Study Materials for Water Well Pump Installer Exam—

Ground water—Water occurring beneath the surface of the ground, regardless of location or form (Law 10). It is held within the interconnected openings of saturated rock, soil, or deeper unconsolidated formations, much the same way water is held in a sponge. Although ground water is often thought of as an underground river or lake, or described as a vein, it does not occur this way except in caves (which are rare) or lava flows (not found in Indiana).

Water table—The top of the saturated zone, where all the interconnected openings between rock and soil particles are filled with water. Above the water table is the unsaturated zone (or vadose zone), which contains both water and air.

Consolidated Formation— Often referred to as bedrock, these formations consist of rock and mineral particles of different sizes and shapes that have been welded together by heat and pressure or cemented by chemical reactions into a rock mass. The consolidated formations encountered by water well drillers in Indiana are sedimentary rocks, including sandstone, siltstone, shale, limestone and dolomite, and coal. Water flows through these rocks in cracks and fractures. In some sandstones, water can move through pore spaces.

Unconsolidated Formation— Geologic materials or deposits, such as soil, sand, gravel, and clay, overlying bedrock (Rule 2). These are derived from the disintegration of rock (soils include decayed plant materials). Unconsolidated formations may originate from the underlying bedrock, as do many of the soils in southern Indiana. Other unconsolidated deposits have been transported to their present locations by streams (alluvial deposits), wind (sand dunes and loess), glaciers (glacial till in northern and central Indiana), gravity (rockfalls and landslides), or a combination of these (glacial outwash, for example).

Aquifer—Any underground geologic formation, consolidated or unconsolidated (see definitions below), that has the ability to receive, store, and transmit water in amounts sufficient for the satisfaction of any beneficial use (Law 4).

Aquifer characteristics—The type, thickness, transmissivity, coefficient of storage, and materials of a water-bearing unit (Rules 2). The amount of water held and the rate of water flow depend on a formation's porosity and permeability. Porosity is the amount of pore space in a formation and determines the amount of water the formation can hold. Permeability determines the rate of ground water flow and depends on pore size and path of flow. Water moves freely in the large pores found in highly permeable sand and gravel. Clay holds a great deal of water, but it has low permeability because water moves very slowly through its small pores. Silt is less permeable than sand and gravel but more permeable than clay.

Unconfined aquifer—An aquifer near the earth's surface for which the top boundary is the water table and the lower boundary is an impermeable or slowly permeable layer.

Confined aquifer—An aquifer that contains sufficient hydrostatic head to cause ground water to rise above the upper boundary of the aquifer (Rules 8). A confined aquifer contains water bound by impermeable layers both above and below. Because this water is confined, it is usually under pressure. A well drilled into a pressurized aquifer will be an artesian well, in which water will rise above the top of the aquifer—but not necessarily above the ground surface. A flowing well is a special type of artesian well from which water flows out on the ground without pumping.

Pump Installation—The placement and preparation for operation of equipment and materials used in withdrawing or obtaining water from a well. The term includes construction to enter the well and the establishment of seals and safeguards to protect water from contamination.

Pitless Adapter—Means an assembly of parts that 1) allows water to through the wall of the well casing or extension of the well casing; 2) provides access to the well and the parts of the pumping system within the well; 3) provides for the transportation of water; and 4) protects the well from contamination at or near the ground surface.

Pitless Unit—Means a factory assembled device consisting off the pitless adapter, a mechanism which attaches to the well casing, and a well casing riser in a single unit to prevent the contaminates from entering the well.

Drawdown (in a pressure tank)—Refers to the amount of water that leaves the tank before activating the pump. Drawdown can be affected by the pump, the size of the tank and the pressure settings that govern the system.

Pre-Charge—The amount of air pressure that exists in a pressure tank under non-pumping conditions.

Cut-in Pressure—The low pressure level that switches on the pumping unit.

Amp Draw—The measure of the amount of energy needed to run the pump motor. Amp draw increases and decreases according to pumping efficiency.

Total Dynamic Head—Summation of all the friction factors in a system; 'TDH' consists of three components: pump shut off pressure, pumping level, and friction loss through piping and valves.

Drawdown—The amount of lowering of the water level in a well resulting from the discharge of water by pumping from the well (Rules 12). This can also be described as the vertical drop in height between the water level in a well before pumping and the water level in the well at a given time during pumping (especially at the end of test pumping). Drawdown is usually measured in feet.

Static level—The water level in a well before pumping, expressed as a distance (in feet) below the ground surface. In a shallow well, the static level may be approximately at the water table, but this will not be true if the well taps a deeper, confined aquifer. Static levels change with the seasons. In Indiana, typically, water stands highest in a well (i.e., the distance below the surface is smallest) in April or May, and stands lowest (a larger distance) at the end of the growing season in October. Static level is affected by pumping from other wells nearby, especially if they draw water from the same aquifer.

Regulatory flood—This has the meaning set forth in 310 IAC 6-1-3(f) [now 310 IAC 6-1-3-20]:The flood having a peak discharge that can be expected to be equaled or exceeded on the average of once in a one hundred (100) year period. This flood is equivalent to a flood having a probability of occurrence of one percent (1%) in any given year. The term is also sometimes referred to as the one hundred (100) year frequency flood (Rules 18).

NOTE:The water well driller & pump installer examination contains a few questions on hydrology & pump installation for which answers are not available in the drilling statute and regulations. Other questions may be answered more easily with hydrological principles in mind. This study sheet has been prepared by the DNR Division of Water to help candidates better prepare for the exam. PLEASE READ AND REVIEW IT.