TFS
Flow Control System

The Heart of the Controlled Flow Roof Drainage System, The TFS flow control Weir

In order to use the roof as a reservoir, it was necessary to design a system where the rate of flow was easily determined for any possible rainfall conditions. The problem is that the rate of flow naturally varies exponentially with the depth of stored water on the roof (a.k.a. head pressure). This made the calculations necessary to design a rooftop rain storage system very difficult. The answer was to design a flow control weir with a parabolic opening which would make the flow off the roof linear instead of exponential. This meant that once a constant linear flow rate was decided, a weir was designed to admit water to the system at only this fixed rate. The MIFAB system uses a fixed rate of 5 U.S. G.P.M. per inch of water.

IN AN UNREGULATED SYSTEM, FLOW IS EXPONENTIALLY PROPORTIONAL TO DEPTH OF RAINWATER ON THE ROOF, AND QUICKLY REACHES THE SATURATION POINT OF THE SYSTEM.

IN AN CONTROLLED SYSTEM, FLOW IS LINEARLY PROPORTIONAL TO DEPTH OF RAINWATER ON THE ROOF AND GRADUALLY DRAINS WITHOUT OVERLOADING THE STORM SEWER SYSTEM.

THE SPECIALLY DESIGNED PARABOLIC OPENING OF THE TFS FLOW CONTROLLED WEIR CREATES A CONSTANT FLOW OF RAINWATER THAT INCREASES PROPORTIONATELY AT A RATE OF 5 GPM PER INCH OF STANDING WATER UP TO 30 GPM ON THE R1200 SERIES AND 20 GPM ON THE R1100 SERIES.

Controlled Flow Roof Drainage: Design Considerations.

Three main considerations must guide the design of a controlled flow roof drainage system:

1. It must drain quickly enough to avoid the weight of water building to the point of being an architectural hazard.
2. It must drain slowly enough to prevent overloading the sewage system with the consequent risk of flooding or pollution or both.
3. It must drain down in a reasonable time to minimize the risk of freezing in low temperatures.

To meet these requirements, regional rainfall values had to be carefully considered. From these values, it is possible to calculate the number of gallons per minute (GPM) need to be drained to ensure the build up in the worst conditions did not exceed a depth of three inches. The consideration of the worst conditions had to be determined from government statistics. The figures used were compiled by the Meteorological Branch of the Department of Transport. The information was combined to produce values that would predict the worst conditions that one could expect over a period of time, in this case ten, twenty-five and fifty years. Hence the expression, ten year rain or fifty year rain.

As well, there are also the local building codes, which specify drain down time (in hours) and maximum head of water on the roof in inches. The maximum drain down time has been determined to be 30 hours to eliminate the possibility of freezing.

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A constant rate of flow makes it possible, with the use of our Area Selection Table, to quickly determine the number of drains needed for any size of roof where this value is known.

Controlled Flow Roof Drainage: Factors that can effect Roof Drain Sizing & Position.

Where a roof area is surrounded by vertical walls, some consideration must be given to the volume of rainwater that these walls might add to the total volume to be drained under driving rain conditions:

1. One wall: Add 50% of wall area
2. Two walls: Add 35% of wall area
3. Two walls opposite of differing heights: Add 50% of the difference in wall area of that part which extends above the lower wall.
4. Walls on three sides: Add 50% of the inner wall area above the top of the lowest wall(s).

Other Factors to consider:

5. Drains should be located with preference to the downwind side of the roof. In a storm, it is not uncommon for the rainwater level to differ significantly from one side to another due to the effects of high winds.
6. Drains should not be located at columns or other high spots.
7. Rooftop mechanical equipment shall be installed with proper allowances for the ponding a control flow roof drain system will create.
8. Parapets should be high enough to prevent spillage or worse, for in winter there is the danger of ice or snow blowing off the road that must be considered.

Controlled Flow Roof Drainage: Sizing Procedure.

A Determine the roof area(s) (individual areas when the roof is divided by expansion joints, parapet walls, control joints, etc.) to be drained making the allowances for any of the factors (above) which may affect the total square footage of the roof.

B Follow the location and placement guidelines for conventional roof drains as found on the next pages (viii & ix), allowing no more than 50 ft. from an edge, no more than 100 ft. apart, and a maximum square footage of 10,000 per drain, etc.

C Calculate the number of weirs. Divide the total square footage by the area factor (from chart below) for the location of the roof. If the number of weirs is greater than the number of drains from step B, add 2-slot weirs to roof drains as necessary, starting with the drains closest to the downwind edges of the roof. If the number of weirs is fractional, round up. If the number of weirs is less than the number of drains, every drain should still be equipped with a one slot weir.

D Based on the slope and area to be drained by each weir, the maximum flow from all the drains on the roof (see chart below) can be added together to determine vertical leader sizing and horizontal storm sewer requirements.