FLOOR DRAIN SIZING and LOCATION

The location, number, and size of floor drains are all important factors in the design of a drainage system. Proximity of the drain to the source of water is important, as well as the grade, so that water on any floor area naturally flows to the drain. The number of drains must be considered based on anticipated volume and proximity. In any case, local and national codes should be followed for drain sizing and placement.

The size of floor drains is important as it affects the number of drains required and the amount of water which can be efficiently drained. As a general reference, floor drains should be sized to handle an overflow condition of water that may be discharged onto the floor. The chart below illustrates water outlets and the demand (GPM) requirements.

Type of Water Outlet	Demand (GPM)	Type of Water Outlet	Demand (GPM)
Aspirator (Operating Room or Laboratory)	2.5	Ordinary Lavatory Faucet	2.0
Ball Cock in Water Closet Flush Tank	3.0	Self-Closing Lavatory Faucet	2.5
Bath Faucet, 1/2"	5.0	Shower Head, 1/2"	5.0
Dishwashing Machine (Domestic)	4.0	Sink Faucet, 3/8" or 1/2"	4.5
Drinking Fountain Jet	0.75	Sink Faucet, 3/4"	6.0
Hose Bib or Sill Cock, 1/2"	5.0	3/4" Flush Valve (15 PSI Flow Pressure)	15.0
Laundry Faucet, 1/2"	5.0	1" Flush Valve (15 PSI Flow Pressure)	27.0
Laundry Machine (8 lbs. or 16 lbs.)	4.0	1" Flush Valve (25 PSI Flow Pressure)	35.0

HOW TO CHOOSE A FLOOR DRAIN

Given a piping system with a designed flow rate, an appropriate floor drain can be readily selected. Factors such as flow rate, length of horizontal pipe, and pipe size are some of the predominate factors upon which the selection of a floor drain depends. These factors are the first to be considered because together with a floor drain, they fulfill the purpose of a drainage system, which is to carry all water efficiently from the floor. Also to be considered is the maximum head and buildup of water on the floor. This value can range typically up to 2" depending on pipe size or any other design consideration of the particular application.

Pipe Size and Open Area

Pipe size and open area of grate should be one of the first specifications decided on in the selection of a floor drain because they are most important in fulfilling the requirements of the specified flow rate and drainage system. However, additional criteria exists in selecting the most appropriate drain. The type of connection, either Inside Caulk (IC), Threaded (IP), No-Hub (NH), Neo-Loc (NL) or Spigot (SP), needs to be chosen. Backwater valves are useful to reduce drainage backup. Sediment buckets can filter out of the water flow such items as leaves, jewelry, hair, paper, and dirt, which can cause the drainage system to clog.

Flow Rate Calculation

Based upon a specified flow rate and head, the grate open area of the required drain can be calculated using the following equation:

$Q = 448.2\ Cd\ A\sqrt{2gh}$ where Q = Flow Rate (Gallons per Minute)
Cd = Discharge Coefficient (Typically 0.6)
A = Open Area of Grate (ft^2)
g = Acceleration (32.2 ft/s^2)
h = Head Above the Floor (ft)

Open Area Calculation

The equation can be easily arranged to solve for 'A':

$$A = \frac{Q}{448.2\ Cd\ \sqrt{2gh}}$$

Example: For a maximum 0.25" (0.021 ft.) head (h), flow rate of 10 gallons per minute (Q), and an average discharge coefficient (Cd) of 0.6 yields a grate with an open area (A) of 0.032 sq. ft., multiplying by 144 in^2/ft^2 yields an open area of 4.62 sq. in.

Grate Loading

Depending on the purpose and location, an extra heavy, heavy, medium, or light duty drain may be selected. Extra-heavy and heavy-duty drains are useful in places where heavy and medium size trucks are being operated. Medium duty drains can be used where there is lighter vehicle traffic. For pedestrian traffic and bicycles, light duty drains may be used. The type of material chosen is important for corrosion characteristics, as well as for blending into the surroundings. The top shape (round, square, rectangular, etc.) and finish should be selected in accordance with the surrounding environment.

Heel-Proof Grates

In areas where pedestrian traffic is the norm, floor drains with heel-proof grates should be used. Heel-proof grates are designed to provide a relatively secure surface in which the maximum grate hole size in least dimension shall be 5/16 inch. The heel-proof feature, if available, is contained in the Engineering Specification of that product.