



Canadian Standards Association
Mississauga, Ontario
To the Part I Committee

Subject No. 1667

Chair: S. Paulsen

Date: March 30, 2005

Title: Sewage Lifts & Treatment Plants, Rules 22-700 and 22-710

Submitted by: D. Dunsire of Manitoba Hydro on July 13, 1984.

Proposal: Add the following new Subsection.

Sewage Lift and Treatment Plants

22-700 Scope. Rules 22-702 to 22-710 apply to the installation of electrical facilities in:

- (i) Sewage lift and pumping stations; and
- (ii) Primary and secondary sewage treatment plants.

22-702 Definitions

Suitably cut off means an area cut off from adjoining areas with no communication such as doors, windows or ventilation grills between the areas.

Wet well means the below ground location into which the raw sewage is collected prior to passing through the lift pumps or being processed in a treatment plant.

Dry well means the below ground location which is isolated from the wet well locations so as to prevent the migration of gases or vapours into the dry well.

Continuous positive pressure ventilation means a ventilation system capable of maintaining a positive pressure in a room or area and changing the air in the room or area at least 6 times an hour with means for detecting ventilation failure.

22-704 Classification of Areas (see Appendix B)

(1) Except as permitted by Paragraph (c) of Subrule (3), all below ground locations suitably cut off from the location in which sewage gases are present shall be classified Category 1.

- (2) All locations in which sewage gases are present shall be classified Category 2.

- (3) The following areas shall be permitted to be classified as ordinary locations:
 - (a) All locations suitably cut off from a Category 2 location and not classified as a Category 1 location; and
 - (b) All locations not suitably cut off from a Category 2 location but with adequate continuous positive pressure ventilation; and
 - (c) Below ground dry well locations where adequate heating and ventilation is installed.

22-706 Wiring Methods

- (1) Wiring methods in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of this Code.
- (2) Wiring methods in a wet or damp Category 2 location shall be in accordance with the applicable requirements of this Code except that:
 - (a) Rigid steel conduit and electrical metallic tubing shall not be used; and
 - (b) Mineral insulated cable and aluminum sheathed cable shall be permitted to be used provided it is spaced from walls at least 12 mm, the cable has a corrosion resistant jacket and the cable connectors are suitably sealed from the corrosive atmosphere; and
 - (c) Liquid tight flexible metal conduit shall be permitted to be used where permitted in accordance with Rule 12-1400, provided connectors suitable for the location are used.
 - (d) Ground wires shall be insulated or otherwise protected from corrosion and the point of connection to ground, if exposed to a corrosive atmosphere, shall be protected from corrosion by a suitable sealant.

22-708 Electrical Equipment

- (1) Electrical equipment installed in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of this Code.
- (2) Electrical equipment installed in a wet or damp Category 2 location shall be in accordance with the applicable requirements of this Code except that:
 - (a) Receptacles shall be fitted with self-closing covers, and if of the duplex type, have individual covers over each half of the receptacle; and
 - (b) Lighting switches shall have weatherproof covers; and
 - (c) Lighting fixtures shall be totally enclosed; and

- (d) Unit emergency lighting equipment and emergency lighting control units with the exception of remote lamps, shall not be located in such locations; and
- (e) Heating equipment shall be approved for such locations or installed outside the corrosive location; and
- (f) Motors shall be totally enclosed, fan cooled and shall not incorporate dissimilar metals relative to the motor frame and connection box; and
- (g) Electrical equipment in wet well areas shall not contain devices which will cause an open arc or spark during normal operation.

22-710 Grounding of Structural Steel. Below ground structural steel in contact with the surrounding earth shall be bonded to the system ground.

APPENDIX B Add the following:

22-704 *Figures 1, 2, 3 and 4 detail typical installations and area classifications for sewage lift and treatment plants.*

Sewage lift and treatment plants produce a combination of conditions which may require specialized attention to the electrical installation. The wet well area normally contains an atmosphere of high humidity and corrosive hydrogen sulphide vapours. Abnormal hazardous conditions may occur in the wet wells due to spills of chemicals, gasoline or other volatile liquids into the sewer systems.

An extreme hazard to personnel working in wet wells exists because of sewer gas (hydrogen sulphide). This gas is treacherous as the ability to sense it by smell is quickly lost. If a person ignores first notice of the gas, his senses will give him no further warning. If the concentration is high enough, unconsciousness and death may result.

Before working in wet well locations, the air in the wet well area should be purged and ventilation with fresh air should be continued while working in the area.

Reasons for Request: The reason for this proposal is to set down definitive area classifications and wiring requirements for sewage handling and processing locations.

These requirements were formulated in 1978 by a Winnipeg Task Group comprising experts in the sewage disposal field as well as Inspection Authorities. These requirements have been mandated in Manitoba since that time with excellent results.

Historically, sewage handling locations have been designated Class I Group D, Division 1, especially in the wet well location. In reviewing existing installations wired to Class and Group requirement, we found the effect of corrosion had nullified the integrity of explosion proof enclosures.

In researching requirements in other jurisdictions, the main area of concern and reason for a class and group classification is the introduction of flammable liquids into the waste water. Most authorities recognize that Methane, Hydrogen sulphide and Hydrogen are not generated in sufficient quantities to create an explosive concentration.

With more controls being put into effect today to reduce the dumping of flammable liquids into waste water systems, the possibility of a hazardous atmosphere being present in a wet well is greatly reduced.

The proposal however, recognizes a potential hazard and prohibits electrical equipment in wet wells, containing devices which could cause an open arc or spark during normal operation.

I have included with the proposal, a paper on "Volatile Fluids" and a copy of the NFPA Vol. 13 1982 Section NFPA 328-1982 Clause 1.3.7 Sewage Gases.

Supporting Information: Attached

History

This Subject was first assigned to Section 22, but at the time, referred it to Section 18. However, the Part I Committee sent it back to Section 22.

Since its locations in the Code seemed to be controversial, it was sent to the Executive Committee for comment. They provided a wide variety of suggestions including Section 18, 20, and 22 as well as a new Section.

Your new Chair, Dunc Dunsire, has now suggested that it remain in Section 22, but that an Appendix B Note be added to help allay the concerns of some inspection authorities.

*22-700 Flammable liquids may spill into sewers and temporarily create a
to hazardous condition. For this reason, some inspection authorities require
22-710 these locations to be classed as hazardous locations.*

Chair's Comments: I recommend that this be a separate section in Section 22.

Chair's Comments (SECOND ROUND): I would like to try this one once more before putting it to bed. I have pulled up our copy, fixed it up a wee bit and attached it with the four drawings and an Appendix B Note.

Section 22

CORROSIVE LIQUIDS, VAPOURS OR MOISTURE

Sewage Lift and Treatment Plants.

Rule 22-700 Scope

Rules 22-702 to 22-710 apply to the installation of electrical facilities in:

- (a) Sewage Lift and Pumping Stations, and
- (b) Primary and Secondary Sewage Treatment Plants.

Rule 22-702 Definitions

"Continuous Positive Pressure Ventilation" means a ventilation system capable of maintaining a positive pressure in a room or area and changing the air in the room or area at least six (6) times an hour with means for detecting ventilation failure.

"Dry well" means the below ground location that is isolated from the wet well location so as to prevent the migration of gases and vapours into the dry well.

"Suitably cut off" means an area cut off from adjoining areas with no communication such as doors, windows or ventilation grills between the areas.

"Wet well" means the below ground location into which the raw sewage is collected before passing through the lift pumps or being processed in a treatment plant.

Rule 22-704 Classification of Areas (See Appendix B)

- (1) Except as permitted by paragraph (c) of Subrule 3 of this Rule, all below ground locations suitably cut off from locations in which sewage gases are present shall be classified Category 1.
- (2) All locations in which sewage gases are present shall be classified Category 2.
- (3) The following areas shall be permitted to be classified as ordinary locations:
 - (a) all locations suitably cut off from a Category 2 location and not classified as a Category 1 location; and
 - (b) all locations not suitably cut off from a Category 2 location but with adequate continuous positive pressure ventilation; and
 - (c) below ground dry well locations where adequate heating and ventilation is installed.

Rule 22-706 Wiring Method

- (1) Wiring methods in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of the Code.
- (2) Wiring methods in a wet or damp Category 2 location shall be in accordance with the applicable requirements of the Code, with the following exceptions:
 - (a) rigid steel conduit and electrical metallic tubing shall not be used; and
 - (b) mineral insulated cable and aluminum sheathed cable shall be permitted to be used provided it is spaced from walls by at least 12 mm, the cable has a corrosion resistant jacket and the cable connectors are suitably sealed from the corrosive atmosphere; and
 - (c) liquid tight flexible metal conduit shall be permitted to be used where permitted in accordance with Rule 12-1302, provided connectors suitable for the location are used; and

(d) grounding and bonding conductors shall be insulated or otherwise protected from corrosion and the point of connection to ground, if exposed to a corrosive atmosphere, shall be protected from corrosion by a suitable sealant.

Rule 22-708 Electrical Equipment

- (1) Electrical equipment installed in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of this Code.
- (2) Electrical equipment installed in a wet or damp Category 2 location shall be in accordance with the applicable requirements of the Code, with the following exceptions:
 - (a) receptacles shall be fitted with self-closing covers, and if of the duplex type, have individual covers over each half of the receptacle; and
 - (b) lighting switches shall have weatherproof covers; and
 - (c) lighting fixtures shall be totally enclosed; and
 - (d) unit emergency lighting equipment and emergency lighting control units, other than remote lamps, shall not be located in such locations; and
 - (e) heating equipment shall be approved for such locations or installed outside the corrosive location; and
 - (f) motors shall be totally enclosed, fan cooled and shall not incorporate dissimilar metals relative to the motor frame and connection box; and
 - (g) electrical equipment in wet well areas shall not contain devices which will cause an open arc or spark during normal operation.

Rule 22-710 Grounding of Structural Steel

Below ground structural steel in contact with the surrounding earth shall be bonded to the system ground.

Appendix B

The following is added after the Notes on Rule 22-204 in Appendix B.

22-704 Sewage Lift and Treatment Plants

Figures 1, 2, 3 and 4 detail typical installations and area classifications for sewage lift and treatment plants.

Sewage lift and treatment plants produce a combination of conditions which may require specialized attention to the electrical installation. The wet well area normally contains an atmosphere of high humidity and corrosive hydrogen sulphide vapours. Abnormal hazardous conditions can occur in the wet wells due to spills of chemicals, gasoline or other volatile liquids into the sewer system.

An extreme hazard to personnel working in wet wells exists because of the presence of sewer gas (hydrogen sulphide). This gas is treacherous as the ability to sense it by smell is quickly lost. If workers ignore first notice of the gas, their senses will give them no further warning. If the concentration is high enough, unconsciousness and death can result.

Before work in wet well locations begins, the air in the wet well area should be purged, and ventilation with fresh air should be continued while work continues in the area.

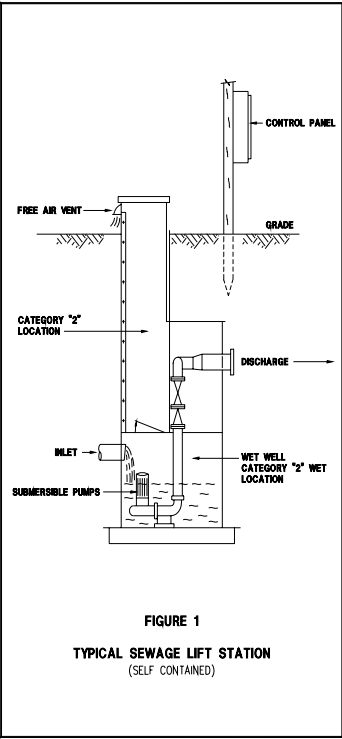


FIGURE 1
TYPICAL SEWAGE LIFT STATION
(SELF CONTAINED)

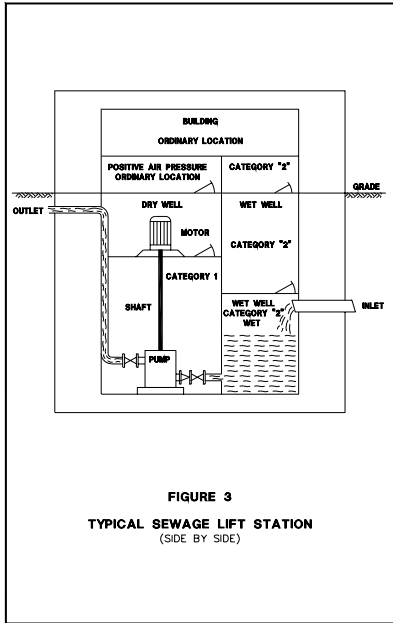


FIGURE 3
 TYPICAL SEWAGE LIFT STATION
 (SIDE BY SIDE)

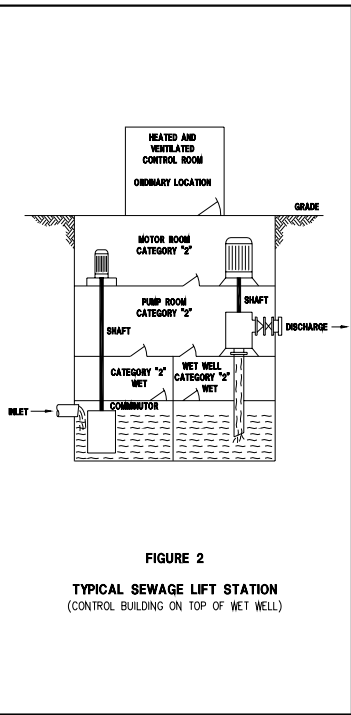


FIGURE 2
TYPICAL SEWAGE LIFT STATION
(CONTROL BUILDING ON TOP OF WET WELL)

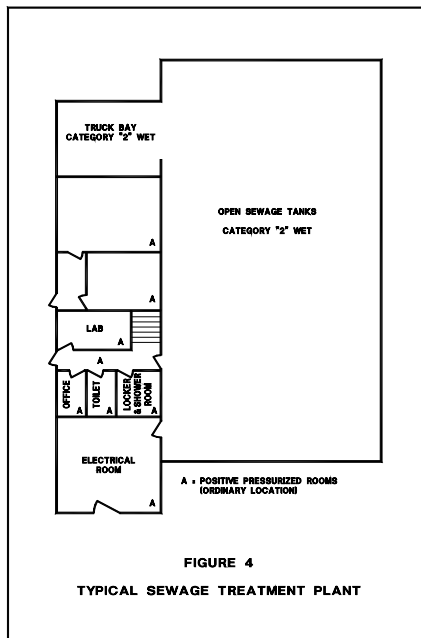


FIGURE 4
TYPICAL SEWAGE TREATMENT PLANT

New Chair's Response to 2nd Round

Subcommittee Deliberations (2nd Round)

There were three out of four members that replied with 1 in agreement with the Chair's proposal, 1 in agreement with the Chair's proposal with comments and 1 in disagreement. As the new Chair for Section 22 I would first like to deal with the comments from the second round of deliberations and then provide a general comment at the end. Following are the comments from those in disagreement with the submission as well as one member in agreement.

The one member in agreement with comments indicated that 22-706(c) should read "12-1300" not "12-1400" and that if possible should include residential lift pumps as well.

New Chair's Comments (Second Round): *The reference in Rule 26-706(2)(c) had been changed to reference Rule 12-1302.*

The member who was in disagreement raised four issues.

1. This member was not in favour of the definition "Suitably Cut-Off" and in particular the term "suitably" since this implies a judgement on the part of somebody, with no criteria provided for the judgement. The member proposed that Rule 22-704(1) be revised to read: "Except as permitted by paragraph (c) of Subrule 3, all below ground locations rendered impermeable to sewage gases shall be classified as Category 1." And that 22-704 (3)(a) and (b) are also revised accordingly.

New Chair's Comments (Second Round): *I would propose that the term "Suitably cut off" be modified to include the term "rendered impermeable". The revised definition would read as follows: "Suitably cut off" means an area rendered impermeable and cut off.....*

2. This member also felt that rigid steel conduit and EMT are available as epoxy coated products, which are corrosion resistant and should be used. He suggested that 22-706(2)(a) be reworded along the following lines:

22-706() Wiring Methods... . Shall be in accordance with Sections 10 and 12 of this code,"

"(a) Rigid metal conduit and electrical metallic tubing shall be coated against corrosive attack by the particular chemicals present."

Appendix B Note.

"The products intended for use in this application require protection other than that used for protection of steel in ordinary environments, such as galvanized coatings. Products such as epoxy coating are intended"

New Chair's Comments (Second Round): *There is a concern that rigid steel conduit or EMT, even though they are protected on the exterior by a coating, will corrode from the inside out when placed in this type of environment. Also, Rule 22-202(3) prohibits the use of surface metal raceways in Category 2 locations. Therefore I would suggest that rigid steel conduit or EMT not be permitted.*

3. The question of why armoured cable products is not permissible was also raised, provided that they are corrosion protected. The following proposed wording for Rule 22-706(b) was suggested: "., armoured cables, ..." before "... and aluminum sheathed... ."

New Chair's Comments (Second Round): *This is a valid point. Rule 22-202(3) and Table 19 permits TECK90 for exposed wiring in wet locations as well as in dry locations where exposed to corrosive action, if suitable for corrosive conditions encountered. I propose that Rule 22-706(2)(b) be revised as follows:*

"(b) armoured cable, mineral insulated cable and...."

4. The member also felt that the product indicated in 22-706(c) contains features of dissimilar metals in contact and recommended that that clause be dropped.

New Chair's Comments (Second Round): *This raises a concern, not for the issue of dissimilar metals but that 12-1302(3)(d) indicates that liquid-tight flexible conduit shall not be used where exposed to corrosive liquids or vapours having an injurious effect on the outer jacket. Therefore I am proposing that Rule 22-706(2)(c) be removed.*

New Chair's Overall Comments (Second Round): *As your new Chair I am having difficulty trying to determine if this is really a Section 22 Subject or whether it should be placed in Section 20 under a separate Subsection. I have researched NFPA 820 that deals with Fire Protection in Wastewater Treatment and Collection Facilities and comprised a table for some of the locations mentioned in this Proposal. Basically NFPA 820 classifies these locations as Class I, Division 1 or Division 2 unless substantial and sophisticated ventilation criteria is met. I am including a copy of the Table for your review.*

Therefore, I would like the Subcommittee to decide whether or not we should continue with this proposal or recommend that it be sent on to another Section. I am also including an up to date draft of the Proposal with changes recommended in the Chair's Comments (Second Round).

Section 22

Corrosive Liquids, Vapours or Moisture

Sewage Lift and Treatment Plants.

Rule 22-700 Scope

Rules 22-702 to 22-710 apply to the installation of electrical facilities in:

- (a) Sewage Lift and Pumping Stations, and
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Rule 22-704 Classification of Areas (See Appendix B)

- (1) Except as permitted by paragraph (c) of Subrule 3 of this Rule, all below ground locations suitably cut off from locations in which sewage gases are present shall be classified Category 1.
- (2) All locations in which sewage gases are present shall be classified Category 2.
- (3) The following areas shall be permitted to be classified as ordinary locations:
 - (a) all locations suitably cut off from a Category 2 location and not classified as a Category 1 location; and
 - (b) all locations not suitably cut off from a Category 2 location but with adequate continuous positive pressure ventilation; and
 - (c) below ground dry well locations where adequate heating and ventilation is installed.

Rule 22-706 Wiring Method

- (1) Wiring methods in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of the Code.
- (2) Wiring methods in a wet or damp Category 2 location shall be in accordance with the applicable requirements of the Code, with the following exceptions:
 - (a) rigid steel conduit and electrical metallic tubing shall not be used; and
 - (b) armoured cable, mineral insulated cable and aluminium sheathed cable shall be permitted to be used provided it is spaced from walls by at least 12 mm, the cable has a corrosion resistant jacket and the cable connectors are suitably sealed from the corrosive atmosphere; and
 - (c) grounding and bonding conductors shall be insulated or otherwise protected from corrosion and the point of connection to ground, if exposed to a corrosive atmosphere, shall be protected from corrosion by a suitable sealant.

Rule 22-708 Electrical Equipment

- (1) Electrical equipment installed in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of this Code.
- (2) Electrical equipment installed in a wet or damp Category 2 location shall be in accordance with the applicable requirements of the Code, with the following exceptions:
 - (a) receptacles shall be fitted with self-closing covers, and if of the duplex type, have individual covers over each half of the receptacle; and
 - (b) lighting switches shall have weatherproof covers; and
 - (c) lighting fixtures shall be totally enclosed; and
 - (d) unit emergency lighting equipment and emergency lighting control units, other than remote lamps, shall not be located in such locations; and
 - (e) heating equipment shall be approved for such locations or installed outside the corrosive location; and
 - (f) motors shall be totally enclosed, fan cooled and shall not incorporate dissimilar metals relative to the motor frame and connection box; and
 - (g) electrical equipment in wet well areas shall not contain devices which will cause an open arc or spark during normal operation.

Rule 22-710 Grounding of Structural Steel

Below ground structural steel in contact with the surrounding earth shall be bonded to the system ground.

Appendix B

The following is added after the Notes on Rule 22-204 in Appendix B.

22-700 Flammable liquids may spill into sewers and temporarily create a hazardous condition.

To For this reason, some inspection authorities require these locations to be classed as

22-710 hazardous

22-704 Sewage Lift and Treatment Plants

Figures 1, 2, 3 and 4 detail typical installations and area classifications for sewage lift and treatment plants.

Sewage lift and treatment plants produce a combination of conditions which may require specialized attention to the electrical installation. The wet well area normally contains an atmosphere of high humidity and corrosive hydrogen sulphide vapours. Abnormal hazardous conditions can occur in the wet wells due to spills of chemical, gasoline or other volatile liquids into the sewer system.

An extreme hazard to personnel working in wet wells exists because of the presence of sewer gas (hydrogen sulphide). This gas is treacherous as the ability to sense it by smell is quickly lost. If workers ignore first notice of the gas, their senses will give them no further warning. If the concentration is high enough, unconsciousness and death can result.

Before work in wet well locations begins, the air in the wet well area should be purged, and ventilation with fresh air should be continued while work continues in the area.

Area Classification of Collection Systems in Accordance with NFPA 820

Location and Function	Ventilation	Extent of Classified Area	NEC Area Classification (Class 1, Group D)
Storm Sewer	NNV	Inside Sewer	Division 2
Storm Water Pumping Station Wet Well	NNV	Entire Room or Space	Division 2
Storm Water Pumping Station Dry Well	NV or ventilated at less than 6 air changes per hour	Entire Dry Well	Division 2, or unclassified, if space provided with pressurization to NFPA 496
	Continuously ventilated at 6 air changes per hour		Unclassified
Individual Residential Sewer	NNV	Within enclosed space	Unclassified
Individual Residential Pumping Unit	NNV	Within enclosed space	Unclassified
Residential Sewer	NNV	Within enclosed space	Division 2
	Continuously ventilated at 12 air changes per hour		Unclassified
Residential Wastewater Pumping Station Wet Well	NV or ventilated at less than 12 air changes per hour	Entire Room or Space	Division 2
	Continuously ventilated at 12 air changes per hour		Unclassified
Residential Wastewater Pumping Station Dry Well	NV or ventilated at less than 6 air changes per hour	Entire Room or Space	Division 2
	Continuously ventilated at 6 air changes per hour		Unclassified
Sanitary Sewer	NNV	Inside of Sewer	Division 1
	Continuously ventilated at 12 air changes per hour		Division 2
Wastewater Pumping Station Wet Wells	NV or ventilated at less than 12 air changes per hour	Entire room or space	Division 1
	Continuously ventilated at 12 air changes per hour		Division 2
Wastewater Pumping Station Dry Well (below grade or partially below grade)	NV or ventilated at less than 12 air changes per hour	Entire room or space	Unclassified
	NV or ventilated at less than 6 air changes per hour		Division 2, or unclassified, if space provided with pressurization to NFPA 496
Wastewater Pumping Station (above grade with pump room physically separated from wet well)	No requirement	Not applicable	Unclassified
Wastewater Pumping Station (above grade with pump room not physically separated from wet well)	NV or ventilated at less than 12 air changes per hour	Entire space or room	Division 1
	Continuously ventilated at 12 air changes per hour		Division 2

Enclosed Wastewater Holding Basins	NV or ventilated at less than 12 air changes per hour	Enclosed space	Division 1
	Continuously ventilated at 12 air changes per hour		Division 2
Open Wastewater Holding Basins	No requirement	No requirement	No requirement

NNV – Not normally ventilated

Chair’s Response to 3rd Round

Subcommittee Deliberations (3rd Round)

There were five out of eight members that replied with 3 in agreement with the Chair’s proposal, 1 in agreement with the Chair’s proposal with comments and 2 in disagreement. The two members in disagreement felt that the electrical installation in these areas could be subject to hazardous gases under certain conditions and that precaution must be taken to ensure adequate ventilation and other methods are provided to treat these areas as non-classified. There was also a comment that combustible gas detection should be considered in certain areas to ensure that if a build up of combustible gas is present, forced ventilation and alarms will be activated.

Chair’s Comments (for 3rd Round Deliberations):

The subcommittee recommended that this Subject remain in Section 22 since the wet and corrosive atmosphere is more of a concern than the possibility of the area becoming hazardous. The two individuals that voted negative have raised very good points regarding the classification of wet wells and dry wells when adequate ventilation is not provided. This is also substantiated since there are jurisdictions that treat these areas as classified. I have deleted the Figures referenced in the Appendix ‘B’ note since these would be better suited to the Handbook.

Based of this I would like to present the following for consideration by the Subcommittee:

Section 22 Corrosive Liquids, Vapours or Moisture

Sewage Lift and Treatment Plants.

Rule 22-700 Scope

Rules 22-702 to 22-710 apply to the installation of electrical facilities in sewage lift and pumping stations, and primary and secondary sewage treatment plants where the environment could contain multiple hazards such as moisture, corrosion, explosion, fire and atmospheric poisoning.

Rule 22-702 Special Terminology

In this Section, the following definitions apply:

"Continuous Positive Pressure Ventilation" means a ventilation system capable of maintaining a positive pressure in a room or area and changing the air in the room or area at least six (6) times an hour with means for detecting ventilation failure.

"Dry well" means the below ground location designed to accommodate equipment associated with wastewater pumping and is isolated from the wet well location so as to prevent the migration of gases and vapours into the dry well.

"Suitably cut off" means an area rendered impermeable and cut off from an adjoining area with no means of liquid, gas or vapour communication between the areas.

"Wet well" means the below ground location into which the raw sewage is collected and temporarily stored before passing through the lift pumps or being processed in a treatment plant.

Rule 22-704 Classification of Areas (See Appendix B)

- (1) Wet wells provided with adequate continuous positive pressure ventilation shall be classified Class I, Zone 2.
- (2) Except as permitted by paragraph (c) of Subrule 3 of this Rule, all below ground locations suitably cut off from locations in which sewage gases may be present shall be classified Category 1.
- (3) All locations in which sewage gases may be present shall be classified Category 2.
- (4) The following areas shall be permitted to be classified as ordinary locations:
 - (a) all locations suitably cut off from a Category 2 location and not classified as a Category 1 location; and
 - (b) all locations not suitably cut off from a Category 2 location but with adequate continuous positive pressure ventilation; and
 - (c) below ground dry well locations where adequate heating and adequate continuous positive pressure ventilation is installed.

Rule 22-706 Wiring Method

- (1) Wiring methods in a Category 1 or a dry Category 2 location shall be in accordance with Rules 22-200 and 22-202, respectfully.
- (2) Wiring methods in a wet or damp Category 2 location shall be in accordance with Rule 22-202, with the following exceptions:
 - (a) rigid steel conduit and electrical metallic tubing shall not be used; and
 - (b) armoured cable, mineral insulated cable and aluminium sheathed cable shall be permitted to be used provided it is spaced from walls by at least 12 mm, the cable has a corrosion resistant jacket, and the cable connectors are suitably sealed from the corrosive atmosphere; and
 - (c) grounding and bonding conductors shall be insulated or otherwise protected from corrosion and the point of connection to ground, if exposed to a corrosive atmosphere, shall be protected from corrosion by a suitable sealant.
- (3) Conduits installed from the wet well to an electrical enclosure shall be suitably sealed to prevent the entrance of moisture, vapour or gases into the enclosure.

Rule 22-708 Electrical Equipment

- (1) Electrical equipment installed in wet wells shall be in accordance with Rules 18-150 to 18-182.

- (2) Notwithstanding Subrule (1), electrical equipment installed in wet wells equipped with combustible gas detection conforming to Rule 18-070 shall be permitted to be classed as non-hazardous and shall be in accordance with Subrule (4).
- (3) Electrical equipment installed in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of this Code.
- (4) Electrical equipment installed in a wet or damp Category 2 location shall be in accordance with the applicable requirements of the Code, with the following exceptions:
 - (a) receptacles shall be fitted with self-closing covers, and if of the duplex type, have individual covers over each half of the receptacle; and
 - (b) lighting switches shall have weatherproof covers; and
 - (c) unit emergency lighting equipment and emergency lighting control units, other than remote lamps, shall not be located in such locations; and
 - (d) heating equipment shall be approved for such locations or installed outside the corrosive location; and
 - (e) motors shall be totally enclosed, fan cooled and shall not incorporate dissimilar metals relative to the motor frame and connection box; and
 - (f) electrical equipment in wet well areas shall not contain devices which will cause an open arc or spark during normal operation.
- (5) Ventilation fans shall not be located within the wet well and fan blades shall be of non-sparking material.
- (6) Areas provided with continuous positive pressure ventilation shall be interlocked to de-energize all electrical equipment not approved for a Class I location in case the ventilating equipment is inoperative.

Rule 22-710 Grounding of Structural Steel

Below ground structural steel in contact with the surrounding earth shall be bonded to the system ground.

Appendix B

The following is added after the Notes on Rule 22-204 in Appendix B.

22-700 Flammable liquids may spill into sewers and temporarily create a hazardous to condition.

22-710 For this reason, some inspection authorities require these locations to be classed as hazardous

22-704 Sewage Lift and Treatment Plants

Sewage lift and treatment plants produce a combination of conditions which may require specialized attention to the electrical installation. The wet well area normally contains an atmosphere of high humidity and corrosive hydrogen sulphide vapours. Abnormal hazardous conditions can occur in the wet wells due to the build up of methane gas and the spills of chemical, gasoline or other volatile liquids into the sewer system.

An extreme hazard to personnel working in wet wells exist because of the presence of sewer gas (hydrogen sulphide). This gas is treacherous as the ability to sense it by smell is quickly lost. If workers ignore first notice of the gas, their senses will give them no further warning. If the concentration is high enough, unconsciousness and death can result.

Before work in wet well locations begins, the air in the wet well area should be purged, and ventilation with fresh air should be continued while work continues in the area.

Subcommittee Recommendation

There were five out of seven members voting, not including the Chair, four voting affirmative and one voting negative. To address the comments from the one negative voter I have amended the wording as follows which does not digress from the original intent and is agreeable to the original submitter. With this I declare we have a consensus and recommend we go to Part I with this Subject.

Section 22 Corrosive Liquids, Vapours or Moisture

Sewage Lift and Treatment Plants.

Rule 22-700 Scope

- (1) Rules 22-702 to 22-710 apply to the installation of electrical facilities in sewage lift and pumping stations, and primary and secondary sewage treatment plants where the environment could contain multiple hazards such as moisture, corrosion, explosion, fire and atmospheric poisoning.
- (2) Rules 22-702 to 22-710 do not apply to methane generation facilities associated with some treatment facilities

Rule 22-702 Special Terminology

In this Section, the following definitions apply:

"Continuous Positive Pressure Ventilation" means a ventilation system capable of maintaining a positive pressure in a room or area and changing the air in the room or area at least six (6) times an hour with means for detecting ventilation failure.

"Dry well" means the below ground location designed to accommodate equipment associated with wastewater pumping and is isolated from the wet well location so as to prevent the migration of gases and vapours into the dry well.

"Suitably cut off" means an area rendered impermeable and cut off from an adjoining area with no means of liquid, gas or vapour communication between the areas.

"Wet well" means the below ground location into which the raw sewage is collected and temporarily stored before passing through the lift pumps or being processed in a treatment plant.

Rule 22-704 Classification of Areas (See Appendix B)

- (1) Sewage lift and treatment plants shall be classified for:

- (a) Hazardous areas in accordance with Section 18, and
- (b) Corrosive liquids, vapours or moisture in accordance with this Section
- (2) Wet wells provided with adequate continuous positive pressure ventilation shall be classified Class I, Zone 2.
- (3) Except as permitted by paragraph (c) of Subrule 4 of this Rule, all below ground locations suitably cut off from locations in which sewage gases may be present shall be classified Category 1.
- (4) All locations in which sewage gases may be present shall be classified as a hazardous area and as Category 2.
- (5) The following areas shall be permitted to be classified as ordinary locations:
 - (a) all locations suitably cut off from a Category 2 location and not classified as a Category 1 location; and
 - (b) all locations not suitably cut off from a Category 2 location but with adequate continuous positive pressure ventilation; and
 - (c) below ground dry well locations where adequate heating and adequate continuous positive pressure ventilation is installed.

Rule 22-706 Wiring Methods

- (1) Wiring methods within hazardous areas shall be in accordance with Section 18.
- (2) Wiring methods in a Category 1 or a dry Category 2 location shall be in accordance with Rules 22-200 and 22-202, respectfully.
- (3) Wiring methods in a wet or damp Category 2 location shall be in accordance with Rule 22-202, with the following exceptions:
 - (a) rigid steel conduit and electrical metallic tubing shall not be used; and
 - (b) armoured cable, mineral insulated cable and aluminium sheathed cable shall be permitted to be used provided it is spaced from walls by at least 12 mm, the cable has a corrosion resistant jacket, and the cable connectors are suitably sealed from the corrosive atmosphere; and
 - (c) grounding and bonding conductors shall be insulated or otherwise protected from corrosion and the point of connection to ground, if exposed to a corrosive atmosphere, shall be protected from corrosion by a suitable sealant.
- (4) Conduits installed from the wet well to an electrical enclosure shall be suitably sealed to prevent the entrance of moisture, vapour or gases into the enclosure.

Rule 22-708 Electrical Equipment

- (1) Electrical equipment installed in hazardous areas shall be in accordance with Section 18.
- (2) Notwithstanding Subrule (1), electrical equipment installed in wet wells provided with adequate continuous positive pressure ventilation and equipped with combustible gas detection conforming to Rule 18-070 shall be permitted to be classed as non-hazardous and shall be in accordance with Subrule (4).
- (3) Electrical equipment installed in a Category 1 or a dry Category 2 location shall be in accordance with the applicable requirements of this Code.
- (4) Electrical equipment installed in a wet or damp Category 2 location shall be in accordance with the applicable requirements of the Code, with the following exceptions:
 - (a) receptacles shall be fitted with self-closing covers, and if of the duplex type, have individual covers over each half of the receptacle; and
 - (b) lighting switches shall have weatherproof covers; and
 - (c) unit emergency lighting equipment and emergency lighting control units, other than remote lamps, shall not be located in such locations; and

- (d) heating equipment shall be approved for such locations or installed outside the corrosive location; and
 - (e) motors shall be totally enclosed, fan cooled and shall not incorporate dissimilar metals relative to the motor frame and connection box; and
 - (f) electrical equipment in wet well areas shall not contain devices which will cause an open arc or spark during normal operation.
- (5) Ventilation fans shall not be located within the wet well and fan blades shall be of non-sparking material.
- (6) Areas provided with continuous positive pressure ventilation shall be interlocked to de-energize all electrical equipment not approved for a Class I location in case the ventilating equipment is inoperative.

Rule 22-710 Grounding of Structural Steel

Below ground structural steel in contact with the surrounding earth shall be bonded to the system ground.

Appendix B

The following is added after the Notes on Rule 22-204 in Appendix B.

22-700 Flammable liquids may spill into sewers and temporarily create a hazardous to condition.

22-710 For this reason, some inspection authorities require these locations to be classed as hazardous.

Reference material for hazardous area classification can be found in NFPA 820, Fire Protection in Wastewater Treatment and Collection Facilities

22-704 Sewage Lift and Treatment Plants

Sewage lift and treatment plants produce a combination of conditions which may require specialized attention to the electrical installation. Abnormal hazardous conditions can occur due to the build up of methane gas and the spills of chemical, gasoline or other volatile liquids into the sewer system. The wet well area normally contains an atmosphere of high humidity and corrosive hydrogen sulphide vapours.

An extreme hazard to personnel working in wet wells exist because of the presence of sewer gas (hydrogen sulphide). This gas is treacherous as the ability to sense it by smell is quickly lost. If workers ignore the first notice of the gas, their senses will give them no further warning. If the concentration is high enough, unconsciousness and death can result.

Before work in wet well locations begins, the air in the wet well area should be purged, and ventilation with fresh air should be continued while work continues in the area.