

Working With a Standard Well Design: Is it Viable?

Introduction

Shopping can be a nightmarish experience, especially when one is faced with myriad choices. No matter how simple an item one might want, there are always several models or variants to consider. Walk the aisles of any department store or hardware department and you are guaranteed to find options, and options for the options. In contrast, if you've ever shopped in a rural town you quickly found that your choices of any item were very limited. In fact, you may have purchased that item in a type that is best described as "one-size-fits-all". While it might not have been exactly what you wanted, you found the item was suitable, functional, and immediately available.

There are interesting parallels between the experience of shopping in a rural store and finalizing the selections of water well screens and filter packs at remote or overseas construction sites. When a site is far from the well screen manufacturer's plant, the contractor and/or on-site designer must quickly settle on the final design and then complete the construction in a timely manner. Time is of the essence because an open borehole will remain open for a relatively short time before it begins to cave in. Once the design is finalized, the contractor needs to install the casing, screen, and filter pack while the borehole walls are stable. Lengthy delivery times for construction materials are problematic for the contractor; and they are made more so if the final design is "customized" on site for the slot size of the well screen and the gradation of the filter pack and then passed to the well screen manufacturer and filter pack supplier. This is when the option of a "standard" well design is particularly desirable, as explained below.

Customized Well Design

The design process for many projects is to 1) drill the pilot hole and collect sample cuttings; 2) run the geophysical survey(s); 3) identify the aquifer interval(s) to be screened; 4) perform sieve analyses for samples from the selected aquifer(s); 5) determine the appropriate gradation of the filter pack; and 6) select the slot size to retain the filter pack. This clearly is the most reliable approach, but in remote or overseas locations it is not always viable because of the delivery time for the well screen and filter pack. This is when a "standard well design" can be employed.

Standard Well Design

The process for the standard well design is simple: 1) drill the pilot hole, 2) run the geophysical survey(s), and 3) identify the aquifer intervals. Naturally, sample cuttings should be collected, described, and logged; but there's no need to determine the gradation of the aquifer(s) materials because a standard design specifies the gradation of the filter pack and slot size. A standard design, when properly conceived, is very functional. Its value is that it is more universal because it is intended to suit the "typical" conditions that characterize an area. The key to the utility of a standard design is to make it generally suitable to the local conditions. This is where local knowledge is vital.

When settling on a standard design for an area, the decision should be based on a careful analysis of existing wells, their performance, and the character of the aquifer(s).

Obviously, matching a large slot size and coarse filter pack to a fine-grained aquifer would be problematic; the well would likely be a perennial “sander” and an operational disaster. So, developing the parameters of a standard design should not be taken lightly.

One way to provide greater flexibility for the use of a standard design approach is to have more than one that fit markedly different regional (i.e., hydrogeological) conditions, as described below:

- Wells completed in volcanic rock are unlikely to need a graded filter pack. A stabilization pack consisting of coarse, rounded gravel might be all that is needed. In this case, a slot size of 0.100” (2.5 mm) might be selected.
- If neither a filter pack nor stabilization pack is needed, then perhaps the standard design might consist of a slot size of 0.250” (6.4 mm).
- In areas where alluvium dominates, then the standard design might combine a 0.060” (1.5 mm) slot size with a well-graded (i.e., poorly sorted), rounded, filter pack (U.S. sieves 6x16). In fact, this design is extremely effective.

Summary

The utility of a standard design is that it gives the owner some assurance that the new well will function as planned because the design takes into consideration the local hydrogeology and the operational history of existing wells completed with the standard design. It benefits the owner and contractor because there is no delay waiting for the delivery of well screen and filter pack. The contractor will have pre-ordered and taken delivery of the casing, screen, and filter pack before the start of drilling. This makes for a more timely completion.

To minimize cost, the standard design can be used with low-carbon steel (LCS). This approach benefits the owner by having a more reliable well design and a cost-efficient material. In those instances where corrosion resistance is needed (since LCS has no corrosion resistance), the owner can opt to modify the standard design by specifying that the pipe be provided as copper-bearing steel which will extend the useful life of the well.

About the Author

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