Large Sump or Drainage Pumps

Pump Selection Data

Total Pumping Head:

Often overlooked in selecting vertical pumps that take suction from open sumps is the need to add the losses in the sump below the mounting plate to the head above the mounting plate to determine the total pumping head for selecting the pump. These additions include the elevation from the lowest liquid in the sump to the support plate plus friction loss in the discharge elbow and discharge pipe plus velocity head in the discharge pipe to the support plate.

The pump characteristic curves indicate the pump performance measured at the casing discharge flange; therefore in selecting the pump size and motor horsepower, the total pumping head must include the data as above.

Example of Total Head Calculations:

Pump required - 400 GPM, Pit depth 10'-6", lowest liquid level 7ft. below support plate, highest point in discharge line 38ft., pressure required at the discharge 8 p.s.i., friction loss in 4" discharge line beyond the pump 4 ft.

Highest Elevation	38 ft.
Pressure Required 8 p.s.i. x 2.31	18.48 ft.
Friction Loss - Discharge line	4 ft.
Lift in Sump	7 ft.
Friction in elbow and discharge pipe	2.05 ft.
Velocity head in pump discharge pipe	1.58 ft.
Total Pumping Head	71.11 ft.

Normally the "pit depth" can be substituted to compensate for the low liquid level and pipe losses below the support plate; when added to the pumping head above the pump, this will give the approximate total pumping head for selecting the pump.

When the capacity and the total pumping head are specified by the customer, it will be assumed that the total pumping head includes all friction losses and velocity head beyond the pump casing plus allowance for lowest liquid level in the sump; otherwise the indicated total pumping head must be corrected as above.

Minimum Submergence:

The distance from the surface of a liquid in a sump or tank to the pump suction inlet is known as submergence. Depending on the pump size, a "minimum submergence" is required to prevent vortex formation around the pump suction which will reduce pump capacity and may cause pump damage and rapid wear.

Submergence should not be confused with Net Positive Suction Head or NPSH. It is possible to have sufficient submergence but insufficient net positive head or vice versa depending on the installation and liquid characteristics.

Proposed installations must be checked for both required submergence and available NPSH to be sure they are equal to or greater than that required by the pump.

The table below shows minimum submergence above the pump suction nozzle in 65°F water, where pump is fitted with standard strainer and where tank liquid velocity is negligible. Omission of pump strainer, liquid velocity, sump obstructions or other pumps installed in the same sump may require greater submergence.

Minimum Submergence Above Suction Nozzle

Figure 4501 - 4511 - 4521

Pump Size	1	1½	2½	1¼ S	1½ S	1½ M	1½ L	2 S	2 M
Min. Subm.	18"	18"	18"	18"	18"	18"	18"	18"	18"
Pump Size	3 S	3 MD	4 S	4 MD	5 MSD	5 MD	6 MD	6 MLD	
Min. Subm.	24"	24"	24"	24"	24"	24"	24"	24"	

Figure 4565 - 4566 - 4568

Pump Size	4 x 4 x 12	6 x 4 x 12	6 x 6 x 12	8 x 6 x 12	8 x 8 x 12	10 x 10 x 12
Min. Subm.	18"	20"	24"	30"	36"	36"