WELLS

A well is a hole, usually vertical, extending in to the water bearing layer in the ground. The quantity of water that can be drawn from a well is known as the yield.

Wells classified according to the method of construction: Wells are classified into dug, driven and drilled wells depending on the method of construction used in the making them. The method selected for constructing a well depends largely on the depth to which it must be carried, the elevation of the ground water table, and the nature of the material through which the hole is to dug. **As per Para 4. II. (i) of Schedule-I, MGNREGA, construction of Dug Wells are permitted under MGNREGS.**

DUG WELLS:

Dug wells are dug down to the water bearing strata. The open excavation is usually circular in shape, the diameter varying from 1.5 to 4.5 m (5 to 15ft.).The wells derive their water from unconfined aquifers. They may be lined or unlined. They can yield relatively large quantities of water from shallow sources. Their large diameters permit the storage of large quantities of water.

i) Dug wells are usually constructed by hand using pick axe and shovel. The earth at the bottom is loosened and collected in buckets. The bucket when full is lifted up by means of rope and pulley.

ii) In unstable material considerable care must be exercised to prevent cave-ins, which may result in serious or fatal injury. Large dug wells can be constructed rapidly with portable excavating equipment such as clam-shell and orange-peel buckets.

iii) Dug wells must be deep enough to extend about 4 to 10m (15 to 35 ft.) below the water table in dry weather.

LOCATION OF DUG WELLS:

i) Investigate the existing supplies in the neighborhood of the proposed site as regards depth of hole, quality and quantity of water and pumping head & **go with the advice of the local Ground Water Department.**

ii) Locate the well under sanitary surroundings. Drainage from barns, poultry shelters, toilets etc., should be away from the well.

iii) Locate the well above flood water elevation.

iv) If possible locate the well as near the point of use as possible.

v) The distance from the existing well in nearby should be more than the radius of influence of the soil formation and texture.

vi) Before finalizing the locating

CONSTRUCTION OF DUG WELLS:

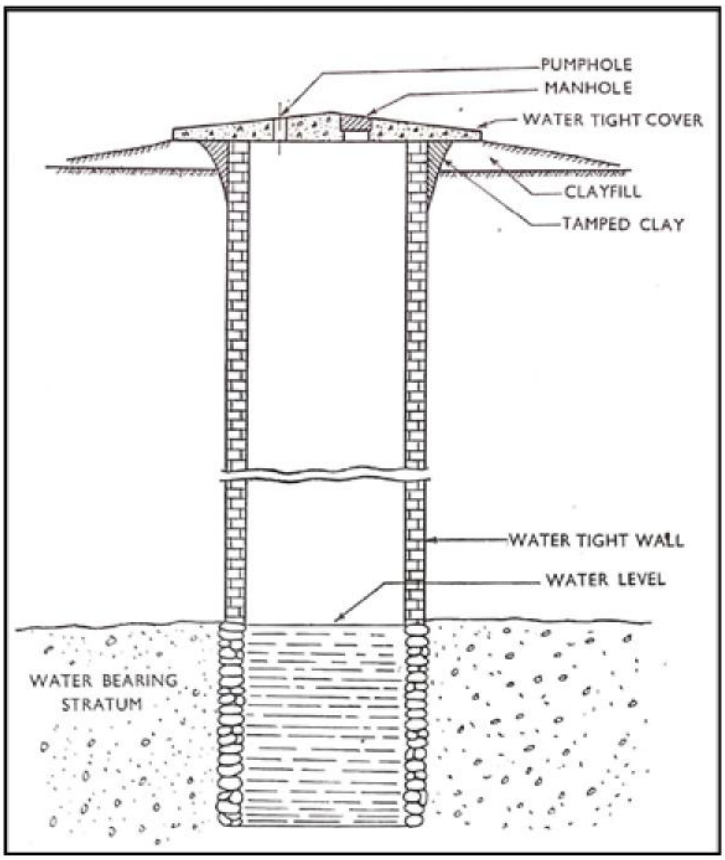
Good construction requires the well to be lined with a casing (often referred to as a “curb”) of stones, brick or concrete. At least the upper 3m (10ft.) should be made water-tight with mortar between the stones and sand and cement plaster, or by use of concrete.

i) The portion of the curb surrounded by the aquifer should be perforated or contain openings to permit entry of water. The curb must be firmly seated at the bottom. The space between the curb and the sides of the excavation should, if practically feasible be filled with clean sand and gravel up to the top of the water-bearing stratum, the coarser material being at the bottom.

ii) Surface water will be prevented from moving down along the concrete casing if puddled clay or concrete is used as backfill. The curb should be brought at least 30cm (1ft) above the ground. For drinking water supplies when the water lifting device is a pump, the well should preferably be covered by a concrete platform in which is cast a man-hole, pump base, and pump hole. The man-hole should have a tight fitting iron or concrete cover.

iii) **Quicksand** is a frequent source of trouble in dug wells. While digging, the flow of quicksand can be largely prevented by removing the material with a bucket or pump and keeping the excavation partially full of water. This neutralizes the hydraulic pressure in the quicksand and renders it comparatively solid.

iv) The edge of the temporary or permanent curbing as the case may be should be driven 0.3 to 1.2 m (1 to 4 ft.) below the bottom of the excavation, as the excavation proceeds. After excavation is completed, further entry of quicksand at the bottom can be prevented by placing a thin layer of clean coarse sand and weighting it with several layers of sand or gravel in increasing coarseness; thereby creating a graded sand filter, each layer of which is held in position by the slightly coarser material above it.



INCREASING YIELD OF DUG WELLS:

i) Sometimes a confined aquifer may lie beneath a dug well. In such cases the yield of a well can be appreciably increased by boring a hole through the impermeable bottom and reaching the artesian aquifer. The bored hole may, if necessary be lined by a pipe. The pipe must be projected 30 to 60 cm (1 to 2 ft.) above the bottom of the well to avoid silting up the connecting pipe line.

ii) Studies conducted in Delhi region by the Geological Survey of India reveal that in many cases the yield of the existing open wells can be increased adequately by driving short lateral tunnels along the fissures in the rocks encountered in the wells below the water table or by sinking bore holes from the bottom of open wells. These lateral or vertical borings in open wells can be done with indigenous boring tools consisting of sharp pointed or twisted bits and extension pieces consisting of 2cm square rods in 1 to 1.5 m lengths with two bolt holes at each end for joining to the adjacent piece. While lateral tunnels are being bored, the water level in the well is maintained below the level of the bore. Boring is done by the twisting and reciprocating motions of the tool.

HYDRAULICS OF WELLS:

Static water level: Before pumping starts, the water level in a well is equal to the elevation of the water table (or piezometric surface) and this level is called the static water level.

Radius of influence: When a well is pumped, water is removed from the aquifer surrounding the well and the

water table or the piezometric surface, depending upon the type of aquifer, is lowered. The vertical distance to which the water column is lowered is referred to as **drawdown.** The water level in the well, during pumping, after the drawdown is stabilized. The water table (or the piezometric surface) around the well assumes the general form of an inverted cone. This cone in the aquifer which is devoid of water is called the cone of depression. The distance from the center of the well (or radius) within which the original water table (or piezometric surface) is lowered is known as **radius of influence.**

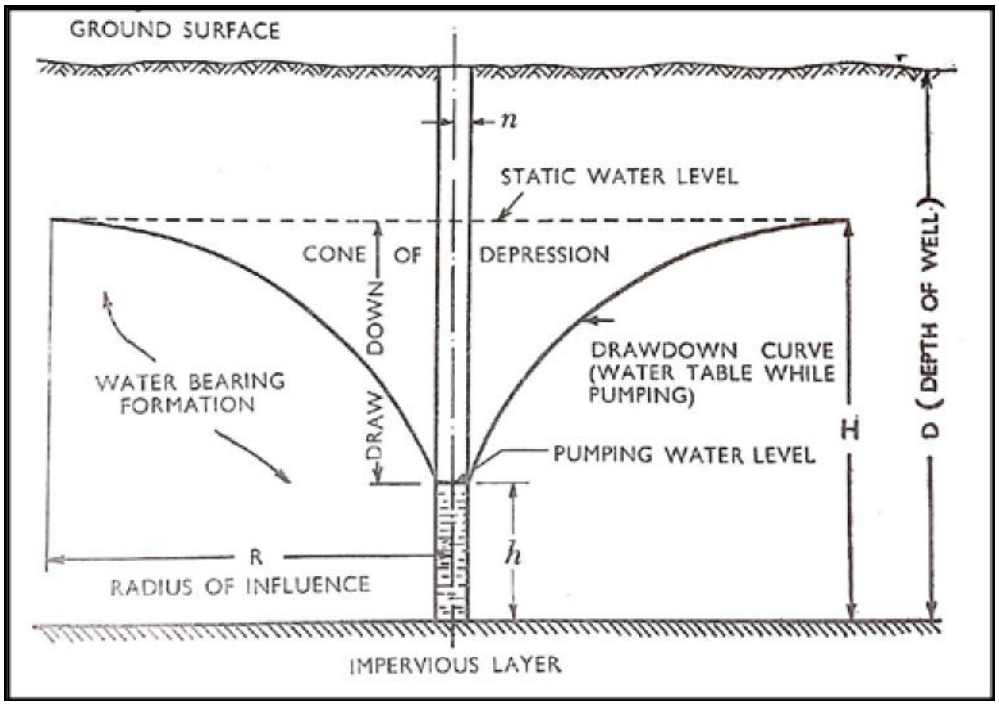


Figure: Condition while pumping in a well tapping an unconfined aquifer

Table: Radius of influence of wells

S.No	Soil formation and texture	Radius of influence	
		Meter	feet
i.	Fine sand layers with some silt and clay	30-90	100-300
ii.	Fine to medium sand layers fairly clean and free from silt and clay	90-180	300-600
iii.	Coarse sand and fine gravel layers free from silt and clay	180-300	600-1000
iv.	Coarse sand and gravel without silt and clay	300-600	1000-2000

Rates at which water can penetrate through aquifer depend on the slopes of the water table (piezometric surface) and the permeability of the materials constituting the aquifer. (Permeability is the facility with which soil will transmit water. It may be defined as the hydraulic conductivity of saturated soil. It is usually measured in centimeter or inches per hour or meters or feet per day).

For optimum utilization of scare ground water resource, the distance of the proposed Dug Well from the existing

well in nearby should be more than the radius of influence of the soil formation and texture existing in the area as specified in above Table,to prevent an adverse effect on neighbor wells.

Therefore, this information along with the information of availability of ground water i.e. area falling in dark, grey zone etc. should be collected from the local Ground Water Department, before proposing/ sanctioning construction of Dug Well at a particular location.