

Pre-Design Considerations for Telescoping Wells

Introduction

Water wells have been constructed with telescoping blank casing and screen for many years going back to the heyday of cable-tool well drilling when reducing the diameter facilitated that drilling method. Today, while most designers are in favor of a uniform diameter for the borehole, casing and screen, some still opt for a telescoping design and do so to save on construction cost. While accepting that a telescoping well is function and less costly to construct, the designer would be well served to keep in mind that there are other important factors to consider beyond cost. For instance, a water well properly designed, constructed, and maintained can be expected to remain functional for decades. During that time, local or regional ground water conditions might change and directly affect the well's performance. Therefore, the designer should consider what impact(s) might result if, for example, water levels decline or the production objectives change. A seemingly good idea at the design stage may become a questionable decision several years down the line. This memorandum surveys important pre-design considerations for telescoping wells.

Borehole Diameter

Unlike the "conventional" well which has a uniform borehole diameter sized to accommodate a uniform diameter of casing and well screen, a telescoping well is drilled with a telescoping borehole. The borehole diameters are sized to provide an annular space throughout its entire length that is 4 to 6 inches larger than the outside diameter (OD) of the casing and well screen. The borehole diameter is important because it must permit the placement of the gravel envelope (if used) and cement grout sanitary seal.

It should be noted that at the depth where the borehole diameter is reduced (e.g. from 26 inches to 20 inches), the transition will be marked by a shelf or shoulder. That is important as discussed below. Borehole deviation, caving, squeezing formations, and borehole wear by repeated contact with tools and/or equipment exacerbate the problem.

Casing Diameters

In a telescoping well, the pump housing casing extends from ground level to a pre-determined depth which is based upon the anticipated depth setting of the pump. The inside diameter (ID) of the pump housing casing should be at least 2 inches larger than the outside diameter (OD) of the pump plus any other permanent ancillary piping. The connection between the pump housing casing and the smaller diameter casing and/or screen is made with a reducer that is typically 2 to 5 feet in length.

During the design phase, it is vital to properly estimate the maximum depth of the pump setting. If ground water levels decline over time it might be desirable or necessary to lower the pump to allow for a deeper pumping level and proper submergence. If the reducer was set too shallow, lowering the pump might be impossible. In a worst case scenario, the operator might be forced to install smaller diameter pump (with less production capacity) that will pass through the reducer.

Casing and Screen Installation

Both the borehole diameter and its plumbness are important during construction. The shoulder of the borehole does create a restriction to both casing and well screen, particularly as the centralizers pass the shoulder. The shoulder can be gouged and exacerbate the task of going into and out of the borehole.

Filter Packing

The filter pack for a telescoping well is equally important to that of a conventional well. That said, its placement is clearly made more difficult in a telescoping borehole because of the change in borehole diameter. The two most-often used methods of filter pack placement are: via tremie (preferred) and via free-fall. As noted above lowering a tremie past the borehole shoulder is not always easy. Even more difficult, is the placement of filter pack by free-falling because the potential for a bridge at the shoulder of the borehole is extremely high. Free-falling filter pack is not recommended.

Redevelopment

Although the telescoping well is no significant challenge for well-equipped well contractors, they do require two sets of brushes (wire or nylon) and surge blocks that are sized for the ID of the well casing and well screen. Foreign contractors do not always have an array of such tools, so for them the expense of a multiple sets of rehabilitation tools can be restrictive.

Summary

Telescoping wells are utilitarian and functional as optional designs that can be considered. Whether the savings in construction cost are sufficient to justify the risk of this design is a matter for the designer to consider.

About the Author

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