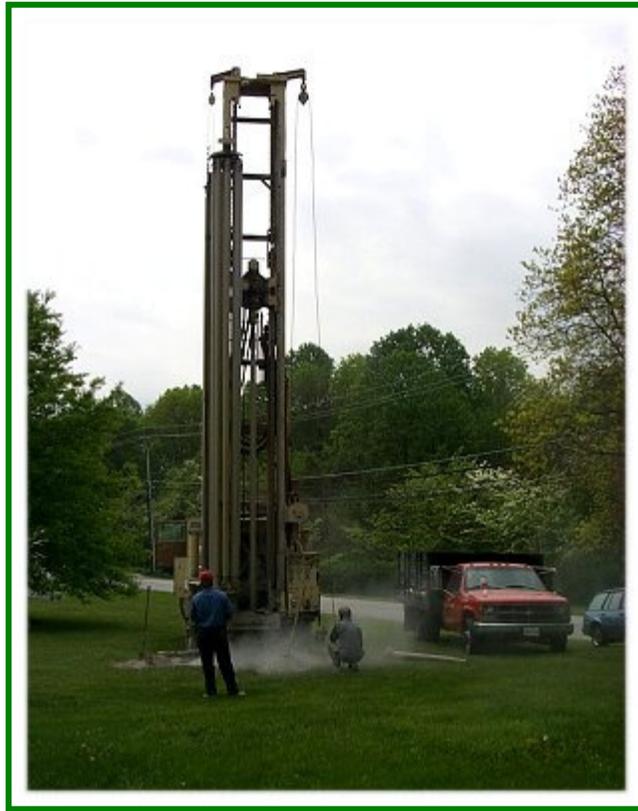




## BUTTE COUNTY WELL CONSTRUCTION MANUAL



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## Purpose and Development of Manual

This manual has been established as required by Butte County Code Chapter 23B Water Wells in order to provide local interpretation and guidance in the application of Bulletins 74-81, its supplement 74-90, and future revisions and supplements. Provisions in the manual are developed by the Division in collaboration with the Well Drillers Advisory Group (WDAG).

The WDAG is an informal association of well drillers and other interested engineers and contractors who are involved in the design and construction of domestic water systems in Butte County. The WDAG meets a minimum of twice a year for the purpose of assisting the Division in enforcing Butte County Code Chapter 23B in a manner that maintains and enhances the protection of public health, is user-friendly for both the public and contractors, and addresses the practical conditions encountered in the field by well drillers.

The Division is responsible for establishing meeting agendas, providing needed meeting logistical support, and maintaining meeting records.

## Requirement of Use of Concrete Slabs

### Regulatory Requirement and Rationale

Bulletin 74-90 Section 10.A. states: *“A concrete base or pad, sometimes called a pump block or pump pedestal, shall be constructed at ground surface around the top of the well casing and contact the annular seal... the base shall extend at least two feet laterally in all directions from the outside of the well boring, unless otherwise approved by the enforcing agency...the base shall be a minimum of 4 inches thick.”*

The purpose of concrete slabs is to protect the well casing from accidental damage and to prevent surface water from ponding over a shrunken bentonite seal and possibly contaminating the aquifer.

### Concerns

Reasons have been considered for why concrete slabs may not be desirable. They may cover the ground surface immediately over a shrunken bentonite seal, obscuring the problem and preventing the addition of more bentonite to resolve the problem, while at the same time being ineffective at preventing the intrusion of surface water.

Reasons have also been considered for why concrete slabs should be required as part of the building permit process rather than at the time of well construction. Well construction may take place some time before the property owner proceeds with their building project, and therefore occurs before construction contractors begin working the site but also might thereby interfere with the construction of a future well house.

### Analysis

The potential benefits outweigh potential concerns about the requirement of well slabs. The slabs, though small at approximately 30 inches x 30 inches, provide an adequate degree of protection of the well seal from ponding surface water, erosion of the bentonite, or the disturbance of the bentonite through weathering or vandalism. Although the slabs prevent future addition of bentonite to fill the space created by shrunken bentonite, in practice well drillers seldom return to wells to add bentonite and instead the well seals remain exposed to the weather. The slabs do not prevent the construction of well houses with larger slabs. Delaying slab construction until the property owner constructs the home, could mean that parcels developed with only septic systems and wells could remain in the vacant condition for many months or even years prior to construction of the house.

When wells are constructed not as part of an overall building project, they may be expected to be on the parcel for a period of time without a building. These wells in particular need the added protection of a well pad at the time of construction approval. A well that is constructed in conjunction with permits for a building may more legitimately have the installation of there pad delayed until the building is ready for occupancy approval.

### Conclusion

The Division will continue to require concrete slabs for wells. The Division will continue to specify that slabs extend 18 inches laterally in all directions outside the well boring. To help mitigate concerns that the well slab should not be considered part of the well construction process, the Division's Well Compliance Certificate has been modified to distinguish between well construction activities and the slab construction activity to clarify that slab construction is the property owner's responsibility.

## **Continuous Pour of Concrete Slab with Concrete Seal**

### Regulatory Requirement and Rationale

Bulletin 74-90 Section 10.A. states: *“Where cement-based annular sealing material is used, the concrete base shall be poured before the annular seal has set, unless otherwise approved by the enforcing agency.”*

The intent of this requirement is to have a base that is an integral part of the annular seal.

### Concerns

Some settling may occur after placement of annular seals, including concrete, cement, and bentonite materials. Cement can have issues with shrinkage.

### Analysis

Immediate placement of the cement base will not result in a superior seal and base installation in many cases; it is often preferable to pour the slab after the seal has been placed and set.

### Conclusion

The Division will continue to approve the current practice of allowing construction of the cement base subsequent to seal placement.

## Use of Bentonite as Annular Seal Material

### Use in Vegetated Areas

#### Regulatory Requirement and Rationale

Bulletin 74-90, Section 9.D.3, states: *“Bentonite clay shall not be used as a sealing material if roots from trees and other deep rooted plants might invade and disrupt the seal, and /or damage the well casing. Roots may grow in an interval containing a bentonite seal depending of surrounding soil conditions and vegetations.”*

#### Concerns

This requirement is vague and could be misapplied to preclude use of bentonite from any vegetated area that would include the majority of well sites were it is utilized.

#### Analysis

Well drillers and staff concur that there have been no known problems with roots growing in bentonite at vegetated well sites.

#### Conclusion

The current practice of allowing the use of bentonite in vegetated areas at the discretion of the well driller will continue.

### Use in “Arid Areas”

#### Regulatory Requirement and Rationale

Bulletin 74-90, Section 9. D.3., states: *“Unamended bentonite clay seals shall not be used where structural strength of the seal is required, or where it will dry. Bentonite seals may have a tendency to dry, shrink, and crack in arid and semi-arid areas of California where subsurface moisture levels can be low....”*

#### Concerns

This requirement could be interpreted to preclude use of bentonite from use as an annular seal material in much of Butte County.

#### Analysis

Well drillers and staff concur that there have been no known problems with shrinkage and/or drying of bentonite products designed and marketed for use as annular seal materials, when mixed and placed in accordance with manufacturer’s directions.

#### Conclusion

The current practice of allowing the use of bentonite products designed and marketed for use as annular seal materials at the discretion of the well driller will continue. Bentonite based seal materials shall be mixed and placed in accordance with manufacturer’s directions, and applicable County standards.

## Screened Well Vents

### Regulatory Requirement and Rationale

Bulletin 74-81 Section 10.E. states:

“Air vents are also (in addition to requiring them for community water systems) recommended for other types of wells except those having jet pump installations requiring positive pressure (which cannot have a vent).”

Bulletin 74-81 Section 10.A. states:

“Access openings designed to permit the entrance or egress of air or gas (air or casing vents) shall terminate above the ground and above known flood levels and shall be protected against the entrance of foreign material by installation of down-turned and screened “U” bends.”

### Concerns

Members of the Well Drillers Advisory Group strongly recommend screened vents for all wells.

### Analysis

Both knowledgeable well drillers and pump installers state that well vents are needed to assure proper pump operation.

### Conclusion

Environmental health will require screened pump vents constructed according to the specifications described above.

## Well Installation in Areas Subject to Flooding

### Regulatory Requirement and Rationale

Butte County Code, Chapter 23B-9c Flood Protection, states:

Whenever possible, wells shall be located outside of any area subject to flooding. If it is not possible to locate a well outside of a flood area, the well casing shall extend three (3) feet or more above the one hundred (100) year flood elevation. Within “areas of special flood hazard,” as defined in section 26-29 of this Code, for which flood elevations have been established, the casing shall terminate three (3) feet or more above the established one hundred (100) year flood elevation. The health officer may accept an approved watertight “pitless adapter” as a means to provide flood protection for an individual well to serve a single-family residence. (Ord. No. 3272, § 1, 6-25-96)

### Concerns

When it is not possible to locate a well outside of a flood area, the code specifies only two alternatives: (1) Extend the well casing at least three feet above the one hundred year flood elevation, or (2) Install an approved watertight “pitless adapter” for single family residences.

Well drillers indicate that both of these alternatives are problematic.

Extending well casings high into the air makes the wells difficult to access and service, and flood maps are not always accurate. On the other hand, pitless adapters are often not watertight.

### Analysis

The intent of Chapter 23-Bc is clearly to protect the aquifer from contamination from floodwater. The Chapter attempted to offer an alternative to extended casings for wells that will serve single family residences by allowing pitless adapters. It can be assumed that it was not the intent of the Chapter to exclude other watertight construction features or backflow prevention methodologies that are equal or more effective than watertight pitless adapters.

### Conclusion

When is not possible for wells serving single family residences to be drilled outside of areas subject to flooding, the Environmental Health Director may consider approval of other backflow prevention devices and methodologies that provides protection equal to or greater than the “watertight pitless adapter” referenced in the code.

Consideration of these methodologies or devices will be based on the following criteria:

1. Is the proposal based on sound technical and scientific principles?
2. Is the proposal supported by the Department of Water Resources, Department of Health Services, and the Well Drillers Advisory Group?
3. If the proposal is a mechanical backflow prevention device, has there been third-party review by a mechanical engineer?

Future cleanup language for this code section will be proposed in the future.