Ontario

Green Facts

June 2000

Environment topics at a glance

Installation of well pumps

The quality of Ontario's well water and aquifers is of prime concern to those who rely on wells as a source of water supply and to the Ontario Ministry of the Environment. Under the Ontario Water Resources Act, people who install pumping equipment in water wells must obtain a well contractor licence to engage in the business and a well technician licence to perform the work. By obtaining these licences, and by following regulatory requirements and proper construction practices, well pump installers help protect and enhance the province's well water quality.

Recommended construction practices

Today's water wells use a wide range of pumps and installations. Although it is impossible to describe in detail each pump installation, the following practices should help to secure and maintain an adequately functioning water supply system.

1) Pump selection and operation

Select the pump on the basis of:

- the recommendations and well information provided by the well contractor in the water well record*
- a realistic estimate of the user's present and/or projected water demands
- the pressure requirements of the well water pumping system.

The pump selected must be capable of lifting water from the well and discharging it to the system at the required pressure and desired capacity.

The capacity and type of pneumatic tank or water storage facility will affect the frequency of pumping cycles and the operating time of the pump and hence the life of the pump. Both the storage facility and pump should be correctly assessed when designing a water well pumping system. Ideally, the pump capacity and well yield should equal the system's demand. The system's storage tank may be increased in size to accommodate low yielding wells.

A low water level control system installed in a low yielding well will avoid damage to the pump. A flow control device will prevent overpumping and damage to the well.

On submersible pumps, there must be sufficient water moving past the pump motor to prevent overheating. You should therefore consider the diameter of the pump and the minimum inside diameter of the drilled well when selecting a pump. To meet the pump specifications, you may require a flow-inducing sleeve to improve the cooling of the pump motors.

Follow the pump manufacturer's recommendations on pump installation and operation in all cases.

Where pump or pump intakes must be located near the bottom of the well, position the pump high enough above the bottom to prevent the intake of sand and silt.

All materials and products used in the well pumping system should be CSA (Canadian Standards Association) approved and not previously used for non-potable water purposes.

2) Piping and fittings

Pipe sizes are determined by the required capacity, the length of pipe to be installed, and the head loss calculation, and should be selected accordingly.

Inter-connecting pipes between the well and building should be placed in trenches that are properly graded and deep enough to prevent freezing.

Make sure that pipe joints in the trench between the well and the building protect the quality of the well water.

Install a pressure relief valve on the water system as a precaution against malfunction of the pressure control switch in the system.

3) Electrical

All electrical work and materials should comply with the Ontario Hydro Electrical Safety Code. You can get additional information from your local Ontario Hydro office or local utility.

All equipment shall be properly grounded according to the Canadian Electrical Code, Part 1, and Ontario Hydro regulations.

* A water well record is a Ministry of the Environment form that every well contractor must complete and provide to the well owner within two weeks of well completion. The form recommends the pumping rate, pump setting, and pump type, and provides well construction details. NOTE: The water well record is not required for pump installation.

All electrical equipment must be approved by the Canadian Standards Association and bear the CSA symbol or be approved by Ontario Hydro.

4) Operation and maintenance

Well pumping rates in excess of that recommended in the water well record could break down the hydraulic stability of the well, move silt and sand into the pump and system, and result in reduced well yield or total well or pump failure. Sand or silt pumped with the well water will, through abrasion, quickly erode pump impellers and shorten the operating life of a pump.

When undertaking chemical rehabilitation of a well in association with pump installation, use only approved commercially manufactured chemicals in strict conformity with the manufacturer's recommendations. You should also follow special safety procedures when handling the chemicals. Persons undertaking chemical rehabilitation with chemicals other than chlorine must have a well technician licence, class 3.

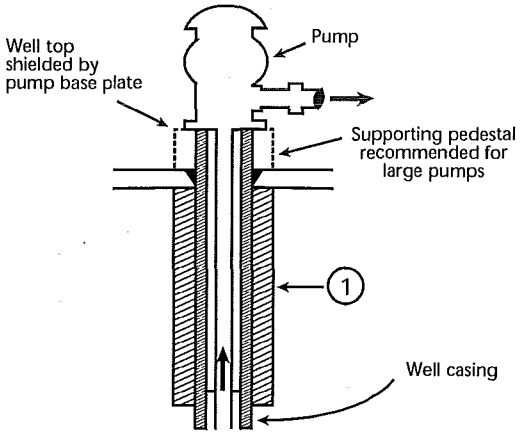
The well owner is responsible for maintaining the well in a manner that will prevent the entry of contamination into the well and aquifer.

Regulatory requirements

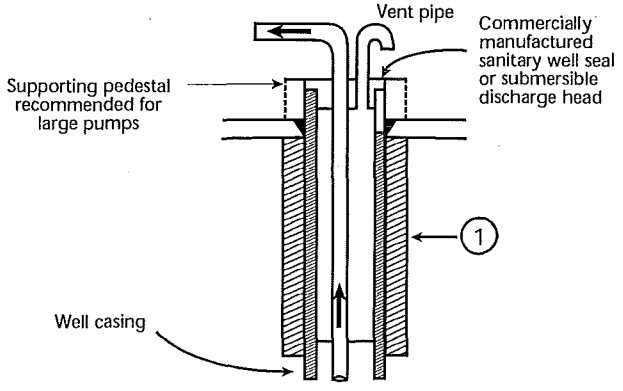
Ontario Regulation 903 outlines the construction requirements for installing pumps and equipment in water wells. Figures A, B, C, and D show various configurations of pump-discharge connections based on the requirements. The following explanations summarize and clarify in more detail each of the construction requirements.

- A pump discharge connection to or through the side well casing below the ground surface must be watertight. Connection to a drilled well casing must be made through a commercially manufactured pitless well adaptor or pitless well unit, and the top of the casing must be equipped with a commercially manufactured well cap [Figure C]. Connection to or through the top of the casing in a bored or dug well [Figure E] or the wall of a well pit [Figure D] must be sealed with a durable, nontoxic sealing material and the top of the casing or well pit must be equipped with a durable, tight-fitting well cover.
- A pump discharge connection through the top of a drilled well casing above the ground surface must be made through a sanitary well seal [Figure B]. If the pump is directly mounted on the casing [Figure A], shield the top of the casing to prevent contamination from entering the well. A well connection through the top of a well casing cut-off below the ground surface in a well pit must be through a commercially manufactured sanitary well seal [Figure D]. The top of a well casing and a well seal may not be completed and buried below the ground surface.
- If disturbed during pump installation the formation seal, and any joint seal on the well casing must be restored according to regulations.

Typical well pump installations required under Ontario Regulation 903

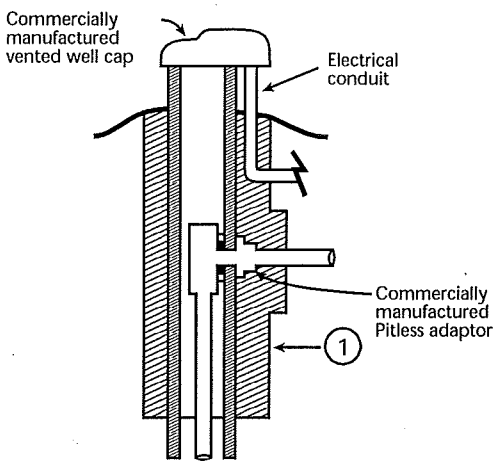


A Connection in drilled well through pump mounted on top of well casing

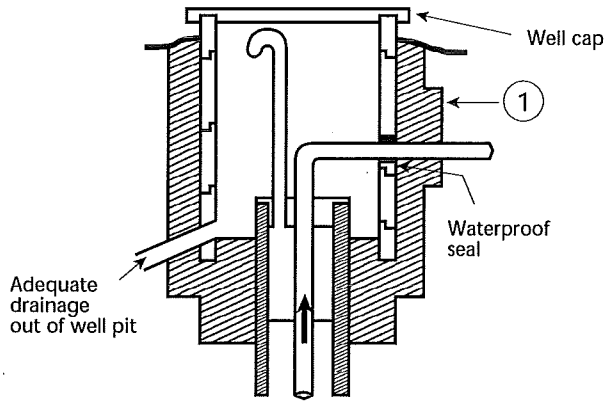


B Connection in drilled well through well seal on top of well casing

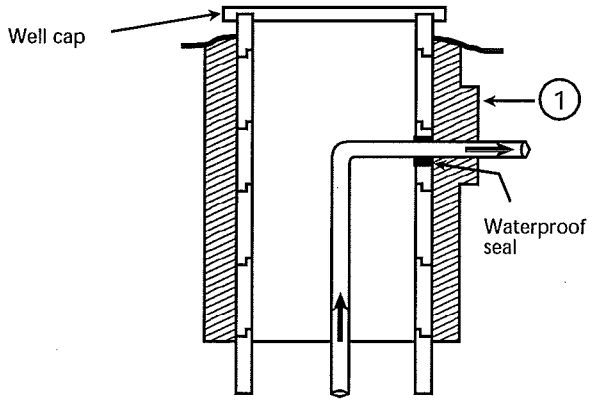
(1) = Formation seal in annular space



C Connection in drilled well through pitless adaptor



D Connection in drilled well in well pit through top of well casing and pit wall



E Connection in bored well through casing wall

(1) = Formation seal in annular space

Any modifications or changes to the well head or casing must also be made according to regulations. The contractor should advise the homeowner of the modifications.

- Well pits that are subject to inflow of groundwater or surface water must be provided with adequate drainage, or equipped with automatic sump pump equipment [Figure D].
- Piping connected to the well casing that directs above-ground artesian flow away from the well must be constructed to prevent contamination from entering the well. The piping must also be equipped with a control device that can stop or regulate the flow of water from the well.
- For the proper operation of the well pump, the well must be vented to equalize the pressure between the inside of the well casing and the atmosphere. The venting requirements are detailed in Regulation 903, Section 18 and are shown in a typical installation in Figure B or C. Special venting may be necessary where natural gases or flowing conditions are present.
- During pump installation or maintenance, take precautions to restrict the entry of contaminants into the pump or the well.
- The well pump and discharge piping should be disinfected following construction or repairs. This usually involves flushing the well and disinfecting it with a chlorine. This must be maintained for 12 hours in the well before being discharged.

Licensing

In order to qualify for a well contractor licence, an applicant must complete an examination showing adequate knowledge of:

- the Ontario Water Resources Act and Ontario Regulation 903
- well structure, design, and hydraulic operation
- pumping equipment design, installation, and operation.

The holder of a well contractor licence will be required to maintain liability insurance and to use only licensed technicians to install pumps in water wells.

Pump installers will be granted a well technician licence, class 4, only after they successfully complete an examination and demonstrate appropriate work experience as per Ontario Regulation 903, Section 6(3).

Additional information sources

There are some additional ministry references you may wish to read. You can obtain a copy of Regulation 903 itself. The Ministry of the Environment also has fact sheets titled Protection of water quality in drilled wells, Protection of water quality in bored and dug wells and Recommended methods for plugging abandoned water wells.

For further information about wells contact your nearest Ministry of the Environment office as listed in the blue pages of your telephone directory. Or call the ministry's public information centre at 1-800-565-4923. In Toronto call 416-325-4000. The ministry's Web site is at www.ene.gov.on.ca.

Printed on 100% recycled paper including 75% post-consumer fibre

PIBS: 3789e 2M - 06 - 00