OHIO DEPARTMENT OF HEALTH

246 North High Street
Columbus, Ohio 43215

614/466-3543
www.odh.ohio.gov

John R. Kasich / Governor

MEMORANDUM

Date: July 28, 2014

To: Registered Private Water Systems Contractors in Ashtabula, Geauga, Lake and Trumbull Counties

From: Rebecca Fugitt, Program Manager, Residential Water and Sewage Program, ODH

Subject: Recent Explosion at home in Ashtabula County related to methane gas in the water well

---

You may have recently heard of the explosion at a home in Ashtabula County that occurred on July 16, 2014. The home was completely demolished and a fatality occurred. The investigation into the explosion has been traced to methane gas from the water well at the home that accumulated to explosive levels inside the house and was ignited.

We are contacting your company because you may be called by concerned homeowners regarding the possible or known presence of methane in their wells. Homeowners may want to know what they can do to vent their well or treat the water to remove methane. If you are contacted by a homeowner or work on a well that produces methane, please be aware of the following requirements in the private water systems rules (Ohio Administrative Code Chapter 3701-28-10) and our recommendations to help ensure the safety of homeowners in additon to you and your staff who may work on these wells.

Methane occurs in two forms in a water well – 1) either as free gas coming into the borehole from the geologic formations and the gas migrates up the water well casing and along water lines, or 2) as dissolved gas that is pumped into the water lines of the home and can accumulate in areas such as basements or crawl spaces, or released from a faucet. Free gas is detected by using a combustible gas detection meter to determine if methane is present in the atmosphere at the well head or in a confined space (basement, etc.). Dissolved methane in the water is detected through a water sample and analysis. Visual inspection of a water sample can sometimes indicate the presence of dissolved gas. Water that effervesces (bubbles) or appears turbid (cloudy) then dissipated from the bottom to the top of the container are signs of dissolved gas, however, it may not be dissolved methane. Harmless carbon dioxide (CO_2) and water containing bicarbonate (HCO_3^-) greater than 70 mg/l will also effervesce like soda.

Pure methane is colorless, odorless, and tasteless. Unprocessed natural gas from oil and gas producing formations does have an odor since it is not pure methane; however the odor is different from processed natural gas. Methane is considered explosive when it is mixed with air in concentrations ranging from 5 to 15 percent by volume. On the standardized scale used by fire departments and safety officials across the country, the lower limit of explosivity, 5 percent natural gas by volume, is redefined as 100 percent of the LEL which

means that the methane in the air is 100 percent explosive at that level. Methane can also become an asphyxiant if it replaces the oxygen in an enclosed area at a concentration of over 50 per cent in air.

The private water systems rules require that wells that produce over 10 mg/l of dissolved methane must be vented using one of these methods:

(1) Venting the well through the use of vented (1 inch), screened well cap – extended if necessary to move gas away from the home;
(2) Use of a gas shroud combined with a vented cap (likely to be less effective);
(3) Use of a vented spray aeration system;
(4) Wells located in basements, well houses, offsets or other structures must be vented to the outside of the house with a minimum three inch vent pipe extending ten feet from the foundation of the house, installed no less than eighteen inches from the ground surface, with a screened cover;
(5) Other methods of methane gas venting as approved by the director.

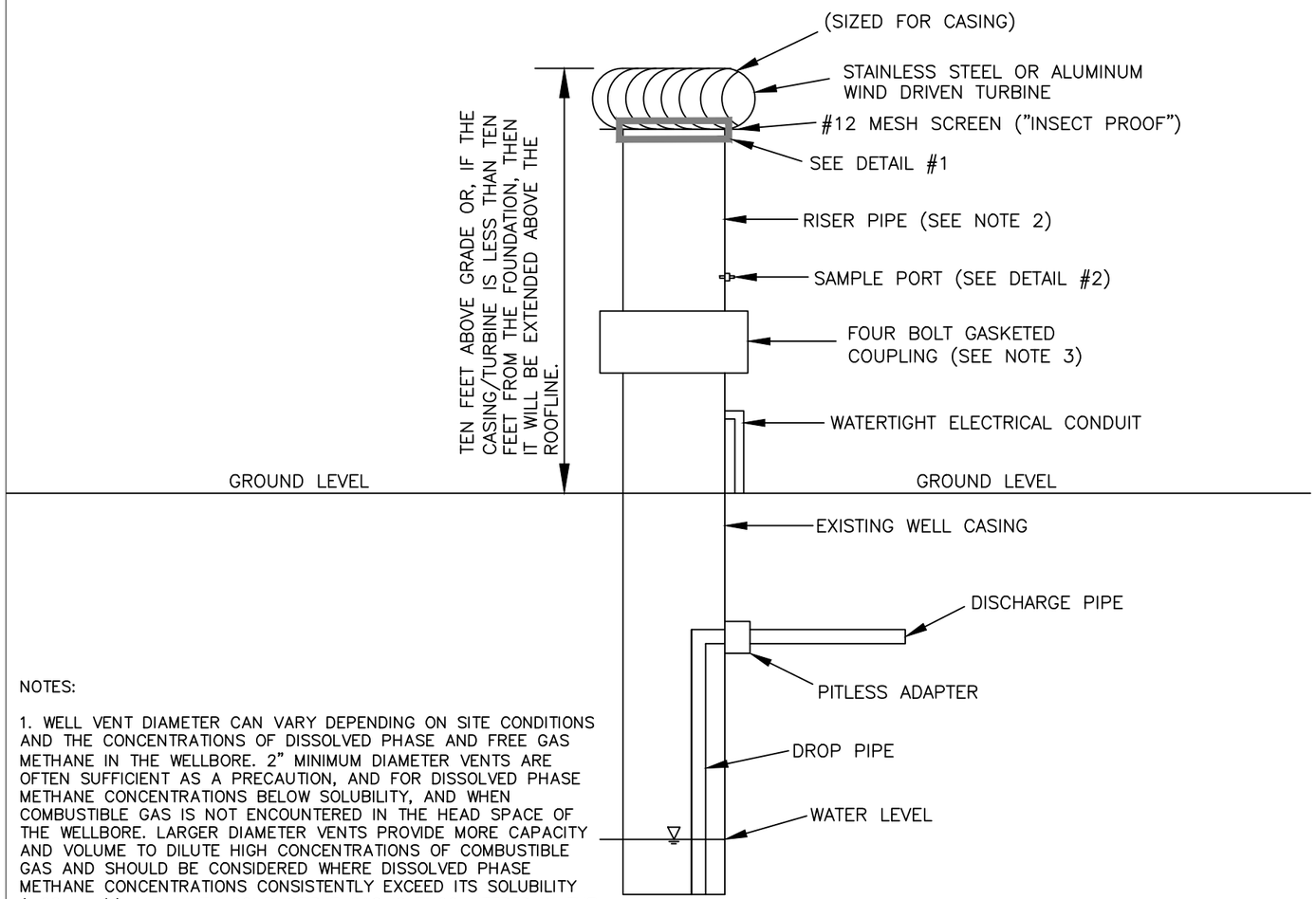
ODH has also approved a method of venting using a turbine vent attached to the top of a casing extension (please see attached schematic).

It is important to determine if the source of the gas is free gas entering the borehole above the static water level or above the pumping water level when the well is in use, if the gas is in the form of dissolved gas in the ground water, or if both conditions are occurring. Methane in the dissolved phase will naturally release to the air in the borehole to some extent depending on the depth of where the water is entering the well and how much methane will bubble up through the water column and into the borehole.

If dissolved methane is detected at the sample tap, a methane removal system (an aeration system) is the only way to remove methane out of the water at the tap because it is already in the plumbing in the house, and can accumulate in a closed space and cause an explosion hazard. Any gas that escapes from the water in the borehole will collect in the well casing and rise to the top of the well. This could also include methane that is entering the well from a geologic formation above the static water level. The passive turbine system will help remove this type of gas more effectively from the well casing than a regular well cap. Industry experts recommend that at 28 mg/l or greater of dissolved methane, homes should have both a passive well venting unit installed like the turbine, in addition to a whole house aeration unit to remove the dissolved phase methane. Below 28 mg/l (this is the solubility of methane in water at one atmosphere) the methane levels are generally low enough that some of the methane will off gas in the borehole and can be removed with a passive vent.

Please remember to exercise caution and use safe practices to prevent explosions and asphyixiation in confined spaces when working on a well that produces any amount of methane. ODH is developing more detailed guidance and fact sheets related to methane occurrence and mitigation for private water systems which will be completed soon. We also plan to develop and offer training on methane mitigation of private water system wells in cooperation with the Ohio Water Well Association. If you have any questions regarding methane occurrence in water wells and mitigation measures, please contact the Residential Water and Sewage Program staff at (614) 644-7558 or at BEH@odh.ohio.gov.

PASSIVE TURBINE SYSTEM FOR METHANE REDUCTION

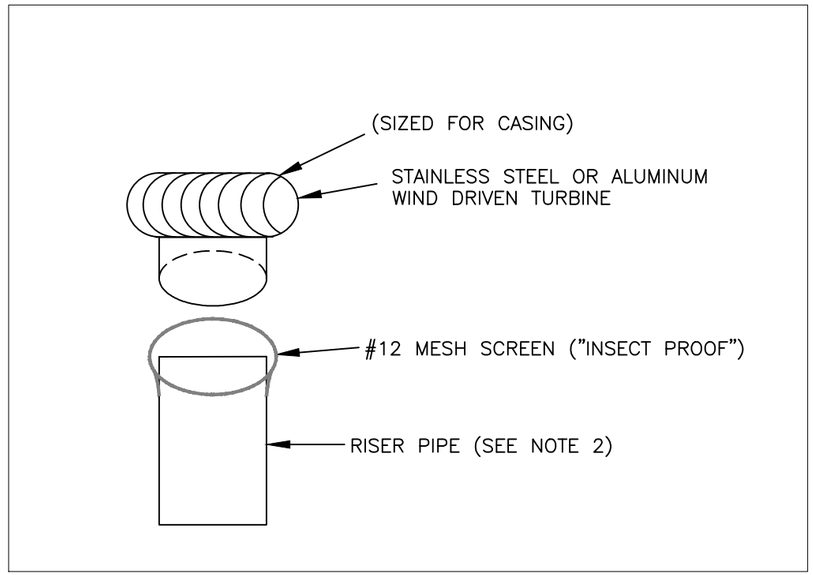


NOTES:

1. WELL VENT DIAMETER CAN VARY DEPENDING ON SITE CONDITIONS AND THE CONCENTRATIONS OF DISSOLVED PHASE AND FREE GAS METHANE IN THE WELLBORE. 2" MINIMUM DIAMETER VENTS ARE OFTEN SUFFICIENT AS A PRECAUTION, AND FOR DISSOLVED PHASE METHANE CONCENTRATIONS BELOW SOLUBILITY, AND WHEN COMBUSTIBLE GAS IS NOT ENCOUNTERED IN THE HEAD SPACE OF THE WELLBORE. LARGER DIAMETER VENTS PROVIDE MORE CAPACITY AND VOLUME TO DILUTE HIGH CONCENTRATIONS OF COMBUSTIBLE GAS AND SHOULD BE CONSIDERED WHERE DISSOLVED PHASE METHANE CONCENTRATIONS CONSISTENTLY EXCEED ITS SOLUBILITY (~28 mg/L) AND WHEN COMBUSTIBLE GAS IS ENCOUNTERED IN THE HEAD SPACE OF THE WELL.

2. EITHER PVC OR STEEL (STAINLESS PREFERABLE) IS RECOMMENDED FOR PERMANENT INSTALLATIONS.

3. ADDITIONAL SUPPORT/STABILIZERS MAY BE UTILIZED IF NEEDED FOR ADEQUATE SUPPORT.



DETAIL #1: TURBINE ATTACHMENT

DETAIL #2: SAMPLE PORT

	ISSUE DATE:	PASSIVE TURBINE SYSTEM FOR METHANE REDUCTION
		PROPOSED VENT SYSTEM / FIGURE 1