What is Siphonic Roof Drainage?

Siphonic Drainage is an innovative solution which utilizes the power of a natural siphon to create a high-performance roof drainage solution.
Siphonic drainage eliminates air from entering the system, allowing smaller diameter pipe to be used (approximately half the diameter).
How a Siphonic System Functions

Rainwater (without air) falling down the vertical pipe accelerates, creating negative pressure in the tail piece below the drain, which draws water off the roof siphonically.
Siphonic System

Roof or Gutter  Siphonic Roof Drain  Tail-pipes  Horizontal Carrier Pipe  Downpipe

More Height = Greater Negative Pressure
Greater Negative Pressure = Higher Flow Rates
What is wrong with Traditional Gravity Drainage Systems?

Traditional Gravity drainage systems are inefficient and have a number of factors restricting performance.
## Restrictive Factors of Gravity Drainage

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gravity drains require $\frac{2}{3}$ <strong>air</strong> to transport $\frac{1}{3}$ <strong>water</strong> = bigger diameter pipes required for water to properly flow</td>
<td>2. The vortex formation of a gravity roof drain results in the <strong>water being transported in an inefficient spiral motion</strong></td>
<td>3. The flow of water in gravity drainage is <strong>dictated by ¼” pitch</strong>, this <strong>limits the distance a pipe can travel</strong></td>
</tr>
<tr>
<td>4. The ¼” <strong>pitch also dictates the location of discharge</strong>, rather than the design team’s choice of where to route</td>
<td>5. The <strong>driving force</strong> is directly correlated to the <strong>depth of ponding</strong></td>
<td>6. <strong>No Test Standards</strong> currently in place to test ponding flow graphs for <strong>Gravity Drains</strong> = <strong>unidentified ponding on roof</strong></td>
</tr>
</tbody>
</table>
Why use Siphonic Roof Drainage?

Siphonic Drainage offers **cost savings** ranging from **25% to 45%!**

AND

is an Engineered Solution which provides many Technical Benefits
| 1. Reduction in Pipe Diameters |
| 2. Reduction of Down Pipes |
| 3. Reduction of Manholes |
| 4. Elimination of Excavation |
| 5. Ability to Choose Discharge Point |
| 6. Less Pipework |
| 7. Fewer Drains |

**Traditional Gravity System**
1600 feet of Pipe Diameters 6” to 18”

**Siphonic Drainage**
Only 1000 feet of Pipe Diameters 3” to 8”
Benefits of Siphonic Drainage
# Top Technical Benefits of Siphonic Roof Drainage

<table>
<thead>
<tr>
<th>Smaller Diameter pipe used: approximately half the size of gravity diameter pipe size</th>
<th>Horizontal pipes are installed without <strong>PITCH – Flat Level</strong></th>
</tr>
</thead>
</table>
| **Smaller Diameter** pipe =  
- Smaller Fittings  
- Smaller Couplings  
- Smaller Hangers | **Easy co-ordination** of services for BIM modeling due to pipe work running flat |
|  | Fewer pipes = **Reduced construction time and cost** |
Top Technical Benefits of Siphonic Roof Drainage

| Rainwater down pipes **routed to the Engineer’s Preferred Locations**  
- This frees up valuable building space | A significant **Reduction in Civil Drainage**  
(common range is from 20% to 60%) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Routing of rainwater down pipes to the perimeter of buildings <strong>Eliminates Below Grade Excavation Under the Building Floor</strong></td>
<td>Ability to route rainwater pipes to <strong>Retention Ponds or Detention Basins or Rainwater Harvesting</strong></td>
</tr>
</tbody>
</table>
Top Technical Benefits of Siphonic Roof Drainage

Pipes run full-bore with **self-scouring properties**

**Four Flow Patterns of Siphonic Drainage**

**Stage 1**
Light Rainfall - Wavy or Gravity flow
- Air above water
- Gravity flow in pipework

**Stage 2**
Plug flow
- Plug of water filling whole pipe at high velocities which achieves self-cleansing.
- Air pockets driven down pipework

**Stage 3**
Bubble flow
- Water filling whole pipe
- Air bubbles in suspension carried at high velocity

**Stage 4**
Full-bore flow
- No more air entry – Air within Pipe now Fully Purged
Top Technical Benefits of Siphonic Roof Drainage

VIDEO
Top Technical Benefits of Siphonic Roof Drainage

More efficient water discharge = Reduced ponding on the roof compared to traditional gravity drains creating **Safer Overall Roofs**

<table>
<thead>
<tr>
<th>3” Drain</th>
<th>4” Drain</th>
<th>5” Drain</th>
<th>6” Drain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponding</td>
<td>Gravity</td>
<td>HydroMax</td>
<td>Ponding</td>
</tr>
<tr>
<td>1”</td>
<td>25 GPM</td>
<td>75 GPM</td>
<td>1”</td>
</tr>
<tr>
<td>2”</td>
<td>87 GPM</td>
<td>310 GPM</td>
<td>2”</td>
</tr>
<tr>
<td>3”</td>
<td>214 GPM</td>
<td></td>
<td>3”</td>
</tr>
<tr>
<td>4”</td>
<td>225 GPM</td>
<td></td>
<td>4”</td>
</tr>
<tr>
<td>5”</td>
<td>231 GPM</td>
<td></td>
<td>5”</td>
</tr>
<tr>
<td>6”</td>
<td>247 GPM</td>
<td></td>
<td>6”</td>
</tr>
</tbody>
</table>

Flow Rates of Gravity drains compared to Siphonic drains = **less drains/roof penetrations needed**

IPC 2015 Code Compliance

MIFAB HydroMax™ siphonic roof drains have performance graphs from testing to siphonic roof drains standard ASME A112.6.9

**MIFAB Data**
Example of Technical Benefits of Siphonic Roof Drainage

Original Gravity Design
1,100,000 sq. ft Warehouse
13,600 ft of trenching and 12” civils drainage
18,000 ft of 12” pipework

62 x Internal drains have vertical drops then 225ft run outs to perimeter below grade
Example of Technical Benefits of Siphonic Roof Drainage

**MIFAB HydroMax™ Design**

- Completely Flat Pipe at High level taken to perimeter
- Zero trenching and civils drainage
- Smaller diameters and only 13,000ft pipework

32 x 4 drains systems run flat at high level with vertical drops at the perimeter –SAVING 13,600 ft of trenching and civils drainage under floor
Codes Governing Siphonic Drainage
USA Siphonic Standards
Siphonic Drainage is an Engineered System
Submitted through Chapter One

Roof Drain Product & Performance Standard
ASME/ANSI A112.6.9 Siphonic Roof Drain Standard
(published in 2005)

System Design/Installation/Performance Standard
ASPE/ANSI Technical Standard #45 2013
(first issued published in 2007 revised in 2013)

IPC 2015
(Simply seeks compliance with ASPE 45 and ASME A112.6.9)
USA Siphonic Standards – ASPE 45

ASPE Technical Standard #45
Published in 2007 and reviewed 2012.
(HydroMax’s™ Bill Ross on committee)

In October 2013, having gained American National Standards Institute approval this revision was published as

ASPE/ANSI 45-2013: Siphonic Roof Drainage

*ASPE/ANSI 45-2018 currently in review stage*
Gravity Roof Drain Standard is ASME A112.6.4 Issue #1

This standard **does not** include a performance test to provide the published roof drain flow rates.

Any flow graphs provided by a manufacturer is not provided through testing to an accepted test method written into a published standard – No Standard to test to.

**Potential Options:**

- No Piping
- Straight Piping Arrangement
- Modified Piping Arrangement
Change to Roof Sizing Methods

IPC 2015

Seeks use of published roof drain flow rate ponding graphs

Why the call for published roof drain flow rates?
Change to Roof Sizing Methods: WHY?

Storm Drainage System Research Project

FLOW RATE THROUGH ROOF DRAINS
Issues with Traditional Gravity Drain Sizing Methods
ASPE Research Foundation Recommendation

Sizing Method Recommendation

Based on the results of the testing, the plumbing engineering profession must establish a new and proper method for sizing storm drainage systems. The new sizing method must be based on the capacity of the roof drain, the maximum amount of ponding under various storm conditions at the roof drain, and the maximum capacity of the piping system.

The archaic method of using roof area needs to be abandoned. The roof area method does not address the pitch and roughness of the roof, resulting in ponding at the roof drain. The method also does not consider the flow rate through the roof drain.

The ASME A112.6.4 standard regulates the design and construction of roof drains. An important part of this standard should include the performance of the roof drain. This would include the flow rate through the roof drain at various ponding heights.
Gravity Roof Drain Standard is ASME A112.6.4

Issue #2

Gravity Roof Drains can’t handle the GPM flow rates being required through traditional sizing methods
Traditional Gravity Roof Drain Sizing Method
Rain Fall Rate x Sq Ft = Roof Drain Diameter Needed

<table>
<thead>
<tr>
<th>SIZE OF HORIZONTAL PIPING (inches)</th>
<th>HORIZONTALLY PROJECTED ROOF AREA (square feet)</th>
<th>Rainfall rate (inches per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td>1,096</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>2,506</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>4,453</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>7,133</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>15,330</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>27,600</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>44,400</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>72,800</td>
</tr>
<tr>
<td>1 1/4 unit vertical in 12 units horizontal (1-percent slope)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1,644</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>3,760</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>6,680</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>10,700</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>23,000</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>41,400</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>66,600</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>109,000</td>
</tr>
<tr>
<td>1 1/4 unit vertical in 12 units horizontal (2-percent slope)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>2,320</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>5,300</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>9,440</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>15,100</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>32,600</td>
</tr>
</tbody>
</table>

10,066 sq. ft. at 3” per hour rainfall = 314 GPM
Effectively, the table says a 6” leader at ¼” per foot can take 314 GPM
BUT CAN IT TAKE 314GPM??
Calculation for GPM Given Rainfall Rate x Sq Ft Feeding Dr

Run-Off From Catchment Area

\[ q_i = \frac{1}{43200} \times I_d \times A_i \]

\[ q_i = \text{Volume in Cubic feet per second} \]
(multiply by 448.83 to convert to Gallons per Minute)

\[ I_d = \text{Design rainfall in inches per hour as per code} \]

\[ A_i = \text{Tributary Catchment Area running to the drain} \]
The roof area x rainfall rate equates to a GPM flow
(Use Mifab HydroMax™ GPM calculation spreadsheet)

GPM Calculator

Insert Rainfall Rate Below

| Inches per Hour Rainfall | 3.0 |

<table>
<thead>
<tr>
<th>ROOF AREA #</th>
<th>SQ. FEET</th>
<th>Q</th>
<th>GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>10066</td>
<td>0.70</td>
<td>314</td>
</tr>
<tr>
<td>A2</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>A3</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

10,066 sq. ft. at 3” per hour rainfall = 314 GPM
Effectively, the table says a 6” leader at ¼” per foot can take 314 GPM
BUT CAN IT TAKE 314 GPM??
Gravity 6” Drain at Ponding Depth = 2” can only Discharge 185 GPM

Even at 6” ponding this 6” Gravity drain can only Discharge 218 GPM

Effectively you would need 2 x 6” Gravity drains to obtain 314 GPM = the target flow
"The archaic method of using roof areas needs to be abandoned... method does not consider flow rate through the roof drain"

**Sizing Method Recommendation**

Based on the results of the testing, the plumbing engineering profession must establish a new and proper method for sizing storm drainage systems. The new sizing method must be based on the capacity of the roof drain, the maximum amount of ponding under various storm conditions at the roof drain, and the maximum capacity of the piping system.

The archaic method of using roof area needs to be abandoned. The roof area method does not address the pitch and roughness of the roof, resulting in ponding at the roof drain. The method also does not consider the flow rate through the roof drain.

The ASME A112.6.4 standard regulates the design and construction of roof drains. An important part of this standard should include the performance of the roof drain. This would include the flow rate through the roof drain at various ponding heights.
ASPE Research Foundation Recommendation
Gravity Drain
“A112.6.4 ... should include the performance of the roof drain”
“A112.6.4 needs to add a test for flow rate”

Sizing Method Recommendation
Based on the results of the testing, the plumbing engineering profession must establish a new and proper method for sizing storm drainage systems. The new sizing method must be based on the capacity of the roof drain, the maximum amount of ponding under various storm conditions at the roof drain, and the maximum capacity of the piping system.

The archaic method of using roof area needs to be abandoned. The roof area method does not address the pitch and roughness of the roof, resulting in ponding at the roof drain. The method also does not consider the flow rate through the roof drain.

The ASME A112.6.4 standard regulates the design and construction of roof drains. An important part of this standard should include the performance of the roof drain. This would include the flow rate through the roof drain at various ponding heights.

ASME A112.6.4 needs to add a test for flow rate through a roof drain. The testing for flow rate should utilize the test setup developed by ASPE RF. This test setup has proven to be an accurate method of testing the flow rate through roof drains.
10” Gravity Drain
(taken from an American Drain Manufacture's web-site)

Gravity 10” Drain @ Depth = 7.0” to Discharge 1200 GPM
5” Siphonic Roof Drain
(Tested to ASME A112.6.9)

Half the diameter drain
(10” to 5”)

Half the ponding depth
of the Gravity drain
(7” to 3.45”)

Equivalent Flow
(1200 GPM)

Siphonic 5” Drain @ Depth = 3.45” to Discharge 1200 GPM

©HydroMax Inc.
**MIFAB Data
Gravity Drain Compared to Siphonic Drain

Weight of Water on the Roof in pounds
(assuming flat roof)

38,660 sq. ft. Roof Area
Water 62.43lb = 1 cu. ft.

7” Ponding - 22,422 cu. ft. – 1,399,760 lbs. (GRAVITY)

Only 3.45” Ponding - 11,211 cu. ft. – 699,880 lbs. (Siphonic)

699,880 lbs. SAVED
Using a Siphonic Drain

A 10” gravity roof drain drains 20,000sq ft
the same rate a 5” Siphonic drains 40,000sq ft
Gravity Roof Drain Standard ASME A112.6.4

Issue #3

Different Gravity Roof Drain models of the same diameter have significant variance in GPM flow

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Model No.</th>
<th>Description</th>
<th>Type of Strainer</th>
<th>Flow Rate (qpm) Based on Head Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>A-3</td>
<td>4” cast iron drain</td>
<td>cast iron dome</td>
<td>48 129 166 177 184 191</td>
</tr>
<tr>
<td>8</td>
<td>B-3</td>
<td>4” cast iron drain</td>
<td>cast iron dome</td>
<td>72 198 275 240 304 348</td>
</tr>
<tr>
<td>12</td>
<td>C-3</td>
<td>4” cast iron drain</td>
<td>poly dome</td>
<td>38 197 292 323 350 383</td>
</tr>
<tr>
<td>17</td>
<td>D-3</td>
<td>4” cast iron drain</td>
<td>aluminum dome</td>
<td>58 140 215 226 305 355</td>
</tr>
<tr>
<td>20</td>
<td>E-2</td>
<td>4” PVC drain</td>
<td>poly dome</td>
<td>58 113 166 210 270 302</td>
</tr>
<tr>
<td>21</td>
<td>E-3</td>
<td>4” PVC drain</td>
<td>aluminum dome</td>
<td>26 90 189 230 242 257</td>
</tr>
<tr>
<td>23</td>
<td>E-5</td>
<td>4” cast iron drain</td>
<td>poly dome</td>
<td>17 76 162 180 215 296</td>
</tr>
<tr>
<td>25</td>
<td>E-7</td>
<td>4” cast iron drain</td>
<td>cast iron dome</td>
<td>72 180 253 225 295 360</td>
</tr>
<tr>
<td>28</td>
<td>F-2</td>
<td>4” cast iron drain</td>
<td>cast iron dome</td>
<td>83 155 240 306 334 367</td>
</tr>
<tr>
<td>32</td>
<td>F-6</td>
<td>4” cast iron drain</td>
<td>cast iron dome</td>
<td>43 150 130 190 229 248</td>
</tr>
<tr>
<td>37</td>
<td>G-3</td>
<td>4” PVC drain</td>
<td>ABS dome</td>
<td>16 118 247 265 289 314</td>
</tr>
<tr>
<td>41</td>
<td>H-3</td>
<td>4” cast iron drain</td>
<td>cast iron dome</td>
<td>16 102 245 239 281 300</td>
</tr>
<tr>
<td>46</td>
<td>I-3</td>
<td>4” PVC drain</td>
<td>poly dome</td>
<td>12 93 147 233 292 340</td>
</tr>
<tr>
<td>49</td>
<td>J-3</td>
<td>4” cast iron drain</td>
<td>cast iron dome</td>
<td>17 78 179 172 255 301</td>
</tr>
<tr>
<td>54</td>
<td>J-8</td>
<td>4” cast iron drain</td>
<td>brass dome</td>
<td>67 130 210 217 299 271</td>
</tr>
<tr>
<td>59</td>
<td>J-14</td>
<td>4” cast iron drain</td>
<td>brass dome</td>
<td>95 138 180 215 251 298</td>
</tr>
</tbody>
</table>
Private Test conducted at University of Minnesota

Siphonic 5” Drain ONLY 3.46”

**MIFAB Data**
Gravity Roof Drain Standard is ASME A112.6.4

This **does not** include a performance test to provide the published roof drain flow rates.

Any flow graphs provided by a manufacturer is not provided through testing to an accepted test method written into a published standard – No Standard to test to.

So how do you as Engineers obtain Code compliance?

Specify Siphonic roof drains using ponding graphs obtained through testing to ASME A112.6.9 siphonic roof drains test standard to gain compliance.
Siphonic Roof Drainage Tested to ASME A112.6.9

**MIFAB Data**
Ideal Applications for Siphonic Drainage
Siphonic Examples

Level, Small Diameter, Pipes Makes for Easy Co-ordination with structure and services
Siphonic Examples

Pipework Installed
Absolutely Flat Level
Runs to Corner of Building

Target Distribution Center, CA
Siphonic Examples

Collector Pipe at High Level
Siphonic Examples

Pipework Installed Absolutely Flat Level at High level
- Warehouses
- Distribution Centers
- Box Stores/Malls
- Parking Decks
- Podium/Promenade Decks

- Office Buildings
- Hotels
- Hospitals
- Airports/Rail Stations
Suitable Projects for Siphonic Drainage

Retail Chains
Suitable Projects for Siphonic Drainage

Racecourse

Ricoh Arena, UK

Stadium of Light, Sunderland AFC, UK

Stadium and Arena
Suitable Projects for Siphonic Drainage
Retail Shopping Malls with Multi-Level Car Parks
Suitable Projects for Siphonic Drainage

Commercial Office Buildings

E-Tek Flagship

Accident Fund, Lansing
Suitable Projects for Siphonic Drainage

Student/University Dorms
Suitable Projects for Siphonic Drainage

Disney Springs Orlando, FL
Mixed Use Restaurants & Retail
Suitable Projects for Siphonic Drainage

Disney Springs Orlando, FL
Mixed Use Restaurants & Retail
Suitable Projects for Siphonic Drainage

Hotels/Prisons

Ibis Hotel

Johnstone County Detention Center
Suitable Projects for Siphonic Drainage

Hospitals

Forest Park Medical Center, Dallas

Mercy Hospital, Des Moines, IA
Suitable Projects for Siphonic Drainage
Schools and Universities

Naperville High School, IL
Suitable Projects for Siphonic Drainage

Lincoln Apartments
Tinner Hill,
Fall Park VA
Podium Decks

Marina Heights,
Tempe AZ

with Trench Drain
Suitable Projects for Siphonic Drainage

Green Roofs

Wal-Mart Chatham, IL
Suitable Projects for Siphonic Drainage

Airports

Newcastle International

Phoenix Sky Harbor T3
Suitable Projects for Siphonic Drainage

Manufacturing Plants/Warehousing

John Deere, Milan, IL

Target Distribution Center, Shafter, CA
Suitable Projects for Siphonic Drainage

Flagship Projects

Scottish Parliament
Suitable Projects for Siphonic Drainage

Special Projects

Pipe systems include multiple pipe materials within single RWP’s using PVC, Cast Iron and Copper Piping for Architectural detailing

Embry Riddle Aeronautical University Students Union, FL
Determine Piping Material

Design Choices Include a Variety of Non-Proprietary Piping Systems

- Schedule 40 PVC (must be Solid Wall – No Foam Core)
- No-Hub Cast Iron
- Roll Groove Galvanized Steel
- Roll Groove Copper
Design Process

Please provide an ISO riser drawing of the piping design including:

• Sketch up path of your preferred routing to optimize benefits using Mifab HydroMax® routing flat

• Show the routing from each roof drain to the discharge

• **Provide all the distances (ft, in) of the piping (diameters not needed)**
  • Both vertical and horizontal dimensions needed

• Provide GPM's per drain OR Define the catchment area (sq. ft.) each roof drain is collecting

• If surcharging, the height between the center of siphonic horizontal line at discharge to the manhole grate cover
Prepare Simple Isometric Schematic Drawing
Calculate Gallons per Minute to each Siphonic Roof Drain

**MIFAB provides a ready-to-use spreadsheet**

Simply input Code rainfall rate, roof area reference and roof area.

<table>
<thead>
<tr>
<th>ROOF AREA #</th>
<th>SQ. FEET</th>
<th>Q</th>
<th>GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>5400</td>
<td>0.50</td>
<td>224.415</td>
</tr>
<tr>
<td>A2</td>
<td>5400</td>
<td>0.50</td>
<td>224.415</td>
</tr>
<tr>
<td>A3</td>
<td>5400</td>
<td>0.50</td>
<td>224.415</td>
</tr>
<tr>
<td>A4</td>
<td>0</td>
<td>0.00</td>
<td>0.000</td>
</tr>
<tr>
<td>A5</td>
<td>0</td>
<td>0.00</td>
<td>0.000</td>
</tr>
</tbody>
</table>
Step 9B.

Enter Pipe Routing into hydraulic calculation program

Select the roof drain model drain based on whether it’s a Primary or Overflow system and enter the GPM inflow
The Engineer can then optimise the design for cost and performance benefits.

A Green “PASS” means the solution is in **FULL accordance with ASPE/ANSI 45:2013**

**With MIFAB HydroTechnic Program**
Design Software Supplied By
MIFAB, Inc
1321 West 119th Street
Chicago, IL 60643-5109
USA
Ken Tan
1-800-465-2736
1-773-341-3049
sales@mifab.com

Hydraulic Calculation Summary

<table>
<thead>
<tr>
<th>Current Out of Balance</th>
<th>1,478 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Pressure</td>
<td>23.471 ft</td>
</tr>
<tr>
<td>Maximum Pressure</td>
<td>0.785 ft</td>
</tr>
<tr>
<td>Minimum Velocity</td>
<td>5,655 ft/sec</td>
</tr>
<tr>
<td>Maximum Velocity</td>
<td>21,455 ft/sec</td>
</tr>
<tr>
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Tail Pressures

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Material Parameters

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MIFAB HydroTechnic™ was independently tested by CRM (IAPMO accredited test laboratory) who confirm FULL compliance with ASPE/ANSI 45:2013
Rules for Siphonic Drainage System
Primary and Overflow Systems are both still required

Primary

Overflow
Roof at different Levels

Roofs at different elevations may be affected by wind driven rain.

There is a risk that Roofs A and C will be affected by wind driven rain.

This vertical surface run-off will contribute more flow to roof A and provide less flow to Roof C.

Where roofs at different elevations may be affected by wind driven rain........

The Design should incorporate separate piping systems to each roof.
Termination Details (Siphon Break)

**Manhole or Catch Pit**
- Grate Cover
- Free area for the Grate Cover should be twice the cross-sectional area of the siphonic pipe.

**HYDROMAX® Siphonic Downpipe**
- **Length** = 10 x Siphonic Dia.

**Flare out discharge pipework**
- 10 x siphonic pipe diameter in length from manhole
- Sized for open channel gravity flow (Expect at least 2 step-ups in diameter.)

**Siphonic Break in Vertical**
- Ventilated to Atmosphere
- Break to Gravity Flow
- Recommended vent size being two-thirds gravity pipe size (2/3 air to 1/3 water in the gravity flow)
Bracket Supports and Bracing

Mifab-HydroMax™ recommendation

Code ASPE45 9.3.4: If the distance from the top of a suspended pipe to the point of connection of the hanger rod is greater than 0.46 m (18 in.), lateral restraints shall be installed every 9.0 m (30 ft) at each branch take-off and at each change in direction.

Typical Pipe Hangers, Clamps, and Supports

Rules to Follow:
1. Sway Bracing every 30ft
2. Pipe Bracing needed 1 ft away from every change of direction (i.e. WYE branch has 3 braces)
3. Pipe Support in Horizontal:
   - For PVC every 4ft
   - For Cast Iron every 10ft
4. Pipe Bracing in Vertical every 10ft
Siphonic action may stop here

A 90° bend creates turbulence forcing the vertical tailpipe to prime and create suction early on in the rainfall event.
Piping Details

Knuckle Bends not permitted, must use Long 90’s; Bends can be 45°;

No Clean Outs; No Crosses

Only 45° WYE’s; no double branches permitted
Piping Details

It is essential that all pipe lengths, bends, branches and roof drains are installed **EXACTLY** as they are drawn and calculated within the HydroTechnic™ program.

From ASPE 45 Tolerances are permitted as follows:-

- **Piping 4” and smaller:** Install within +/- 4.0” of the designed length.
- **Piping larger than 4”:** Install within +/- 8.0” of the designed length.

**ALL** components to be installed **MUST** be included in the calculation.

If **ANY CHANGE** to the design is required onsite, the Engineer of Record must be informed to recalculate the system (Our inside team is there for quick help).
OVER 8,000 Siphonic Roof Drain Systems
SUCCESSFULLY designed by HydroMax™

100% SUCCESS RATE
ZERO System Design Failures

TRIED - TESTED - PROVEN
Why MIFAB HydroMax™ Siphonic Roof Drainage?

1. HydroMax™ drain is IAPMO listed (not all manufacturers are)
2. HydroMax™ is the only manufacturer with their design software independently tested – confirms a “PASS” is 100% in compliance with ASPE 45 Standards
3. More projects completed in the US than any other manufacturer
4. Design Assist Team in Chicago which helps free of charge
5. Bill Ross, Director of HydroMax™, is on the ASPE 45 committee responsible for making the standards governing Siphonic roof drainage – in depth/up-to-date understanding of codes
6. Brennan Doherty and Bill Ross are published - helped write section on Siphonic Drainage in the new ASPE Volume 2
7. Pre-Install Call with Contractor before PO can ship – lets them know:
   1. This is an engineered system which needs to be installed exactly as designed
   2. Gives them a direct contact if changes are needed
   3. Way for contractor to ask any questions they may have on Siphonic drainage as it’s not something they can go on google to fact find on
8. Drains have lowest K values on in the market (friction loss factor)
Ryan Moore
Regional Manager Southeast

rmoore@Mifab.com

872-222-0274