be located above the maximum flood line or ground level.]*

A. Where a potable water supply is to be used for any purpose in a wastewater treatment facility other than those listed in paragraph (8)(B)2. of this rule, a break tank, pressure pump, and pressure tank or an approved reduced pressure backflow preventer shall be provided. Water shall be discharged to the tank through an air gap twice the diameter of the discharge pipe or at least six inches (6") (15.2 cm) above the maximum flood line or the spill line of the tank, whichever is higher. For more information, refer to 10 CSR 60-11.010(3)(A) and 10 CSR 60-11.010(4)(C).

B. A sign shall be permanently posted at every hose bib, faucet, hydrant**,** or sill cock located on the water system beyond the break tank or backflow preventer to indicate that the water is not safe for drinking. **Figure 1 below provides the minimum wording for the warning sign.**

NON-POTABLE WATER
DO NOT DRINK

Figure 1. Minimum text for a non-potable water warning sign.

*[4.]***5.** Separate potable water supply. Where it is not possible to provide potable water from a public water supply, a separate well may be provided. Location and construction of the well should comply with requirements of *[10 CSR 60-2.010]* **the department's Public Drinking Water Branch**. Requirements governing the use of the **potable water** supply are those contained in paragraphs *[(8)(B)2. and 3.]* **(8)(C)2. through (8)(C)4.** of this rule.

*[5.]***6.** Separate non-potable water supply. Where a separate non-potable water supply is to be provided, a break tank will not be necessary, but all system outlets shall be posted with a permanent sign indicating the water is not safe for drinking. **See Figure 1 of this rule.**

*[(C)]***(D)** Sanitary Facilities. Toilet, shower, lavatory**,** and locker facilities should be provided in sufficient numbers and **at** convenient locations to serve the expected *[plant]* **facility** personnel.

[(D) Laboratory. All treatment works shall include a laboratory for making the necessary analytical determinations and operating control tests, except in individual situations where other arrangements are approved by the agency. The laboratory shall have sufficient size, bench space, equipment and supplies to perform all self-monitoring analytical work required by discharge permits and to perform the process control tests necessary for good management of each treatment process included in the design. The facilities and supplies necessary to perform analytical work to support industrial waste control programs will normally be included in the same laboratory. The laboratory size and arrangement must be sufficiently flexible and adaptable to accomplish these assignments. The layout should consider future needs for expansion in the event that more analytical work is needed.

1. Location and space. The laboratory should be located on ground level, easily accessible to all sampling points, with environmental control as an important consideration. It shall be located away from vibrating machinery or equipment which might have adverse effects on the performance of laboratory instruments or the analyst or design or to prevent adverse effects from vibration. A minimum of four hundred (400) square feet (37m^3) of floor space should be allocated for the laboratory. If more than two (2) persons will be working in the laboratory at any given time, one hundred (100) square feet (9.3m^3) of additional space should be provided for each additional person. Bench top working surface should occupy at least thirty-five percent (35%) of the total floor space. Minimum ceiling height should be eight feet six inches (8'6") (2 m). If possible this height should be increased to provide for installation of wall-mounted water stills, distillation racks and other equipment with extended height requirements.

2. Materials.

A. Ceilings. Acoustical tile should be used for ceiling except in high humidity areas where they should be constructed of plaster.

B. Walls. For easy maintenance and a pleasant working environment, light colored ceramic tile should be used from floor to ceiling for all interior walls.

C. Floors. Floor surfaces should be either vinyl asbestos or rubber, fire-resistant and highly resistant to acids, alkalies, solvents and salts.

D. Doors. Two (2) exit doors should be located to permit a straight egress from the laboratory preferably at least one (1) to outside the building. Panic hardware should be used. They should have large glass windows for easy visibility of approaching or departing personnel. Automatic door closers should be installed; swinging doors should not be used. Flush hardware should be provided doors if cart traffic is anticipated. Kick plates are also recommended.

3. Cabinets and bench tops. Wall hung cabinets are useful for dust-free storage of instruments and glassware. Units with sliding doors are preferable. They should be

hung so the top shelf is easily accessible to the analyst. Thirty inches (30") (76 cm) from the bench top is recommended. One (1) or more cupboard style base cabinets should be provided for storing large items; however, drawer units are preferred for the remaining cabinets. Drawers should slide out so that entire contents are easily visible. They should be provided with rubber bumpers and with stops which prevent accidental removal. Drawers should be supported on ball bearings or nylon rollers which pull easily in adjustable steel channels. All metal drawer fronts should be of double wall construction. All cabinet shelving should be acid resistant and adjustable from inside the cabinet. Water, gas, air and vacuum service fixtures; traps, strainers, overflows, plugs and tailpieces; and all electrical service fixtures shall be supplied with the laboratory furniture. Generally, bench top height should be thirty-six inches (36") (91 cm). However, areas to be used exclusively for sit-down type operations should be thirty inches (30") (76 cm) high and include knee hole space. One-inch (1") (2.54 cm) overhangs and drip grooves should be provided to keep liquid spills from running along the face of the cabinet. Tops should be furnished in large sections one and one-fourth inches (1 1/4") (3.18 cm) thick. They should be field joined into a continuous surface with acid, alkali and solvent resistant cements which are at least as strong as the material of which the top is made.

4. Hoods. Fume hoods to promote safety and canopy hoods over heat releasing equipment shall be installed.

A. Fume hoods.

(I) Location. Fume hoods should be located where air disturbance at the face of the hood is minimal. Air disturbance may be created by persons walking past the hood, supply in diffusers, drafts from opening or closing a door, etc. Safety factors should be considered in locating a hood. If a hood is situated near a doorway, a secondary means of egress must be provided. Bench surfaces should be available next to the hood so that chemicals need not be carried long distances.

(II) Design and materials. The selection of fume hoods, their design and materials of construction must be made considering the variety of analytical work to be performed and the characteristics of the fumes, chemicals, gases or vapors that will or may be released by the activities therein. Special design and construction is necessary if perchloric acid use is anticipated. Consideration should be given for providing more than one (1) fume hood to minimize potential hazardous conditions throughout the laboratory. Fume hoods are not appropriate for operation of heat releasing equipment, that does not contribute to hazards, unless they are provided in addition to those needed to perform hazardous tasks.

(III) Fixtures. A cup sink should be provided inside each fume hood. All switches, electrical outlets, utility and baffle adjustment handles should be located outside the hood. Light fixtures should be explosion proof.

(IV) Exhaust. Twenty-four (24)-hour continuous exhaust capability should be provided. Exhaust fans should be explosion proof. Exhaust velocities should be checked when fume hoods are installed.

(V) Alarms. A buzzer for indicating exhaust fan failure and a static pressure gauge should be placed in the exhaust duct. A high temperature sensing device located inside the hood should be connected to the buzzer.
(VI) Canopy hoods. Canopy hoods should be installed over the bench top areas where hot plate, steam bath or other heating equipment or heat releasing instruments are used. The canopies should be constructed of steel, plastic or equivalent material and finished with enamel to blend with other laboratory furnishings.

5. Sinks. The laboratory shall be equipped with at least one (1) double-wall sink with drainboards. Additional sinks should be provided in separate work areas as needed and identified for the use intended. Sinks should be made of epoxy resin or plastic material with all appropriate characteristics for laboratory applications. Waste openings should be located toward the back so that a standing overflow will not interfere. All water fixtures on which hoses may be used should be provided with reduced zone pressure backflow preventers to prevent contamination of water lines. The sinks should be constructed of material highly resistant to acids, alkalies, solvents and salts, should be abrasion and heat resistant, nonabsorbent and light in weight. Traps should be made of glass, plastic or lead and easily accessible for cleaning.
6. Ventilation and lighting. Laboratories should be separately air conditioned with external air supply for one hundred percent (100%) makeup volume. In addition, separate exhaust ventilation should be provided. Ventilation outlet locations should be remote from ventilation inlets. Good lighting, free from shadows, is important for reading dials, meniscuses, etc., in the laboratory.
7. Gas and vacuum. Natural gas should be supplied to the laboratory. Digester gas should not be used. An adequately sized line source of vacuum should be provided with outlets available throughout the laboratory.
8. Balance and table. An analytical balance of the automatic, digital readout, single pan 0.1 milligram sensitivity type shall be provided. A heavy special design balance table which will minimize vibration of the balance shall be provided. It shall be located as remote as possible from windows, doors or other sources of drafts or air movements, so as to minimize undesirable impacts from these sources upon the balance.
9. Equipment, supplies and reagents. The laboratory shall be provided with all of the equipment, supplies and reagents that are needed to carry out all of the facility's analytical testing requirements. Discharge permit requirements, process control requirements and industrial waste monitoring requirements should be considered when specifying equipment needs.]

(E) Floor Slope. Floor surfaces shall be sloped adequately to a point of drainage.

(F) Stairways**, Railings, and Walkways**.

1. Stairways shall be installed *[wherever possible]* in lieu of ladders **for access to units requiring routine inspection and maintenance, such as digesters, trickling filters, aeration tanks, clarifiers, tertiary filters, etc**. Spiral or winding stairs are permitted only for secondary access where dual means of egress are provided.

2. Stairways shall have slopes between *[fifty]* **thirty** degrees (*[50]***30**°) and *[thirty]* **forty** degrees (*[30]***40**°) *[(preferably nearer the latter)]* from the horizontal to facilitate

carrying samples, tools, etc. Each tread and riser shall be of uniform dimension in each flight. Minimum tread run shall not be less than *[eight]* **nine** inches (*[8]***9**") (*[20.3]***22.9** cm). The sum of the tread run and riser shall not be less than seventeen inches (17") (43**.2** cm) nor more than eighteen inches (18") (*[46]***45.7** cm). A *[flight of stairs shall consist of not]* **stairway shall not have** more than a twelve*[-]* foot (12') (3.7 m) continuous rise without a platform.

3. An opening in a railing must have a removable chain.

4. An open valve box, pit, tank, basin, trench, stairwells, and other hazardous structures with the tops of walls less than forty-two inches (42") (106.7 cm) above the surrounding ground level must have a hand railing with toe-boards where appropriate capable of preventing a person from falling into it.

5. A walkway above an open tank must have a raised edge designed to prevent a person from slipping off the walkway.

6. An overhead pipe must have at least a seven foot (7') (2.1 m) clearance, unless the pipe is padded to prevent head injury and has a warning sign.

(G) Protection from the Elements. All wastewater treatment facilities except those facilities which operate only seasonally shall be designed to assure effective operation under all weather conditions. Protection from the elements must be given consideration for wastewater treatment facilities with a design average flow of less than one hundred thousand gallons per day (100,000 gpd) and include the following:

1. Provisions for covering exposed process areas with boards or insulating panels may be sufficient;

2. The use of heat tapes around sludge and scum return piping should be considered in addition to covering the tanks;

3. A sufficient number of electrical outlets should be provided;

4. Tanks which are not completely backfilled on all sides may require additional protective measures during freezing weather; and

5. Any such measures taken to protect the process units shall not present a hazard to facility personnel nor hinder the operation of the wastewater treatment facility.

*[(G)]***(H)** Flow Measurement.

1. Location. Flow measurement *[facilities shall be provided at all plants.]* **to measure the following flows:**

A. Influent flow measurement shall be provided;

B. Measurement of other flows, such as effluent flow, required to be monitored under the provisions of the operating permit shall be provided; and

C. Measurement of other flows such as return activated sludge, waste activated sludge, recirculation, and recycle required for wastewater treatment facility operational control should be considered.

2. Facilities. Indicating, totalizing**,** and recording flow measurement devices shall be provided for *[all mechanical plants]* **wastewater treatment facilities with a design average flow of one hundred thousand gallons per day (100,000 gpd) or greater**. *[Flow measurement facilities for lagoon systems shall not be less than pump calibration time clocks or calibrated flume and shall be provided on both the influent and effluent.]* **Wastewater treatment facilities with a design average flow less than one hundred**

thousand gallons per day (100,000 gpd) shall provide at a minimum a flume or a weir without a secondary measuring device or an elapsed time meter used in conjunction with pumping rate tests and the design shall facilitate the installation of continuous flow recording equipment.

3. Measuring equipment. All flow measurement equipment must be sized to function effectively over the full range of flows expected and shall be protected against freezing. The following flow measurement equipment are acceptable but not all-inclusive.

A. Magnetic flow meters. A magnetic flow meter provides no obstruction to the liquid flow and uses Faraday's law of electromagnetic induction to determine the flow of liquid in a pipe. A display of instantaneous flow rate and a means of reading the totalized flow shall be included.

B. Flumes. A flume is a specially shaped open channel flow section providing a restriction in channel area and/or a change in channel slope. A non-corrodible rule or gauge that is clearly visible shall be included.

C. Weirs. A weir is an obstruction or dam built across an open channel over which the liquid flows, often through a specially shaped opening. A non-corrodible rule or gauge that is clearly visible shall be included. Weirs shall not be acceptable for influent flow measurement except for very low flows where self-flushing flow measuring devices are not accurate.

D. Secondary measuring device. A secondary measuring device, or open channel flow meter, measures the liquid level at one (1) point in the channel and then converts this measurement into a flow rate based on the known level-to-flow rate relationship of the flume or weir. This device must measure the liquid level and convert this liquid level into a flow rate that is integrated to a totalized flow. A display of the instantaneous flow rate and a means of reading the totalized flow shall be included.

E. Elapsed time meters. Elapsed time meters with an event recorder on pump station controls will generally be an acceptable method of providing continuous flow monitoring, but only when it can be shown that the installation of a flume or weir is an impractical alternative.

4. Hydraulic conditions. Flow measurement equipment including approach and discharge conduit configuration and critical control elevations shall be designed to ensure that the required hydraulic conditions necessary for accurate measurement are provided. Turbulence, eddy currents, air entrainment, or any other aspect that upsets the normal hydraulic conditions that are necessary for accurate flow measurement shall be avoided.

(I) Sampling Equipment. Effluent twenty-four (24) hour composite automatic sampling equipment shall be provided at all mechanical wastewater treatment facilities and at other facilities where necessary to meet operating permit monitoring requirements. See 10 CSR 20-7.015. Twenty-four (24) hour composite automatic sampling equipment shall also be provided for influent sampling as necessary to meet operating permit monitoring requirements. The influent sampling point should be located prior to any process return flows.

(J) Housed Facilities. Where treatment units are in a housed facility, fresh air continuously shall be introduced at a rate of twelve (12) air changes per hour, or intermittently at a rate of thirty (30) air changes per hour.

(9) Safety.

(A) General. Adequate provision shall be made to effectively protect *[the operator]* **facility personnel** and visitors from hazards*[,]*. *[t]***T**he following shall be provided to fulfill the particular needs of each *[plant]* **wastewater treatment facility**:

1. Fencing. *[e]***E**nclosure of the *[plant]* **facility** site with a fence designed to discourage the entrance of unauthorized persons and animals*[;installation of hand rails and guards around tanks, trenches, pits, stairwells, and other hazardous structures;]*. **The design shall include the following:**

A. A minimum of five feet (5') (1.5 m) in height and shall be constructed of durable materials appropriate to the site and nature of the wastewater treatment facility. Posts shall be imbedded to a sufficient depth or otherwise securely anchored to prevent displacement and shall not be spaced more than twenty feet (20') (6.1 m) apart. Barbed wire, woven wire fabric, or chain link mesh shall be securely fastened to the posts with fasteners designed for the type of material used;

B. A minimum of four feet (4') (1.2 m) clearance from all process units should be provided to permit easy access for operation and maintenance;

C. Fencing materials less than two feet (2') (0.6 m) off the ground should prevent the passage of small animals;

D. At least two (2) strands of barbed wire should be provided above the fence spaced no more than six inches (6") (15.2 cm) apart for locations with vulnerable security (e.g., along high traffic roadways, where vandalism is common, etc.);

E. At least one (1) gate shall be provided for access of maintenance equipment and vehicles and each gate shall be provided with a lock. Gates shall be constructed in a manner and of materials comparable to those used for the fence. Gates shall be designed to prohibit entry of the enclosure by crawling underneath. When sizing the gate, consideration must be given to the need for entry of mowing equipment, sludge trucks, or other vehicles or equipment necessary for routine maintenance and operation; and

F. At least one (1) warning sign shall be placed on each side of the facility enclosure in such positions as to be clearly visible from all directions of approach. A sign shall be placed on each gate. Signs shall be made of durable materials with characters at least two inches (2") (5.1 cm) high and shall be securely fastened to the fence. Figure 2 below provides the minimum wording for the warning sign;

WASTEWATER TREATMENT FACILITY
KEEP OUT

Figure 2. Minimum text for a fence warning sign.

2. Gratings over appropriate areas of treatment units where access for maintenance is required;
3. *[provision of f]***F**irst*[-]* aid equipment;
4. *[posting of]* "No Smoking" signs in hazardous areas;
5. *[provision of p]***P**rotective clothing and equipment**,** such as *[air pacs]* **self-contained breathing apparatus, gas detection equipment**, goggles, gloves, hard hats, safety harnesses **and line**, **hearing protectors,** etc.;
6. *[provision of p]***P**ortable blower and *[sufficient]* hose **sufficient to ventilate accessed confined spaces**;
7. *[p]***P**ortable lighting equipment *[approved by the United States Bureau of Mines]* **complying with National Electric Code (NEC) requirements**; *[and]*
8. Gas detectors listed and labeled for use in Class I, Division 1, Group D locations;
9. *[a]***A**ppropriately-placed warning signs for slippery areas, non-potable water fixtures **(see subsection (8)(C) of this rule)**, low head clearance areas, open service manhole**s**, hazardous chemical storage areas, flammable fuel storage areas, **high noise areas,** etc.**;**
10. Adequate ventilation in pump station areas in accordance with 10 CSR 20-8.130(4);
11. Explosion-proof electrical equipment, non-sparking tools, etc., in work areas where hazardous conditions may exist, such as digester vaults and other locations where potentially explosive atmospheres of flammable gas or vapor with air may accumulate.
12. Provisions for local lockout on stop motor controls;
13. Provisions for confined space entry in accordance with Occupational Safety and Health Administration requirements; and
14. Adequate vector control.

(10) Chemical Handling, Housing, Safety and Identification.

(A) *[Hazardous]* Chemical Handling.

1. Containment materials. The materials utilized for storage, piping, valves, pumping, metering, splash guards, etc., shall be specially selected considering the physical and chemical characteristics of each hazardous or corrosive chemical.

[2. Secondary containment. Chemical storage areas shall be enclosed in dikes or curbs which will contain the stored volume until it can be safely transferred to alternate storage or released to the wastewater at controlled rates which will not damage the facilities, inhibit the treatment processes, or contribute to stream pollution.]

2. Secondary containment. Secondary containment shall be designed to contain any spilled product from the primary containers or rainfall from the operational containment area and secondary containment area for the amount of time required for proper cleanup and recovery.

A. The volume of the secondary containment area when not protected from precipitation shall have a minimum volume of one hundred twenty-five percent (125%) of the volume of the largest storage container located within the

containment area plus the space occupied by any other tanks located within the containment area.

B. The volume of the secondary containment area when protected from precipitation shall have a minimum volume of one hundred ten percent (110%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area.

C. The secondary containment structure shall not have a discharge outlet or gravity drain through the wall or floor of the containment structure.

D. The walls and floors of the secondary containment structure shall be constructed of suitable material that is compatible with the specifications of the product being stored.

3. Liquid polymer should be similarly contained **as in paragraph (10)(A)2. of this rule** to reduce areas with slippery floors, especially to protect travelways. Non-slip floor surfaces are desirable in polymer-handling areas.

[3. Eye wash fountains and safety showers. Eye wash fountains and safety showers utilizing potable water shall be provided in the laboratory and on each floor level or work location involving hazardous or corrosive chemical storage, mixing (or slaking), pumping, metering, or transportation unloading. These facilities are to be as close as practicable to possible chemical exposure sites and are to be fully useful during all weather conditions. The eye wash fountains shall be supplied with water of moderate temperature— fifty degrees to ninety degrees Fahrenheit (50° – 90 °F) (ten degrees to thirty-two degrees Celsius (10° – 32 °C)), separate from the hot water supply, suitable to provide fifteen to thirty (15 – 30) minutes of continuous irrigation of the eyes. The emergency showers shall be capable of discharging thirty to fifty gallons per day (30 – 50 gpm) (1.9 – 3.2 l/s) of water at moderate temperature at pressures of twenty to fifty pounds per square inch (20 – 50 psi) (1.41 – 3.52 kgf/cm^2). The eye wash fountains and showers shall be no more than twenty-five feet (25') (7.6 m) from points of hazardous chemical exposure.]

4. Splash guards. All pumps or feeders for hazardous or corrosive chemicals shall have guards which will effectively prevent spray of chemicals into space occupied by **facility** personnel. The splash guards are in addition to guards to prevent injury from moving or rotating machinery parts.

5. Piping, labeling, **and** coupling guard*[s,]* location**s**.

A. All piping containing or transporting corrosive or hazardous chemicals shall be identified with labels every ten feet (10') (3.0 m) and with at least two (2) labels in each room, closet**,** or pipe chase. Color-coding may also be used**,** but is not an adequate substitute for labeling. **Refer to subsection (6)(E) of this rule for paint color schemes.**

B. All connections (flanged or other type), except **those** adjacent to storage or feeder areas, shall have guards which will direct any leakage away from space occupied by **facility** personnel. Pipes containing hazardous or corrosive chemicals should not be located above shoulder level except where continuous drip collection trays and coupling guards will eliminate **chemical** spray or dripping onto **facility** personnel.

[6. Protective clothing and equipment. The following items of protective clothing or equipment shall be available and utilized for all operations or procedures where their use will minimize injury hazard to personnel: respirators, air supply type recommended for protection against chlorine; chemical workers' goggles or other suitable goggles (safety glasses are insufficient); face masks or shields for use over goggles; rubber gloves, rubber aprons with leg straps; rubber boots (leather and wool clothing should be avoided near caustics); and safety harness and line.]

7. *[Warning]* **Alarm** system**.** *[and signs.]* Facilities shall be provided for automatic shutdown of pumps and sounding of alarms when failure occurs in a pressurized chemical discharge line. *[Warning signs requiring use of goggles shall be located near chemical unloading stations, pumps, and other points of frequent hazard.]* **Refer to subsection (8)(B) of this rule for alarm system requirements.**

8. Dust collection. Dust collection equipment shall be provided to protect personnel from dusts injurious to the lungs or skin and to prevent polymer dust from settling on walkways **which become slick when wet**. *[The latter is to minimize slick floors which result when a polymer-covered floor becomes wet.]*

(B) Chemical Housing.

1. The chemical storage room should be constructed of fire and corrosion resistant material.

2. Doors shall be equipped with panic hardware. Doors shall lock to prevent unauthorized access, but do not need a key to exit the locked room using the panic hardware.

3. Floor surfaces should be smooth, impervious, and slip-proof.

4. Rooms shall be well-lighted. The lights and electrical equipment shall comply with the NEC requirements for Class I, Division 2 locations.

5. Chemical containers should be stored in a cool, dry, and well-ventilated area.

6. Storing chemical containers in direct sunlight should be avoided.

7. Temperatures above eighty-six degrees Fahrenheit (86° F) (30° C) and below forty degrees Fahrenheit (40° F) (4° C) should be avoided.

8. The storage area shall have designated areas for "full" and "empty" chemical containers.

9. Storage rooms housing flammable chemicals should have an automatic sprinkler system designed for four tenths gallons per minute per square foot (0.4 gpm/ft^2) and minimum twenty (20) minute duration.

10. Liquefied gas chemicals. Areas intended for storage and handling of chlorine and sulfur dioxide and other hazardous gases shall be properly designed and isolated. Gas detection kits, alarms, controls, safety devices, and emergency repair kits shall be provided. Refer to 10 CSR 20-8.190(4) and 10 CSR 20-8.190(5) for additional chlorine and dechlorination considerations.

(C) Chemical Safety.

1. Protective clothing and equipment. The following items of protective clothing or equipment shall be available and utilized for all operations or procedures where their use will minimize injury hazard to facility personnel:

A. Self-contained breathing apparatus recommended for protection against

chlorine and peracetic acid and other hazardous fumes;

B. Chemical worker's goggles or other suitable goggles (safety glasses are insufficient);

C. Face masks or shields for use over goggles;

D. Dust mask to protect the lungs in dry chemical areas;

E. Rubber gloves;

F. Rubber aprons with leg straps;

G. Rubber boots (leather and wool clothing should be avoided near caustics); and

H. For additional safety considerations, refer to section (9) of this rule.

2. Eye wash fountains and safety showers. Eye wash fountains and safety showers utilizing potable water shall be provided on each floor level or work location involving hazardous or corrosive chemical storage, mixing (or slaking), pumping, metering, or transportation unloading.

A. The eye wash fountains shall be supplied with water of moderate temperature fifty degrees to ninety degrees Fahrenheit (50° – 90°F) (10° – 32°C) suitable to provide fifteen to thirty (15 – 30) minutes of continuous irrigation of the eyes.

B. The emergency showers shall be capable of discharging twenty gallons per minute (20 gpm) (1.3 L/s) of water at moderate temperature and at pressures of twenty to fifty pounds per square inch (20 – 50 psi) (1.4– 3.5 kgf/cm^2).

C. The eye wash fountains and showers shall be no more than twenty-five feet (25') (7.6 m) from points of hazardous chemical exposure.

D. The eye wash fountains and showers are to be fully operable during all weather conditions.

3. Warning signs. Warning signs requiring use of goggles shall be located near chemical stations, pumps, and other points of frequent hazard.

*[9.]***(D) Chemical** Container *[i]***I**dentification. The identification and hazard warning data included on shipping containers, when received**,** shall appear on all containers (regardless of size or type) used to store, carry**,** or use a hazardous substance. *[Sewage]* **Wastewater** and sludge sample containers should be adequately labeled. *[Following]* **Figure 3 below** is **an example of** a suitable label *[for a sewage]* **to identify a wastewater** sample **as a hazardous substance**:

RAW *[SEWAGE]* **WASTEWATER**
Sample point No. _____
Contains Harmful Bacteria.
May contain hazardous or toxic material.
Do not drink or swallow.
Avoid contact with openings or breaks in the skin.

Figure 3. Sample text for a raw wastewater label.

(11) Laboratory Facilities. Careful consideration should be given to the laboratory facilities needed for the operational control of each wastewater treatment facility.

(A) All wastewater treatment facilities shall include a laboratory for making the necessary analytical determinations and operating control tests, except in individual situations where operational testing is minimal or not required and self-monitoring analyses are to be performed off-site.

(B) The laboratory shall have sufficient size, bench space, equipment, and supplies to perform all on-site self-monitoring analytical work required by the operating permit, and to perform the process control tests necessary for management of each treatment process included in the design.

(C) The laboratory size and arrangement must be sufficiently flexible and adaptable to accomplish these assignments.

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