

Technical Bulletin

Wells Regulation – Completing the Structure of the New Test Hole or Dewatering Well

This technical bulletin is one in a series of seventeen ¹ on well issues created for a person who:

- may have a new test hole ² or dewatering well ³ constructed in the future, or
- currently owns a test hole or dewatering well.

The purpose of this technical bulletin is to:

- summarize the information found in the *Test Holes and Dewatering Wells – Requirements and Best Management Practices* manual published by the Ministry of the Environment, April 2014 (**hereon in referred to as the “Manual”**) regarding the completion of new test holes and dewatering wells, and
- present the finishing construction steps that must be undertaken and materials that must be used to meet the requirements of Regulation 903 (Wells Regulation), as amended, made under the Ontario Water Resources Act.

Some of the finishing steps to complete a test hole or dewatering well include developing, venting, covering and securing the well.

¹ A list of the seventeen technical bulletins is shown in the Additional Information Sources section near the end of this technical bulletin.

² A “test hole” means a well that, (a) is made to test or to obtain information in respect of ground water or an aquifer, and (b) is not used or intended for use as a source of water for agriculture or human consumption, subsection 1(1) of the Wells Regulation, e-laws: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900903_e.htm

³ A “dewatering well” means a well that is not used or intended for use as a source of water for agriculture or human consumption and that is made, (a) to lower or control the level of ground water in the area of the well, or (b) to remove materials that may be in the ground water, subsection 1(1) of the Wells Regulation, e-laws: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900903_e.htm

There are other requirements and exemptions for finishing a new well that are not listed in this technical bulletin because they do not relate to the structure of the well. For example, unless exempt, a person constructing a test hole or dewatering well must affix a well tag on a cased well and must complete a well record or a cluster well record and deliver it to the well purchaser and the owner of the land, as required by the Wells Regulation. The well tag, well record and other requirements relating to documentation and notifications are summarized in the *Wells Regulation – Well Record, Reporting and Tagging for a Test Hole & Dewatering Well* technical bulletin.

The Wells Regulation requires a person constructing a test hole or dewatering well to meet the requirements discussed in this technical bulletin unless an exemption is provided in the Wells Regulation. Exemptions are also summarized in this technical bulletin and in Chapter 3 of the Manual: *Exemptions: Wells, Activities & Experienced Professionals*.

Covering a Well

If the well is left unattended during construction, including during a minor alteration or the installation of a pump, the person constructing the test hole or dewatering well must cover the upper open end of the well securely to prevent the entry of surface water and other foreign materials into the well.

Surface Drainage (Earth Mounding) around the Well

The person constructing the test hole or dewatering well must ensure that the slope of the ground surface (surface drainage) is such that water will not collect or pond near the well. Preventing the collection or ponding of water can be ensured by properly mounding with earth around the well and outward from the well to direct surface water away from the well.

Mounding earth immediately around the casing helps to direct surface drainage away from the well to reduce the risk of surface water ponding at the well site and the potential for surface water to migrate down the side of the well casing into the well.

Extent of Casing (Above and Below Ground Surface) for New Test Holes and Dewatering Wells in an Overburden Aquifer

A sufficient height of casing ⁴ above the ground surface, or above the floor of a well pit, helps to prevent the entry of surface water or foreign materials through the top of the well.

Unless exempted, a person constructing a new test hole or dewatering well that obtains water from an overburden formation must case the well:

- from the water intake zone,
- to at least 40 cm (16") above the highest point on the ground surface within 3 m (10') radially from the outside of the casing after the land is properly mounded for surface drainage as measured on completion of the well's structural stage ⁵.

See Figure 1 in this technical bulletin for further information.

There are a number of exemptions to these casing requirements which will be discussed on the following pages [e.g. an uncased well, a well constructed by use of a driven point and a well completed with a flush-mounted well pit (vault)].

⁴ "Casing" means means pipe, tubing or other material installed in a well to support its sides, but does not include a well screen, subsection 1(1) of the Wells Regulation, e-laws: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900903_e.htm

⁵ A well's structural stage is complete on the day on which the well is capable of being used for the purpose for which it was constructed but for, (a) compliance with section 15; (b) the installation of a pump; or (c) any alterations necessary to accommodate pumping, monitoring, sampling, testing or water treatment equipment, subsection 1(3) of the Wells Regulation, e-laws: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900903_e.htm

Extent of Casing (Above and Below Ground Surface) for New Test Holes and Dewatering Wells in a Bedrock Aquifer

Unless exempted, a person constructing a new test hole or dewatering well that obtains water from a bedrock formation must case the well:

- from the bedrock,
- to at least 40 cm (16") above the highest point on the ground surface within 3 m (10') radially from the outside of the casing after the land is properly mounded for surface drainage as measured on completion of the well's structural stage.

See Figure 1 at the end of this technical bulletin for further information.

There are a number of exemptions to these casing requirements which will be discussed on the following pages [e.g. an uncased well, a well constructed by use of a driven point and a well completed with a flush-mounted well pit (vault)].

Extent of Casing (Above and Below Ground Surface) for Multi-Level Monitoring Test Holes

In the case of a new nested or bundled multi-level monitoring test hole, the person constructing the well must comply with the following requirements unless exempt:

- all casings attached to well screens must extend to at least 40 cm (16") above the highest point on the ground surface within a 3 metres (10 feet) radius from the outside of the casing after the ground surface is properly mounded and meets the surface drainage requirements, or
- any permanent outer casing must extend to at least 40 cm (16") above the highest point on the ground surface within a 3 metres (10 feet) radius from the outside of the casing after the ground surface is properly mounded and meets the surface drainage requirements.

All casing height measurements must be taken upon completion of the well's structural stage.

In the case of a new dedicated multi-level monitoring test hole, the person constructing the well must comply with the following requirements unless exempt:

- the casing of the dedicated system must extend to at least 40 cm (16") above the highest point on the ground surface within a 3 metres (10 feet) radius from the

- outside of the casing after the ground surface is properly mounded and meets the surface drainage requirements,
- any permanent outer casing must extend to at least 40 cm (16") above the highest point on the ground surface within a 3m (10') radius from the outside of the casing after the ground surface is properly mounded and meets the surface drainage requirements.

All casing height measurements must be taken upon completion of the well's structural stage.

Casing Height Exemption for New Driven Point or Jetted Point Wells

An exemption to the minimum casing height requirement of 40 cm (16") above the ground surface exists if the new test hole, multi-level test hole or dewatering well is made by the use of a jetted point or driven point, and it has a visible, permanent marker.

To qualify for this exemption:

- the casing must extend a sufficient height to permit the attachment of a well tag,
- the casing must be at least as high as the highest point on the ground surface within a 3 m (10') radius of the well's casing after the ground surface is properly mounded with earth to direct surface drainage away from the well as measured on completion of the well's structural stage, and
- the permanent marker must identify the location of the well and be visible at all times of the year.

In certain circumstances, a test hole or dewatering well may be completely exempt from the casing height requirements discussed above [e.g. an uncased well and a well completed with a flush-mounted well pit (vault)].

Casing Height Exemption for Test Holes and Dewatering Wells Completed with Flush-mounted Well Covers

A test hole, a multi-level test hole or dewatering well is not required to be cased above the ground surface if:

- the well is located where vehicle or pedestrian traffic is likely to pass directly over the well,
- the well is completed with a flush-mounted watertight commercially manufactured well cover sufficient to prevent entry of surface water and other foreign materials into the well, and

- the well cover is sufficiently strong, durable and well-installed to protect the well from damage, or the well cover is covered with a metal plate that is sufficiently large and strong, durable and well-installed to protect the well cover and the well from damage.

See Figures 2 and 3 at the end of this technical bulletin.

Well Pits

In most circumstances, well pits are not allowed to be constructed on new or existing test holes or dewatering wells.

In certain circumstances, however, a person constructing a new test hole or dewatering well may be allowed to finish the well with a well pit or add a well pit to an existing test hole or dewatering well. The Wells Regulation provides options for the construction of permitted well pits depending on the location of the well, the type of equipment used to construct the well and the well's purpose.

The sections below provide the Wells Regulation construction requirements for various well pit scenarios.

Flush-Mounted Well Pit (Vault)

In Ontario, there are commercially manufactured well pit assemblies for test holes and dewatering wells. The industry commonly calls these well pits flush-to-grade well vaults, well vaults or flush-mounted well pits. This type of assembly is considered a well pit with a flush-mounted watertight commercially manufactured well cover.

The technical bulletin describes a well vault as a “flush-mounted well pit (vault)”. Further clarification is provided in the Glossary and in Table 2-3 of Chapter 2 of the Manual: *Definitions & Clarifications* under the terms “well pit” and “flush-mounted watertight commercially manufactured well cover”.

Location

A test hole or dewatering well is only allowed to be constructed in a flush-mounted well pit (vault) if the well is located where vehicle or pedestrian traffic is likely to pass directly over the well.

Flush-Mounted Well Pit Walls (or Casing)

The walls of the flush-mounted well pit (vault) are considered casing.

The casing requirements found in Chapter 6 of the Manual: *Constructing the Hole, Casing & Covering the Test Hole or Dewatering Well* and Chapter 9 of the Manual: *Completing the Test Hole or Dewatering Well Structure* apply to the walls of a well pit (i.e. casing) when a new well pit is constructed.

Surface drainage must not collect or pond in the vicinity of the well pit's casing.

Flush-Mounted Well Pit (Vault) Floor

The floor of the well pit must be covered with at least 10 cm (4") of suitable sealant that, when set to a solid state, will be capable of supporting the weight of a person.

Flush-Mounted Well Pit (Vault) Cover

The top of the new flush-mounted well pit (vault) must be covered with a solid, watertight cover. The flush-mounted cover must also meet the requirements in the "Casing Height Exemption for Test Holes and Dewatering Wells Completed with Flush-mounted Well Covers" section in this technical bulletin.

See Figures 4 to 7 at the end of this technical bulletin for further information.

Other Permitted Well Pits

A new well pit, other than a flush-mounted well pit (vault), is permitted for new test holes and dewatering wells as long as the well is constructed with diamond drilling equipment in connection with mineral exploration. See Chapter 12 of the Manual: *Equipment Installation* for further information.

See Figure 8 at the end of this technical bulletin for further information.

Well Caps or Covers

Securing and covering the casing are the primary safeguards against unauthorized entry into the well, vandalism or tampering. Well caps and covers also protect against the movement of surface water or foreign materials from the surface into the well. Securing the well includes ensuring that the well cap, seal or cover is on properly and may include the use of a protective cover with locking cap, barriers or fences.

Dug or Bored

The top of the casing of a test hole or dewatering well that is constructed by digging or boring must be covered with a solid, watertight well cover, to prevent surface water and other foreign materials from entering the well.

Drilled or Other

The top of the casing of a test hole or dewatering well that is not constructed by digging or boring must be sealed with a commercially manufactured vermin-proof well cap (this includes a properly installed and sealed sanitary well seal and a watertight and airtight well cap for a point well).

See Chapter 12 of the Manual: *Equipment Installation* for further information on the various types of caps and covers for test holes and dewatering wells.

Securing a Test Hole that Extends Above the Ground

To properly secure a test hole that is finished above the ground surface, the person constructing the well should have a lockable steel protective cover anchored in a concrete mound around the base. The person constructing the well should install the steel protective cover using the information in the “Best Management Practice - Use of Protective Cover for a Test Hole Finished Above Ground” in Chapter 9: *Completing the Test Hole or Dewatering Well Structure* of the Manual.

Exemption - Well Caps or Covers

A cover, cap or seal is not required if all of the following criteria are met:

- a floor has been constructed around or adjacent to the casing of the well,
- a pump (includes associated pumping equipment such as a waterline connected to a pump) is installed above or adjacent to the well,
- the top of the casing is shielded in a manner sufficient to prevent entry of any material that may impair the quality of the water in the well, and
- the casing of the well is extended to at least 15 cm (6") above the floor that has been constructed around or adjacent to the casing of the well.

Venting the Test Hole or Dewatering Well

When constructing a new dewatering well where water is transmitted out of the well with pumping equipment, the person constructing the well must ensure that the well is vented to the outside atmosphere in a manner that will safely disperse all gases from the well. Additional venting requirements may apply after pumping equipment is installed in the well.

Venting does not apply to a new test hole or a new well in which the casing is used to transmit water out of the well. For example, venting requirements do not apply to a drive point dewatering system or a flowing well. Venting requirements may apply if pumping equipment is installed in a well.

The purpose of the vent is to allow the well to breathe, which enables pressures to equalize (e.g., when water is drawn out, air can enter the well keeping the column of water at atmospheric pressure). The vent also allows for dispersal of natural gases to the outside atmosphere. In many cases, a properly designed vent is required to be installed on a well to safely disperse a gas that is poisonous, explosive or otherwise hazardous.

Well Development

The purpose of well development is to remove any water or drilling fluids introduced into the test hole or dewatering well during drilling; stabilize the filter pack and formation materials opposite the well screen; minimize the amount of fine-grained sediment entering the test hole or dewatering well; and improve well efficiency and inflow of water into the test hole or dewatering well.

Development of a test hole is important when sampling for water quality or determining hydraulic characteristics of a subsurface formation. Development of a dewatering well maximizes the efficiency of the dewatering system and minimizes the turbidity of the discharge water.

The Wells Regulation provides an exemption from well development for test holes and dewatering wells because of the various testing and monitoring needs that are required for many different types of test holes and dewatering wells. For example, there is no practical way to develop a test pit excavation when a person is observing the location of the shallow groundwater and soils.

Although it is important to develop test holes and dewatering wells, they are often not properly developed. If the construction process goes according to plan, and the water level appears to recover quickly after drilling, test holes or dewatering wells are often deemed complete. This may be adequate for establishing where the aquifer is located but may not be adequate for water quality sampling or testing of the aquifer's physical characteristics.

When making a decision whether or not to develop a test hole or dewatering well, the person constructing the well should take into consideration of the following:

- A person constructing a well on a contaminated site should consider the effect that development may have on the contaminated plume.
- A person constructing a well on a contaminated site may want to limit the handling of development water.
- A person constructing a well may have to consider a potentially significant cost and time associated with the development of a test hole or dewatering well in fine grained formations.

Best Management Practice for Test Hole Development

As a best management practice ⁶, where it is necessary to obtain representative groundwater samples and measurements or the highest well efficiency, a test hole or dewatering well should be properly developed. Proper well development will result in a well that produces water that is representative of conditions in the formation(s) from which the well obtains groundwater.

Monitoring well development should continue until:

- the discharge water is visibly clear,
- the pH, Eh and conductivity field measurements are stable in the discharge water,
- the turbidity is below 10 Formazin Turbidity Units (FTU), and
- the volume of discharge water at least equals the estimated volume of fluid lost during the well construction and installation.

ASTM D5521-05 “Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers” ⁷ should be reviewed for further information on well development.

⁶ Best management practices are recommended actions or steps that exceed the minimum regulatory requirements to better protect the groundwater and the natural environment but are not enforceable.

⁷ ASTM D5521-05 “Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers” ASTM International, West Conshohocken, PA, 2004, .DOI: 10.1520/D5521-05. www.astm.org.

Well Development of Monitoring Wells Under the Records of Site Condition Regulation

There are additional well construction requirements for monitoring wells that are used in an assessment in support of a record of site condition for a property.

Starting on July 1, 2011, amendments to O. Reg. 153/04⁸ came into force and apply to phase two environmental site assessments (ESAs) conducted in support of records of site conditions (RSCs). For any such RSC submitted on or after this date, the following requirements related to well construction apply:

- where sampling of groundwater is being undertaken to demonstrate if the applicable site condition standard for a contaminant has been met or not, the qualified person must ensure that:
 - a monitoring well from which a sample is to be collected has been developed to remove any fluids that may have been introduced into the well during drilling and to remove particulates that may have become entrained in the well and filter pack.
 - the well development referred to above is documented by recording:
 - the date of the development,
 - the time the development started and stopped, and
 - the volume of fluid removed from the well during development
 - a rationale for concluding the development was complete is documented
 - a description of the measures taken to minimize cross contamination between wells when using non-dedicated equipment is documented, and
 - precautions are taken to minimize the potential for cross-contamination or contamination through preferential pathways.

There are additional obligations when taking groundwater samples for the purpose stated above. Please refer to O. Reg. 153/04 for RSC requirements.

A monitoring well is considered a test hole.

⁸ Ontario Regulation 153/04 as amended made under the Environmental Protection Act, R.S.O. 1990, c. E. 19, e-laws - http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_040153_e.htm

Implications for the Qualified Person

The qualified person ⁹ shall ensure that the phase two ESA is conducted in accordance with requirements stated above.

Please refer to O. Reg. 153/04 for RSC requirements.

Exemption - Yield Test

The person constructing a test hole or dewatering well is exempt from performing a yield test if the static water level is measured as described below.

While yield tests are not required for test holes or dewatering wells as long as a static water level is measured, there are several types of pumping tests used to determine aquifer and well hydraulic characteristics. Examples of pumping tests include constant rate and step-drawdown pumping tests. See Chapter 13: *Water Level Measurements, Aquifer Testing & Discharge Water Handling* of the Manual for more information.

Measuring Static Water Level

Before the structural stage of a test hole or dewatering well is complete, the person constructing the test hole or dewatering well must:

- measure the static water level using a tape, air line or electrical device, and
- ensure that any part of the tape, air line or electrical device that comes into contact with water in the well is clean.

⁹ See the definition of Qualified Person in Chapter 2 *Definitions and Clarifications of the Manual* and section 5 of Ontario Regulation 153/04 as amended made under the Environmental Protection Act, R.S.O. 1990, c. E. 19, e-laws: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_040153_e.htm

Exemptions - Static Water Level Measurement

Measuring the static water level or testing the well yield, in a test hole or dewatering well, is not required in any of the following situations:

- the well or activity is exempt from the **Wells Regulation**,
- the well construction activity consists of a minor alteration,
- the well construction activity consists of the installation of a pump, or
- the well construction activity consists of an alteration that only involves:
 - the removal of the casing above the ground surface so that the casing is flush with the ground surface,
 - the addition of casing above the ground surface, or
 - the addition or removal of a well pit.

Figures at End of this Technical Bulletin

Figures 1 to 8 show cross-sectional illustrations and relevant graphics for various requirements related to completing the structure of a new test hole or dewatering well, including installing the casing above the ground surface and in well pits.

Exempted Wells & Shallow Works

The Wells Regulation exempts certain types of wells, such as a pond or trench, from the Wells Regulation and from the sections on licensing of the Ontario Water Resources Act that pertain to wells ¹⁰.

A person who constructs, maintains or abandons a shallow works that meets the conditions set out in section 1.1 of the Wells Regulation:

- is exempt from the sections on licencing of the Ontario Water Resources Act that pertain to wells, ¹¹ and
- need only meet the requirements found in section 1.1 of the Wells Regulation.

¹⁰ Sections 36 to 50 of the Ontario Water Resources Act, R.S.O. 1990, c. O. 40, e-laws: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

¹¹ Sections 36 to 50 of the Ontario Water Resources Act, R.S.O. 1990, c. O. 40, e-laws: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

The shallow works exemption contained in section 1.1 of the Wells Regulation does not apply to a monitoring well that is constructed as part of a phase one or two environmental site assessment for a record of site condition ¹².

See the *Wells Regulation – Understanding a Well, Test Hole and Dewatering Well* and *Wells Regulation – Shallows Works* technical bulletins for further information.

Water Supply Wells

Certain licensing and construction requirements for water supply wells are different from the requirements for test holes and dewatering wells as defined by the Wells Regulation. For further information on the requirements for water supply wells see the *Water Supply Wells – Requirements and Best Management Practices* manual, published by the Ministry of the Environment, December 2009 and the Wells Regulation.

Additional Information Sources

The seventeen technical bulletins on test holes and dewatering wells are:

- Wells Regulation – Understanding the Meaning of Well, Test Hole and Dewatering Well
- Wells Regulation – Shallow Works Test Holes & Dewatering Wells
- Wells Regulation – Exempted Activities Performed on Wells, Including Test Holes & Dewatering Wells
- Wells Regulation – Test Hole and Dewatering Well Licensing
- Wells Regulation – Licensing (Class 5) for Individuals who Perform Tests on Wells
- Wells Regulation – Site Considerations & Initial Planning for Test Holes & Dewatering Wells
- Wells Regulation – Constructing New Uncased Test Holes & Dewatering Wells in Operation for No Longer than 30 Days
- Wells Regulation – Constructing New Test Holes & Dewatering Wells in Operation for No Longer than 180 Days
- Wells Regulation – Constructing New Test Holes & Dewatering Wells
- Wells Regulation – Constructing New Multi-level Monitoring Test Holes

¹² Ontario Regulation 153/04 as amended made under the Environmental Protection Act, R.S.O. 1990, c. E. 19, e-laws: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90e19_e.htm

- Wells Regulation – Completing the Structure of the New Test Hole or Dewatering Well
- Wells Regulation – Flowing Test Holes & Dewatering Wells
- Wells Regulation – Test Hole & Dewatering Well Maintenance
- Wells Regulation – Well Record, Reporting & Tagging for a Test Hole & Dewatering Well
- Wells Regulation – Test Hole & Dewatering Well Repairs & Alterations
- Wells Regulation – Well Abandonment - When to Plug & Seal a Test Hole or Dewatering Well
- Well Regulation – Well Abandonment - How to Plug & Seal a Test Hole or Dewatering Well

These technical bulletins are available on Ontario.ca.

Further information on finishing the construction of a test hole or dewatering well can be found in Chapter 9: *Completing the Test Hole or Dewatering Well Structure*, Chapter 12: *Equipment Installation* and Chapter 13: *Water Level Measurements, Aquifer Testing & Discharge Water Handling* of the Manual.

A copy of the *Test Holes and Dewatering Wells – Requirements and Best Management Practices* manual can be obtained on Ontario.ca.

A copy of the Ontario Water Resources Act, Wells Regulation and other regulations can be obtained from the e-Laws website at www.e-laws.gov.on.ca.

The publications are also available by calling the Publications Information Centre at 1-800-565-4923 or (416) 325-4000.

For further information about wells, contact the Wells Help Desk at 1-888-396-9355 (Well) or the nearest Ministry of the Environment office listed in the blue pages of the telephone directory.

Notice: This bulletin is being provided for information purposes only and is not intended, nor should it be construed as providing legal advice in any circumstances. The applicable environmental legislation, including the following, should be consulted.

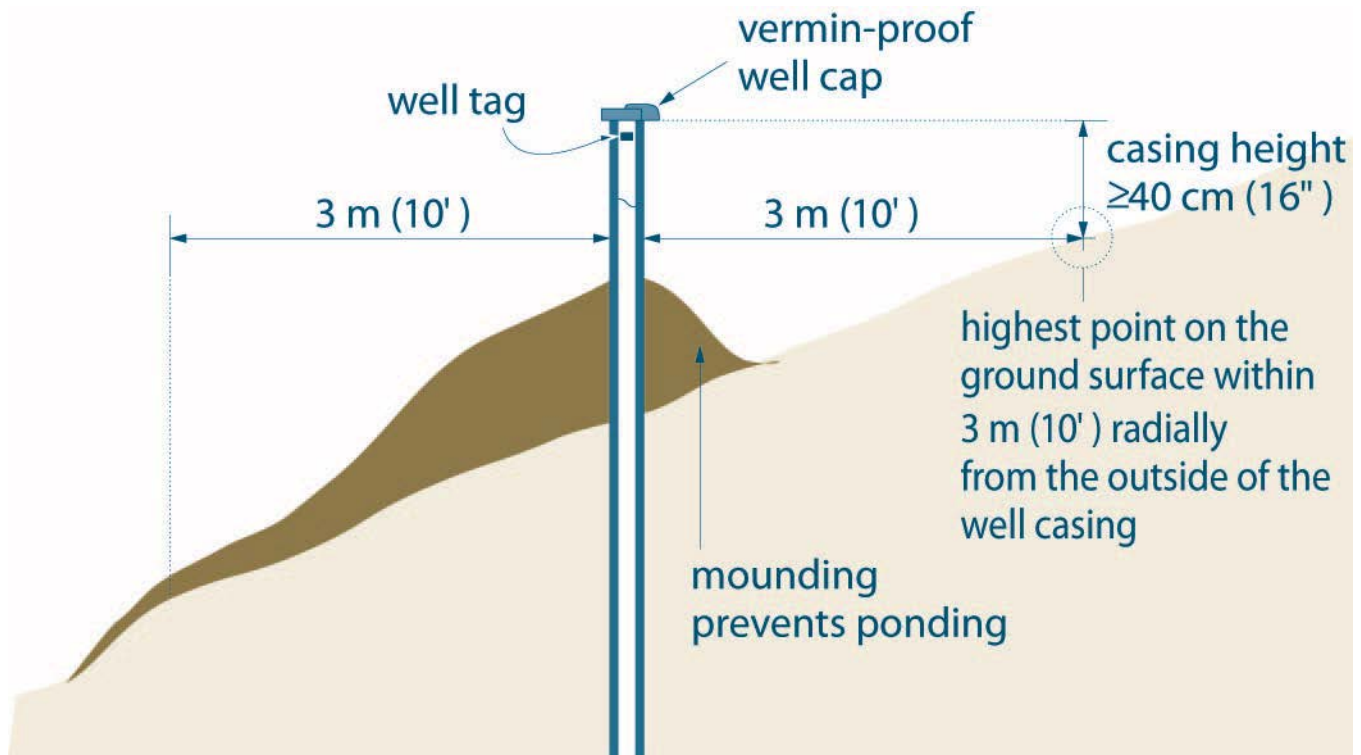
- ***Ontario Water Resources Act, R.S.O. 1990, c. O. 40***
- ***R.R.O. 1990, Regulation 903 (Wells) as amended made under the Ontario Water Resources Act, R.S.O. 1990, c. O. 40***
- ***Ontario Regulation 153/04 as amended made under the Environmental Protection Act, R.S.O. 1990, c. E. 19***

Legislation and regulations change from time to time so it is essential that the most current versions be used.

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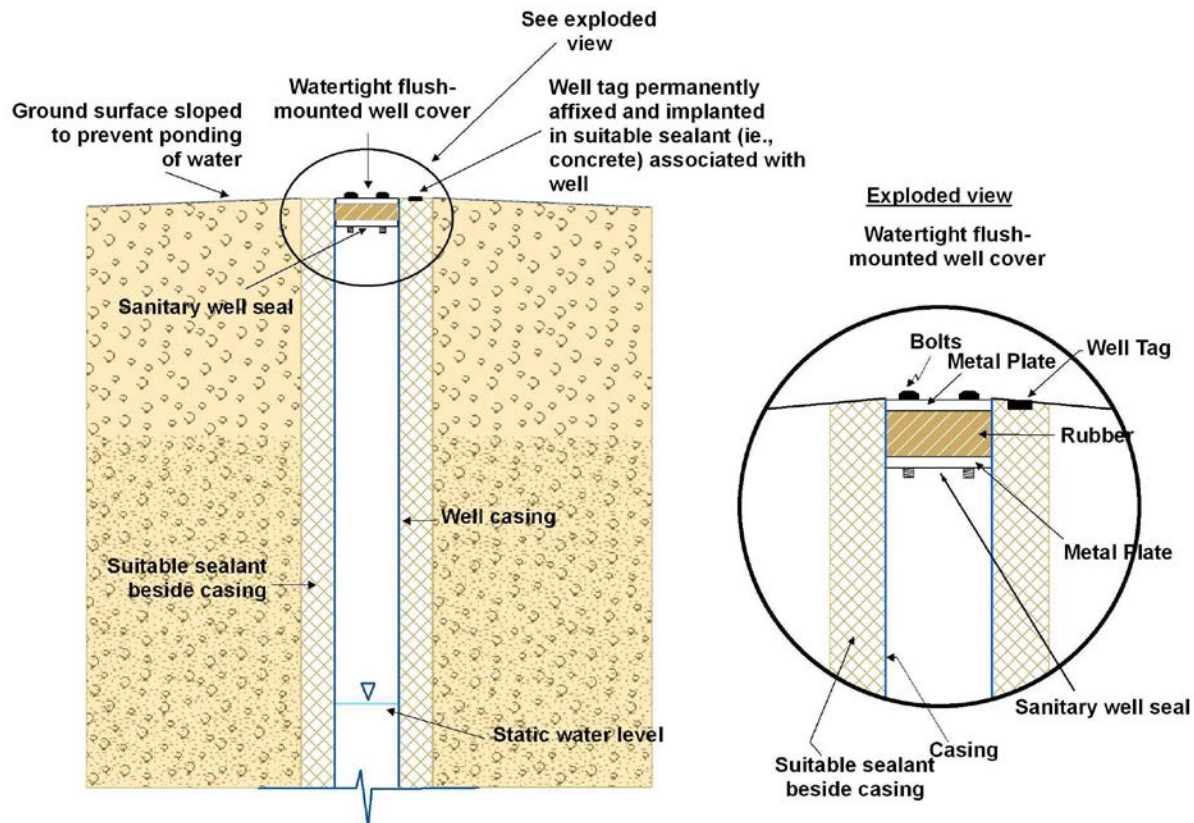
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Figure 1: How to Measure Casing Height Above the Ground Surface for a New Well
(Other Than a Well Constructed By the Use of a Jetted Point or Driven Point)
with a Permanent Visible Marker Identifying the Well



This figure is not to scale, it is for illustrative purposes for this technical bulletin only and does not necessarily represent full compliance with other requirements found in the Wells Regulation.

Figure 2: An Example of a Flush-Mounted Watertight Commercially Manufactured Well Cover



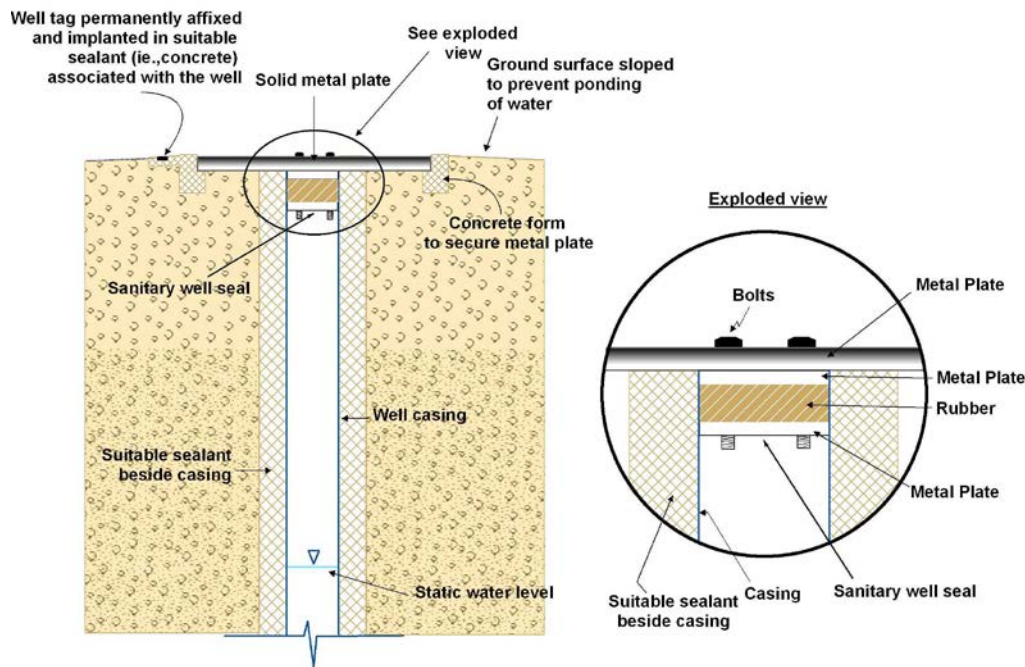
The well cover, in this case a sanitary well seal, must be sufficiently strong, durable and well-installed to protect the well from damage. The well cover must be commercially manufactured and must prevent the entry of surface water and other foreign materials into the well. The cover should be fastened to prevent tampering.

If the cover is placed onto a well that has been constructed by boring or digging, then the cover must be solid, watertight and sufficient to prevent the entry of surface water and other foreign materials into the well. If the cover is placed onto a well that has not been constructed by boring or digging, then the cover must be a commercially manufactured vermin-proof well cap.

The casing should be strong enough and properly seated and sealed into the ground to withstand the weight of any person or vehicle and to prevent the casing from sinking into the ground.

This figure is not to scale, it is for illustrative purposes for this technical bulletin only and does not necessarily represent full compliance with other requirements found in the Wells Regulation.

Figure 3: An Example of a Flush-Mounted Watertight Commercially Manufactured Well Cover with Metal Plate for a New Well



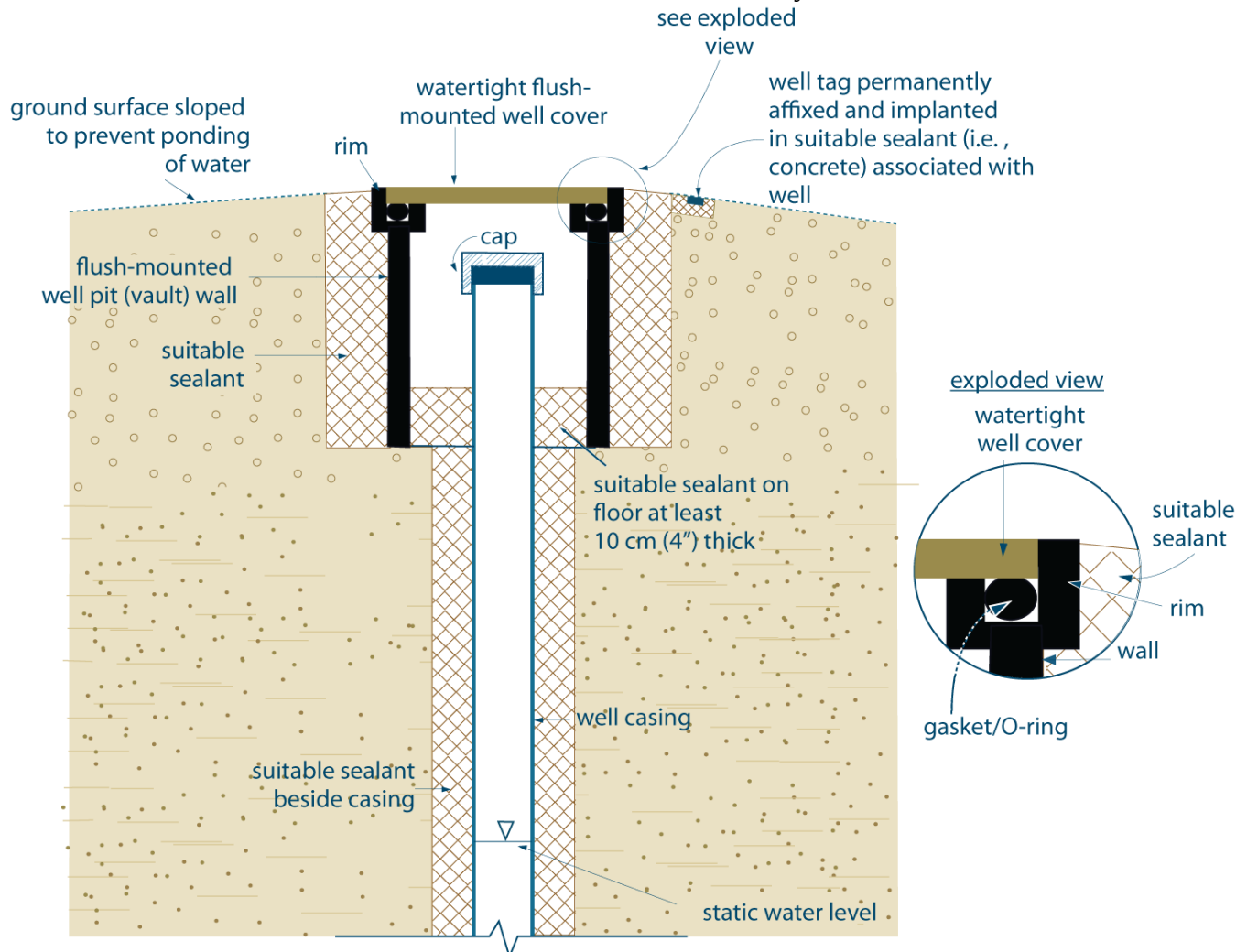
A well cover, in this case a sanitary well seal, is placed atop the well casing. The sanitary well seal has been covered with a larger metal plate that is sufficiently large and sufficiently strong, durable and well-installed to protect the well cover and the well from damage. The metal plate has been bolted into the sanitary well seal. The well cover must be commercially manufactured and must prevent the entry of surface water and other foreign materials into the well. The cover should be fastened to prevent tampering.

If the cover is placed onto a well that has been constructed by boring or digging, then the cover must be solid, watertight and sufficient to prevent the entry of surface water and other foreign materials into the well. If the cover is placed onto a well that has not been constructed by boring or digging, then the cover must be a commercially manufactured vermin-proof well cap.

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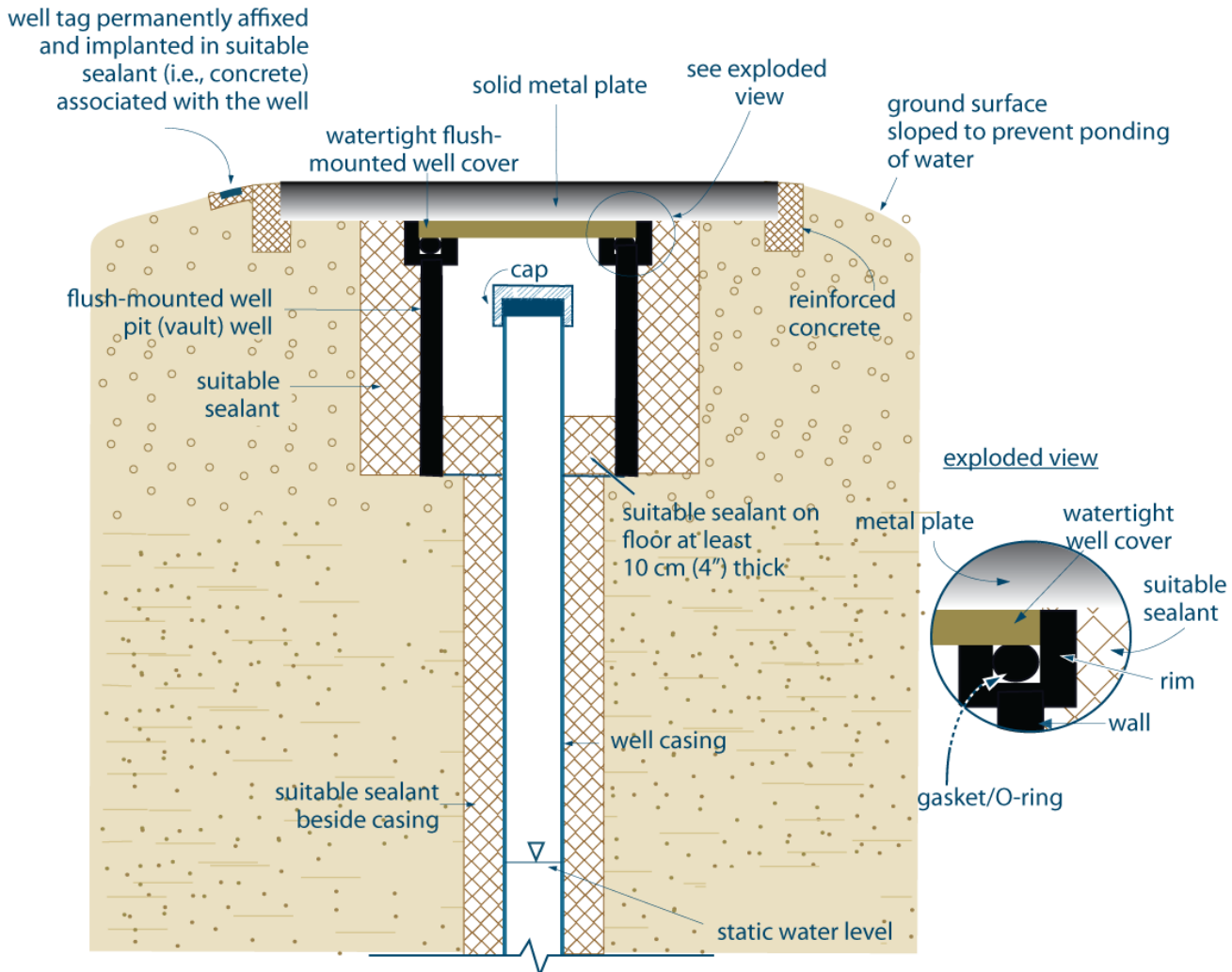
Figure 4: Flush-Mounted Well Pit (Vault) for a New Test Hole or Dewatering Well that Is Not Scheduled to Be Abandoned within 180 Days



- The hole diameter must be at least 7.6 cm (3") greater than the diameter of the flush-mounted well pit vault.
- It is important that the gasket/O-ring be clean (including sand free) and greased to ensure a proper seal and to prevent cracking.
- The well cover must be commercially manufactured and sufficiently strong, durable and well-installed to prevent damage to the well.
- Cover should be fastened to prevent tampering
- The suitable sealant beside the flush-mounted well pit wall and above the pit floor must provide the appropriate structural strength to support the weight of persons or vehicles that may move over the well

This figure is not to scale, is for illustrative purposes for this technical bulletin only and does not necessarily represent full compliance with other requirements found in the Wells Regulation.

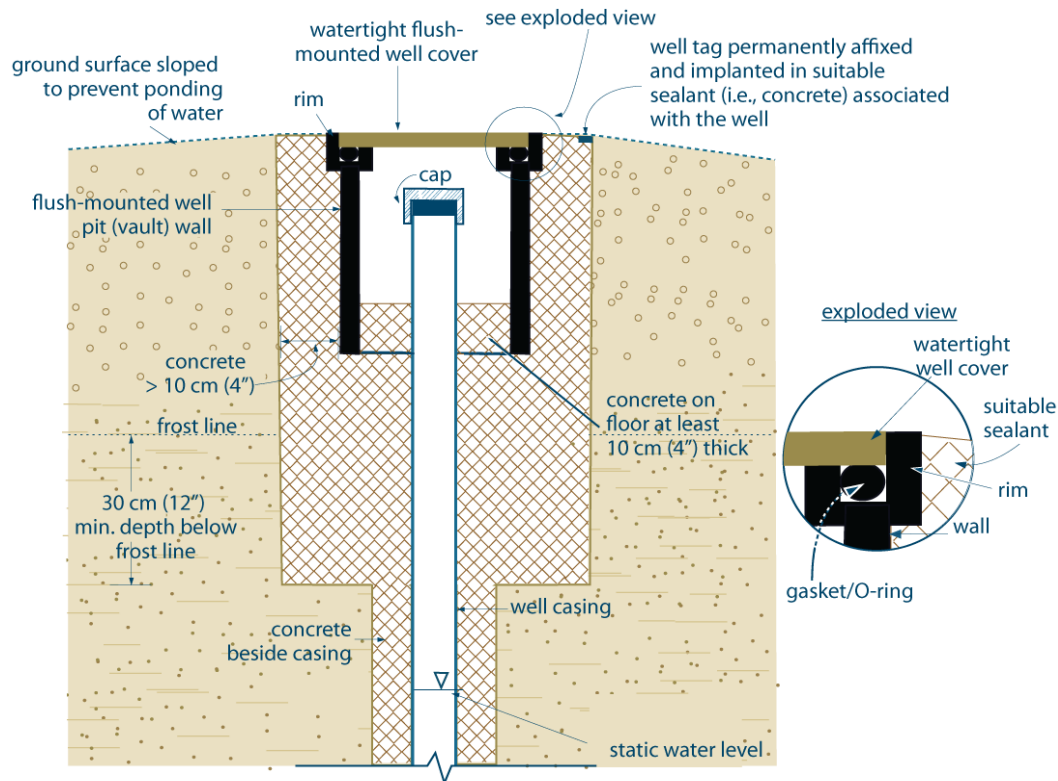
Figure 5: Flush-Mounted Well Pit (Vault) with Metal Plate for a New Test Hole or Dewatering Well that is Not Scheduled to be Abandoned within 180 Days



- The hole diameter must be at least 7.6 cm (3") greater than the diameter of the flush-mounted well pit vault.
- It is important that the gasket/O-ring be clean (including sand free) and greased to ensure a proper seal and to prevent cracking
- The well cover must be commercially manufactured and sufficiently strong, durable and well-installed to prevent damage to the well.
- Cover should be fastened to prevent tampering.
- The suitable sealant beside the flush-mounted well pit wall and above the pit floor must provide the appropriate structural strength to support the weight of persons or vehicles that may move over the well.

This figure is not to scale, is for illustrative purposes for this technical bulletin only and does not necessarily represent full compliance with other requirements found in the Wells Regulation.

Figure 6: Stronger Flush-Mounted Well Pit (Vault) for a New Test Hole or Dewatering Well that Is not Scheduled to Be Abandoned within 180 Days



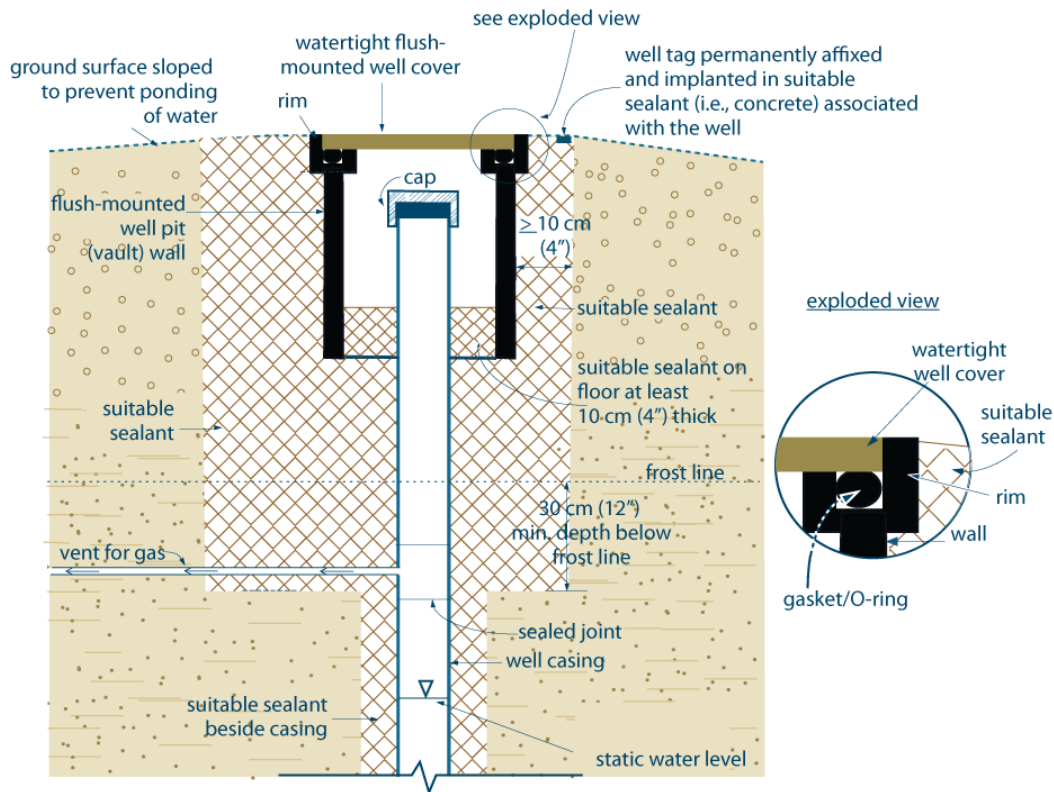
- The use of concrete as a suitable sealant is recommended as a best management practice in this case.
- The thickness of concrete beside the flush-mounted well pit (vault) wall and below the flush-mounted well pit (vault) is recommended as a best management practice.
- It is important that the Gasket/O-ring be clean (including sand-free) and greased to ensure a proper seal and to prevent cracking.
- The well cover must be commercially manufactured and sufficiently strong, durable and well-installed to prevent damage to the well.
- Cover should be fastened to prevent tampering.
- The suitable sealant must provide the appropriate structural strength to support the weight of persons or vehicles that may move over the well.

This diagram shows a well pit design that has increased structural strength and protection from frost heaving¹³ compared to Figure 4 or 5.

This figure is not to scale, is for illustrative purposes for this technical bulletin only and does not necessarily represent full compliance with other requirements found in the Wells Regulation.

¹³ Nielsen, David M. 2006. *Practical Handbook for Environmental Site Characterization and Ground-Water Monitoring*: Second Edition. CRC/Taylor and Francis. Boca Raton, Florida. P.787

Figure 7: Flush-Mounted Well Pit (Vault) with Vent for a New Test Hole or Dewatering Well that Is Not Scheduled to Be Abandoned within 180 Days

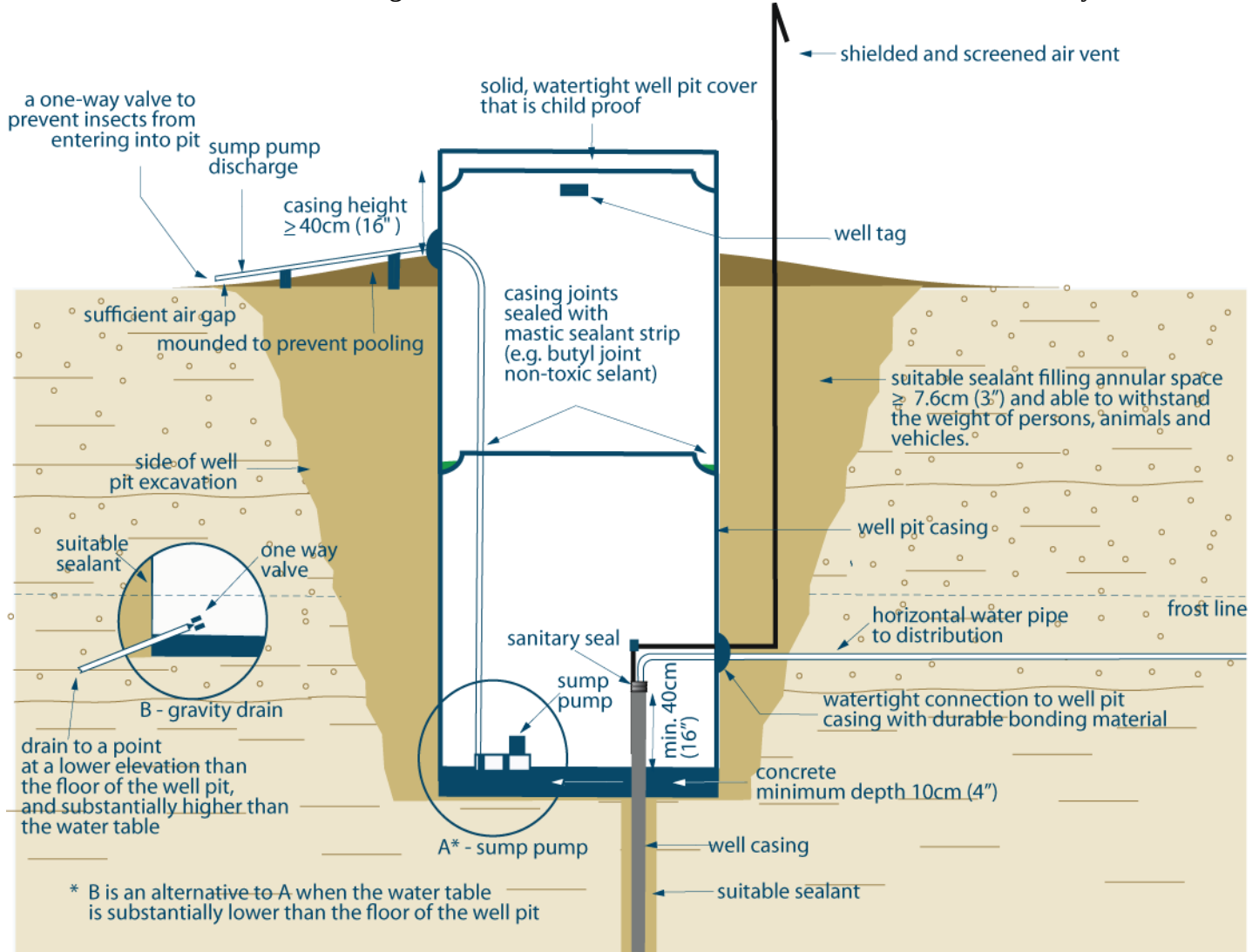


- The use of concrete as a suitable sealant is recommended as a best management practice in this case.
- Vent for gas extends to an approved collection system or to a place where gas can safely disperse.
- The vent must be designed to prevent the entry of surface water or other foreign material.
- The trench for the vent must be sealed with suitable sealant from:
 - o the casing outward a minimum of 20 cm (7.9"), and
 - o the bottom of the excavation upward to within 20 cm (7.9") of the ground surface.
- The thickness of concrete beside (except around the vent) and below the flush-mounted well pit (vault) is recommended as a best management practice.
- It is important that the gasket/O-ring be clean (including sand-free) and greased to ensure a proper seal and to prevent cracking
- The well cover must be commercially manufactured and sufficiently strong, durable and well-installed to prevent damage to the well.
- The well cover should be fastened to prevent tampering.
- The suitable sealant must provide the appropriate structural strength to support the weight of persons or vehicles that may move over the well.

This diagram shows a well pit design for areas where there is the potential for gas and frost heaving.

This figure is not to scale, is for illustrative purposes for this technical bulletin only and does not necessarily represent full compliance with other requirements found in the Wells Regulation.

Figure 8: An Example of a Well Pit with Sump Pump and Gravity Drain for a Test Hole or Dewatering Well that Is Not Scheduled to Be Abandoned within 180 Days



- Sometimes the pump and air tank are located within the well pit

Larger diameter well pits are considered confined spaces. Persons working on well pits must only enter them when adequate safety precautions are followed based on Confined Spaces Regulation 632/05 under the Occupational Health and Safety Act.

This figure is not to scale, is for illustrative purposes for this technical bulletin only and does not necessarily represent full compliance with other requirements found in the Wells Regulation.