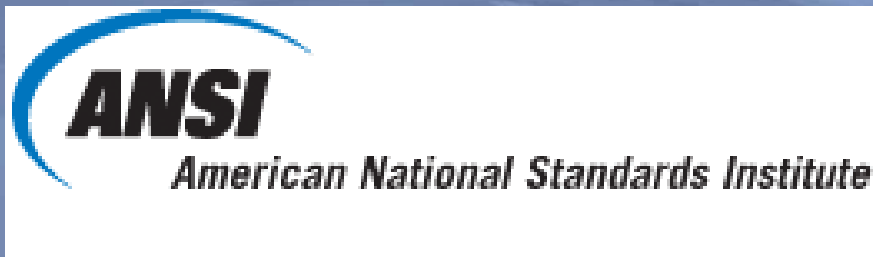


NGWA Standard Development Process as Approved by ANSI

What is ANSI?

- The American National Standards Institute (ANSI), founded in 1918, promotes and facilitates voluntary consensus standards and conformity assessment systems, and safeguards their integrity.
- ANSI is a 501 (c) (3) not-for-profit



NGWA's Accredited ANSI Procedure

1

- Project Initiation (PINS) for new and revised American National Standards

2

- Development of draft ANS in accordance with NGWA's ANSI-accredited procedures

3

- Public review period (45 or 60 day announcement in *Standards Action*)

NGWA's Accredited ANSI Procedure

4

- Vote and comment resolution
- (recirculation and 2nd announcement, if necessary)

5

- Conclusion of all developer-level appeals

6

- Submit to ANSI Board of Standards Review

NGWA's Accredited ANSI Procedure



- Approval/Denial as ANS by the ANSI Board of Standards Review



- Appeals to ANSI Board of Standards Review (if necessary)



- Approval/Denial as ANS by the ANSI Board of Standards Review if not previously approved (step 7)

Detail of NGWA's Step 2

2a

- NGWA Standard Development Oversight Committee assigns work to 10 task groups

2b

- Task groups draft content for subject areas

2c

- Task groups reach consensus acceptance of drafted content

Step 2 Detail

2d

- Task groups send consensus accepted draft content to NGWA Standard Development Oversight Committee

2e

- NGWA Standard Development Oversight Committee collates task groups' draft content into whole

2f

- NGWA Standard Development Oversight Committee votes on proposed standard

Step 2 Detail

2g

- NGWA Standard Development Oversight Committee forwards approved standard to NGWA Board of Directors

2h

- NGWA Board of Directors reviews and acts on draft standard

2i

- NGWA Board of Directors sends approved draft standard, as well as consensus process documentation to ANSI Board of Standards Review

Proposed NGWA/ANSI Water Well Construction Standard

1.0 Well Site Selection

The well shall be sited for the protection of the aquifer while considering the following:

- desired yield;
- desired water quality;
- availability and restrictions of water rights;
- vulnerability to known or suspected natural risks (e.g., flooding, saltwater intrusion);
- distance from potential contaminant sources (e.g., septic tanks, oil wells);
- property boundaries and set-backs;
- potential for interference with other wells, surface water flows, or environmentally important waters (e.g., wetlands or springs) or areas;
- potential for interference with utilities;
- accessibility for rigs and equipment, proximity to power source (either for testing or eventually for production wells), and logistics associated with infrastructure such as pump houses and transmission pipelines.

2.0 Well Casing and Casing Installation

A string of pipe composed of steel, plastic, fiberglass, cement tubular retaining structure or possibly other materials, which is placed into the borehole during well construction to provide structural stability in the wellbore and prevent the well from caving in. The casing provides a suitable location to accommodate the installation and operation of pump equipment.

Well Casing Materials

Table 1: Water Well Casing Material Standards	
Carbon Steel	ASTM A589-89a
	ASTM A53-90b
	ASTM A139 Grade B
	API Spec, 5L and 5LS
Copper Bearing Steel	ASTM A139 Grade B
High-Strength Low-Alloy	ASTM A606 Type 4
Stainless Steel	ASTM A778
	ASTM A312
	ASTM A409
Thermoplastic Polyvinyl Chloride	ASTM F480
Fiberglass	No Applicable Standard
Concrete Tile	No Applicable Standard

3.0 Well Screens, Filter Pack, and Formation Stabilizer

3.1 Screen

A pre-manufactured perforated interval of a well that allows water to pass from the aquifer into the well through designed slots or perforations. The well screen also provides structural support to stabilize the borehole. Numerous types of screens are available, and selection of the appropriate screen type depends on the specific hydrogeologic conditions and the specific application for which the well is to be used. Well screen types include wire-wrap screen, louvered screen, and bridge slot screen. Casing perforations, such as mill slots or Mills knife cuts, provide the same function as well screen.

4.0 Grouting

4.1 Annular Space

The space surrounding a cylindrical object within a cylinder. General designation for annular space such as the space between the drill pipe or casing and the borehole wall.

4.2 Well Grouting

Well grouting consists of completely filling the annular space between a casing and the formation, or outer casing, with a low permeability (not to exceed 1×10^{-7} cm/sec) grout from the bottom of the annular space to the top of the annular space. Grouting procedures apply to the decommissioning of an abandoned well, test hole, or borehole. For decommissioning and grout placement in an open borehole see Section 11 Permanent Well and Test Hole Decommissioning.

5.0 Plumbness and Alignment

Wells shall be completed to accommodate the pumping equipment intended for the well. All casing in this section is nominal size.

5.1 Plumbness Requirements

The measurement of the vertical drift of the borehole.

Casing Ten (10) Inches or Less

The casing shall be sufficiently plumb that it will not interfere with the installation and operation of the pump. In the event a well having a nominal diameter casing of ten (10) inches or less and will be equipped with a line shaft turbine pump, the plumbness of the well shall be as specified for wells having casing diameters greater than ten (10) inches.

Casing Greater than Ten (10) Inches

The maximum allowable horizontal deviation of the well from the vertical shall not exceed $\frac{2}{3}$ times the smallest inside diameter per one hundred (100) feet of that part of the well being tested to the depth of the expected pump installation.

6.0 Well Development

The act of repairing damage to the formation caused during drilling procedures and increasing the porosity and permeability of the materials surrounding the intake portion of the well. Well development is a necessary step in the construction of a water well and is directly related to well design and aquifer characteristics. It is crucial to optimizing performance of the well.

6.1 Development Process

The development process is the application of mechanical energy and/or chemicals to disturb the natural formation or filter pack to make the well hydraulically efficient and prevent pumping of fines.

Development (1) removes drilling fluids and formation damage caused by the borehole drilling and well completion processes, (2) removes formation fines near the wellbore to increase hydraulic conductivity and creates a filter medium, (3) establishes optimal hydraulic contact between the well and the geologic formation (aquifer) supplying water, (4) provides for an acceptable level of sand and turbidity, and (5) provides for an appropriate level of drawdown at the production pumping rate. The following shall be monitored and recorded to evaluate development effectiveness:

- type of development utilized;
- type and volume of chemical(s) used;
- duration of each development type;
- dynamic and static water level(s);
- production (pumping) rate;
- amount of sand(s) and turbidity.

7.0 Testing for Performance

A well performance test (WPT) is conducted at predetermined pumping capacities and durations to collect data to determine peak capacity, long-term capacity, and well efficiency. The WPT shall always be conducted on a fully developed well. All equipment shall be tested for performance prior to taking test measurements.

7.1 Test Measurements

7.1.1 Pumping Rates

The pumping unit shall be operated without interruption for the testing period. Discharge shall be maintained within plus or minus five (± 5) percent of the designated rate.

7.1.2 Water Levels

All measurements shall be made relevant to the same base datum. Water levels shall be measured to the nearest 0.1 foot.

7.1.2.1 Determination of Static Water Level

Determination of the static water level occurs when there is less than one (1) foot difference between two (2) consecutive water level measurements taken a minimum of sixty (60) minutes apart.

8.0 Data Recording

Appropriate field records shall be maintained in order to report the as-built condition as required herein.

Well Completion Reports

A completion report shall be prepared for each well which will include:

- well identification (e.g., regulatory notification number);
- name of responsible party;
- date;
- use of well;
- type of work (e.g., new completion, decommission, rehabilitation);
- well location (see Data Recording Section 8.1.1. Well Location);
- reference point for all depth measurements;
- drilling method;
- description of each formation or hydrogeologic change (see Hanna 2006);
- nominal borehole diameter(s) and depth(s);
- nominal diameter, depth, materials, length of any casing and screen, and screen opening size;
- type, size, and location of filter pack used;
- type, volume, depth of emplacement, and top of grout;
- static water level (SWL);
- yield and drawdown.

Hanna, Thomas M. *Guide for Using the Hydrogeologic Classification System for Logging Water Well Boreholes*. NGWA Press. Westerville. 2006.

9.0 Disinfection with Chlorine

Approved Compounds

Compounds used in the disinfection process shall either meet the requirements of NSF 60 Chemical, or be approved by the U.S. Environmental Protection Agency (USEPA) for use in water well applications.

Concentrations

Chlorine

Chlorine concentration in new well or well-repair disinfection shall be applied in a quantity of water/chlorine solution to equal at least 1.5 well volumes to ensure a minimum of fifty (50) to two-hundred (200) mg/L of available chlorine throughout the well and immediate formation.

Adjustments to pH shall be made to the water to maintain a pH of 5.5 to 7.5 in the well during the chlorination treatment. The chlorine solution shall be actively agitated through the well.

Contact time shall equal a minimum of one-thousand (1000) contact units. Chlorine solution shall be mixed in such a way to ensure uniformity from bottom to top of the well.

Contact units are calculated by multiplying the concentration of available chlorine by the hours of exposure (e.g., one-hundred [100] mg/L chlorine × ten [10] hours = one-thousand [1000] units).

10.0 Water Sampling and Analysis

All wells shall be sampled during or immediately following construction and development. Appropriate field and laboratory analyses shall be based upon the intended use of the water. All sampling shall be performed by qualified personnel.

Sample Collection for Analyses

Water samples collected from a well shall be representative of the source water quality intersected by the well. The well shall be purged to ensure the sample is representative of the water in the targeted aquifer.

Sample Collection for Microbial Analyses

At least one-hundred (100) milliliters (mL) of water shall be collected for analysis for the presence of coliform bacteria. The sample shall not have residual chlorine present. A sterile sample bottle provided or approved by the laboratory shall be used and shipped to the laboratory cooled (4°C).

11.0 Permanent Well and Test-hole Decommissioning

The proper decommissioning of abandoned wells or boreholes is critical to protecting aquifer and groundwater resources. Proper decommissioning and sealing eliminates the decommissioned boring as a conduit for loss of hydrologic pressure in confined formations, intermingling of groundwaters of differing quality, and entry of contaminated and polluted water. Proper decommissioning shall be performed by licensed/certified water well contractors.

Decommissioned Borehole or Well

Decommissioned boreholes or wells shall be properly sealed to prevent physical injury, entry into the borehole, and contamination of groundwater from:

- solids, gases, or liquids;
- comingling of water penetrated by the borehole; and
- compression of backfill near the surface.

Abandoned

A well or borehole that has gone dry, is contaminated, or no longer serves a useful purpose is abandoned.

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