Electrical Requirements For
Sewage Lift Stations and Treatment Plants

Sewage lift stations 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 may contain quantities of hydrogen sulphide vapours, and/or methane gas.

Abnormal hazardous conditions can occur in the wet wells due to spills of chemicals, gasoline or other flammable or explosive liquids into the sewer system.

Classifications:

As a general rule, the wet well areas associated with Sewage Lift Stations shall be classified as no less than a Class I, Zone 2 hazardous location. Despite the normal short retention period of the sewage, the CE Code does recognize hydrogen sulphide and methane as a hazardous gas.

Under abnormal circumstances involving the operation of a wet well, compounded by the possible addition of other volatile liquids into the system, there may be instances where hazardous concentrations of gas exist.

Sewage Treatment Plants typically retain the sewage material for a sufficient time to allow flammable gases or vapours to accumulate in quantities that could produce explosive gas atmospheres and are usually classified as Class I, Zone 1 or Zone 2 hazardous locations.

The responsibility to decide upon and to clearly specify the classification for such hazardous locations shall rest with the engineering consultant who is designing the electrical requirements for a particular installation. This decision will be based on the concentration of flammable gases that may accumulate for a given facility and this will vary with the design of the ventilation and the sewage handling process used.

Wet Well Ventilation during Work Activity:

An extreme hazard to personnel working in wet wells exists because of the presence of sewer gas (hydrogen sulphide and methane). These gases are very dangerous as the ability to detect it by smell is quickly lost. If the concentration is high enough, unconsciousness and death can result. Methane is an odourless, lighter than air gas which is highly flammable.

Before working in wet wells, the air should be purged and fresh air should be continuously introduced while working in the area.
Definitions:

A 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 a ventilation failure.

A 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.

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

A 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.

Classification of Areas: (Rule 22-002)

Category 1 - All locations in which moisture in the form of vapour or liquid is present in quantities which are liable to interfere with the normal operation of electrical equipment, whether the moisture is caused by condensation or the dripping or splashing of liquid.

Category 2 - All locations in which corrosive liquids or vapours are likely to be present in quantities which are likely to interfere with the normal operation of electrical equipment.

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.

Wiring Methods:

1) Wiring methods in a Category 1 or a Category 2 location shall conform to CE Code Section 22.

2) Wiring methods in a Category 2 location shall be in accordance with CE Code Section 22, with the following exceptions:

   a) Rigid steel conduit and electrical metallic tubing shall not be used; (PVC conduit or rigid steel epoxy coated is acceptable); and

   b) Conduits shall not be sealed in the wet well areas. An open fitting at the conduit low point shall be provided to allow it to breathe and drain; and

   c) Mineral insulated cable and aluminium sheathed cable shall be permitted provided it is spaced from walls not less than 12mm, the cable has a corrosion resistant jacket and cable connectors are approved for the application; and

   d) Liquid-Tight Flexible conduit shall be permitted when installed as per CE Code Rule 12-1302, connectors shall be suitable for the location; and

   e) Flexible cords used for wiring pumps or float switches shall be of extra hard usage type, approved for wet location as listed in CE Code Table 11. They shall include but not be limited to SOOW, SOW or STW; and

   f) Sufficient cable slack shall be provided to permit adjustment or removal of equipment; and

   g) Cable loops shall be left where cables leave conduits; and
h) Cables, flexible cords and conduits shall be supported by corrosive resistant material. Cables and flexible cords shall be supported every 1.0 m maximum. Conduit supports shall conform to CE Code Rule 12-1114; and
i) Grounding and bonding conductors shall be insulated coloured as per CE Code Rule 4-036(1), protected from corrosion at all points (terminations) by a suitable sealant.

Cable and Conduit Sealing Requirements:

Due to abnormal operating conditions which may produce an explosive gas atmosphere in the wet well areas, precaution must be taken to ensure hazardous gas concentrations do not accumulate in equipment that incorporates arcing or sparking devices.

Where power supply and control cables, flexible cords and conduits enter an electrical equipment cabinet outside the wet well area, they shall be provided with a gas or vapour tight positive seal. This seal may be installed as required by Rule 18-158, or a transition barrier adaptor may be applied such as the Appleton Transit Assembly referenced in the appendix section of this bulletin. Transition barrier adaptors shall incorporate proper sized tolerant insert blocks for cables.

Electrical Equipment in Wet Well Areas:

Sewage wet well areas fall under the location classification of Category 1 or Category 2, and also of Class I, Zone 2.

Electrical equipment installed in such locations for use in sewage lift stations shall comply with the following requirements -

1) Electrical equipment installed in the wet well area shall normally be limited to that which is essential to the operation of the lift station.

2) Electrical equipment installed in a Category 1 or a Category 2 location, shall conform to CE Code Section 22.

3) Electrical equipment installed in a wet well area, shall specifically comply with the following requirements:
   a) Receptacles shall not be installed in a wet well area, unless they conform to Rule 18-124; and
   b) Lighting switches shall be located outside wet well areas, unless they are installed as per Section 18; and
   c) Lighting fixtures shall be totally enclosed, gasketed and shall be of a corrosion resistant type of construction; and
   d) Conductors supplying lighting fixtures shall have proper temperature ratings as indicated on fixtures; and
   e) Heating equipment shall be approved for such locations; and
   f) Motors installed in ventilation exhaust ducts shall be of a type that meets the requirements for a Class I, Zone 2 location, as per Rule 18-168; and
   g) Electrical equipment in wet well areas shall not contain devices which will cause an open arc or spark during normal operation.
Appendix: Appleton Transit Assembly

Appleton Electric Limited, based in Cambridge Ontario, manufactures a Transit Barrier System, (Catalogue No. HRT50), which provides an effective sealing method for cable and conduit penetrations and a barrier against fire, water, gas vapour and vermin.

This sealing device, referred to as a TBR, can be used for various applications in commercial and industrial installations.

It can effectively seal cables or conduits within pipes, core drilled holes or welded tubes.

This sealing system has successfully undergone independent testing and has been approved by several agencies including Underwriters Laboratories Canada (ULC) and Underwriters Inc. (UL).